City of Warrenton City Commission
Agenda
City Hall, 225 S. Main Warrenton, OR 97146
Tuesday, February 11, 2025

*****The meeting will be broadcast via Zoom at the following link*****
https://us02web.zoom.us/j/5332386326?pwd=VHNVVXU5blkxbDZ2YmxISWpha0dhUT09#success
Meeting ID: 533 238 6326 | **Passcode:** 12345 | **Dial-in Number**: 253-215-8782

Public Comment: To provide public comment, participants should register prior to the meeting. All remarks will be addressed to the whole City Commission and limited to 3 minutes per person. The Commission reserves the right to delay any action, if required, until such time as they are fully informed on a matter. Once your public comment is submitted it becomes part of permanent public record.

You may provide public comment using the following methods:

1. In-person: Complete a public comment card and submit to the City Recorder prior to the start of the meeting.
2. Via Zoom: Register with the City Recorder, at cityrecorder@warrentonoregon.us no later than 3pm the day of the meeting. Please ensure that your zoom name matches the name registered to comment.
3. Written comments: Submit via e-mail to the City Recorder, at cityrecorder@warrentonoregon.us, no later than 3:00 p.m. the day of the meeting.

City Commission Regular Meeting 6:00 PM

1. **Call to order**
2. **Pledge of Allegiance**
3. **Consent Calendar**
   A. City Commission Meeting Minutes 01.28.25
   B. Finance Department Monthly Report – November 2024
   C. Finance Department Monthly Report – December 2024
   D. Marina Advisory Committee Meeting Minutes – 12.16.24
   E. Harbormaster Report – January 2025
4. **Commissioner Reports**
5. **Public Comment**
6. **Public Hearings**
   A. Continuation - Consideration of Comprehensive Plan & Municipal Code Amendment; Exception for Flowlane Dredge Material
   B. Consideration of VFW Deed – Former Hammond Library Building
7. **Business Items**
   A. Presentation – Interior Drainage Analysis
   B. Safe Routes to School Phase 2 – Project Update
   C. Consideration of Hammond Transmission Waterline - Amendment #3

Warrenton City Hall is accessible to the disabled. An interpreter for the hearing impaired may be requested under the terms of ORS 192.630 by contacting Dawne Shaw, City Recorder, at 503-861-0823 at least 48 hours in advance of the meeting so appropriate assistance can be provided.

D. Consideration of RV Parking Ordinance Amendment; Ordinance No. 1290 – Second Reading/Adoption

8. Discussion Items

A. Annual Moorage Rates

B. Hammond Dredge Permitting

9. Good of the Order

10. Executive Session

11. Adjournment

Warrenton City Hall is accessible to the disabled. An interpreter for the hearing impaired may be requested under the terms of ORS 192.630 by contacting Dawne Shaw, City Recorder, at 503-861-0823 at least 48 hours in advance of the meeting so appropriate assistance can be provided.

City of Warrenton City Commission Minutes

City Hall, 225 S. Main Warrenton, OR 97146

Tuesday, January 28, 2025

1. City Commission meeting called to order at 6:01 pm.

2. Pledge of Allegiance

Commission Members	Present	Excused
Gerald Poe	X	
Jessica Sollaccio	X	
Tom Dyer	X	
Paul Mitchell	X	
Henry Balensifer, Mayor	X	

Staff Members Present	
City Manager Esther Moberg	Interim Planning Director Scott Fregonese
Deputy City Recorder Hanna Bentley	Police Officer Ethan Bullock
Police Chief Mathew Workman	Code enforcement Office Christian Salians
Interim Public Works Director Dale McDowell	Police Office Aaron Berndt

3. Badge Pinning and Oath of Office – Officer Ethan Bullock

Police Chief Mathew Workman introduced police officer Ethan Bullock. Chief Workman gave a brief overview of the history of the police badge. Mayor Balensifer conducted the oath of office, swearing in Police Officer Ethan Bullock.

Mayor Balensifer requested to add an item 4.E to the consent calendar; approval to add city logo to a flyer created by Clatsop County regarding transit lodging tax and addressing the impact of tourism on public safety.

4. Consent Calendar

*Items on the Consent Calendar have previously been discussed and/or are considered routine. Approval of the Consent Calendar requires a motion, a second, and no discussion, unless requested by a member of the City Commission.

A. City Commission Meeting Minutes 1.14.25
B. Police Department Monthly Report – November 2024
C. Police Department Monthly Report – December 2024
D. Warrenton Police Department Statistics Review – 2024
E. Approval to add City Logo to Clatsop County Flyer Addressing the Impact of Tourism on Public Safety

Motion:	Move to approve the consent calendar as amended.				
Moved:	Mitchell				
Seconded:	Poe	**Aye**	**Nay**	**Abstain**	**Recused**
Vote:	Poe	X			
	Sollaccio	X			
	Dyer	X			

	Mitchell	X			
	Balensifer	X			
Passed:	5/0				

5. Commissioner Reports

Commissioner Mitchell thanked Commissioner Sollaccio for attending the Clatsop Economic Development Resources (CEDR) meeting he was supposed to attend.

Commission Sollaccio provided a summary of the CEDR and Clatsop County Housing Task Force meetings she attended.

Commissioner Poe provided a summary of the Columbia River Estuary Study Taskforce (CREST) meeting he attended.

City Manager Esther Moberg noted a fire truck went out of service today and that there was a pause on federal grant funding and that a federal judge has already ruled against it. There was brief discussion on the Safe Routes to School project.

Mayor Balensifer noted he will be meeting with state legislature to discuss the Wastewater Treatment Plant and that he attended the community forum for the Warrenton School District.

6. Public Comment

Mike Larson spoke regarding parking on Russell Drive and noted his concerns.

7. Public Hearings

A. Comprehensive Plan & Municipal Code Amendment; Exception for Flowlane Dredge Material
Mayor Balensifer opened the Public Hearing on the Exception for Flowlane Dredge Material. Formalities followed. No conflicts of interest or ex parte contacts were reported. Interim City Planner Scott Fregonese discussed his staff report. The applicant Bill Ryan from the Department of State Lands provided a brief overview of the application. There was brief questions and answers between the commission and the applicant. Mayor Balenisfer requested the Army Corps of Engineers attend the second hearing; Mr. Ryan stated he would request their attendance. The Commission noted their concerns with dredge material affecting the Hammond Marina. Meg Reed from Department of Land Conservation and Development (DLCD) provided an overview of the application. Mayor Balensifer asked for public comments. There were no comments in favor, opposition or neutral. There being no further comments, Mayor Balensifer closed the public testimony section of the hearing.

Motion:	Move to continue the public hearing until such time as the Corps can answer the questions related to the effects to the local jurisdiction.				
Moved:	Mitchell				
Seconded:	Poe	**Aye**	**Nay**	**Abstain**	**Recused**
Vote:	Poe	X			
	Sollaccio	X			
	Dyer	X			
	Mitchell	X			
	Balensifer	X			
Passed:	5/0				

B. Rezone and Site Design Review:

Mayor Balenisfer noted there was an issue with the City Code not being in compliance with State ORS. Mr. Fregonese request to hold the hearing at a later date to allow proper notice to be given to neighboring properties. William Caplinger spoke for the applicant and noted that he forwarded an email to the applicant about the hearing being moved. There was unanimous consent to postpone the hearing.

8. Business Items

A. Consideration of Public Nuisance Declaration:

Code Enforcement Officer Christian Salians presented his staff report, provided updated photographs to the commission and also noted the current condition of the property. There was brief discussion on individuals living in the buildings. Property owner Marie Medjo discussed the history of the property and noted she does not currently live at the property but will be moving back this week. There was brief discussion between the commission and property owner.

Motion:	Move to declare the property a nuisance and to issue a 30 day time table for review and if substantial improvements have not been made to begin to impose penalties.				
Moved:	Poe				
Seconded:	Dyer	**Aye**	**Nay**	**Abstain**	**Recused**
Vote:	Poe	X			
	Sollaccio	X			
	Dyer	X			
	Mitchell	X			
	Balensifer	X			
Passed:	5/0				

B. Consideration of Various Code Amendments:

Police Chief Mathew Workman presented Ordinance No. 1289 and noted the amendments made from the last meeting. It is presented for its second reading and adoption.

Motion:	Move to conduct the second reading by title only of Ordinance No. 1289 as amended.				
Moved:	Dyer				
Seconded:	Poe	**Aye**	**Nay**	**Abstain**	**Recused**
Vote:	Poe	X			
	Sollaccio	X			
	Dyer	X			
	Mitchell	X			
	Balensifer	X			
Passed:	5/0				

Mayor Balensifer conducted the second reading by title only of Ordinance No. 1289; an Ordinance amending chapter 10.04 "traffic regulations" chapter 12.04 "concessions in Warrenton City Park" and chapter 12.08 "City Park Hours" of the Warrenton municipal code.

Motion:	Move to adopt Ordinance No. 1289.
Moved:	Dyer

Seconded:	Poe	**Aye**	**Nay**	**Abstain**	**Recused**
Vote:	Poe	X			
	Sollaccio	X			
	Dyer	X			
	Mitchell	X			
	Balensifer	X			
Passed:	5/0				

C. Consideration of Ordinance No. 1288; Fourth and Fifth Avenue Street Vacation:

Mr. Fregonese presented his staff report on the Fourth and Fifth Avenue Street Vacation.

Motion:	Move to conduct the second reading, by title only, of Ordinance No. 1288, an ordinance to vacate Fourth and Fifth Avenue in the City of Warrenton, Oregon.				
Moved:	Dyer				
Seconded:	Poe	**Aye**	**Nay**	**Abstain**	**Recused**
Vote:	Poe	X			
	Sollaccio	X			
	Dyer	X			
	Mitchell	X			
	Balensifer	X			
Passed:	5/0				

Mayor Balensifer conducted the second reading by title only of Ordinance No. 1288, an ordinance to vacate Fourth and Fifth Avenue in the City of Warrenton, Oregon.

Motion:	Move to adopt Ordinance No. 1288.				
Moved:	Poe				
Seconded:	Dyer	**Aye**	**Nay**	**Abstain**	**Recused**
Vote:	Poe	X			
	Sollaccio	X			
	Dyer	X			
	Mitchell	X			
	Balensifer	X			
Passed:	5/0				

D. Consideration of Ordinance No. 1287; Third Avenue Street Legalization:

There was no discussion.

Motion:	Move to conduct the second reading, by title only, of Ordinance No. 1287.				
Moved:	Sollaccio				
Seconded:	Poe	**Aye**	**Nay**	**Abstain**	**Recused**
Vote:	Poe	X			
	Sollaccio	X			
	Dyer	X			
	Mitchell	X			
	Balensifer	X			
Passed:	5/0				

Mayor Balensifer conducted the second reading by title only of Ordinance No. 1287, an ordinance to legalize a portion of Third Avenue in the City of Warrenton, Oregon.

Motion:	Move to adopt Ordinance No. 1287.				
Moved:	Sollaccio				
Seconded:	Dyer	**Aye**	**Nay**	**Abstain**	**Recused**
Vote:	Poe	X			
	Sollaccio	X			
	Dyer	X			
	Mitchell	X			
	Balensifer	X			
Passed:	5/0				

E. Consideration of Seafarers Park Bank Stabilization – RFQ:

Interim Public Works Director Dale McDowell presented his staff report. It was noted that the project is budgeted for $350,000 and that the project is expected to have a phase in the next budget year as well.

Motion:	Move to approve the release of an informal procurement to solicit qualified consultants for the Seafarers Park Bank Stabilization Project.				
Moved:	Mitchell				
Seconded:	Dyer	**Aye**	**Nay**	**Abstain**	**Recused**
Vote:	Poe	X			
	Sollaccio	X			
	Dyer	X			
	Mitchell	X			
	Balensifer	X			
Passed:	5/0				

F. Consideration of Iredale Culvert Replacement Project Contract:

Mr. McDowell provided an overview of the contract. The contract covers plans, construction administration, and observation.

Motion:	Move to approve a professional services contract with North Coast Civil Design, LLC to complete the Iredale Culvert Replacement Project – Phase 2.				
Moved:	Dyer				
Seconded:	Sollaccio	**Aye**	**Nay**	**Abstain**	**Recused**
Vote:	Poe	X			
	Sollaccio	X			
	Dyer	X			
	Mitchell	X			
	Balensifer	X			
Passed:	5/0				

G. Consideration of RV Parking Ordinance Amendment:

Chief Workman stated after previous discussion and suggestions by the Commission, he has completed amendments to the City Code regarding RV parking. There was brief discussion on the code interpretation of Camp Host. There was consensus to amend Ordinance 1290 section 10.16.030A subparagraph 5 to state that individuals providing site security or monitoring of any property in an Open Space Institutional zone as per WMC 16.52.

Motion:	Move to amend to Ordinance 1290 as stated.				
Moved:	Poe				
Seconded:	Dyer	**Aye**	**Nay**	**Abstain**	**Recused**
Vote:	Poe	X			
	Sollaccio	X			
	Dyer	X			
	Mitchell	X			
	Balensifer	X			
Passed:	5/0				

Motion:	Move to conduct the first reading, by title only, of Ordinance No. 1290				
Moved:	Dyer				
Seconded:	Sollaccio	**Aye**	**Nay**	**Abstain**	**Recused**
Vote:	Poe	X			
	Sollaccio	X			
	Dyer	X			
	Mitchell	X			
	Balensifer	X			
Passed:	5/0				

Mayor Balensifer conducted the first reading by title only of Ordinance No. 1290, amending chapter 10.16 "recreational vehicle parking" of the Warrenton Municipal Code.

H. Consideration of Noise Variance Request – AT&T Building :

Ms. Moberg discussed a request for a noise variance for repair work at the AT&T building. She noted the building was damaged by a vehicle.

Motion:	Move to approve the noise variance for repair work at AT&T.				
Moved:	Mitchell				
Seconded:	Dyer	**Aye**	**Nay**	**Abstain**	**Recused**
Vote:	Poe	X			
	Sollaccio	X			
	Dyer	X			
	Mitchell	X			
	Balensifer	X			
Passed:	5/0				

I. Consideration of Lower Columbia Youth Soccer Association (LCYSA) Lease Agreement:

Ms. Moberg presented a new lease for LCYSA for the soccer fields. Andrew Schauerman from LCYSA noted that LCYSA would like the city to continue to pay the garbage fee of $500 a year. Ms. Moberg noted that the lease is for 15 years and is at a rate of one dollar a year. There was brief discussion on whether or not LYCA should pay for trash. There was consensus to make the utilities subject to an annual review.

Motion:	Move to amend the lease to enable no garbage cost the first year then an annual review of the utility costs.				
Moved:	Mitchell				
Seconded:	Dyer	**Aye**	**Nay**	**Abstain**	**Recused**
Vote:	Poe	X			
	Sollaccio	X			
	Dyer	X			
	Mitchell	X			
	Balensifer	X			
Passed:	5/0				

Motion:	Move to approve the new lease agreement with Lower Columbia Youth Soccer Association.				
Moved:	Mitchell				
Seconded:	Poe	**Aye**	**Nay**	**Abstain**	**Recused**
Vote:	Poe	X			
	Sollaccio	X			
	Dyer	X			
	Mitchell	X			
	Balensifer	X			
Passed:	5/0				

9. Discussion Items

10. Good of the Order

Commissioner Poe noted that at the last meeting it was stated that he had a good idea about the city leases and that it wasn't just him but the commission and City Manager as a team.

11. Executive Session

12. Adjournment

There being no further business, Mayor Balensifer adjourned the meeting at 7:57 pm.

Approved:

Attest:

Henry A. Balensifer III, Mayor

Dawne Shaw, CMC, City Recorder

CITY OF WARRENTON

3.B

FINANCE DEPARTMENT

Volume 18, Issue 5 | Monthly Finance Report November 2024 | February 11, 2025

Economic Indicators

	Current	1 year ago
♦ Interest Rates:		
LGIP :	4.99%	5.00%
Prime Rate:	7.75%	8.50%
♦ CPI-U change:	2.7%	3.1%
♦ Unemployment Rates:		
Clatsop County:	4.1%	3.8%
Oregon:	4.0%	4.0%
U.S.:	4.2%	3.7%

Department Statistics

♦ Utility Bills mailed	3,167
♦ New Service Connections	2
♦ Reminder Letters	434
♦ Door Hangers	111
♦ Water Service Discontinued	14
♦ Counter payments	405
♦ Mail payments	833
♦ Auto Pay Customers/pmts	628
♦ Online (Web) payments	1,581
♦ Checks issued	344

Current and Pending Projects

- ♦ Audit Report for FYE 6/30/24
- ♦ DEQ Landfill Financial Assurance
- ♦ Budget Preparation
- ♦ CIP Preparation

Financial Narrative as of November 30, 2024

Note: Revenues and expenses should track at 5/12 or 41.7% of the budget.

General Fund: Year to date revenues amount to $3,165,820, which is 55.63% of the budget, compared to the prior year amount of $3,034,730, which was 43.2% of the budget and are up by $131,090. Increases are shown in current year property tax, transient room tax, franchise fees, planning fees, police charges, fire charges, lease receipts, food pod receipts and proceeds from sale of assets, and are offset by decreases in state revenue sharing, municipal court, park charges, miscellaneous, interest and donations.

Expenses year to date amount to $2,495,262, which is 37.11% of the budget, compared to the prior year amount of $2,659,838, which was 39.54% of the budget. All departments are tracking under budget with exception to Admin/Commission/Finance due to one time payments at the beginning of the fiscal year and Fire which is at 43.98%.

WBL: Business license revenue amounts to $82,254, compared to $84,410 at this time last year, a decrease of $2,156. Year to date licenses issued is 718 compared to 712 at this time last year.

Building Department: Permit revenues this month amount to $5,934 and $110,126 year to date, which is 62.01% of the budgeted amount. Last year to date permit revenue was $63,244.

State Tax Street: State gas taxes received this month amount to $42,847 fuel sold in October and $168,475 year to date. City fuels taxes received this month amount to $32,003 for fuel sold in September and are $105,134 year to date. Total gas taxes received year to date are $273,609 compared to $269,133 at this time last year.

Warrenton Marina: Total revenues to date are $636,788, 87.3% of the budgeted amount, compared to the prior year amount of $622,798, which was 83.26% of the budgeted amount. There is $73,908 in moorage receivables outstanding.

Hammond Marina: Total revenues to date are $425,839, 92.8% of the budgeted amount, compared to the prior year amount of $419,166, which was 100% of the budgeted amount. There is $4,487 in moorage receivables outstanding.

Of the total outstanding receivables:

$9,607 (12.25%) is current,

$8,450 (10.78%) is 30-60 days past due,

$5450 (6.95%) is 60-90 days past due and

$54,887 (70%) is over 90 days past due.

Water Fund: Utility fees charged this month are $191,961 and $104,869, and $1,364,383 and $1,109,098 year to date for in-city and out-city respectively and totals $2,473,481 and is 56.6% of the budget. Last year at this time, year to date fees were $1,285,368 and $871,277, for in-city and out-city, respectively and totaled $2,156,645.

Sewer Fund: Utility fees charged this month are $261,649 and $1,351,432 year to date, which is 43.7% of the budget. Last year at this time, year to date fees were $1,134,984. Shoreline Sanitary fees year to date are $64,110. Total revenues year to date are $1,415,542 compared to $1,570,974 at this time last year.

Page 5 shows the same revenue history for the sewer revenue as previously mentioned for water.

Storm Sewer: Utility fees (20% of sewer fees) this month are $52,306 and $270,146 year to date and is 43.8% of the budget. Last year to date revenues were $255,298 which was 46.6% of the budget.

Sanitation Fund: Service fees charged this month for garbage and recycling were $94,029 and $21,748, and $481,222 and $108,450, year to date, and are 43% and 45.5% of the budget respectively.

Financial data as of November, 2024

	General Fund			
	Current Month	Year to Date	Budget	% of Budget
Beginning Fund Balance	2,301,216	2,602,003	1,850,000	140.65
Plus: Revenues	1,350,496	3,165,820	5,690,803	55.63
Less: Expenditures				
Municipal Court	13,468	78,622	212,822	36.94
Admin/Comm/Fin(ACF)	85,791	845,120	1,596,972	52.92
Planning	23,508	114,072	444,512	25.66
Police	161,514	837,356	2,678,362	31.26
Fire	79,735	542,383	1,233,234	43.98
Parks	15,135	77,709	286,839	27.09
Transfers	-	-	270,778	-
Total Expenditures	379,151	2,495,262	6,723,519	37.11
Ending Fund Balance	3,272,561	3,272,561	817,284	400.42

(see details of revenue, page 4)

	WBL				Building Department			
	Current Month	Year to Date	Budget	% of Budget	Current Month	Year to Date	Budget	% of Budget
Beginning Fund Balance	194,635	150,786	130,000	115.99	498,291	483,082	460,000	105.02
Plus: Revenues	1,023	86,330	65,800	131.20	8,195	127,328	206,480	61.67
Less: Expenditures	8,465	49,925	77,038	64.81	18,596	122,520	481,132	25.46
Ending Fund Balance	187,192	187,192	118,762	157.62	487,890	487,890	185,348	263.23

	State Tax Street				Warrenton Marina			
	Current Month	Year to Date	Budget	% of Budget	Current Month	Year to Date	Budget	% of Budget
Beginning Fund Balance	2,977,573	3,241,761	3,300,000	98.24	821,242	451,107	410,000	110.03
Plus: Revenues	86,491	338,307	4,350,625	7.78	19,081	636,789	729,364	87.31
Less: Expenditures	141,102	657,106	5,215,225	12.60	44,967	292,540	892,096	32.79
Ending Fund Balance	2,922,963	2,922,963	2,435,400	120.02	795,356	795,356	247,268	321.66

Financial data as of November 2024, continued

	Hammond Marina				Water Fund			
	Current Month	Year to Date	Budget	% of Budget	Current Month	Year to Date	Budget	% of Budget
Beginning Fund Balance	547,857	322,296	275,000	117.20	3,693,573	2,101,761	2,000,000	105.09
Plus: Revenues	20,676	425,839	459,022	92.77	353,417	2,757,818	7,381,792	37.36
Less: Expenditures	41,014	220,616	563,469	39.15	201,746	1,014,333	7,703,880	13.17
Ending Fund Balance	527,519	527,519	170,553	309.30	3,845,245	3,845,245	1,677,912	229.17

	Sewer Fund				Storm Sewer			
	Current Month	Year to Date	Budget	% of Budget	Current Month	Year to Date	Budget	% of Budget
Beginning Fund Balance	3,991,393	3,355,550	3,100,000	108.24	1,900,190	1,837,304	1,515,000	121.27
Plus: Revenues	520,607	1,861,462	3,430,625	54.26	60,136	312,577	1,737,264	17.99
Less: Expenditures	175,084	880,096	4,990,921	17.63	16,903	206,458	2,283,391	9.04
Ending Fund Balance	4,336,916	4,336,916	1,539,704	281.67	1,943,422	1,943,422	968,873	200.59

	Sanitation Fund				Community Center			
	Current Month	Year to Date	Budget	% of Budget	Current Month	Year to Date	Budget	% of Budget
Beginning Fund Balance	609,074	593,041	560,000	105.90	78,604	62,718	60,000	104.53
Plus: Revenues	119,758	610,843	1,388,710	43.99	3,005	28,530	26,800	106.45
Less: Expenditures	64,404	539,456	1,432,337	37.66	1,750	11,389	66,716	17.07
Ending Fund Balance	664,428	664,428	516,373	128.67	79,859	79,859	20,084	397.63

	Library				Warrenton Urban Renewal Agency Capital Projects Fund			
	Current Month	Year to Date	Budget	% of Budget	Current Month	Year to Date	Budget	% of Budget
Beginning Fund Balance	164,816	229,299	220,000	104.23	6,578	6,487	6,400	101.36
Plus: Revenues	217,809	262,064	283,879	92.32	6,935	701,888	1,800,000	38.99
Less: Expenditures	22,725	131,462	333,445	39.43	6,914	701,775	1,806,400	38.85
Ending Fund Balance	359,901	359,901	170,434	211.17	6,600	6,600	-	-

Financial data as of November 2024, continued

($) Cash Balances as of November 30, 2024					
General Fund	3,676,968	Warrenton Marina	731,842	Storm Sewer	1,916,952
WBL	186,947	Hammond Marina	543,052	Sanitation Fund	540,743
Building Department	491,873	Water Fund	3,876,974	Community Center	81,494
State Tax Street	2,892,154	Sewer Fund	4,077,805	Library	359,014

Warrenton Urban Renewal Agency

Capital Projects	32,189
Debt Service	1,427,406

General Fund Revenues	Collection Frequency	2024-2025 Budget	Actual as a % of Current Budget	Collections/Accruals Year to date November 2024	Collections/Accruals Year to date November 2023	(over) under budget
Property taxes-current	AP	1,428,999	86.08	1,230,132	1,215,375	198,867
Property taxes-prior	AP	30,000	73.17	21,951	21,758	8,049
County land sales	A	-	0.00		-	-
Franchise fees	MAQ	695,225	34.99	243,269	211,465	451,956
COW - franchise fees	M	354,629	45.05	159,762	151,707	194,867
Transient room tax	Q	650,000	50.93	331,016	319,446	318,984
Liquor licenses	A	625	0.00		-	625
State revenue sharing	MQ	223,378	17.91	40,006	55,007	183,372
Municipal court	M	94,200	29.53	27,820	31,813	66,380
Planning Fees	I	103,000	38.33	39,477	20,329	63,523
Police charges	I	24,000	70.51	16,922	7,806	7,078
Fire charges	SM, I	119,018	19.16	22,803	8,863	96,215
Park charges	I	-	0.00	535	585	-
Housing rehab loan payments	I	-	0.00		-	-
Miscellaneous	I	5,000	146.51	7,325	12,171	(2,325)
Interest	M	90,000	53.59	48,233	49,562	41,767
Lease receipts	M	272,758	41.18	112,335	95,062	160,423
Food pod receipts	M	-	0.00	14,400	12,845	(14,400)
Proceeds from sale of assets	I	-	0.00	4,714	3,761	(4,714)
Donations	I	-	0.00		871	-
Grants	I	-	0.00		-	-
Sub-total		**4,090,832**	56.73	**2,320,700**	**2,218,426**	**1,770,132**
Transfers from other funds	I	3,000	0.00	-	166,670	3,000
Overhead	M	1,596,971	52.92	845,120	649,634	751,851
Total revenues		**5,690,803**	55.63	**3,165,820**	**3,034,730**	**2,524,983**

M - monthly
Q - quarterly
SM - Semi-annual in January then monthly
AP - As paid by taxpayer beginning in November
MAQ - Century Link, NW Nat & Charter-quarterly, all others monthly
S - semi-annual
I - intermittently
MQ - Monthly, cigarette and liquor and Quarterly, revenue sharing
A - annual

Note: Budget columns do not include contingencies as a separate line item but are included in the ending fund balance. Unless the Commission authorizes the use of contingency, these amounts should roll over to the following year beginning fund balance. For budget details, please refer to the City of Warrenton Adopted Budget for fiscal year ending June 30, 2025. Budget amounts reflect budget adjustments approved by the Commission during the fiscal year. Information and data presented in this report is unaudited.

CITY OF WARRENTON

FINANCE DEPARTMENT

Volume 18, Issue 6 | Monthly Finance Report December 2024 | February 11, 2025

Economic Indicators

	Current	1 year ago
♦ Interest Rates:		
LGIP :	4.85%	5.00%
Prime Rate:	7.50%	8.50%
♦ CPI-U change:	2.9%	3.4%
♦ Unemployment Rates:		
Clatsop County:	4.1%	3.8%
Oregon:	4.1%	4.0%
U.S.:	4.1%	3.8%

Department Statistics

♦ Utility Bills mailed	3,160
♦ New Service Connections	0
♦ Reminder Letters	386
♦ Door Hangers	98
♦ Water Service Discontinued	14
♦ Counter payments	383
♦ Mail payments	902
♦ Auto Pay Customers/pmts	635
♦ Online (Web) payments	1,588
♦ Checks issued	337

Current and Pending Projects

- 2025-2026 Capital Improvement Program (Work session April 7, 2025)
- 2025-2026 Budget Preparation (Budget Committee Meeting May 17th, 2025)
- Finalizing City and WURA Audit
- SAIF Audit

Financial Narrative as of December 31, 2024

Note: Revenues and expenses should track at 6/12 or 50% of the budget.

General Fund: Year to date revenues amount to $3,409,081, which is 59.9% of the budget, compared to the prior year amount of $3,424,467, which was 54.4% of the budget and are down by $15,385. Increases are shown in property tax, franchise fees, city franchise fees, transient room tax, planning fees, police charges, fire charges, leases, food post receipts and proceeds from sale of assets and are offset by decreases in, state revenue sharing, municipal court, park charges, miscellaneous, interest, donations and transfers from other funds.

Expenses year to date amount to $3,343,155, which is 49.72% of the budget, compared to the prior year amount of $2,343,346, which was 46% of the budget. All departments are tracking at or under budget except for Admin/Comm/Finance due to timing of quarterly insurance payment as well as the Fire Department.

WBL: Business license revenue amounts to $82,933, compared to $85,487 at this time last year, a difference of $2,554. Year to date licenses issued is 725 compared to 717 at this time last year.

Building Department: Permit revenues this month amount to $26,487 and $136,613 year to date, which is 76.92% of the budgeted amount. Last year to date permit revenue was $64,888, 24.21% of the budget.

State Tax Street: State gas taxes received this month amount to $45,489 for fuel sold in November and $213,964 year to date. City fuels taxes received this month amount to $27,951 for fuel sold in October and are $133,085 year to date. Total gas taxes received year to date are $347,049 compared to $346,152 at this time last year.

Warrenton Marina: Total revenues to date are $659,924, 90.5% of the budgeted amount, compared to the prior year amount of $659,085, which was 88.1% of the budgeted amount. There is $63,039 in moorage receivables outstanding.

Hammond Marina: Total revenues to date are $439,470, 95.7% of the budgeted amount, compared to the prior year amount of $431,450, which was 102.9% of the budgeted amount. There is $4,209 in moorage receivables outstanding.

Of the total outstanding receivables:

$14,048 (20.9%) is current,

$4,004 (6.0%) is 30-60 days past due,

$2,814 (4.1%) is 60-90 days past due and

$46,382 (69%) is over 90 days past due.

Water Fund: Utility fees charged this month are $194,247 and $101,274, and $1,558,630 and $1,210,372 year to date for in-city and out-city respectively and totals $2,769,002 and is 63.3% of the budget. Last year at this time, year to date fees were $1,455,124 and $961,515, for in-city and out-city, respectively and totaled $2,416,639.

Sewer Fund: Utility fees charged this month are $264,316 and $1,615,748 year to date, which is 52.2% of the budget. Last year at this time, year to date fees were $1,516,260. Shoreline Sanitary fees year to date are $76,932. Total revenues year to date are $1,860,088 compared to $1,860,088 at this time last year.

Storm Sewer: Utility fees (20% of sewer fees) this month are $52,839 and $322,986 year to date and is 52.3% of the budget. Last year to date revenues were $303,130 which was 55.3% of the budget.

Sanitation Fund: Service fees charged this month for garbage and recycling were $93,851 and $21,765, and $575,073 and $130,215, year to date, and are 51.3% and 54.6% of the budget respectively.

Community Center Fund: Rental revenue year to date is $63,743 and is 318.7% of the budget. Last year to date revenue was $27,448, which was 137.2% of the budget. The annual Breakfast with Santa event brought in $3,328 for the Center. The increase in revenue is due to a long term renter that has been renting weekly for three days per week and has prepaid for all of 2025.

Financial data as of December 31, 2024

	General Fund			
	Current Month	Year to Date	Budget	% of Budget
Beginning Fund Balance	3,272,561	2,602,003	1,850,000	140.65
Plus: Revenues	243,261	3,409,081	5,690,803	59.91
Less: Expenditures				
Municipal Court	10,740	89,362	212,822	41.99
Admin/Comm/Fin(ACF)	84,720	929,840	1,596,972	58.23
Planning	24,821	138,892	444,512	31.25
Police	282,631	1,119,987	2,678,362	41.82
Fire	159,743	702,126	1,233,234	56.93
Parks	14,461	92,170	286,839	32.13
Transfers	270,778	270,778	270,778	100.00
Total Expenditures	847,893	3,343,155	6,723,519	49.72
Ending Fund Balance	2,667,929	2,667,929	817,284	326.44

(see details of revenue, page 4)

	WBL				Building Department			
	Current Month	Year to Date	Budget	% of Budget	Current Month	Year to Date	Budget	% of Budget
Beginning Fund Balance	187,192	150,786	130,000	115.99	487,890	483,082	460,000	105.02
Plus: Revenues	1,498	87,828	65,800	133.48	28,857	156,185	206,480	75.64
Less: Expenditures	4,186	54,110	77,038	70.24	16,527	139,047	481,132	28.90
Ending Fund Balance	184,504	184,504	118,762	155.36	500,220	500,220	185,348	269.88

	State Tax Street				Warrenton Marina			
	Current Month	Year to Date	Budget	% of Budget	Current Month	Year to Date	Budget	% of Budget
Beginning Fund Balance	2,922,963	3,241,761	3,300,000	98.24	795,356	451,107	410,000	110.03
Plus: Revenues	84,954	423,262	4,350,625	9.73	23,135	659,924	729,364	90.48
Less: Expenditures	48,213	705,319	5,215,225	13.52	38,108	330,648	892,096	37.06
Ending Fund Balance	2,959,704	2,959,704	2,435,400	121.53	780,383	780,383	247,268	315.60

Financial data as of December 31, 2024, continued

	Hammond Marina				Water Fund			
	Current Month	Year to Date	Budget	% of Budget	Current Month	Year to Date	Budget	% of Budget
Beginning Fund Balance	527,519	322,296	275,000	117.20	3,845,245	2,101,761	2,000,000	105.09
Plus: Revenues	13,631	439,470	459,022	95.74	344,907	3,102,725	7,381,792	42.03
Less: Expenditures	20,358	240,974	563,469	42.77	530,952	1,545,286	7,703,880	20.06
Ending Fund Balance	520,792	520,792	170,553	305.36	3,659,200	3,659,200	1,677,912	218.08

	Sewer Fund				Storm Sewer			
	Current Month	Year to Date	Budget	% of Budget	Current Month	Year to Date	Budget	% of Budget
Beginning Fund Balance	4,336,916	3,355,550	3,100,000	108.24	1,943,422	1,837,304	1,515,000	121.27
Plus: Revenues	323,189	2,184,651	3,430,625	63.68	60,599	373,175	1,737,264	21.48
Less: Expenditures	206,132	1,086,228	4,990,921	21.76	18,249	224,707	2,283,391	9.84
Ending Fund Balance	4,453,973	4,453,973	1,539,704	289.27	1,985,772	1,985,772	968,873	204.96

	Sanitation Fund				Community Center			
	Current Month	Year to Date	Budget	% of Budget	Current Month	Year to Date	Budget	% of Budget
Beginning Fund Balance	664,428	593,041	560,000	105.90	79,859	62,718	60,000	104.53
Plus: Revenues	119,506	730,350	1,388,710	52.59	41,794	70,324	26,800	262.40
Less: Expenditures	186,643	726,100	1,432,337	50.69	38,329	49,718	66,716	74.52
Ending Fund Balance	597,291	597,291	516,373	115.67	83,325	83,325	20,084	414.88

	Library				Warrenton Urban Renewal Agency Capital Projects Fund			
	Current Month	Year to Date	Budget	% of Budget	Current Month	Year to Date	Budget	% of Budget
Beginning Fund Balance	359,901	229,299	220,000	104.23	6,600	6,487	6,400	101.36
Plus: Revenues	380	262,443	283,879	92.45	48,640	750,528	1,800,000	41.70
Less: Expenditures	23,448	154,909	333,445	46.46	48,618	750,393	1,806,400	41.54
Ending Fund Balance	336,833	336,833	170,434	197.63	6,622	6,622	-	-

Financial data as of December 31 2024, continued

($) Cash Balances as of December 31, 2024					
General Fund	3,073,139	Warrenton Marina	723,025	Storm Sewer	1,959,929
WBL	184,258	Hammond Marina	521,968	Sanitation Fund	544,019
Building Department	507,840	Water Fund	3,722,781	Community Center	85,665
State Tax Street	3,077,490	Sewer Fund	4,208,181	Library	345,966

Warrenton Urban Renewal Agency

Capital Projects	20,462
Debt Service	1,927,863

General Fund Revenues	Collection Frequency	2024-2025 Budget	Actual as a % of Current Budget	Collections/Accruals Year to date December 2024	Collections/Accruals Year to date December 2023	(over) under budget
Property taxes-current	AP	1,428,999	88.11	1,259,147	1,230,905	169,852
Property taxes-prior	AP	30,000	48.51	14,554	22,230	15,446
County land sales	A	-	0.00			-
Franchise fees	MAQ	695,225	42.55	295,821	255,485	399,404
COW - franchise fees	M	354,629	52.82	187,300	176,685	167,329
Transient room tax	Q	650,000	50.95	331,169	319,446	318,831
Liquor licenses	A	625	0.00		-	625
State revenue sharing	MQ	223,378	20.80	46,470	66,158	176,908
Municipal court	M	94,200	31.61	29,776	37,201	64,424
Planning Fees	I	103,000	41.20	42,432	21,604	60,568
Police charges	I	24,000	75.45	18,108	10,606	5,892
Fire charges	SM, I	119,018	19.41	23,105	8,963	95,913
Park charges	I	-	0.00	535	585	-
Housing rehab loan payments	I	-	0.00		-	-
Miscellaneous	I	5,000	154.31	7,716	12,966	(2,716)
Interest	M	90,000	69.39	62,455	65,037	27,545
Lease receipts	M	272,758	49.91	136,138	115,864	136,620
Food pod receipts	M	-	0.00	16,800	15,545	(16,800)
Proceeds from sale of assets	I	-	0.00	4,714	3,761	(4,714)
Donations	I	-	0.00		871	-
Grants	I	-	0.00			-
Sub-total		**4,090,832**	60.53	**2,476,241**	**2,363,912**	**1,614,591**
Transfers from other funds	I	3,000	0.00	3,000	183,499	-
Overhead	M	1,596,971	58.23	929,840	877,056	667,131
Total revenues		**5,690,803**	59.91	**3,409,081**	**3,424,467**	**2,281,722**

M - monthly
Q - quarterly
SM - Semi-annual in January then monthly
AP - As paid by taxpayer beginning in November
MAQ - Century Link, NW Nat & Charter-quarterly, all others monthly
S - semi-annual
I - intermittently
MQ - Monthly, cigarette and liquor and Quarterly, revenue sharing
A - annual

Note: Budget columns do not include contingencies as a separate line item but are included in the ending fund balance. Unless the Commission authorizes the use of contingency, these amounts should roll over to the following year beginning fund balance. For budget details, please refer to the City of Warrenton Adopted Budget for fiscal year ending June 30, 2025. Budget amounts reflect budget adjustments approved by the Commission during the fiscal year. Information and data presented in this report is unaudited.

City of Warrenton Marina Advisory Committee
Minutes
City Hall, 225 S. Main Warrenton, OR 97146
Monday, December 16, 2024

1. **Marina Advisory Committee meeting called to order at 2 p.m.**

Members	Present	Excused
William Kerr, Vice Chair	X	
Jennifer Fowler	X	
Dick Hellberg		
Mike Balensifer	X	
Lylla Gaebel, Chair	X	
Larry Ausman – 2025 Member	X	

Staff Members Present	
Jessica McDonald	Harbor Master
Shara Ford	Marina office Assistant

2. **Public Comment**
   A. None

3. **Consent Calendar**
   A. Meeting Minutes from 11.18.24 were presented by staff.

Motion:	Move to approve the consent calendar as presented.				
Moved:	Mike Balensifer				
Seconded:	Jen Fowler	**Aye**	**Nay**	**Abstain**	**Recused**
Vote:	Kerr	X			
	Fowler	X			
	Hellberg				
	Balensifer	X			
	Gaebel	X			
Passed:	5/0				

4. **Reports**
   i. Jessica McDonald presented her Year in Review, Harbormaster Report, YTD Revenues Report, Update on Goals and Priorities. Jessica talked about the Warrenton Marina redesign. There will be a meeting in March 2025 with the commission.

5. **Business Items**
   A. Officer Elections for 2025 were held, the committee was unable to have a majority vote on chair elections and will revisit the chair position in January.

Motion:	I nominate Bill Kerr as Chair – Bill Refused Nomination				
Moved:	Mike Balensifer				
Seconded:	Jen Fowler	**Aye**	**Nay**	**Abstain**	**Recused**
Vote:	Kerr				
	Fowler				
	Hellberg				
	Balensifer				
	Gaebel				
Passed:					

Motion:	I nominate Lylla Gaebel as chair				
Moved:	Bill Kerr				
Seconded:	Lylla was the only one to second, committee unsure if she was able to second her own nomination.	**Aye**	**Nay**	**Abstain**	**Recused**
Vote:	Kerr				
	Fowler				
	Hellberg				
	Balensifer				
	Gaebel				
Passed:					

Motion:	I nominate Bill Kerr as Vice Chair				
Moved:	Lylla Gaebel				
Seconded:	Jen Fowler	**Aye**	**Nay**	**Abstain**	**Recused**
Vote:	Kerr	X			
	Fowler	X			
	Hellberg – not present				
	Balensifer	X			
	Gaebel	X			
Passed:	4/1				

6. Discussion Items

A. The marina held two public events in 2024, which include The Crab Pot Christmas Tree Lighting and the Blessing of the Fleet, both attracted hundreds of people.

B. Committee discussed 2025 meeting schedule and set dates.

C. Chair Lylla Gaebel thanked Jen and Jessica for putting on the Crab Pot Christmas Tree event. Lyla mentioned next year the tree should be moved and Jessica agreed.

D. Jen Fowler mentioned she would like to have a "Welcome to Buoy 10" event in 2025. She would love to gather sponsors and vendors for this event. Jen also mentioned the public voted Hammond as the number one place to crab in Oregon.

E. Jessica shared FishHer is interested in helping with fundraising and grants for both marinas.

F. Chair Lyla mentioned Jen should oversee fundraising for the Hammond Marina. Jessica said it could be beneficial to meet with FishHer regarding fundraising and the opportunity to brainstorm.

7. **Adjournment**

There being no further business, Chair Gaebel adjourned the meeting at 3:06 p.m.

Approved:

~~Lylla Gaebel~~, Chair

Jennifer Fowler

~~Attest~~:

Shara Ford Marina Board Advisory Committee Secretary

WARRENTON & HAMMOND MARINAS

HARBORMASTER REPORT

JANUARY, 2025 // PREPARED BY JESSICA MCDONALD

WARRENTON & HAMMOND MARINAS

Harbormaster Report: January 2025

MONTH IN BRIEF

Introduction:

January was a productive start to 2025, with significant progress made on several key initiatives. We began reviewing and updating marina permits to ensure compliance with current regulations and to support upcoming improvement projects. Staffing needs were also a priority, as we explored options for hiring a marina maintainer and conducted a round of interviews. To support future projects, we initiated research into potential grant opportunities and began identifying suitable funding sources. Additionally, a review of current moorage rates compared to other regional marinas was conducted to help guide us if any rate changes are needed for 2025. Finally, reservations for Buoy 10 opened this month, generating significant interest. We are closely monitoring reservations to ensure a smooth experience for our customers and to maximize occupancy during this peak Buoy 10 season. Overall, January set a strong foundation for a successful year ahead at the marina.

Key Activities:

1. New Projects for 2025
    - OSMB Grant
    - Infrastructure Grant and E Dock Recommendations
    - Hammond Dredge Permit
    - Updating Resolution & Ordinances for FY 2025-2026

1. Projects in Progress
    - Pile Replacement Permitting in Warrenton and Hammond Marinas
    - M & N electrical repair
    - Warrenton and Hammond Marina redesign
    - Hammond Parking Lot Lighting
    - Warrenton Commercial Gates
    - Warrenton Pier Ladders
    - Dock repairs and rebuilds

WARRENTON & HAMMOND MARINAS

Harbormaster Report: January 2025

PROJECTS TO KICK OFF 2025

Grant Opportunities

The Oregon State Marine Board (OSMB) has been incredibly supportive of our efforts to improve the marinas. They have been assisting with permitting and engineering design for the replacement of the Hammond loading dock at the boat launch. All permitting is expected to be completed and submitted by early February. Additionally, we will be completing a grant application for their Cycle 1 funding, with the goal of securing the necessary funds to replace the loading dock. To help us secure this grant we are requesting letters of support from the community for this project.

E Dock Recommendations

E Dock is the most profitable dock in the Warrenton Marina, supporting 22 commercial businesses. However, it is in dire need of replacement. Staff is currently exploring funding options for this critical project, including a Department of Transportation grant for marina infrastructure. We would also like to seek recommendations from the Advisory Board on other potential funding opportunities.

Hammond Dredge Permitting

New requirements now mandate that new dredge permits be obtained every five years, and existing permits can no longer be renewed after 5 years. Additionally, new surveys must be conducted every 2–5 years, depending on the current regulations. The permitting process has changed significantly since we last obtained permits in 2018. Staff are actively exploring all permitting options and making plans to ensure we are prepared if budgeting allows and conditions are warranted to dredge during the 2026 in-water work window.

Updating Resolution

Our annual moorage billing increases by $1–$2 per foot each year to keep pace with inflation and rising marina costs. The current resolution governing these adjustments is set to expire, and with support from the Advisory Board we would like to continue this practice of implementing small annual increases to our annual moorage to ensure our rates remain competitive and aligned with operational needs. Based on our recent rate comparison we don't have any recommendations to increase any additional marina rates this year.

WARRENTON & HAMMOND MARINAS

Harbormaster Report: January 2025

PROJECTS IN PROGRESS

Pile Permitting

We've submitted permits to DSL, Army Corps of Engineers and DEQ and hopefully will have permits in place soon so we can begin planning for the critical pile replacement that is needed in both marinas.

M & N Electrical:

The project has been completed, customers have been notified to comply with new electrically requirements and have until January 1, 2025 to come into compliance or risk not having electrical service. Staff will be scheduling switch over shortly to new electrical.

Warrenton and Hammond Marina Redesign:

A joint session has been scheduled for March 11, 2025, to review the Warrenton and Hammond redesign plans and gather feedback from the Commission and Advisory Boards. If there are specific elements you would like to see included in the redesigns or topics you'd like to discuss at the meeting, please inform staff by February 21, 2025.

Hammond Parking Lot Lights

Pacific Power required a new meter for the lights service and we are awaiting final approvals to complete project.

Warrenton Commercial Dock Security Gates

Staff are currently exploring options for security gates at the two commercial docks in the Warrenton Marina. We aim to have bids secured very soon.

Warrenton Pier Ladders

Ladders have been ordered and are currently being fabricated. Marina Forman Don Beck will be overseeing the installation soon.

Dock Repairs and Rebuilds

We are still prepping sections in our maintenance shop throughout winter but will most likely not launch and install new sections until March 2025.

City Commission Agenda Memo

Meeting Date: February 11, 2025
From: Scott Fregonese, Interim Planning Director
Subject: Ordinance 1283, Goal Exception for Flowlane Dredge Material

Summary:

The United States Army Corps of Engineers (USACE) operates and maintains the Columbia River Federal Navigation Channels (CR FNCs), which includes dredging and dredged material placement to maintain congressionally-authorized channel dimensions. The 600-foot wide, 43-foot deep navigation channel generally follows the Oregon-Washington border and extends 142 miles from the Mouth of the Columbia River (RM3) to the Bonneville Dam (RM 145). Per information from the USACE, the Columbia-Snake River Navigation System moves over 50 million tons of cargo annually. The estimated value of that cargo is approximately $23 billion. The Lower Columbia River is used to annually transport and/or export commodities including wheat, soy, corn, grain, and forest and mineral bulk exports.

In 2023, the USACE applied to the Oregon Department of Environmental Quality (DEQ) to renew its existing Section 401 Water Quality Certification for the continued Operation and Maintenance (O&M) of the Columbia River FNC. This includes associated disposal of dredged materials in identified locations. As part of ongoing Columbia River management discussion with the USACE, the State had been aware of the Corps' ongoing maintenance included disposing of materials in the "flowlane".

Around 2010, the USACE altered its flowlane disposal practices, such that they were no longer consistent with flowlane definition contained in Clatsop County's or the City of Warrenton's policies. The intent of the changes, as stated by the USACE, was to adaptively manage sediments based on current river conditions and to keep sediments within the riverine sediment budget whenever feasible. To accomplish this goal, the USACE switched from disposing of dredged materials only on the flowlane, to a "thalweg"-based approach that utilizes both the flowlane and contours immediately adjacent to the flowlane that are 20-foot deep or deeper. It is estimated that the annual volume of dredged sediment that is typically placed within the expand flowlane/thalweg is approximately one million cubic yards per year. That estimate does not include future placement by non-USACE users such as the Port of Astoria and the U.S. Coast Guard.

Because the thalweg-based approach is based upon river hydrology and hydraulics, it does not remain in a fixed location. Conversely, the flowlane designated by Clatsop County is a static area. Therefore, USACE's change in practice resulted in a discrepancy between the City's comprehensive plan and the actual work being performed by the Corps.

In 2023, Clatsop County was notified by DEQ that USACE had submitted an application for a 401 Water Quality Certification for continued operations and maintenance in the Lower Columbia River. As part of that review, the state and County became aware that USACE's flowlane disposal practices had evolved and were no longer in compliance with flowlane regulations adopted by Clatsop County in 2005. As a result, County staff were unable to complete the required land use compatibility statement demonstrating consistency with the comprehensive plan and the County's land use regulations. Subsequently, DEQ was unable to approve the 401 Water Quality Certification. The denial led to a series of ongoing meetings between county, state and USACE staff, resulting in these applications. City of Warrenton staff were brought in to the conversation once a path of compliance was identified.

The purpose of this application is threefold:

1. to obtain a reasons-based exception from Goal 16 to allow this practice to continue and to be in compliance with the City of Warrenton's comprehensive plan and implementing ordinances,
2. allow dredged material to be placed in areas 20ft or deeper contiguous with the federal navigation channel and in waters deeper than 65' downstream of the Megler Bridge,
3. allow the expanded thalweg dredged material disposal area to be available for use by USACE as well as all other dredging users.

The Warrenton Development Code directs applicants requesting an Amendment to the Comprehensive Plan Text and Map, Rezone, and Development Code (16.232) to follow the Type IV Procedures outlined in Section 16.208.060. The application is being reviewed in accordance with those procedures. The application went before the Planning Commission on December 12, 2024, who moved to forward the applications to the City Commission for a decision.

The Interim Planning Director recommends approval of this application.

The action requested tonight is to either adopt or reject Ordinance 1283 for the approval of the changes to the Comprehensive Plan.

Recommendation/Suggested Motion:

"I move to conduct the first reading, by title only, of Ordinance number 1283, AN ORDINANCE APPROVING THE CHANGES TO THE WARRENTON COMPREHENSIVE PLAN AS DESCRIBED IN ORDINANCE NUMBER 1283 SUBJECT TO THE RECOMMENDED CONDITIONS OF APPROVAL."

Fiscal Impact:

N/A

Attachments:

(All supporting documentation, i.e., maps, exhibits, etc., must be attached to this memorandum.)

- Staff Report
- Ordinance No. 1283
- Exhibit 1

Approved by City Manager: ______________________________

Oregon
Tina Kotek, Governor

Department of State Lands
775 Summer Street NE, Suite 100
Salem, OR 97301-1279
(503) 986-5200
FAX (503) 378-4844
www.oregon.gov/dsl

February 4, 2025

TO: Warrenton City Commission

FROM: Oregon Department of State Lands

RE: Addressing concerns arising from January 28th City Commission meeting regarding the goal exception application for flowlane disposal of dredged material in the Columbia River

On the evening of January 28, 2025, the Oregon Department of State Lands answered questions from the City Commission regarding an application submitted by DSL for an exception to Goal 16: Estuarine Resources, to allow the disposal of dredged materials in water areas designated Conservation Aquatic. The following information is provided to address those concerns raised.

Effects of the proposed action on sedimentation of the Hammond Boat Basin

The US Army Corps of Engineers would not place dredged material in areas that could contribute to sedimentation in the Hammond Boat Basin.

The map provided as Exhibit 1 represents the expanded thalweg area within which the Corps believes sufficient capacity exists to perform flowlane dredged material disposal (DMD). Of the approximately 23,000 acres represented by the proposed expanded thalweg area, the Corps estimates that 2,300 acres (10%) would be utilized for DMD each year.

Dredged material placement would continue to be consistent with Section 5.305 Dredging and Dredged Material Disposal 10. Flowlane disposal within this area shall only be allowed where: (a) sediments can reasonably be expected to be transported downstream without excessive shoaling.

Dredged sediment is placed within the river thalweg to not harm living resources, not adversely affect other uses of the river, sustain the thalweg, and not rapidly return to the Federal Navigation Channel. Success requires constant adaptation as the river continuously relocates the dredged sediment placed in-water each year. Placement areas are specified for each event based on an applied understanding of hydrodynamic and sediment transport processes informed by bathymetric depth surveys and river current velocity data from the Corps' Lower Columbia River adaptive hydraulics model. The placement location must be deep enough for the dredge or scow to safely access based on that vessel's draft below the water surface. Velocity data and bathymetric differencing and evaluation of bedforms can inform sediment movement after placement, to minimize movement into Federal Navigation Channel shoals and support movement into areas to counteract riverbed erosion.

Further, the Corps recently released a “Draft Integrated Material Management Plan and Environmental Impact Statement” (DMMP-EIS) for the purposes of maintaining the congressionally authorized channel dimensions of the Lower Columbia River Federal Navigation Channel. Appendix L of the DMMP-EIS evaluated potential effects to Public Infrastructure and Navigation Projects and confirms that the Hammond Boat Basin should not experience increased sedimentation because of Lower Columbia River Federal Navigation Channel operations and maintenance (O&M).
Effects of proposed action on flood-carrying capacity of the Columbia River:

The proposed flowlane placement in waters 20 feet or deeper is a relocation of shoal material dredged from the Federal Navigation Channel to discrete morphological features that are also located within the active river floodway. No new sediment will be imported to the river under the proposed action. Implementation of in-water dredged material features is not considered an encroachment on the river’s floodway and is not anticipated to increase flood risk because the total volume of dredged material in the floodway remains the same and conveyance capacity of the Lower Columbia River is not changed.

The Corps recently released a “Draft Integrated Material Management Plan and Environmental Impact Statement” (DMMP-EIS) for the purposes of maintaining the congressionally authorized channel dimensions of the Lower Columbia River Federal Navigation Channel. Based on the hydraulic evaluation described in Appendix C.2 of the DMMP-EIS, changes to existing patterns of erosion, deposition, and flooding would not be expected. Any effects associated with the proposed action would be temporary, localized, and minor with respect to the flood carrying capacity of the river. Thus, there would be no direct or indirect impacts on the bank full flood carrying capacity as a result of the proposed action relative to the current baseline conditions. Therefore, the flood-carrying capacity of the Lower Columbia River is not reduced.

Sincerely,

Bill Ryan
Deputy Director, Aquatic Resource Management
Oregon Department of State Lands

City of Warrenton

Planning Department

225 S Main Avenue ▪ P.O. Box 250 ▪ Warrenton. OR 97146

Phone: 503.861.0920 Fax: 503.861.2351

STAFF REPORT

TO: The Warrenton City Commission
FROM: Scott Fregonese, Interim Planning Director
DATE: January 21, 2025
SUBJ: Comprehensive Plan Amendment CP-24-2

BACKGROUND

The United States Army Corps of Engineers (USACE) operates and maintains the Columbia River Federal Navigation Channels (CR FNCs), which includes dredging and dredged material placement to maintain congressionally-authorized channel dimensions. The 600-foot wide, 43-foot deep navigation channel generally follows the Oregon-Washington border and extends 142 miles from the Mouth of the Columbia River (RM3) to the Bonneville Dam (RM 145). Per information from the USACE, the Columbia-Snake River Navigation System moves over 50 million tons of cargo annually. The estimated value of that cargo is approximately $23 billion. The Lower Columbia River is used to annually transport and/or export commodities including wheat, soy, corn, grain, and forest and mineral bulk exports.

In 2023, the USACE applied to the Oregon Department of Environmental Quality (DEQ) to renew its existing Section 401 Water Quality Certification for the continued Operation and Maintenance (O&M) of the Columbia River FNC. This includes associated disposal of dredged materials in identified locations. As part of ongoing Columbia River management discussion with the USACE, the State had been aware of the Corps' ongoing maintenance included disposing of materials in the "flowlane".

Around 2010, the USACE altered its flowlane disposal practices, such that they were no longer consistent with flowlane definition contained in Clatsop County's or the City of Warrenton's policies. The intent of the changes, as stated by the USACE, was to adaptively manage sediments based on current river conditions and to keep sediments within the riverine sediment budget whenever feasible. To accomplish this goal, the USACE switched from disposing of dredged materials only on the flowlane, to a "thalweg"-based approach that utilizes both the flowlane and contours immediately adjacent to the flowlane that are 20-foot deep or deeper. It is estimated that the annual volume of dredged sediment that is typically placed within the expand flowlane/thalweg is approximately one million cubic yards per year. That estimate does not include future placement by non-USACE users such as the Port of Astoria and the U.S. Coast Guard.

Because the thalweg-based approach is based upon river hydrology and hydraulics, it does not remain in a fixed location. Conversely, the flowlane designated by Clatsop County is a static area. Therefore, USACE's change in practice resulted in a discrepancy between the City's comprehensive plan and the actual work being performed by the Corps.

In 2023, Clatsop County was notified by DEQ that USACE had submitted an application for a 401 Water Quality Certification for continued operations and maintenance in the Lower Columbia River. As part of that review, the state and County became aware that USACE's flowlane disposal practices had evolved and were no longer in compliance with flowlane regulations adopted by Clatsop County in 2005. As a result, County staff were unable to complete the required land use compatibility statement demonstrating consistency with the comprehensive plan and the County's land use regulations. Subsequently, DEQ was unable to approve the 401 Water Quality Certification. The denial led to a series of ongoing meetings between county, state and USACE staff, resulting in these applications. City of Warrenton staff were brought in to the conversation once a path of compliance was identified.

The purpose of this application is threefold:

1. to obtain a reasons-based exception from Goal 16 to allow this practice to continue and to be in compliance with the City of Warrenton's comprehensive plan and implementing ordinances,
2. allow dredged material to be placed in areas 20ft or deeper contiguous with the federal navigation channel and in waters deeper than 65' downstream of the Megler Bridge, and
3. allow the expanded thalweg dredged material disposal area to be available for use by USACE as well as all other dredging users.

PUBLIC PROCESS, PROCEDURES & PUBLIC NOTICE

Notice was provided to DLCD on September 9, 2024. Public hearing notice was published in The Astorian on November 26, 2024. No public comment was received. The Planning Commission held a public hearing on the proposal on December 12, 2024. We published notice of the public hearing before the City Commission on January in the Astorian on January 18, 2025.

CODE PROVISIONS, APPLICANT RESPONSES, AND FINDINGS

Applicable Warrenton Municipal Code (WMC) chapters for this application include:

16.208 TYPES OF APPLICATIONS AND REVIEW PROCEDURES
16.232 AMENDMENTS TO COMPREHENSIVE PLAN TEXT AND MAP, REZONE, AND DEVELOPMENT CODE

Only the applicable standards are addressed below. Portions that do not apply have been omitted.

Chapter 16.208 TYPES OF APPLICATIONS AND REVIEW PROCEDURES
16.208.060 Type IV Procedure (Legislative and Map Amendments).

APPLICANT RESPONSE: None.
STAFF FINDING: The application was submitted with the required materials and the application fee was paid. **This criterion is met.**

Chapter 16.232 AMENDMENTS TO COMPREHENSIVE PLAN TEXT AND MAP, REZONE, AND DEVELOPMENT CODE
16.232.030 Quasi-Judicial Amendments.

B. Criteria for Quasi-Judicial Amendments. A recommendation or a decision to approve, approve with conditions or to deny an application for a quasi-judicial amendment shall be based on all of the following criteria:
   1. Demonstration of compliance with all applicable Comprehensive Plan policies and map designations. Where this criterion cannot be met, a Comprehensive Plan amendment shall be a pre-requisite to approval.

APPLICANT RESPONSE: See application narrative.
STAFF FINDING: The application for a goal exception is compliant with the applicable Warrenton Comprehensive Plan policies and map designations, save for those policies which are being excepted. **This criterion is met.**

   2. Demonstration of compliance with all applicable standards and criteria of this Code, and other applicable implementing ordinances.

APPLICANT RESPONSE: See application narrative.
STAFF FINDING: The application is compliant with the applicable standards of the Warrenton Municipal Code. **This criterion is met.**

   3. Evidence of change in the neighborhood, or community, or a mistake or inconsistency in the Comprehensive Plan or land use district map regarding the property which is the subject of the application; and the provisions of Section 16.232.060, as applicable.

APPLICANT RESPONSE: See application narrative.
STAFF FINDING: The applicant has shown a change in conditions in the Columbia River and has conducted numerous federal, state, and local consultations on the impact of this flowlane disposal. **This criterion is met.**

OREGON ADMINISTRATIVE RULES ON GOAL EXCEPTIONS

OAR 660-004-0000 Purpose

1. The purpose of this division is to interpret the requirements of Goal 2 and ORS 197.732 regarding exceptions. This division explains the three types of exceptions set forth in Goal 2 "Land Use Planning, Part II, Exceptions." Rules in other divisions of OAR 660 provide substantive standards for some specific types of goal exceptions. Where this is the case, the specific substantive standards in the other divisions control over the more

general standards of this division. However, the definitions, notice, and planning and zoning requirements of this division apply to all types of exceptions.

2. An exception is a decision to exclude certain land from the requirements of one or more applicable statewide goals in accordance with the process specified in Goal 2, Part II, Exceptions. The documentation for an exception must be set forth in a local government's comprehensive plan. Such documentation must support a conclusion that the standards for an exception have been met. The conclusion shall be based on findings of fact supported by substantial evidence in the record of the local proceeding and by a statement of reasons that explains why the proposed use not allowed by the applicable goal, or a use authorized by a statewide planning goal that cannot comply with the approval standards for that type of use, should be provided for. The exceptions process is not to be used to indicate that a jurisdiction disagrees with a goal.
3. The intent of the exceptions process is to permit necessary flexibility in the application of the Statewide Planning Goals. The procedural and substantive objectives of the exceptions process are to:
   a. Assure that citizens and governmental units have an opportunity to participate in resolving plan conflicts while the exception is being developed and reviewed; and
   b. Assure that findings of fact and a statement of reasons supported by substantial evidence justify an exception to a statewide goal.
4. When taking an exception, a local government may rely on information and documentation prepared by other groups or agencies for the purpose of the exception or for other purposes, as substantial evidence to support its findings of fact. Such information must be either included or properly incorporated by reference into the record of the local exceptions proceeding. Information included by reference must be made available to interested persons for their review prior to the last evidentiary hearing on the exception.

STAFF FINDING: The proposed exception is being processed as a "reasons" exception, consistent with Statewide Planning Goal 2, Part II, Exceptions, and with OAR 660-004-0018(4) and OAR 660-004- 0020 through 660-004-0022. The request has complied with all required and applicable notices and planning and zoning requirements of OAR 660-004. The documentation for this goal exception will be set forth in the City's comprehensive plan. This documentation will include findings of fact, based upon substantial evidence in the record and concluding that the standards for the exception have been met. As noted elsewhere in this report, the City has complied with all required public notifications to ensure that citizens and governmental units have been provided an opportunity to participate in the process. The findings in this report verify that the justification for a goal exception is supported by substantial evidence. All information and documentation prepared by other groups or agencies used as substantial evidence to support these findings of fact will be included or properly incorporated by reference into the record of these proceedings. All information included by reference in the record will be made available to interested persons for their review prior to the last evidentiary hearing on the exception. **The proposal satisfies and is consistent with the criteria listed in OAR 660-004-0000.**

<u>OAR 660-004-0015: Inclusion as Part of the Plan</u>

1. A local government approving a proposed exception shall adopt, as part of its comprehensive plan, findings of fact and a statement of reasons that demonstrate that the standards for an exception have been met. The reasons and facts shall be supported by substantial evidence that the standard has been met.
2. A local government denying a proposed exception shall adopt findings of fact and a statement of reasons that demonstrate that the standards for an exception have not been met. However, the findings need not be incorporated into the local comprehensive plan.

STAFF FINDING: Should the City Commission determine that the application meets the standards for an exception to Goal 16, staff would recommend that the Warrenton Comprehensive Plan be amended as shown in Ordinance 1283. The proposed amendments would clearly identify the sub-areas designated Conservation where this goal exception would apply. **This criterion will be met.**

<u>OAR 660-004-0018: Planning and Zoning for Exception Areas</u>

1. Purpose. This rule explains the requirements for adoption of plan and zone designations for exceptions. Exceptions to one goal or a portion of one goal do not relieve a jurisdiction from remaining goal requirements and do not authorize uses, densities, public facilities and services, or activities other than those recognized or justified by the applicable exception. Physically developed or irrevocably committed exceptions under OAR 660-004- 0025 and 660-004-0028 and 660-014-0030 are intended to recognize and allow continuation of existing types of development in the exception area. Adoption of plan and zoning provisions that would allow changes in existing types of uses, densities, or services requires the application of standards outlined in this rule.

4. “Reasons” Exceptions:
   a. When a local government takes an exception under the “Reasons” section of ORS 197- 732(1)(c) and OAR 660-004-0020 through 660-004-0022, OAR 660-014-0040, or OAR 660- 014-0090, plan and zone designations must limit the uses, density, public facilities and services, and activities to only those that are justified in the exception.
   b. When a local government changes the types of intensities of uses or public facilities and services within an area approved as a “Reasons” exception, a new “Reasons” exception is required.
   c. When a local government includes land within an unincorporated community for which an exception under the “Reasons” section of

ORS 197.732(1)(c) and OAR 660-004-0020 through 660-004-0022 was previously adopted, plan and zone designations must limit the uses, density, public facilities and services, and activities to only those that were justified in the exception or OAR 66-022-0030, whichever is more stringent.

STAFF FINDING: The requested goal exception would only apply to areas that are 20' in depth or greater and that are immediately adjacent to the flowlane. The exception would be limited to areas designated aquatic Conservation in the Warrenton Comprehensive Plan and would not apply to areas designated aquatic Natural. Conditions of approval would require dredged material disposal within the expanded flowlane/thalweg to comply with the requirements of Warrenton Development Code Chapter 16.164 Impact Assessment and Resource Capability Determination, with regard to procedure for approval. A further condition of approval would require the informational thalweg map to updated on a five-year schedule when updated by Clatsop County. Should the potential location of the thalweg change significantly during that time, a new exception would be required if the shifted location would not comply with the City's policies and standards. **All applicable requirements of OAR 660-004-0018 are met.**

<u>OAR 660-004-0020 Goal 2, Part II(c), Exception Requirements</u>

1. If a jurisdiction determines there are reasons consistent with OAR 660-004-0022 to use resource lands for uses not allowed by the applicable Goal or to allow public facilities or services not allowed by the applicable Goal, the justification shall be set forth in the comprehensive plan as an exception. As provided in OAR 660-004- 0000(1), rules in other divisions may also apply.
2. The four standards in Goal 2 Part II(c) required to be addressed when taking an exception to a goal are described in subsections (a) through (d) of this section, including general requirements applicable to each of the factors:
    a. "Reasons justify why the state policy embodied in the applicable goals should not apply." The exception shall set forth the facts and assumptions used as the basis for determining that a state policy embodied in a goal should not apply to specific properties or situations, including the amount of land for the use being planned and why the use requires a location on resource land.

STAFF FINDING: The Department of State Lands, in their application to Clatsop County, cite information provided by the U.S. Army Corps of Engineers as to why anexception to Goal 16 should be approved to allow in-water placement of dredged material within waters designated aquatic Conservation. These reasons include:

1. Maintaining the ability to re-introduce dredged sediment along the river's thalweg, thus sustaining the river's finite sediment budget and increasing the resilience of the Lower Columbia River Estuary morphology.

2. Reducing the seasonal dredging operations required to maintain the Federal Navigation Channel, as dredged material placed into the flowlane more quickly returns to the channel.

3. Reducing shoal encroachments in the Federal Navigation Channel between dredging seasons, which could result in draft restrictions on maritime commerce.

It is estimated that the proposed expanded flowlane/thalweg disposal areas would encompass approximately 23,000 acres within the estuary, from RM 3 to RM 44. It is estimated that 10% of that area, or 2,300 acres, would be used annually for the placement of dredged materials throughout the Columbia River Estuary. Maintaining the finite supply of riverine sediment cannot be accomplished by placement on upland sites or through ocean disposal. Additionally, there is insufficient capacity with the flowlane as currently designated to retain the sediment budget. Continued reduction of riverine sediment could result in riverbank erosion and deepening of the river thalweg, resulting in channel instability over time. **For these reasons, the requirements of OAR 660-004-0020(2)(a) have been met.**

b. "Areas that do not require a new exception cannot reasonably accommodate the use". The exception must meet the following requirements:
   - A. The exception shall indicate on a map or otherwise describe the location of possible alternative areas considered for the use that do not require a new exception. The area for which the exception is taken shall be identified;
   - B. To show why the particular site is justified, it is necessary to discuss why other areas that do not require a new exception cannot reasonably accommodate the proposed use. Economic factors may be considered along with other relevant factors in determining that the use cannot reasonably be accommodated in other areas. Under this test the following questions shall be addressed:
     - i. Can the proposed use be reasonably accommodated on nonresource land that would not require an exception, including increasing the density of uses on nonresource land? If not, why not?
     - ii. Can the proposed use be reasonably accommodated on resource land that is already irrevocably committed to nonresource uses not allowed by the applicable Goal, including resource land in existing unincorporated communities, or by increasing the density of uses on committed lands? If not, why not?
     - iii. Can the proposed use be reasonably accommodated inside an urban growth boundary? If not, why not?

iv. Can the proposed use be reasonably accommodated without the provision of a proposed public facility or service? If not, why not?

C. The “alternative areas” standard in paragraph B may be met by a broad review of similar types of areas rather than a review of specific alternative sites. Initially, a local government adopting an exception need assess only whether those similar types of areas in the vicinity could not reasonably accommodate the proposed use. Site specific comparisons are not required of a local government taking an exception unless another party to the local proceeding describes specific sites that can more reasonably accommodate the proposed use. A detailed evaluation of specific alternative sites is thus not required unless such sites are specifically described, with facts to support the assertion that the sites are more reasonable, by another party during the local exceptions proceeding.

STAFF FINDING:

The U.S. Army Corps has considered five possible alternative locations for dredged disposal that would not require a goal exception:

1. Placement within the flowlane as currently defined and designated
2. Placement with Aquatic Development zones, which would include the currently-designated flowlane
3. Placement in areas outside of the Columbia River Estuary
4. Upland disposal
5. Ocean disposal

One of the primary purposes for the USACE’s use of adaptive management practices and the reason for these applications is to preserve and retain, to the maximum extent possible, the finite riverine sediment budget. Upland placement or ocean disposal would be inconsistent with the goal of retaining riverine sediment, as that material would either not be able to re-enter the river (upland disposal) or would be permanent lost (ocean disposal). Additionally, upland placement either within an urban growth boundary or on resource land that is already irrevocably committed to nonresource uses would require significant costs, as it would require dredged materials to either be transported overland to those sites or shipped considerable distances as the equipment employed by the USACE is not capable of piping dredged material over distances more than a few miles.

The applicant’s response indicates that areas within the flowlane and outside of the estuary do not have adequate capacity to support the amount of materially annually dredged each season.

The informational thalweg map included as Exhibit 1 illustrates the anticipated areas where the thalweg disposal would occur over a five-year period. Because river dynamics continually shift the thalweg location, the map is intended to be advisory in nature. Actual operations and locations of dredged material will be based upon the new definition of “expanded flowlane/thalweg disposal”.

The USACE's expanded flowlane/thalweg disposal methods are intended to minimize the rate at which sediment re-enters the Federal Navigation Channel. As sediment builds up, or as shoaling occurs, draft restrictions can be placed of vessels, impacting maritime commerce. As noted by the applicant, ships utilizing the Columbia River FNC transport shipments worth nearly $5.6 billion per year. Maritime commerce is directly and indirectly responsible for approximately 100,000 jobs. If draft restrictions are imposed, there is the potential for significant economic impacts both locally, regionally, nationally and globally.

The proposed use (expanded flowlane/thalweg disposal) can be accommodated without the provision of new public facilities or services.

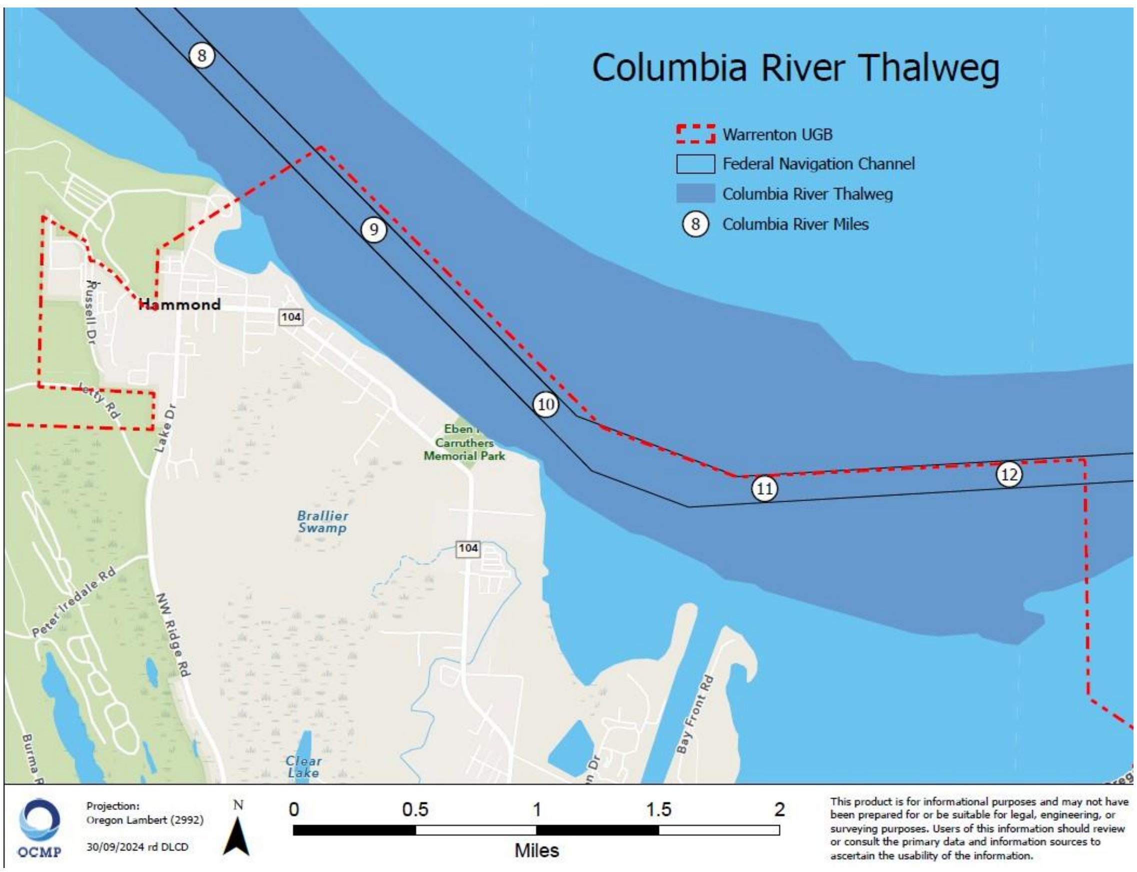


Figure 1 Proposed thalweg for flowlane placement of dredged material in City of Warrenton Urban Growth Boundary and for the whole Columbia River Estuary.

The applications meet the requirements of OAR 660-004-0020(2)(b).

c. “The long-term environmental, economic, social and energy consequences resulting from the use at the proposed site with measures designed to reduce adverse impacts are not significantly more adverse than would typically result from the same proposal being located in areas requiring a goal exception other than the proposed site.” The exception shall describe: the characteristics of each alternative area considered by the jurisdiction in which an exception might be taken, the typical advantages and disadvantages of using the area for a use not allowed by the Goal, and the typical positive and negative consequences resulting from the use at the proposed site with measures designed to reduce adverse impacts. A detailed evaluation of specific alternative sites is not required unless such sites are specifically described with facts to support the assertion that the sites have significantly fewer adverse impacts during the local exceptions proceeding. The exception shall include the reasons why the consequences of the use at the chosen site are not significantly more adverse than would typically result from the same proposal being located in areas requiring a goal exception other than the proposed site. Such reasons shall include but are not limited to a description of: the facts used to determine which resource land is least productive, the ability to sustain resource uses near the proposed use, and the long-term economic impact on the general area caused by irreversible removal of the land from the resource base. Other possible impacts to be addressed include the effects of the proposed use on the water table, on the costs of improving roads and on the costs to special service districts;

STAFF FINDING: The long-term environmental, economic, social and energy consequences that might occur if the goal exception is approved are not significantly more adverse than would typically result from the same proposal being located in an area that also requires a goal exception. First, the nature of the work and the intended outcomes are reliant upon an in-water area. Second, the review and approval process for this work by the Army Corps includes monitoring measures, the reasonable and prudent measures from the federal biological opinions, as well as mandated in-water work windows through other permitting processes.

The applicant (DSL) submitted supporting documents to the City of Warrenton that are included as Exhibits 1-12. These exhibits demonstrate that in order to meet the goals of maintaining sediment budget, minimizing dredging operations, reducing shoaling and stabilizing the thalweg in order to prevent draft restrictions, in-water dredged material disposal in an expanded flowlane/thalweg area is required. Upland and ocean disposal would lead to increased riverine sediment loss as those materials would either not re-enter the river or would be permanently lost in the case of ocean disposal. Adequate capacity is not available in the currently-defined flowlane and upstream areas outside of the estuary also lack sufficient capacity. Additionally, upland disposal or upstream disposal would consume significantly more energy than expanded in-water flowlane/thalweg disposal, which would be inconsistent with the policies in Goal 6: Air, Water and Land Resources Quality. When disposing of dredged materials, the Corps implements best management practices to minimize effects to water quality, including sediment sampling, water quality monitoring, and turbidity monitoring and minimization measures. The Best Management Practices are further defined in the Determination of Compatibility, included as Exhibit 9. Lastly, dredge-equipment limitations in this particular stretch of the Columbia River would not allow for material placement in areas shallower than 20 feet.

The proposed use would not impact the water table and would not require road improvements or impact special districts. **The application meets the requirements of OAR 660-004-0020(2)(c).**

d. "The proposed uses are compatible with other adjacent uses or will be so rendered through measures designed to reduce adverse impacts." The exception shall describe how the proposed use will be rendered compatible with adjacent land uses. The exception shall demonstrate that the proposed use is situated in such a manner as to be compatible with surrounding natural resources and resource management or production practices. "Compatible" is not intended as an absolute term meaning no interference or adverse impacts of any type with adjacent uses.

STAFF FINDING: As discussed above, disposal of dredged materials within the expanded flowlane/thalweg, are subject to monitoring measures, the reasonable and prudent measures from the biological opinion, as well as mandated in- water work windows.

The National Marine Fisheries Service's three biological opinions have concluded that the USACE's proposed disposal actions would not jeopardize threatened or endangered species or destroy critical habitat essential to those species. Any other user of the goal exception area would be subject to local, state, and federal permitting.

The in-water disposal would occur in waters that are 20 feet in depth or deeper in areas where benthic activity is not anticipated to occur. As noted by the applicant in the narrative in Exhibit 12, juvenile salmonids are unlikely to utilize these mid-depth areas, preferring shallower habitats closer to the shoreline. **The applications meet the requirements of OAR 660-004-0020(2)(d).**

3. If the exception involves more than one area for which the reasons and circumstances are the same, the areas may be considered as a group. Each of the areas shall be identified on a map, or their location otherwise described, and keyed to the appropriate findings.

STAFF FINDING: The City of Warrenton is proposing to revise the Comprehensive Plan and Development Code as needed to accommodate this goal exception proposal. The amendments would revise the definition of "flowlane disposal" and would add an informational map to the comprehensive plan illustrating the predicted location of the Columbia River Estuary thalweg over a 5-year period. In cases where the informational map may conflict with the revised definition, the definition would take precedence. **The requirements of OAR 660-004-0020(3) have been met.**

<u>OAR 660-004-0022 Reasons Necessary to Justify an Exception Under Goal 2, Part II(c)</u>

An exception under Goal 2, Part II(c) may be taken for any use not allowed by the applicable goal(s) or for a use authorized by a statewide planning goal that cannot comply with the approval standards for that type of use…

…(1) For uses not specifically provided for in this division, or in OAR 660-011-0060, 660- 012- 0070, 660-014-0030 or 660-014-0040, the reasons shall justify why the state policy embodied in the applicable goals should not apply. Such reasons include but are not limited to the following: There is a demonstrated need for the proposed use or activity, based on one or more of the requirements of Goals 3 to 19; and either:

(a) A resource upon which the proposed use or activity is dependent can be reasonably obtained only at the proposed exception site and the use or activity requires a location near the resource. An exception based on this subsection must include an analysis of the market area to be served by the proposed use or activity. That analysis must demonstrate that the proposed exception site is the only one within that market area at which the resource depended upon can reasonably be obtained; or

(b) The proposed use or activity has special features or qualities that necessitate its location on or near the proposed exception site.

STAFF FINDING: Criteria (1)(a) is not applicable in this request. As provided in the information above and series of exhibits, the Army Corps has shown that terrestrial sediment supply to the Lower Columbia River has been reduced due to floodplain development and hydro-regulation. The river's sediment supply is now finite and is managed to sustain the ecological health of the estuary. The river thalweg is needed for the disposal of dredged material to sustain the river's sediment budget. Therefore, the goal exception area has special features that necessitate its location. Based upon review of the information provided by DSL to the City of Warrenton and the requirements of OAR 660-004-0020, staff has determined that the requested goal exception would comply with the requirements of OAR 660-004-0022(1)(b). **The requirements of OAR 660-004-0022(1) have been met.**

<u>OAR 660-004-0030: Notice and Adoption of an Exception</u>

1. Goal 2 requires that each notice of a public hearing on a proposed exception shall specifically note that a goal exception is proposed and shall summarize the issues in an understandable manner.
2. A planning exception takes effect when the comprehensive plan or plan amendment is adopted by the city or county governing body. Adopted

exceptions will be reviewed by the Commission when the comprehensive plan is reviewed for compliance with the goals through the acknowledgment or periodic review processes under OAR chapter 660, divisions 3 or 25, and by the Board when a plan amendment is reviewed as a post-acknowledgment plan amendment pursuant to OAR chapter 660, division 18.

STAFF FINDING: These applications are being processed under a Type IV legislative procedure. In accordance with Chapter 16.208, a notice of public hearing was published in the Astorian on November 26, 2024. **The requirements of OAR 660-004-0030 have been met.**

CONCLUSIONS AND RECOMMENDATION

Based on the information provided in the application and supporting materials, staff recommends approval of the request subject to the following Conditions of Approval:

CONDITIONS OF APPROVAL

1. This goal exception only applies to in-water placement of dredged materials. This goal exception does not authorize new dredging activities.
2. No in-water dredge material disposal shall occur outside areas designated Development or outside areas included in this goal exception areas unless a new goal exception is approved.
3. All in-water dredged disposal within the goal exception areas will occur during the in-water work periods established during consultation with the National Marine Fisheries Service under the Endangered Species Act.
4. All in-water disposal within the goal exception areas will follow the Best Management Practices (BMPs) established during consultation with the National Marine Fisheries Service under the Endangered Species Act.
5. Disposal of dredged materials within the expanded flowlane/thalweg exception area shall be subject to the Chapter 16.160 of the Warrenton Municipal Code. Non-federal applicants shall be required to submit all applicable applications and must receive approval prior to commencing work. Federal agencies, consistent with the Oregon Coastal Zone Management Program, must demonstrate consistency with local policies to the maximum extent practicable.
6. Non-federal entities using the expanded flowlane/thalweg exception area for in-water dredged material disposal shall annually submit to the City of Warrenton a copy of the dredging season monitoring and reporting results for the Columbia River that are prepared for the Oregon Department of Environmental Quality to demonstrate compliance with the requirements of the 401 Water Quality Certification. If the user of the goal exception area is a federal agency, the State of Oregon is responsible for requesting the annual report they submit to the Oregon Department of Environmental Quality per the Section 401 Water Quality

Certification and submitting that report annually to the City of Warrenton.

7. The informational thalweg map shall be used for advisory purposes only. In cases where the informational thalweg map conflicts with the definition of “expanded flowlane/thalweg disposal”, the definition shall take precedence.
8. A new thalweg map shall be prepared every 5 years and submitted to Clatsop County Community Development and the U.S. Army Corps of Engineers. The City of Warrenton will request the updated map from Clatsop County. When said map is not available, placement activities will continue solely based on the text definition of thalweg placement.
9. Regarding deepwater placement of dredged material within the expanded flowlane/thalweg exception area: Areas deeper than 65 feet below MLLW may be used for thin-layer placement only if the placement does not cause the area to become permanently converted to depths shallower than 65 feet. Thin-layer placement is defined a maximum deposition on the riverbed of 0.25 feet during placement of each hopper dredge or barge load to minimize benthic impacts.

RECOMMENDED MOTION

“Based on the findings and conclusions of this January 28, 2025, staff report, I move to conduct the first reading, by title only, of Ordinance number 1283.”

ATTACHMENTS

1. Ordinance No. 1283
2. Application
3. Applicant Narrative Findings
4. Applicant Exhibit 1 Columbia River Estuary Thalweg Informational Map
5. Applicant Exhibit 2 Warrenton Thalweg Map
6. Applicant Exhibit 3 2012 BiOp
7. Applicant Exhibit 4 PSET Memo
8. Applicant Exhibit 5 2021 BiOp
9. Applicant Exhibit 6 2023 BiOp
10. Applicant Exhibit 7 Determination of Compatibility CR O&M
11. Applicant Exhibit 8 Corps ODLCD Clatsop visuals
12. Applicant Exhibit 9 BMPs Excerpt Determination of Compatibility
13. Applicant Exhibit 10 USACE JPA ODEQ 401 ColRiver
14. Applicant Exhibit 11 2014USFWS BiOp

ORDINANCE NO. 1283
INTRODUCED BY ALL COMMISSIONERS

AN ORDINANCE AMENDING THE CITY OF WARRENTON COMPREHENSIVE PLAN AND WARRENTON MUNICIPAL CODE TO ADOPT AN EXCEPTION TO STATEWIDE PLANNING GOAL 16 AND MODIFY STANDARDS REGARDING FLOWLANE DISPOSAL IN THE COLUMBIA RIVER

WHEREAS, the United States Army Corps of Engineers (USACE) is federally mandated to maintain the Federal Navigation Channel of the Columbia River, which includes dredging and disposal of dredged material to maintain the deep draft channel; and

WHEREAS, in 2002, the Columbia River Estuary Study Taskforce (CREST) completed the *Columbia River Estuary Dredged Material Management Plan*, which refined the dredging and disposal policies in the City of Warrenton's Comprehensive Plan and inventoried an adequate number of disposal sites with sufficient capacity to accommodate projected disposal needs for at least a five-year period; and

WHEREAS, the City of Warrenton adopted the necessary provisions from the *Columbia River Estuary Dredged Material Management Plan* in Article 5 of the City of Warrenton Comprehensive Plan and Section 16.160 of the Warrenton Municipal Code; and

WHEREAS, Section 16.160 of the Warrenton Municipal Code currently allows flow lane disposal in areas designated aquatic development; and

WHEREAS, in approximately 2010, the United States Army Corps of Engineers (USACE) altered its dredge material disposal practices to include the river thalweg within contour depths of 20 feet or greater as part of its flowlane disposal area; and

WHEREAS, the expanded flowlane/thalweg area encompasses in-water areas that are designated Conservation Aquatic, which does not allow flowlane disposal; and

WHEREAS, this discrepancy between USACE practices and City of Warrenton policies was identified in 2023; and

WHEREAS, it has been demonstrated that the use of the expanded flowlane/thalweg is required to maintain the river's sediment budget and to reduce shoaling and that no other alternatives are available that would meet these requirements; and

WHEREAS, in September 2024, the Oregon Department of State Lands (DSL) submitted an application for an exception to Goal 16: Estuarine Resources, to allow the disposal of dredged materials in water areas designated Conservation Aquatic; and

WHEREAS, the application meets the criteria outlined in the City of Warrenton Comprehensive Plan and Warrenton Municipal Code and it is in the public's best interest to adopt this exception to Goal 16: Estuarine Resources; and

NOW THEREFORE, the City of Warrenton ordains as follows:

Section 1. Section 5.110 of the City of Warrenton Comprehensive Plan is amended to read as follows:

Section 5.110 Estuary Channels Subarea Findings

(1) General Description - This subarea includes the deep water portions of the estuary from Jetty A (RM 3) to the upper end of Rice Island (RM 22.5). The subarea contains the authorized navigation channel. The subarea boundary generally follows the 20-foot bathymetric contour; however, it varies from this contour in the vicinity of cities and other subareas containing deep channels. There are no intertidal wetland or shoreland areas. Portions of Clatsop, Pacific and Wahkiakum Counties, and Astoria and Warrenton are within this subarea. The Warrenton portion comprises only a small portion of this 16,500 acre subarea.

(2) Aquatic Designations - All aquatic areas in the Estuary Channels Subarea in Warrenton are designated Conservation except:

(a) The main navigational channel and a flowlane disposal area on each side of the channel (either 600 feet wide or extending to the 20 foot bathymetric contour, whichever is narrower) is designated Aquatic Development.

(b) Dredged material disposal sites CC-E-8.5 and CC-E-2LO, listed in the *Columbia River Estuary Dredged Material Management Plan*, are designated Aquatic Development.

(3) Goal Exception - An exception to Goal 16 to allow in-water disposal of dredged material in the expanded flowlane in depths greater than 20 feet and contiguous to the Federal Navigation Channel, which encroach into designated Conservation Aquatic areas, was approved by Ordinance 1283 on January 28, 2024.

Section 2. Section 5.120 of the City of Warrenton Comprehensive Plan is amended to read as follows:

Section 5.120 Tansy Point/Alder Cove Subarea Findings

(1) General Description - This subarea includes aquatic areas in Alder Cove and the Columbia River out to the pierhead line, and shorelands between the waterward extension of Railroad Drive (the old Warrenton/Hammond boundary) and the mouth of Alder Creek. This subarea contains about 600 acres of both shorelands and aquatic areas within the City of Warrenton.

(2) Aquatic and Shoreland Designations

(a) Development Aquatic:

- The aquatic area bounded by the shoreline on the South, the pierhead line to the North, the waterward extension of Railroad Drive on the West and Tansy Point on the East.
- The barge moorage area on the East side of Tansy Point.
- The flowlane disposal area south of the main channel (600 feet wide or to the 20-foot bathymetric contour, whichever is narrower).

(b) Conservation Aquatic:

- The area at the southern end of Alder Cove where effluent from the Warrenton sewage ponds is discharged.
- The mouth of Alder Cove from the 3-foot bathymetric contour north to the flowlane disposal area.

(c) Natural Aquatic:

- Remaining aquatic area within Alder Cove.

(d) Water-Dependent Development Shorelands:

- All shoreland areas are designated Water-Dependent Development Shorelands, except for a portion of dredged material disposal site Wa-S-9.4, which is designated Development Shorelands.

(e) The regulatory shoreland boundary is 50 feet from the Columbia River Estuary shoreline, or from the landward toe of dikes and associated toe drains, whichever is greatest, except where it extends further inland to include the following features:

- Shoreland areas designated Water-Dependent Development Shorelands.

- Mitigation site M3 from the *Mitigation and Restoration Plan for the Columbia River Estuary*.

- Dredged material disposal site Wa-S-9.4 from the *Columbia River Estuary Dredged Material Management Plan*.

- A wetland at Tansy Creek identified as significant under Oregon Statewide Planning Goal 17.

(3) Goal Exception - An exception to Goal 16 to allow in-water disposal of dredged material in the expanded flowlane in depths greater than 20 feet and contiguous to the Federal Navigation Channel, which encroach into designated Conservation Aquatic or Natural Aquatic areas, was approved by Ordinance 1283 on January 28, 2024.

Section 3. Section 5.150 of the City of Warrenton Comprehensive Plan is amended to read as follows:

Section 5.150 Mouth of the Skipanon River Subarea Findings

(1) General Description - This subarea contains filled and diked shorelands north of Harbor Drive and east of Skipanon Drive; the Skipanon River from the Harbor Drive Bridge to its mouth; the East and West Skipanon Peninsulas; and adjacent Columbia River waters out to the navigation channel. Parts of downtown Warrenton are also included.

(2) Aquatic and Shoreland Designations

(a) Development Aquatic:

- The Skipanon waterway between the Harbor Drive Bridge and the main navigation channel.
- Approximately 7.8 acres of tidal marsh and flats on the west side of the West Peninsula.
- The flowlane disposal area south of the main channel (600 feet wide or to the 20-foot bathymetric contour, whichever is narrower).
- The area from the Skipanon Channel to the eastern boundary of the Subarea and from the line of aquatic vegetation on the East Peninsula north to the Columbia River navigation channel.

(b) Conservation Aquatic:

- The aquatic area between the shoreline and the flowlane disposal area west of the Skipanon Channel.

(c) Development Shoreland:

- The area adjacent to the mooring basin east to N.E. Iredale Avenue.
- The area north of Harbor Drive on the east side of the Skipanon waterway.
- An area on the south side of the West Peninsula.
- The area east of Holbrook Slough.

(d) Water-Dependent Development Shorelands:

- All other shorelands are designated Water-Dependent Development.

(e) The regulatory shoreland boundary is 50 feet from the Columbia River Estuary shoreline, or from the landward toe of dikes and associated toe drains, whichever is greatest, except where it extends further inland to include the following features:

- The East Skipanon Peninsula including all shoreland areas on the northern 96 acres of the East Skipanon Peninsula.

- The West Skipanon Peninsula including all upland adjacent to Alder Cove and east of N. E. Skipanon Drive, with the exception of the area designated commercial by the City of Warrenton Zoning Ordinance; dredged material disposal site Wa-S-10.7 from the Columbia River Estuary Dredged Material Management Plan; and The Holbrook Slough wetland, classified as significant under Oregon Statewide Planning Goal 17.

(3) Goal Exception - An exception to Goal 16 to allow in-water disposal of dredged material in the expanded flowlane in depths greater than 20 feet and contiguous to the Federal Navigation Channel, which encroach into designated Conservation Aquatic areas, was approved by Ordinance 1283 on January 28, 2024.

Section 4. Section 5.305(10) of the City of Warrenton Comprehensive Plan is amended to read as follows:

Section 5.305 Dredging and Dredged Material Disposal

(10) Flowlane disposal sites shall only be allowed in Development Aquatic areas within or adjacent to a channel where an exception to Goal 16 has been approved. The Development Aquatic area adjacent to the channel shall be defined by a line 600 feet from either side of the channel or the 20-foot bathymetric contour, whichever is closer to the channel. Flowlane disposal within this area shall only be allowed where:

(a) Sediments can reasonably be expected to be transported downstream without excessive shoaling,

(b) Interference with recreational and commercial fishing operations, including snag removal from gillnet drifts, will be minimal or can be minimized by applying specific restrictions on timing or disposal techniques,

(c) Adverse hydraulic effects will be minimal,

(d) Adverse effects on estuarine resources will be minimal, and

(e) The disposal site depth is 20 feet below MLLW or deeper.

(f) An exception to Goal 16 to allow in-water disposal of dredged material in the expanded flowlane in depths greater than 20 feet and contiguous to the Federal Navigation Channel, which encroach into designated Conservation Aquatic areas, has been approved.

Section 5. Section 16.76.030 of the Warrenton Municipal Code is amended to read as follows:

The following uses and activities and their accessory uses and activities may be permitted in the A-2 zone when approved under Chapter 16.220, Conditional Use Permits. The uses and activities are also subject to the provisions of Section 16.76.040, Development Standards. They are also subject to a resource capability determination (Section 16.164.050) and impact assessment (Section 16.164.010).

A. High-intensity water-dependent recreation including boat ramps, marinas, and individual docks.
B. Aquaculture and water-dependent portions of aquaculture facilities.
C. Active restoration for purposes other than protection of habitat, nutrient, fish, wildlife and aesthetic resources.
D. Temporary alterations.
E. Filling in conjunction with listed conditional uses, pursuant to the applicable standards in Section 16.160.060.
F. Minor navigational improvement.
G. Mining and mineral extraction.
H. Dredging in conjunction with any of the listed conditional uses pursuant to the applicable standards in Section 16.160.040.
I. Low-intensity water-dependent commercial or industrial uses requiring occupation of water-surface area by means other than fill.
J. In-water log storage.
K. Communication facilities subject to the standards of Chapter 16.148.
L. Piling in conjunction with any of the listed conditional uses.
M. Flow lane disposal of dredged material where an exception to Statewide Goal 16 has been approved.
N. Similar uses to those listed in this section.

Section 6. Section 16.160.050(E) of the Warrenton Municipal Code is amended to read as follows:

E. Flow lane disposal shall be in aquatic development areas, or areas where an exception to Goal 16 has allowed in-water disposal of dredged material in depths greater than 20 feet and contiguous to the Federal Navigation Channel which encroach into designated Conservation Aquatic areas, that have been identified as low in benthic productivity and use of these areas shall not have adverse hydraulic effects. Use of flow lane disposal areas in the estuary shall be allowed only when no feasible alternative land or ocean disposal sites with less damaging environmental impacts can be identified and the biological and physical impacts of flow lane disposal are demonstrated to be insignificant. The feasibility and desirability of alternative sites shall take into account, at a minimum:

1. Operational constraints such as distance to the alternative sites;
2. Sediment characteristics at the dredging site;
3. Timing of the operation;
4. Environmental Protection Agency constraints on the use of designated ocean disposal sites;
5. The desirability of reserving some upland sites for potentially contaminated material only. Long term use of a flow lane disposal area

may only be allowed if monitoring confirms that the impacts are not significant. Flow lane disposal is contingent upon demonstration that:

a. Significant adverse effects due to changes in biological and physical estuarine properties will not result; and
b. Flow lane disposal areas shall be shown able to transport sediment downstream without excessive shoaling, interference with recreational and commercial fishing operations, including the removal of snags from gillnet drifts, undesirable hydraulic effects, or adverse effects on estuarine resources (fish runs, spawning activity, benthic productivity, wildlife habitat, etc.).

6. When determining whether a proposal is within the expanded flowlane/thalweg disposal area covered by an approved Goal 16 exception, the Columbia River Estuary Thalweg map adopted by Ordinance 1283 shall be consulted. It is important to note that the text description of "expanded flowlane/thalweg disposal" are the regulating boundaries of this exception area. Maps and GIS data layers used by the City are a representation of those boundaries. In cases of any doubt, the text description should be used to resolve any boundary confusion.

Section 7. The Flow Lane Disposal map shown in Exhibit 1 is hereby adopted and incorporated into the Warrenton Comprehensive Plan as Appendix III.

Section 8. This ordinance shall take full force and effect 30 days after its adoption by the Commission of the City of Warrenton.

First Reading: February 11, 2025
Second Reading:

ADOPTED by the City Commission of the City of Warrenton, Oregon this_____day of _____, 2025.

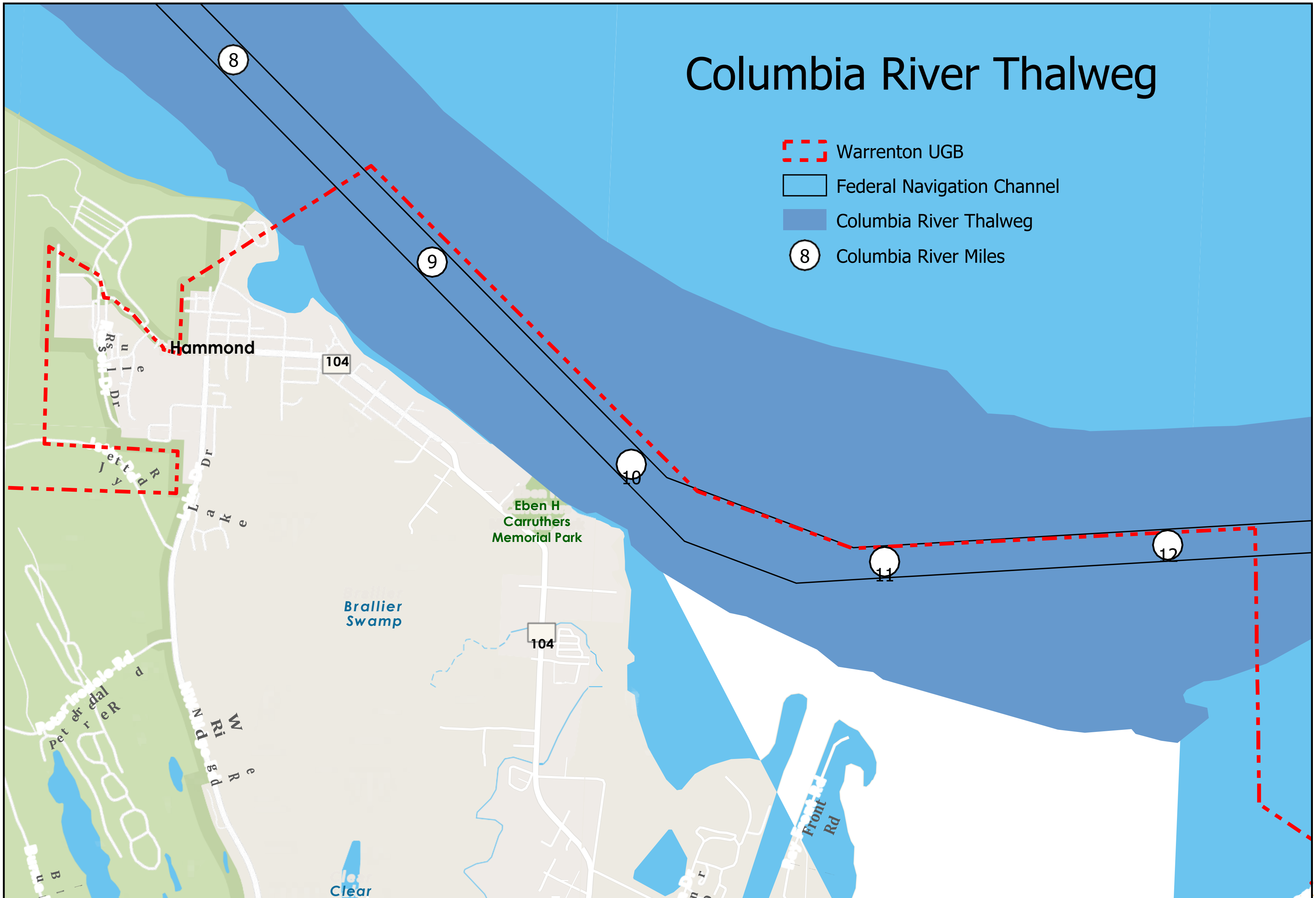
APPROVED:

____
Henry A. Balensifer III, Mayor

ATTEST:

____
Dawne Shaw, CMC, City Recorder

Exhibit 1



OCMP

Projection:
Oregon Lambert (2992)

30/09/2024 rd DLCD

0 0.5 1 1.5 2

Miles

This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.

City Of Warrenton
Planning Department
Comprehensive Plan Amendment
WMC 16.232

OFFICE USE	
	FEE $2,000
	File# CP -_______ - _______
	Date Received __________
	Receipt#________________

Amendments to the Warrenton Comprehensive Plan may be necessary from time to time to reflect changing community conditions, needs, and desires, to correct mistakes, or to address changes in state law (i.e., ORS, OAR, and Statewide Planning Goals). A property owner or designated representative may initiate a request to amend the Warrenton Comprehensive Plan by filing an application with the Planning Department in accordance with the requirements of WMC 16.208.060. In addition, the applicant shall provide any related plans, drawings, and/or information needed to provide background for the request.

Property

Address: Columbia River Estuary. Please see attached narrative and exhibits.

Tax Lot (s):____

Zone:______________Flood Zone:_____________Wetlands: ____________________

Applicant

Name (s): Oregon Department of State Lands

Phone: 503-508-4312 E-Mail Address: chris.castelli@dsl.oregon.gov

Mailing Address: 775 Summer Street NE #100, Salem, OR 97301

Applicant Signature(s):_________________________________Date: ___________

Property Owner (if different from applicant)

Name (s):____

Phone:__________________E-mail Address: ___________________________

Mailing Address:____

Owner's Signature:_________________________________Date: ___________

I am a record owner of property (person(s) whose name is on the most recently-recorded deed), or contract purchaser with written permission from the record owner and am providing my signature as written authorization for the applicant to submit this application.

Description of Amendment (Include Chapter and Section)

In water dredge material disposal deeper than 20' contiguous with the navigational federal navigational channel. Please see attached narrative.

Comprehensive Plan Amendment Review Criteria

Please provide written responses to each of the criteria below that clearly explain how your proposal meets each item. Attach a separate piece of paper if needed. Be as specific as possible. "Yes" and "No" responses are not sufficient.

1. Does the proposal conform to the applicable Oregon Revised Statutes? Yes ☑ No ☐

Please explain: Please see attached narrative.

2. Does the proposal conform to the Statewide Planning Goals? Yes ☑ No ☐

Please explain: Please see attached narrative.

3. Is there a change of circumstances or further studies justifying the amendment?

Please explain:

This application will not be officially accepted until department staff have determined that the application is filled out and signed, the application fee has been paid, and the submittal requirements have been met.

Narrative and Findings for Goal Exception to Goal 16: Estuarine Resources

Applicant: Oregon Department of State Lands

Date: October 15, 2024

Oregon Administrative Rules (OAR) 660-004-0000 (2): *An exception is a decision to exclude certain land from the requirements of one or more applicable statewide goals in accordance with the process specified in Goal 2, Part II, Exceptions. The documentation for an exception must be set forth in a local government's comprehensive plan. Such documentation must support a conclusion that the standards for an exception have been met. The conclusion shall be based on findings of fact supported by substantial evidence in the record of the local proceeding and by a statement of reasons that explains why the proposed use not allowed by the applicable goal, or a use authorized by a statewide planning goal that cannot comply with the approval standards for that type of use, should be provided for. The exceptions process is not to be used to indicate that a jurisdiction disagrees with a goal.*

An exception is a comprehensive plan provision, including an amendment to an acknowledged comprehensive plan, that:

a. is applicable to specific properties or situations and does not establish a planning or zoning policy of general applicability;
b. does not comply with some or all goal requirements applicable to the subject properties or situations; and
c. complies with standards for an exception.

Overview

There are three kinds of goal exceptions. This application is for a "reasons exception" which must meet a four-part test. DSL (the applicant) is submitting this application for a reasons exception to Statewide Planning Goal 16 (Estuarine Resources) for the disposal of dredged material within aquatic zones in the City of Warrenton portion of the Columbia River estuary that would otherwise not allow that activity.

The US Army Corps of Engineers (Corps) operates and maintains the Columbia River Federal Navigation Channels (CR FNCs), which includes dredging and dredged material placement to maintain congressionally authorized channel dimensions. As the owner of submerged lands within the State of Oregon, the Department of State Lands is applying for a goal exception and plan amendment to Warrenton in support of the Corps' efforts to ensure year-round channel access at those dimensions and support safe navigation of vessels through the Columbia River Estuary.

This application pertains to the U.S. Army Corps of Engineers, Portland District's (Corps') operation and maintenance of the lower Columbia River portion of the Columbia and Lower

Willamette Rivers navigation channel and side channels including Baker Bay, Chinook, Skipanon, Tongue Point, Skamokawa Creek, Elochoman Slough, Wahkiakum Ferry and Westport Slough (Projects). Specifically, this application seeks to expand the current area within Warrenton where “flowlane disposal” of dredged materials may occur. Currently, the City of Warrenton Comprehensive Plan defines flowlane disposal as the Federal Navigation Channel (FNC) plus a buffer on either side of the channel 600 feet wide or extending to the 20-foot bathymetric contour, whichever is narrower.

DSL’s goal exception request is to allow flowlane disposal within the river thalweg, in an expanded area contiguous to the FNC that is consistent with the 20-foot depth contour (and to delete the qualifier “whichever is narrower” in the current city definition).

The Corps states that this expanded area for flowlane disposal of dredged material would support the feasibility of its ongoing operations and maintenance of the FNC. This thalweg area features river velocities sufficient to move placed sediments downstream within the river’s natural system without resulting in significant adverse environmental effects. Because the river thalweg is subject to continual change as fluvial hydrodynamics transport sediment into and out of the estuary system, DSL proposes a text-based definition of the thalweg disposal area based on the factors above, which would be supported by maps of the projected thalweg location updated on a regular interval. Exhibits 1 and 2 provide maps of the proposed thalweg dredged material placement area.

It is proposed that a new thalweg dredged material disposal area would be available to the Corps as well as all other dredging users for flowlane dredged material disposal.

Currently, portions of the thalweg area described above are zoned “Aquatic Conservation” under the City of Warrenton Comprehensive Plan. As will be described elsewhere in this application, the proposed expanded thalweg appears to avoid areas described as “Aquatic Natural” within the estuary subareas of the city’s Comprehensive Plan. Goal 16 (Estuarine Resources) specifies uses and activities that are permitted, conditionally permitted, and prohibited within estuarine areas designated aquatic conservation and aquatic natural, which are then implemented through the City’s Comprehensive Plan and the Development Code (Title 16). Currently, disposal of dredged material is not permitted in areas zoned as Aquatic Conservation or Aquatic Natural. A goal exception to Statewide Planning Goal 16 is being sought here to allow flowlane/thalweg placement of dredged material in areas where it is not currently allowed in the City of Warrenton’s Comprehensive Plan.

Background

In 2023, the Corps applied to the Oregon Department of Environmental Quality (DEQ) to renew its existing Section 401 Water Quality Certification for the continued Operation and Maintenance (O&M) of the Columbia River Federal Navigation Channel, which includes the dredging of the navigation channel from Columbia River Mile 3 to River Mile 145 (Bonneville Dam) and associated disposal of dredged materials in identified locations.

As part of ongoing Columbia River management discussions with the Corps, the State has been aware that the Corps' current practice of maintaining the channel involves disposing of materials in the "flowlane." The flowlane is defined in the City of Warrenton Comprehensive Plan, Goal 16, as the Federal Navigation Channel plus a 600-foot area on either side of the channel, which is designated for Aquatic Development uses, including dredged material disposal. Recently, the Oregon Department of Land Conservation and Development (DLCD) became aware that starting around 2010, the Corps' flowlane disposal practices were not consistent with the flowlane definition contained in City of Warrenton's policies. The Corps' stated intent was to adaptively manage sediments based on current river conditions (i.e., the thalweg) in a highly dynamic environment and keep sediments within the riverine sediment budget whenever feasible. However, because the "thalweg" is not fixed and changes based on riverine hydrology, there is a discrepancy with the fixed flowlane as defined in the City of Warrenton Comprehensive Plan. Within this larger area, described as the "thalweg," the Corps has placed dredged material at varying locations based on its analysis of flow conditions, hydrology, and sediment movement in a given year. While the Corps has asserted that their thalweg placement practice is consistent with Goal 16 of Oregon's Statewide Planning Goals to "protect the estuarine ecosystem, including its natural biological productivity, habitat, diversity, unique features and water quality," this practice is inconsistent with the estuary management zone designations in the City of Warrenton.

Once the State became aware of this disparity in flowlane disposal definitions, the State and the Corps initiated a series of discussions to identify an acceptable path forward to harmonize the Corps O&M actions with Columbia River estuary management policies without endangering critical maintenance of navigation in the lower Columbia River. As a result of those discussions, the Department of State Lands, as the administrative manager of state-owned submerged lands, has initiated this goal exception and plan amendment process with the entities that implement the Columbia River Estuary Management Plan, which includes the City of Warrenton.

Request

The Federal Navigation Channel is a 600-ft wide, 43-ft deep channel from River Mile 3 of the Columbia River to River Mile 145 in the Lower Columbia. Warrenton's jurisdiction over the Columbia River estuary is approximately between RM 8 and 13. The Columbia River Estuary includes the first approximately 40 miles of the river. The average volume of Corps in-water placement between RM 3 to 40 from Project maintenance dredging during the period 2020 to 2022 was 2 million cubic yards per year. The information summarized below focuses on the Corps' dredging and placement activities in relation to the City of Warrenton's estuary policies, which currently limit placement of flowlane disposal of dredged material to within 600 feet of either side the Columbia River FNC or the 20-foot bathymetric contour, whichever is closer to the channel. For the reasons described below, the Corps is unable to constrain its maintenance of the Projects to such a fixed, confined area. Therefore, DSL is requesting a goal exception to sustain continued maintenance of the FNC.

Specifically, this application seeks to modify the current definition of flowlane disposal within the City of Warrenton. The City's Comprehensive Plan states, "flowlane disposal sites shall only be allowed in Development Aquatic areas within or adjacent to a channel. The Development Aquatic area adjacent to the channel shall be defined by a line 600 feet from either side of the channel or the 20-foot bathymetric contour, whichever is closer to the channel."

DSL's request is to allow flowlane disposal within the river thalweg, which is the area contiguous to the FNC that is consistent with the 20-foot bathymetric contour. The Corps states that this expanded area would support the feasibility of its ongoing operations and maintenance of the FNC and features river velocities sufficient to move placed sediments downstream within the river's natural system without resulting in significant adverse environmental effects. Because the river thalweg is subject to continual change as fluvial hydrodynamics transport sediment into and out of the estuary system, DSL proposes a text-based definition of the expanded thalweg disposal area based on the factors above, which would be supported by maps of the projected thalweg location updated on a regular interval. Exhibits 1 and 2 provide maps of the proposed thalweg dredged material placement area along the entire Columbia River Estuary and within the City of Warrenton to support this application.

In addition to FNC maintenance, there are other users of the flowlane for dredged material. The US Army Corps Section 408 Program[1] protects federal infrastructure and prohibits other users from impairing the usefulness of the federally authorized FNC. Requests by non-federal users to place material under the Corps Section 408 program must also comply with Corps requirements for placement adjacent to the federal navigation channel. It is proposed that the expanded thalweg dredged material disposal area would be available to the Corps as well as all other dredging users.

The information provided below seeks to address the applicable criteria for a reasons exception to Goal 16.

Applicable Provisions

1. Oregon Revised Statutes: ORS 197.732, Goal exceptions
2. Oregon Administrative Rules:
    i. OAR 660-004-0000 Purpose
    ii. OAR 660-004-0020 Goal 2, Part II(c), Exception Requirements
    iii. OAR 660-004-0022 Reasons Necessary to Justify an Exception Under Goal 2, Part II(c)
3. Article 5 Columbia River Estuaries and Estuary Shorelands, Warrenton Comprehensive Plan
4. Applicable Sections of the City of Warrenton Development Code

[1] The US Army Corps of Engineers (USACE) Section 408 program allows another party, such as a local government, company, or individual, to alter a USACE Civil Works project, including the Federal Navigation Channel. https://www.usace.army.mil/Missions/Civil-Works/Section408/

Goal Exception

An exception to a Statewide Planning Goal can be adopted by a local jurisdiction when the four standards of Goal 2, Part II(c) are met. The Department of State Lands is requesting a "general" reasons exception using OAR 660-004-0022(1). The other types of goal exceptions or specific reasons exceptions are not applicable in this case. Below, DSL describes how each of the relevant criteria under OAR 660-004 are met.

OAR 660-004-0000 (2): An exception is a decision to exclude certain land from the requirements of one or more applicable statewide goals in accordance with the process specified in Goal 2, Part II, Exceptions. The documentation for an exception must be set forth in a local government's comprehensive plan. Such documentation must support a conclusion that the standards for an exception have been met. The conclusion shall be based on findings of fact supported by substantial evidence in the record of the local proceeding and by a statement of reasons that explains why the proposed use not allowed by the applicable goal, or a use authorized by a statewide planning goal that cannot comply with the approval standards for that type of use, should be provided for. The exceptions process is not to be used to indicate that a jurisdiction disagrees with a goal.

Finding: DSL is providing information necessary to meet the requirements of a goal exception as provided in this narrative and supporting documentation.

660-004-0020 Goal 2, Part II(c), Exception Requirements

(1) If a jurisdiction determines there are reasons consistent with OAR 660-004-0022 to use resource lands for uses not allowed by the applicable Goal or to allow public facilities or services not allowed by the applicable Goal, the justification shall be set forth in the comprehensive plan as an exception. As provided in OAR 660-004-0000(1), rules in other divisions may also apply.

(2) The four standards in Goal 2 Part II(c) required to be addressed when taking an exception to a goal are described in subsections (a) through (d) of this section, including general requirements applicable to each of the factors:

> *(a) "Reasons justify why the state policy embodied in the applicable goals should not apply." The exception shall set forth the facts and assumptions used as the basis for determining that a state policy embodied in a goal should not apply to specific properties or situations, including the amount of land for the use being planned and why the use requires a location on resource land*;

Finding: It is our understanding that the Corps' assessment of riverine processes and sediment movement based on bathymetric analyses and hydrodynamic models, along with published studies describing the benefits associated with retaining sediments in the riverine system (Mikhailova 2008, Kaminsky et al. 2010, Stark 2012, Allan 2002) has led to the conclusion that it is more environmentally beneficial to keep dredged material within the estuary river system than it is to remove it and place it in areas where it would not be reintroduced into the river. Arguments to justify this reason for the goal exception follow below.

As it operates and maintains the FNC, the Corps has communicated that it must manage dredged sediment within the Federal standard (i.e., the least costly alternative, consistent with sound engineering practices, and meeting federal Clean Water Act Section 404 and Marine Protection, Research and Sanctuaries Act (aka Ocean Dumping Act) criteria). The Corps has stated that it is also obligated to manage dredged sediment to maximize its beneficial use, while avoiding (or minimizing) adverse effects to the environment and minimizing dredging requirements.

To achieve the above, Corps policy is to manage dredged material placement within the framework of Regional Sediment Management and Engineering with Nature.[2] Terrestrial sediment supply to the Lower Columbia River has been reduced due to floodplain development and hydro-regulation. The river's sediment supply is now finite and is managed to sustain the ecological health of the estuary.

Construction of dams and reservoirs within the Columbia River Basin during 1934-74 has altered the delivery and downstream movement of sediment from its headwaters to the Lower Columbia River, reducing sediment load into the river below Bonneville Dam (RM 145). Reduction of headwater sediment supply to the LCR can eventually lead to reduction of sediment volume transported from the LCR to the seacoast. Although the total volume of sandy sediment within the active LCR is vast, it is finite with respect to the river's present sediment transport capacity.

In a river where headwater sediment supply has been reduced, the carrying-capacity of the river thalweg to transport sediment will remain constant resulting in a sediment budget deficit for the river. To balance the river's transport capacity with its reduced external sediment supply, the river will source sediment from its in-river morphology (riverbanks and islands). As the river feeds on its own morphology, the displaced sediment is transported toward the thalweg where the sediment is then carried downstream leaving the adjacent morphology and other shallow areas in further sediment deficit. Some of the sediment is deposited within the FNC. Over time, erosion trends become manifest along riverbank areas, submerged morphology, and islands. Initially, the thalweg will remain stable as sediment displaced from other in-river sources acts to maintain the thalweg dynamics. But over time, the thalweg may widen & migrate as in-river sediment supply cannot keep pace with the river's transport capacity. In the later stages of a river's sediment deficit, the thalweg may deepen and become more unstable. These trends have occurred along various reaches of the LCR in different stages of development.

Because the volume of sand annually dredged within the LCR FNC is a sizable fraction of the sand volume annually transported within the entire river, it is important that dredged sand be placed back within the river thalweg where it can sustain the thalweg sediment budget. Some of the relocated sediment will be re-distributed to adjacent river morphology, some of it will

[2] https://experience.arcgis.com/experience/008394d6b24944f0af4499a1511e7b85/

continue moving within the thalweg, and some of the replaced sediment will be deposited within the FNC. The Corps understands that thalweg placement of dredged sand will result in re-dredging some of the sediment over the long-term, but this balanced approach (of thalweg sediment placement) is needed to sustain the river's sediment budget, its morphology, and enable eventual downstream progression of river sediment to the ocean.

The Corps has stated that it has the following options for dredged material placement: upland placement, in-water (flowlane) placement, transfer/rehandle sites, beach nourishment, or ocean placement. Alternatives other than placement of dredged material in the thalweg that were considered were: placement of dredged material in the currently defined flowlane (FNC channel plus 600ft on either side); upland disposal in areas already designated for that purpose; ocean disposal; and a combination of these options. Placement of material in these locations would not require a goal exception but are not feasible for the Corps because of the reasons discussed below.

Current Challenges

The proposed action to create a thalweg-based flowlane disposal area would occur within areas currently zoned as Aquatic Conservation and potentially areas zoned as Aquatic Natural under Statewide Planning Goal 16's three-tiered zoning system, where the disposal of dredged material is not allowed. City of Warrenton's Goal 16 estuary policy Section 5.305(10) limits flowlane placement of dredged material to within 600 feet of the Columbia River federal navigation channel (FNC) or the 20-foot bathymetric contour, whichever is closer to the channel. In most cases, the 20-foot bathymetric contour is further away from the FNC than the 600-foot line. Therefore, DSL is seeking a goal exception to delete the modifier "whichever is closer to the channel" for purposes of disposal of dredged material in the flowlane.

The Corps has stated that the current in-water designated locations (aquatic development zones) allowed for dredged material disposal in City of Warrenton are insufficient for the amount of material dredged from the river annually. If the Corps elected to follow the current policies for flowlane placement (within 600 feet of the FNC), they assert that the thalweg's sediment budget would be reduced and would compromise the river's morphology. Instituting flowlane-confined placement of dredged sediment, as specified in current local policies, would increase the amount of sediment directly contributing to FNC shoaling and reduce opportunity to sustain the LCRE sediment budget, as compared with the requested thalweg placement.

The Corps has stated that the areas currently designated for flowlane placement under existing City of Warrenton policies would:

a) Curtail the Corps' ability to re-introduce dredged sediment along the river's thalweg, compromising the thalweg's sediment budget and resilience of LCRE morphology.
b) Increase the seasonal dredging effort needed to maintain the FNC, as the flowlane-confined dredged material would more quickly return to the FNC.

c) Increase shoal encroachment within the FNC during and between dredging seasons, resulting in ship draft restrictions.

The entire annual volume of dredged sediment that is typically placed along/within the river thalweg is estimated to be approximately 1 million cubic yards per year. If this amount were constrained to within the current City of Warrenton definition of the flowlane, it would directly feed sediment to shoaling pathways adjacent to and within the FNC, progressively loading up the supply of shoaling material each year. Dredged sediment placed within the flowlane would not contribute to the sediment budget within the overall thalweg, reducing the supply of sediment needed to sustain the river's morphology. Alternatively, up to 1 million cubic yards per year of LCRE dredged sediment would be placed in the ocean deep water site offshore of the Mouth of the Columbia River (MCR), permanently removing it from the LCRE/MCR sediment budget.

The Corps states that adverse effects of flowlane-confined placement under current policies would be realized within 1-2 years, as sediment shoaling within the FNC would increase as compared to the present thalweg placement practices. FNC shoaling effects would accrue through time as currently defined flowlane-confined placement continued.

The Corps states that its ability to address increased FNC shoaling is constrained by equipment availability and funding. There would not be sufficient dredging capacity (equipment) available to clear the FNC and accommodate a consistent increased volume of shoaling due to placement within the currently defined flowlane, even if federal funds were increased. The resulting adverse consequences would be draft restrictions on Lower Columbia River deep-draft commerce currently valued at $23 billion per year.

After completing a given dredging season, the FNC would be encroached by increased sediment shoaling before onset of the next year's dredging season, also resulting in draft restrictions. The Corps states that significant adverse economic impacts would occur if the high-use, deep-draft FNC is not maintained, and the impact on states outside the project area if the project is not dredged would be significant because this dredging supports international exports from at least eleven states in the region. Vessels drafting the full authorized channel depth of 43 feet annually carried approximately 20.5 million tons of export shipments worth nearly $5.6 billion (USACE Waterborne Commerce Statistics Center average FY18 to FY20). A one-foot draft restriction will disrupt or delay this traffic because all the ships are loading with an assumption of a draft of 43 feet. Economic losses increase exponentially with increased draft restriction severity.

The Corps states that based on the river hydraulic and sediment transport processes at work and the collective experience of their subject matter experts, restricting dredged material placement in the Lower Columbia River Estuary to the confines of the City's existing flowlane placement area would result in rapid increases in FNC shoaling and a reduction of the thalweg's sediment budget. The Corps has also identified operational effects to the FNC. **Table 1** below outlines some of the key effects anticipated if the current City of Warrenton definition of the allowable flowlane placement area were to be applied to the Corps' current operations.

Explanation of Table 1 Qualitative Estimates (provided by the Corps): The following estimates are based on the relative change that is expected to occur if the Corps were to switch from its current practice of thalweg-based placement to City of Warrenton-defined flowlane placement.

- The rationale for estimating changes in thalweg sediment budget is that those areas within the flowlane will fill up during the short-term scenario, while the thalweg area outside the flowlane will have diminished sediment placement and experience a sediment budget deficit.
- The morphology change is directly related to thalweg sediment budget change.
- The FNC shoaling values assume that it takes some time for additional material placed in the flowlane to migrate into the FNC: The placed sediment will quickly accrue within the flowlane and end up in the FNC.
- The dredging volume represents a portion of FNC shoaling volume that becomes shallow enough to require dredging.
- Ship draft restrictions are based on additional time required to remove increased dredge volumes and limited dredge availability timing. Draft restrictions on the Columbia Snake River System compound quickly and cost stakeholders millions of dollars, affect millions of tons of cargo and future business, and have rippling impacts throughout the economy.
- If additional dredges become available, the Corps assumes cost increases linearly with dredge volume in the short term, but would increase significantly under the long-term scenario, with an additional hopper dredge mobilizing annually from the Gulf or East Coast.
- Note: “Short-term effects” are defined as a period of 1-2 years of constrained operations within currently defined flowlane placement area. “Long-term Effects” are defined as constrained operations within currently defined flowlane placement area for the foreseeable future.

Table 1. Summary of anticipated effects of changing placement actions in the Lower Columbia River from thalweg-based to flowlane-confined.

Factors Affected by Changing Placement Constraints	Short-term Effects	Long-term Effects
Thalweg sediment budget	50-100% reduction	100% reduction
Morphology change affecting thalweg & adjacent areas	localized minor-moderate degradation	reach-wide moderate-severe degradation
FNC shoaling volume	20-50% increase	50-100% increase
Dredging volume	10-30% increase	30-80% increase
FNC ship draft restrictions	2-5 days +	5-20 days +
Threat to LCR port viability	YES	YES
Dredging costs, assuming more dredges became available	10-30% increase	30-200% increase

*These effects are for illustration only and show what would occur if the Corps discontinued its existing thalweg placement practice and elected to follow the more restrictive flowlane-confined placement.

In addition to FNC maintenance, there are other users of the flowlane for dredged material. The US Army Corps Section 408 Program[3] protects federal infrastructure and prohibits other users from impairing the usefulness of the federally authorized FNC. Requests by non-federal users to place dredged material under the Corps Section 408 program must also comply with Corps requirements for placement adjacent to the FNC. As a result, there are other users who have been prohibited by the Corps from disposing of dredged material within the currently defined flowlane area because of concerns about impairment of the FNC.

Proposed Flowlane Thalweg Expansion

The overall purpose of Goal 16 is "to recognize and protect the unique environmental, economic, and social values of each estuary and associated wetlands; and to protect, maintain, where appropriate develop, and where appropriate restore the long-term environmental, economic, and social values, diversity and benefits of Oregon's estuaries."

The Corps considers the thalweg to be the "action area" and includes the FNC out to the 20-ft depth contours on both sides of the FNC; this is where the river is moving most of the bed load sediment during the year. The river's thalweg is also where mobilized sediments interact with the river's morphology before migrating downslope toward the deepest part of the thalweg and into the FNC. The Corps has stated that its in-water placement practices strive to emulate natural processes by placing dredged sediment within the river's thalweg to allow sediments to be re-distributed back onto the river's morphology, sustaining the river's sediment budget, and maintaining habitats that rely onsediment.

[3] The US Army Corps of Engineers (USACE) Section 408 program allows another party, such as a local government, company, or individual, to alter a USACE Civil Works project, including the Federal Navigation Channel. https://www.usace.army.mil/Missions/Civil-Works/Section408/

The Corps states that the proposed expansion of the flowlane dredged material placement area within the river thalweg avoids the rapid return of dredged material to the FNC while facilitating reintroduction of dredged material into the river system and maintaining habitat complexity within the river system. Placing material in the thalweg keeps material in the river to stabilize the riverbed and protect habitat. Removing material to uplands or the ocean would remove that sediment from the system and the riverbed and habitat would degrade. The Corps asserts that if this proposal is not adopted, the river will “eat itself alive” and will begin to lose islands, tidal shoals, lagoons, and the living resources that depend on that river morphology. Islands also help the Corps maintain the thalweg and keep the navigation channel stable.

The proposed expanded flowlane disposal area between River Mile (RM) 3 to 44 encompasses approximately 23,000 acres across both Oregon and Washington. Of that, approximately 2,300 acres would be used for Corps in-water dredge material placement annually, or about 10% of the expanded flowlane disposal area. This estimate does not include estimates of future placement by non-Corps users (e.g., Port of Astoria and US Coast Guard) via Corps permits.

The Corps states that their decision-making process for choosing placement areas within the river thalweg is based on the following priorities:

- To not harm living resources,
- To not adversely affect other uses of the river,
- To sustain the thalweg, and
- To not rapidly return sediment to the FNC.

The river continuously relocates the dredged sediment placed in-water each year. Placement areas within the expanded thalweg area would be specified based on an applied understanding of hydrodynamic and sediment transport processes, informed by bathymetric depth surveys and river current velocity data from the Corps’ Lower Columbia River adaptive hydraulics model. The placement location must be deep enough for the dredge or scow to safely access based on that vessel’s draft below the water surface. Velocity data and bathymetric differencing and evaluation of bedforms can inform sediment movement after placement, to minimize movement into FNC shoals and support movement into areas to counteract riverbed erosion. The estuary and its habitats are dynamic, and sediment is constantly redistributing itself based on tides, currents, flow conditions, currents, and other environmental changes (Jay et al. 2015[4], Marcoe and Pilson 2017[5], Talke et al. 2020[6]). Beneficial placement of dredged material retains sediments in the river system that are essential for maintaining shorelines and habitat complexity.

(b) "Areas that do not require a new exception cannot reasonably accommodate the use". The exception must meet the following requirements:

---

[4] https://doi.org/10.1007/s12237-014-9819-0

[5] https://doi.org/10.1007/s11852-017-0523-7

[6] https://doi.org/10.1029/2019JC015656

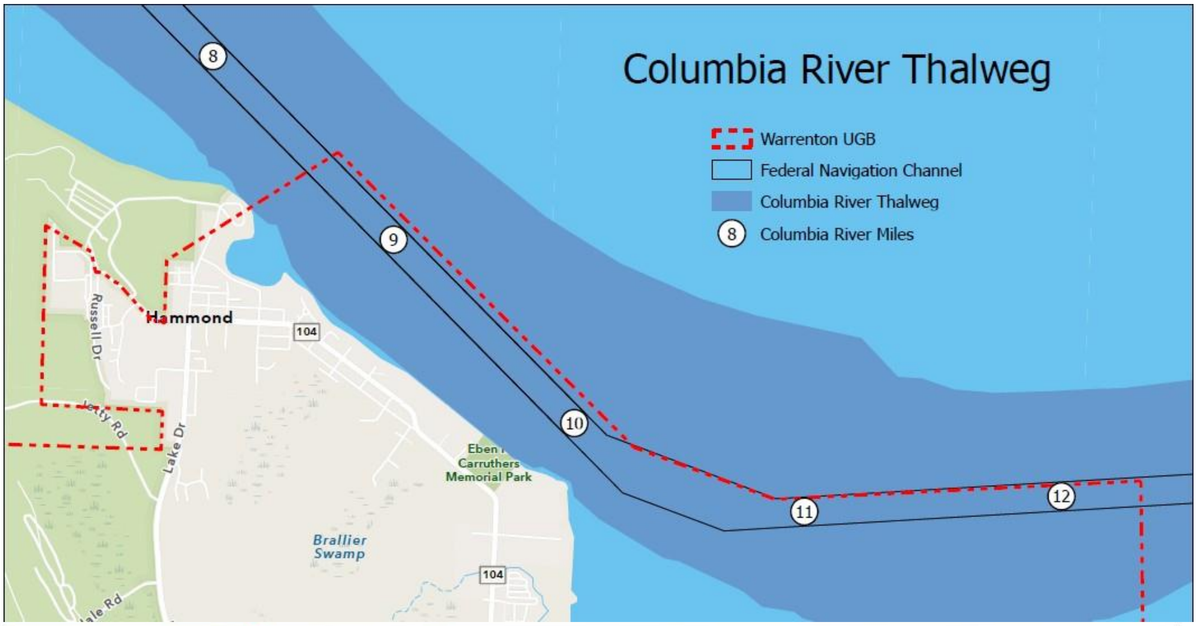
(A) The exception shall indicate on a map or otherwise describe the location of possible alternative areas considered for the use that do not require a new exception. The area for which the exception is taken shall be identified;

(B) To show why the particular site is justified, it is necessary to discuss why other areas that do not require a new exception cannot reasonably accommodate the proposed use. Economic factors may be considered along with other relevant factors in determining that the use cannot reasonably be accommodated in other areas. Under this test the following questions shall be addressed:

> *(i) Can the proposed use be reasonably accommodated on nonresource land that would not require an exception, including increasing the density of uses on nonresource land? If not, why not?*
>
> *(ii) Can the proposed use be reasonably accommodated on resource land that is already irrevocably committed to nonresource uses not allowed by the applicable Goal, including resource land in existing unincorporated communities, or by increasing the density of uses on committed lands? If not, why not?*
>
> *(iii) Can the proposed use be reasonably accommodated inside an urban growth boundary? If not, why not?*
>
> *(iv) Can the proposed use be reasonably accommodated without the provision of a proposed public facility or service? If not, why not?*

(C) The "alternative areas" standard in paragraph B may be met by a broad review of similar types of areas rather than a review of specific alternative sites. Initially, a local government adopting an exception need assess only whether those similar types of areas in the vicinity could not reasonably accommodate the proposed use. Site specific comparisons are not required of a local government taking an exception unless another party to the local proceeding describes specific sites that can more reasonably accommodate the proposed use. A detailed evaluation of specific alternative sites is thus not required unless such sites are specifically described, with facts to support the assertion that the sites are more reasonable, by another party during the local exceptions proceeding.

Finding:



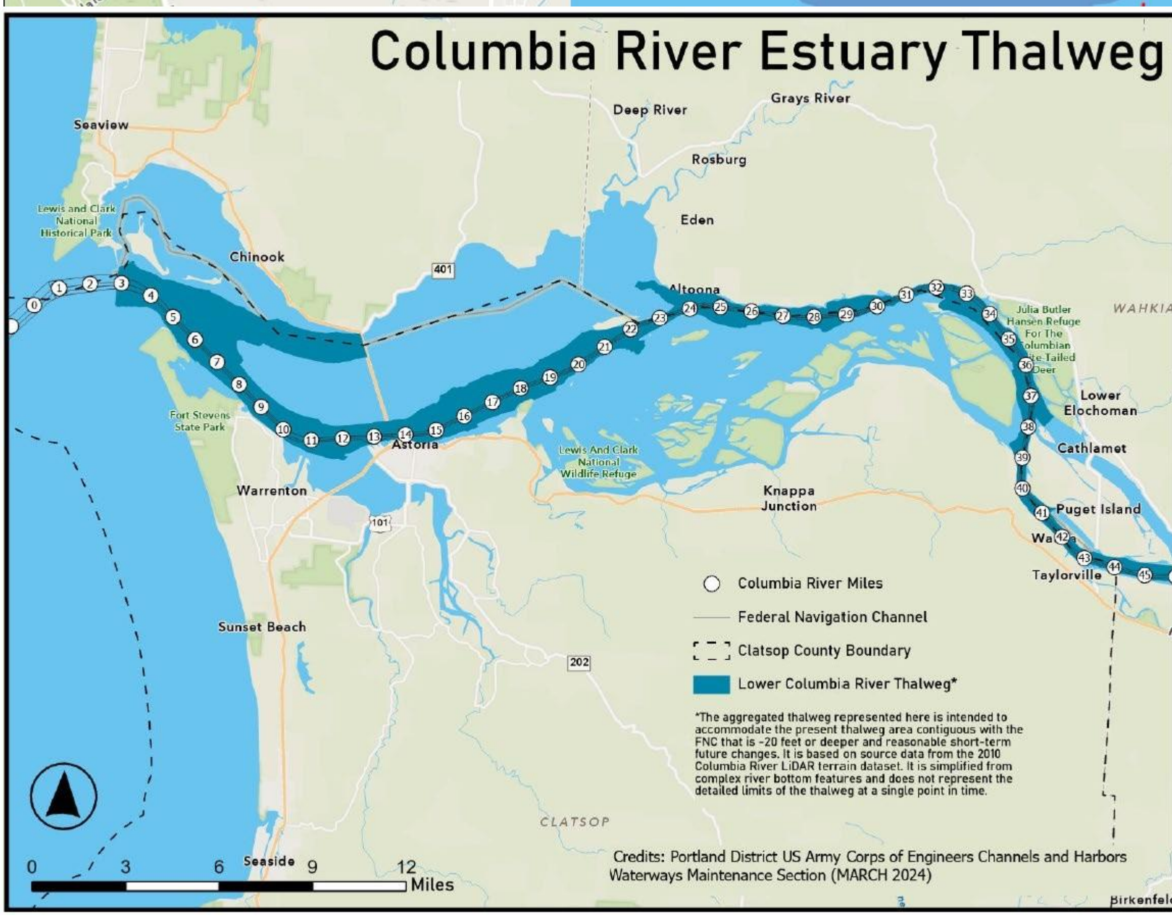


Figure 1 Proposed thalweg for flowlane placement of dredged material in City of Warrenton Urban Growth Boundary and for the whole Columbia River Estuary.

The proposed goal exception application is both within and outside of urban growth boundaries for Warrenton and Astoria as it encompasses the entirety of the Columbia River Estuary[7], it covers resource lands as defined by Clatsop County, since flowlane disposal is already allowed on nonresource lands (aka Aquatic Development) and the application does not include public facilities or services.

"Areas that do not require a new exception cannot reasonably accommodate the use": The Corps has stated that it has five options for dredged material placement: upland placement, in-water (flowlane) placement, transfer/rehandle sites, beach nourishment, or ocean placement. Alternatives other than placement of dredged material in the thalweg that were considered for purposes of this application were: 1) placement of dredged material in the currently defined flowlane (FNC channel plus 600ft on either side); 2) placement of dredged material in designated "Aquatic Development" zones; 3) placement of dredged material outside of the Columbia River Estuary Management Plan; 4) upland disposal in areas already designated for that purpose; and 5) ocean disposal. Placement of material in any of these locations would not require a goal exception but are not feasible for the Corps because of the reasons discussed below.

1) *Placement of dredged material in the currently defined flowlane (FNC channel plus 600ft on either side):* The current flowlane disposal allowance under City of Warrenton policies is considered Aquatic Development zoning, which is nonresource land. The Corps states that there is not sufficient capacity within the Lower Columbia River Estuary (LCRE) flowlane to accept the entire annual volume of dredged sediment that is typically placed along/within the river thalweg. Overuse of flowlane areas by an estimated 1 million cubic yards per year would directly feed sediment to shoaling pathways adjacent to and within the FNC, progressively loading up the supply of shoaling material each year. Dredged sediment placed within the flowlane would not contribute to the sediment budget within the overall thalweg, reducing the supply of sediment needed to sustain the river's morphology. Alternatively, up to 1 million cubic yards per year of LCRE dredged sediment would be placed in the ocean deep water site offshore of the Mouth of the Columbia River (MCR), permanently removing it from the LCRE/MCR sediment budget.

2) *Placement of dredged material in designated "Aquatic Development" zones*: The Corps has stated that the current in-water designated locations (aquatic development zones, considered nonresource lands) allowed for dredged material disposal in Warrenton, Astoria, and Clatsop County are insufficient for the amount of material dredged from the river annually. If the Corps elected to follow the current policies for flowlane placement (within 600 feet of the FNC), they assert that the thalweg's sediment budget would be reduced and would compromise the river's morphology. Instituting flowlane-confined placement of dredged sediment, as specified in current local policies, would increase the amount of sediment directly contributing to FNC

[7] Estuaries extend upstream to the head of tidewater, except for the Columbia River estuary, which, by definition, is considered to extend to the western edge of Puget Island. OAR 660-017-0005.

shoaling and reduce opportunity to sustain the LCRE sediment budget, as compared with the requested thalweg placement.

3) *Placement of dredged material outside of the Columbia River Estuary Management Plan:* The aquatic zoning for estuary waters does not apply in areas upstream of western edge of Puget Island and there are no restrictions on placement of dredged material in the water. The Corps believes there is no capacity available for an additional 1 million cubic yards of material upstream of Clatsop County. There is only one hopper dredge seasonally available in the Columbia River which may be physically capable of pumping material upland, but the additional placement time to stop dredging and pump out each load of material would take the dredge twice as long to remove shoals compared with the proposed amendment for in-water placement.

4) *Upland disposal in areas already designated for that purpose:* Upland placement is not a viable option for material that would otherwise be placed in the thalweg. Upland placement requires local Ports to have or acquire land interests and, as of yet, there have been no lands designated for this purpose in the foreseeable future. Where upland placement is practiced elsewhere in the LCRE/MCR, shoaling occurs in close enough proximity to negate the need for costly material rehandling. Thus, any newly identified placement sites would have to occur within sufficient radius of shoaling to facilitate a pipeline and pump-ashore action, further limiting the selection of sites suitable for upland placement. From an operational standpoint, there is only one hopper dredge seasonally available in the Columbia River which may be physically capable of pumping material upland, but the additional placement time to stop dredging and pump out each load of material would take the dredge twice as long to remove shoals compared with the proposed amendment for in-water placement.

5) *Ocean disposal:* Transporting dredged sediments to the ocean removes those sediments from the estuary system and can contribute to a sediment deficit that may increase erosion of the inner deltas and lead to habitat degradation (Kaminsky et al., 2010). If up to 1 million cubic yards per year of LCRE dredged sediment were placed in the ocean deep water site offshore of the MCR, that material would be permanently removed from the LCR/MCR sediment budget. Use of the ocean disposal site is also not operationally feasible from the Corps' standpoint because the round-trip for a dredging vessel would average greater than 40 miles. Thus, the additional transportation time would equate to more than double the time being needed to complete channel maintenance activities compared with the proposed request to place the material within the thalweg. The Corps would be unable to completely address shoaling in this reach due to these transportation delays.

> *(c) "The long-term environmental, economic, social and energy consequences resulting from the use at the proposed site with measures designed to reduce adverse impacts are not significantly more adverse than would typically result from the same proposal being located in areas requiring a goal exception other than the proposed site." The exception shall describe: the characteristics of each alternative area considered by the jurisdiction in which an exception might be taken, the typical advantages and*

disadvantages of using the area for a use not allowed by the Goal, and the typical positive and negative consequences resulting from the use at the proposed site with measures designed to reduce adverse impacts. A detailed evaluation of specific alternative sites is not required unless such sites are specifically described with facts to support the assertion that the sites have significantly fewer adverse impacts during the local exceptions proceeding. The exception shall include the reasons why the consequences of the use at the chosen site are not significantly more adverse than would typically result from the same proposal being located in areas requiring a goal exception other than the proposed site. Such reasons shall include but are not limited to a description of: the facts used to determine which resource land is least productive, the ability to sustain resource uses near the proposed use, and the long-term economic impact on the general area caused by irreversible removal of the land from the resource base. Other possible impacts to be addressed include the effects of the proposed use on the water table, on the costs of improving roads and on the costs to special service districts;

Finding: DSL is requesting a goal exception to place dredged sediment within the thalweg of the Columbia estuary (the 20-foot bathymetric contour and deeper that is contiguous with the FNC), in areas that under current zoning do not allow for the disposal of dredged material.

The Corps asserts that the environmental analyses and consultations it has performed over its years of maintenance of the FNC[8] support a number of conclusions about the effects of dredged material disposal within the Lower Columbia River Estuary, including within the areas proposed for expanded thalweg disposal.[9,10] Allowing dredged material disposal placement in the thalweg emulates the process of river morphology evolution that naturally occurs within the thalweg. Thalweg-based placement sustains river morphology and shorelands that are essential for water dependent uses, while maintaining the viability of the deep-draft FNC.[11] The

---

[8] 1998 Dredged Material Management Plan and Supplemental Environmental Impact Statement Columbia and Lower Willamette River Federal Navigation Channel; 1999 Integrated Feasibility Report for Channel Improvements and Environmental Impact Statement; 2003 Columbia River Channel Improvement Project Final Supplemental Integrated Feasibility Report and Environmental Impact Statement; 2014 Columbia River Federal Navigation Channel Operations and Maintenance Dredging and Dredged Material Placement Network Update, River Miles 3 to 106.5, Washington and Oregon Final Environmental Assessment.

[9] 2012 Biological Opinion prepared by NOAA-NMFS is based on a definition of the action as follows: "The maintenance activities generally use flowlane sites from 20 to 65 feet in depth with occasional exceptions when disposal may occur in flowlane sites greater than 65 feet in depth."

[10] 2014 Columbia River Federal Navigation Channel Operations and Maintenance Dredging and Dredged Material Placement Network Update, River Miles 3 to 106.5, Washington and Oregon Final Environmental Assessment states: "In-water placement typically occurs adjacent to the FNC at depths between 35 to 65 ft, with occasional exceptions where geologic features situated throughout the Columbia River constrain the channel and require in-water placement in water depths as shallow as 20 ft or deeper than 65 ft. Currently, in-water placement of dredged material occurs within the CR FNC flowlane, adjacent to the CR FNC, or at Harrington Point Sump from RM 20 to 22."

[11] Lower Columbia River Sand Supply and Removal Estimates of Two Sand Budget Components. William J. Templeton and David A. Jay, Ph.D. JOURNAL OF WATERWAY, PORT, COASTAL, AND OCEAN ENGINEERING © ASCE / SEPTEMBER/OCTOBER 2013. https://doi.org/10.1061/(ASCE)WW.1943-5460.0000188.

present river morphology acts to stabilize the thalweg and provides for ecological substrate for the long-term protection and conservation of natural resources. Corps management of dredged material does not degrade the riverbed morphology, substrate, nor adversely affect water dependent uses of the estuary (Ashley 1980; Madej 1999; Kaminsky et al. 2010). Corps management of dredged river sediments sustains the sandy morphology of the coastal margin along Clatsop Plains and Long Beach Peninsula. River sediment dredged from the FNC is managed to emulate the natural downstream movement of river sediment to the estuary's ocean entrance, where much of the sediment is then transported to the coastal margin adjacent to the mouth of the Columbia River, feeding the coastal sediment budget. These benefits of thalweg placement align with the purpose of Statewide Planning Goal 17 Coastal Shorelands.

Placing sediments in deep offshore sites, in conjunction with lower flows and discharge rates that have decreased suspended sediment runoff into the nearshore, have ultimately removed sediments from the Columbia River littoral system that nourishes the nearshore and sustains the beaches of both Washington and Oregon (Mikhailova 2008, Kaminsky et al. 2010, Stark 2012, Allan 2002). The Corps' dredged material management practices in the MCR and LCRE have evolved to focus on retaining sediments in the system and relying less on ocean disposal when in-river placement options are available.

When disposing of dredged materials, the Corps implements best management practices to minimize effects to water quality, including sediment sampling, water quality monitoring, and turbidity monitoring and minimization measures. The Best Management Practices are further defined in the Determination of Compatibility, included as Exhibit 7.

Corps placement does not add to the contamination burden of the Columbia River, nor would it mobilize hazardous materials in the water column. Sediments were sampled and determined to be suitable for unconfined aquatic placement and exposure (Exhibit 4 PSET Documentation). The Corps performs regular dredged material evaluations in the FNC to determine whether sediments are suitable for unconfined in-water placement or exposure, according to the requirements of the Clean Water Act (CWA) or the Marine Protection, Research and Sanctuaries Act (MPRSA), as appropriate. The Corps characterizes sediments present within proposed dredge areas in accordance with national dredged material testing manual protocols (Ocean Testing Manual), Inland Testing Manual, and by using the Sediment Evaluation Framework for the Pacific Northwest (SEF). The Corps, as lead member of the regional Portland Sediment Evaluation Team (PSET), evaluates the discharge of dredged material through the SEF. The Oregon Department of Environmental Quality is also a member of PSET. This framework is based on applicable provisions of CWA Section 404 or MPRSA Section 103. A summary of the most recent results and suitability determinations for locations within Clatsop County (including within Warrenton) is below:

- Lower Columbia River FNC; deep draft channel and associated turning basins (RM 3 to RM 106.5): A total of 59 stations were sampled within this area. All sediment samples consisted of more than 97 percent coarse-grained sediments (gravel and sand) suitable for unconfined, aquatic placement. The total organic carbon (TOC) results for all samples is less than 0.2%.

- Skipanon FNC: Dredge prism sediments are predominantly silt (77-86%) with some clay (12-20%) and minor amounts of sand and gravels (<3%) suitable for unconfined, aquatic placement. TOC in the dredge prism sediments ranged from 2.14 to 2.79%. Total solids in the dredge prism sediments ranged from 35 to 42%.
- Tongue Point FNC: The outer shoal dredge prism was 96.4% sand and the inner shoal averaged 46.9% sand, 45.7% silt, and 7.3% clay suitable for unconfined, aquatic placement.

The Corps will continue to sample and evaluate sediment periodically in the future in accordance with the SEF. Dredged material would only be placed in water after the Corps, in coordination with PSET, determines that sediments are suitable for unconfined aquatic placement and unconfined aquatic exposure, in accordance with the SEF. Sediments that are tested and deemed to be unsuitable (that is, not suitable for unconfined in-water placement) would not be placed in water but would instead be placed in upland sites.

Past monitoring, both instrument and visual, has shown that turbidity quickly dissipates because the dredged material is predominately sand.[12] Placement only occurs in areas that are deeper than 20 feet where little to no benthic productivity is occurring and where fish may migrate but would avoid any dredged material placement activity. Any juvenile fish in the general vicinity would be closer to the shoreline. The most recent dredged material suitability determinations are included as Exhibit 4.

The City's current policies for flowlane material disposal requires placing dredged sediments atop existing shoals, excessively rehandling material, or placing a greater emphasis on land and ocean disposal that removes sediments from the river system. The Columbia River sediment budget is already imbalanced (there is a sediment supply deficit with respect to river transport capacity)—see the erosion and loss of Fitzpatrick Island in Clatsop County. A flowlane placement requirement consistent with the current City definition would load up material in the FNC as sources of shoal material continue to migrate from the shoulders of the river beyond 600 feet from FNC.

As previously described, the loss of sediment from the thalweg beyond 600 feet from the FNC would cause increased degradation of riverbed morphology, including shallow water habitat, sandbars, riverbanks, and islands. A contrasting scenario for comparison would be to place up to 1 million cubic yards per year on land or in the ocean instead of in the thalweg. This scenario removes additional sediment from the system and ultimately the coastal margin. The Corps only transports dredged material to the ocean if there is no capacity for the material to be placed beneficially within the river sediment budget. For the reasons described above, Corps'

---

[12] Source: Annual reports provided by USACE to ODEQ as condition of 401 certification (main channel meter-based monitoring from 2005 until 2014 and then visual monitoring thru 2023 and side channel meter-based monitoring thru 2023). Letter from USACE to ODEQ 10 May 2006 providing supporting documents for 401 certification amendment as requested by ODEQ.

thalweg placement practices are beneficial to Columbia River estuary morphology and ecology. The loss of sediment from the thalweg beyond 600 feet from FNC would cause decreased riverbed morphology, including projected losses of shallow water habitat, sandbars, riverbanks, and islands (i.e., see Exhibit8)

The Corps contracted with several external partners to explicitly evaluate the potential effects of dredging and placement on the benthic environment. Studies investigating the entrainment risk to Dungeness crab across multiple age classes found that crab abundance was highly correlated with salinity and the risk of entrainment for crabs age 2+ to 3+ in summer decreased exponentially as you move upstream, such that locations above the Astoria Bridge had rates that were less than 6% of those noted at the MCR (Pierson et al. 2002[13]; Pierson et al. 2005[14]). In assessing the effects of sediment deposition on Dungeness crab and other epifauna based on lab studies, empirical data collected using video sleds, and models, the collective body of evidence suggests that burial of 10 cm or less has only a nominal effect on crabs and other species (Vavrinec et al. 2007[15]; Roegner and Fields 2015[16]); there don't appear to be significant, adverse, long-term effects to the epibenthic community at large (Fields et al. 2019[17]; Roegner et al. 2021[18]); and crabs that may be dislodged by the lateral surge of material plume typically return to areas within 10 minutes (Roegner et al. 2021). An evaluation of potential effects to white sturgeon similarly found no direct adverse effects, with some indication that some individuals are attracted to disposal areas in the short-term (Parsley et al. 2011[19]). In the Corps' most recent consultation with NMFS evaluating the potential effects of placement activities at seven material transfer sites in the flowlane adjacent to the FNC, NMFS

---

[13] Pearson W.H., G.D. Williams, and J.R. Skalski. 2002. Estimated Entrainment of Dungeness Crab During Dredging for The Columbia River Channel Improvement Project Richland, WA: Pacific Northwest National Laboratory. https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-14129.pdf.

[14] Pearson W.H., G.D. Williams, and J.R. Skalski. 2005. Dungeness Crab Dredging Entrainment Studies in the Lower Columbia River, 2002 – 2004: Loss Projections, Salinity Model, and Scenario Analysis Richland, WA: Pacific Northwest National Laboratory. https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-15021.pdf.

[15] Vavrinec J., W.H. Pearson, N.P. Kohn, J.R. Skalski, C. Lee, K.D. Hall, and B.A. Romano, et al. 2007; Laboratory Assessment of Potential Impacts to Dungeness Crabs from Disposal of Dredged Material from the Columbia River Richland, WA: Pacific Northwest National Laboratory. https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-16482.pdf.

[16] Roegner, G. C. and S. A. Fields. 2015. Mouth of the Columbia River Beneficial Sediment Deposition Project: Benthic Impact Study 2014. Report of the National Marine Fisheries Service to the U.S. Army Corps of Engineers. Portland, Oregon.

[17] Fields, S., Henkel, S., & Roegner, G. C. 2019. Video sleds effectively survey epibenthic communities at dredged material disposal sites. Environmental monitoring and assessment, 191, 1-25.

[18] Roegner, G. C., Fields, S. A., & Henkel, S. K. 2021. Benthic video landers reveal impacts of dredged sediment deposition events on mobile epifauna are acute but transitory. Journal of Experimental Marine Biology and Ecology, 538, 151526.

[19] Parsley, Michael J., Popoff, Nicholas D. and Romine, Jason G. 2011. Short-Term Response of Subadult White Sturgeon to Hopper Dredge Disposal Operations, North American Journal of Fisheries Management, 31: 1, 1 — 11, First published on: 06 February 2011 (iFirst) DOI: 10.1080/02755947.2010.549033 URL: http://dx.doi.org/10.1080/02755947.2010.549033.

included a table in their opinion that estimated the percentage of the flowlane subject to dredging and placement activities below 20-ft depth relative to the overall area of the flowlane and estimated that the area of habitat potentially affected ranged from 0-15.2%, with an average of roughly 9% per reach (NMFS 2023[20]). NMFS ultimately concluded that the proposed action is not likely to jeopardize the continued existence of Lower Columbia River Chinook salmon, Upper Columbia River (UCR) spring run Chinook salmon, Snake River (SR) spring/summer Chinook salmon, Upper Willamette River (UWR) Chinook salmon, SR fall-run Chinook salmon, CR chum salmon, LCR coho salmon, SR sockeye salmon, UCR steelhead, LCR steelhead, UWR steelhead, MCR steelhead, or SR steelhead or destroy or adversely modify their designated critical habitat (NMFS 2023). NMFS also concurred with the Corps that adverse effects to green sturgeon and eulachon were unlikely (NMFS 2023).

Other areas requiring a goal exception for in-water dredged material disposal: The Corps has stated that areas shallower than 20 feet would not be appropriate to accommodate this in-water dredged material disposal use because the effects would be greater in those areas than in the proposed thalweg area. Areas shallower than 20 feet would be dredge-equipment limited and would not be consistent with the consultations the Corps has conducted with the NOAA NMFS. Changes to shallow water habitat in the LCRE, specifically vegetated shallows and tidal swamps, raise concerns about potential adverse effects to habitat that is particularly important for migrating juvenile salmonids (Kukulka and Jay 2003a, 2003b, Fresh 2005, NMFS 2012). The existing Biological Opinion (BiOp) issued by the National Marine Fisheries Service in accordance with the Endangered Species Act (ESA) also places strict limitations on shallow water placement of dredged material and any proposal to place material in this zone would require new ESA consultation for potential effects to fish and other aquatic species not considered under the existing BiOp (NMFS 2012). Lastly, dredge-equipment limitations in this particular stretch of the Columbia River would not allow for material placement in areas shallower than 20 feet.

> *(d) "The proposed uses are compatible with other adjacent uses or will be so rendered through measures designed to reduce adverse impacts." The exception shall describe how the proposed use will be rendered compatible with adjacent land uses. The exception shall demonstrate that the proposed use is situated in such a manner as to be compatible with surrounding natural resources and resource management or production practices. "Compatible" is not intended as an absolute term meaning no interference or adverse impacts of any type with adjacent uses.*

Finding: This exception application would include approximately 38 river miles within the Columbia River Estuary. The overall purpose of Conservation units is to preserve long-term uses of renewable resources that do not require major alteration of the estuary, except for the

[20] NMFS. 2023. Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Lower Columbia River Federal Navigation Channel Dredged Material Transfer Sites (HUC170800060500, 170800030900, 170800030200). NMFS Consultation No. WCRO-2022-02520. 16 February 2023. https://doi.org/10.25923/djwp-c334.

purpose of restoration. Areas directly adjacent to the proposed flowlane expansion area, toward the FNC, would be within the current definition of the flowlane, where dredged material disposal is already a permitted use. Those adjacent areas farther away from the FNC would be shallower than 20-ft where it is unlikely that placed sediments in the deeper areas would accumulate. Within the proposed flowlane expansion area, the Corps would take measures to reduce adverse impacts to water quality or benthic habitat suitability, as further described below.

Corps placement of dredged sediment within the thalweg of the Columbia estuary emulates the process of morphology evolution that naturally occurs within the thalweg. Thalweg-based placement sustains river morphology and shorelands that are essential for water dependent uses, while maintaining the viability of the deep-draft FNC. The present river morphology acts to stabilize the thalweg and provides for ecological substrate for the long-term protection and conservation of natural resources.[21] Corps management of dredged material does not degrade the riverbed morphology, substrate, nor adversely affect water dependent uses of the estuary.[22] Corps management of dredged river sediments sustains the sandy morphology of the coastal margin along Clatsop Plains and Long Beach Peninsula. River sediment dredged from the FNCs is managed to emulate the natural downstream movement of river sediment to the estuary's ocean entrance, where much of the sediment is then transported to the coastal margin adjacent to the mouth of the Columbia River feeding the coastal sediment budget.[23]

The Corps implements best management practices to minimize effects to water quality, including sediment sampling, water quality monitoring, and turbidity monitoring and minimization measures. Sediments were sampled and determined to be suitable for unconfined aquatic placement and exposure (please see prior discussion of sediment testing and the PSET Report in Exhibit 4). Corps placement does not add to the contamination burden of the Columbia River, nor would it mobilize hazardous materials in the water column.[24] Past monitoring, both instrument and visual, has shown that turbidity quickly dissipates because the dredged material is predominately sand.[25] Placement only occurs in areas that are deeper than 20 feet where little to no benthic productivity is occurring and where fish may migrate but

---

[21] Lower Columbia River Sand Supply and Removal Estimates of Two Sand Budget Components. William J. Templeton and David A. Jay, Ph.D. JOURNAL OF WATERWAY, PORT, COASTAL, AND OCEAN ENGINEERING © ASCE / SEPTEMBER/OCTOBER 2013.

[22] See other citations provided re: riverbed morphology stabilization, sediment quality, benthics, and coordination.

[23] Mikhailova 2008, Kaminsky et al. 2010, Stark 2012, Allan 2002.

[24] The most recent dredged material suitability determinations are included as JPA Attachment C and summarized on JPA page 8.

[25] Source: Annual reports provided by USACE to ODEQ as condition of 401 certification (main channel meter-based monitoring from 2005 until 2014 and then visual monitoring thru 2023 and side channel meter-based monitoring thru 2023). Letter from USACE to ODEQ 10 May 2006 providing supporting documents for 401 certification amendment as requested by ODEQ.

would avoid any dredged material placement activity.[26] Most juvenile fish in the general vicinity are anticipated in shallow water habitat and closer to the vegetated shoreline. [27]

(3) If the exception involves more than one area for which the reasons and circumstances are the same, the areas may be considered as a group. Each of the areas shall be identified on a map, or their location otherwise described, and keyed to the appropriate findings.

Finding: Exhibit 1, Columbia Estuary Thalweg Map, describes the expanded geographic area that is proposed to be designated for flowlane disposal. Exhibit 2 shows the map for the area within the Urban Growth Boundary of the City of Warrenton. The goal exception request is an area that is contiguous with the FNC, therefore the goal exception request is for one area within the city's estuary boundary. Within this general area, specific DMD sites would be identified on an annual basis.

Because the Columbia River channel continually moves, the 20-ft depth contour representing the river thalweg likewise will shift on a continual basis. DSL is seeking a text-based definition of thalweg placement that would provide flexibility to adapt to inter-annual changes in the precise location of the thalweg. The maps in Exhibits 1and 2 represent a best-professional-judgment effort by the Corps to physically bound how the extent of the thalweg may change over the next five years. This map is provided as an informational reference to help communicate the likely area where the exception would apply and would need to be updated on a recurring basis.

660-004-0022 Reasons Necessary to Justify an Exception Under Goal 2, Part II(c)

An exception under Goal 2, Part II(c) may be taken for any use not allowed by the applicable goal(s) or for a use authorized by a statewide planning goal that cannot comply with the approval standards for that type of use…

…(1) For uses not specifically provided for in this division, or in OAR 660-011-0060, 660-012-0070, 660-014-0030 or 660-014-0040, the reasons shall justify why the state policy embodied in the applicable goals should not apply. Such reasons include but are not limited to the following: There is a demonstrated need for the proposed use or activity, based on one or more of the requirements of Goals 3 to 19; and either:

> *(a) A resource upon which the proposed use or activity is dependent can be reasonably obtained only at the proposed exception site and the use or activity requires a location near the resource. An exception based on this subsection must include an analysis of the market area to be served by the proposed use or activity. That analysis must*

---

[26] Vavrinec et al. 2007, Roegner and Fields 2015, Fields et al. 2019, Roegner et al. 2021. Also "In-water restoration between Miller Sands and Pillar Rock Island, Columbia River: Environmental surveys, 1992-93" by Hinton, S.A., G.T. McCabe, Jr., and R.L. Emmett, 1995 from compatibility findings document pages 14-15 response to P20.5(10).

[27] Kukulka and Jay 2003a, 2003b, Fresh 2005, NMFS 2012.

demonstrate that the proposed exception site is the only one within that market area at which the resource depended upon can reasonably be obtained; or

(b) The proposed use or activity has special features or qualities that necessitate its location on or near the proposed exception site.

Finding: As the rule criteria above indicates, an exception to a goal requirement can be based on requirements of other statewide planning goals, but that is not the only reason why a goal exception can be justified. DSL is requesting a reasons goal exception to Statewide Planning Goal 16: Estuarine Resources to allow for in-water disposal of dredged material in areas currently zoned as aquatic conservation and (potentially) aquatic natural[28] in the Columbia River Estuary Management Plan and Warrenton Comprehensive Plan. The reasons why the applicant believes the state policy embodied in Goal 16 for locations appropriate for dredged material disposal should not apply in this case are described in the above sections of this document. In summary, the Corps understands that thalweg placement of dredged sand is a balanced approach and is needed to sustain the river's sediment budget, its morphology, and enable eventual downstream progression of river sediment to the ocean.

Additionally, terrestrial sediment supply to the Lower Columbia River has been reduced due to floodplain development and hydro-regulation. The river's sediment supply is now finite and is managed to sustain the ecological health of the estuary. The river thalweg is needed for the disposal of dredged material to sustain the river's sediment budget. Therefore, the goal exception area has special features that necessitate its location.

City of Warrenton Comprehensive Plan Policies and Requirements

The City of Warrenton Comprehensive Plan contains policies of the city. Those sections of the city's Comprehensive Plan (Article 5. Columbia River Estuary and Estuary Shorelands) that are applicable to the proposed action are addressed below.

It should be noted that the proposed goal exception request is to allow disposal of dredged material in an area where it is currently not allowed, and to allow this disposal for any user. The Army Corps is utilizing this area for their operations and maintenance of the FNC. The following sections for comprehensive plan policies and development code provisions are being addressed through the perspective of the Amry Corps undertaking the action. However, other users of the area for disposal (if this goal exception were to be approved) would need to separately apply for and demonstrate consistency with these same polices and criteria.

Section 5.305 Dredging and Dredged Material Disposal

These policies are applicable to all estuarine dredging and dredged material disposal in the Columbia River Estuary, shall be allowed only:

[28] As mentioned elsewhere in the application, while the zoning map for Warrenton shows some areas as Aquatic Natural as potentially impacted by the proposed goal exception, it does not match the descriptions of the estuary subareas in the Comprehensive Plan that are Aquatic Natural. The proposed goal exception avoids areas that are zoned Aquatic Natural as described in the Comprehensive Plan.

1. *If allowed by the applicable zone and required for one or more of the following uses and activities:*
    - *(a) Navigation, navigational access, or an approved water-dependent uses of aquatic areas or adjacent shorelands requiring an estuarine location; and*
    - *(b) A need (i.e., a substantial public benefit) is demonstrated and the use or alteration does not unreasonably interfere with public trust rights; and*
    - *(c) No feasible alternative upland locations exist; and*
    - *(d) Adverse impacts are minimized, avoided, and mitigated; and*
    - *(e) An approved restoration project; and*
    - *(f) Excavation necessary for approved bridge crossing support structures, pipeline, cable, or utility crossing; and*
    - *(g) Maintenance of existing tidegates and tidegate drainage channels where a Goal 16 exception has been approved; and*
    - *(h) Aquaculture facilities.*

Finding: The proposed action is compatible with the above policy because Congress has authorized the Corps to establish and maintain the CR FNCs. Maintaining the CR FNCs will not unreasonably interfere with public trust rights because activities associated with dredge material disposal within the river thalweg will not materially impede or substantially impair the public rights to use the waters for navigation, fishing, commerce, and recreation. The need for the proposed exception and amendment is described in the justification above within this document. Project activities are temporary and will not preclude public use of the river because river users are able to move around the dredge equipment. Moreover, adverse impacts will be minimized using Best Management Practices (Exhibit 9) and as described elsewhere in this document, no feasible upland or ocean alternatives exist for the disposal of this dredged material. For these reasons, the proposed action is compatible with provision 5.305(1).

2. *The appropriate review/ permitting process for impacts to an ESA-listed species has been followed and is approved/permitted by the appropriate Fisheries agency; and*
3. *The activity abides by all required locale state and federal permits.*

Finding: The proposed action is compatible with the above policy because the Corps consulted with the National Marine Fisheries Service in accordance with the Endangered Species Act (ESA). The National Marine Fisheries Service issued a Biological Opinion (BiOp) for the proposed action after reviewing the action for impacts to ESA-listed species. All state and federal agencies with jurisdiction in the river thalweg have been consulted. This application for a goal exception is to meet local policies to the maximum extent practicable for Corps actions, which will in turn be an important step for the Corps' next 401 water quality certification from the Oregon Department of Environmental Quality. The proposed action is consistent with 5.305(2) and 5.305(3).

4. *Dredging and dredged material disposal shall not disturb more than the minimum area necessary for the project and shall be conducted and timed so as to minimize impacts on wetlands and other estuarine resources. Loss*

or disruption of fish and wildlife habitat and damage to essential properties of the estuarine resource shall be minimized by careful location, design, and construction of:
(a) Facilities requiring dredging; and
(b) Sites designated to receive dredged material disposal; and
(c) Dredging operation staging areas and equipment marshalling yards.

Dredged materials shall not be placed in intertidal or tidal marsh habitats or in other areas that local, state, or federal regulatory agencies determine to be unsuitable for dredged material disposal. Exceptions to the requirement concerning disposal in an intertidal or tidal marsh area include use of dredged material as a fill associated with an approved fill project or placement of dredged materials in the sandy intertidal area of a designated beach nourishment site. Land disposal shall enhance or be compatible with the final use of the site area.

Finding: The proposed action is compatible because as a matter of practice, the Corps only dredges the minimum area necessary to maintain the Columbia River FNCs' dimensions and placement sites are designed to be the smallest acreage needed to accommodate the fill. Dredging and placement activities would occur in areas that minimize loss or disruption of fish and wildlife habitat and damage to estuarine resource properties. Biological resources within the Columba River system are diverse. There are four primary habitats that encompass the Lower Columbia River system: Estuarine, Riverine, Riparian, and Upland. Each of these habitats carries an intricate level of biologic complexity. The FNC O&M operates within each of the habitats to a varying degree. The Corps has already undergone consultation with the National Marine Fisheries Service (NMFS) and the US Fish and Wildlife Service (USFWS) for the current O&M dredging of FNCs in the Columbia River, which did evaluate disposal of dredged material deeper than 20ft and contiguous with the FNC. The Corps follows established BMPs to minimize adverse impacts to the aquatic and terrestrial environment; the most recent set of both dredging and placement BMPs were detailed in section 1.3 of the NMFS's Biological Opinion: Reinitiation of Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Columbia River Navigation Channel and Operations and Maintenance, Mouth of the Columbia River to Bonneville Dam, Oregon and Washington, NMFS BiOp # 2011/02095 (NMFS 2012 BiOp, Exhibit 3) that included an incidental take statement for salmon, steelhead, green sturgeon, and eulachon for inadvertent take occurring during proposed maintenance of the CR FNCs. These baseline activities associated with maintenance dredging of the CR FNCs have not changed; and implementation of these BMPs has been successful in minimizing potential adverse impacts to the aquatic environment. NMFS also issued a Biological Opinion on June 16, 2021 (2021 BiOp[29], Exhibit 5) titled Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Operations and Maintenance Dredging of the Federal Navigation

[29] https://doi.org/10.25923/5edr-c970

Channels at Tongue Point, Clatsop County, Oregon; Elochoman Slough, Wahkiakum County, Washington; Lake River, Clark County, Washington; and Oregon Slough, Multnomah County, Oregon. NMFS issued a Biological Opinion on February 16, 2023 (2023 BiOp, Exhibit 6) titled Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Lower Columbia River Federal Navigation Channel Dredged Material Transfer Sites. The Corps will follow the BMPs outlined in the 2012, 2021 and 2023 BiOps unless or until superseded by a later BiOp. The USFWS concurred with the Corps' determination that the action would have no effect on the following listed species: western snowy plover, northern spotted owl, short-tailed albatross, Oregon silverspot butterfly, water howellia, and yellow-billed cuckoo and "may affect, but is not likely to adversely affect" bull trout, marbled murrelet, and Columbian white-tailed deer (Service reference# 13420-2010-I-0165). The Corps will follow all of the reasonable and prudent measures in the associated biological opinions, and conservation measures that USACE included in the proposed action. Lastly, dredge-equipment limitations in this particular stretch of the Columbia River would not allow for material placement in areas shallower than 20 feet.

For these reasons, the proposed action is compatible with provision 5.305(4).

5. *The effects of both initial and subsequent maintenance dredging, as well as dredging equipment marshalling and staging, shall be considered prior to approval of new projects or expansion of existing projects. Projects shall not be approved unless disposal sites with adequate capacity to meet initial excavation dredging and at least five years of expected maintenance dredging requirements are available.*

Finding: As written, this policy applies to the "approval of new projects or expansion of existing projects." This policy does not apply to dredging an existing federal navigation channel, to its existing congressionally authorized dimensions (including advanced maintenance dredging) because it is not a "new" project or "expansion" of an existing project. If this policy did apply to the Corps maintaining the existing navigation channel, USACE Engineering Regulation (ER) 1105-2-100 already requires that there be sufficient dredged material placement site capacity for maintaining this project for a minimum of twenty years. The Corps is in the process of developing a new dredged material management plan (DMMP) for continued maintenance of the deep-draft channel. USACE previously submitted a request for water quality certification to ODEQ under Clean Water Act (CWA) Section 401 for continued maintenance dredging and discharges in Oregon. USACE will submit a separate water quality certification for any new discharges/placement sites associated with the next DMMP.

The map provided as Exhibit 1 represents the expanded thalweg area within which the Corps believes sufficient capacity exists to perform flowlane dredged material disposal. Of the approximately 23,000 acres represented by the proposed expanded thalweg area, the Corps estimates that 2,300 acres (10%) would be utilized for DMD each year. The proposed action is compatible with provision 5.305(5).

6. *Dredging subtidal areas to obtain fill material for dike maintenance may be allowed under some circumstances (see the Development Code). Some dikes in the estuary are not accessible by barge-mounted dredges or land-based equipment. Dredging intertidal areas to obtain fill material may be the only option for maintaining these dikes. Approval of intertidal dredging will require an exception to Statewide Planning Goal 16.*

Finding: This policy is not applicable to the proposed action.

7. *Where a dredged material disposal site is vegetated, disposal should occur on the smallest land area consistent with sound disposal methods (e.g., providing for adequate de-watering of dredged sediments, and avoiding degradation of receiving waters). Clearing of land should occur in stages and only as needed. It may, however, be desirable to clear and fill an entire site at one time, if the site will be used for development immediately after dredged material disposal. Reuse of existing disposal sites is preferred to the creation of new sites provided that the dikes surrounding the site are adequate or can be made adequate to contain the dredged materials.*

Finding: This policy is not applicable to the proposed action as this is requesting disposal of dredged material in the water and not on land.

8. *When identifying land dredged material disposal sites, emphasis shall be placed on sites where (not in priority order):*
   (a) The local designation is Development provided that the disposal does not preclude future development at the site;
   (b) The potential for the site's final use will benefit from deposition of dredged materials;
   (c) Material may be stockpiled for future use;
   (d) Dredged spoils containing organic, chemical, and/or other potentially toxic or polluted materials will be properly contained, presenting minimal health and environmental hazards due to leaching or other redistribution of contaminated materials;
   (e) Placement of dredged material will help restore degraded habitat; or where
   (f) Wetlands would not be impacted.

   Important fish and wildlife habitat, or areas with scenic, recreational, archaeological, or historical values that would not benefit from dredged material disposal and sites where the present intensity or type of use is inconsistent with dredged material disposal shall be avoided. The use of agricultural or forest lands for dredged material disposal shall occur only when the project sponsor can demonstrate that the soils can be restored to agricultural or forest productivity after *disposal use is completed. In cases where this demonstration cannot be made, an exception to the Oregon Statewide Planning Goal 3 or 4 must be approved prior to the use of the site for dredged material disposal. The use of shoreland water-dependent development sites for dredged material disposal shall occur only when the project sponsor can demonstrate that the dredged material placed on the site will be compatible with current and future water-dependent development. Dredged material disposal shall not occur in major marshes, significant wildlife habitat and exceptional aesthetic resources designated under Oregon Statewide Planning Goal 17.*

Engineering factors to be considered in site selection shall include: size and capacity of the site; dredging method; composition of the dredged materials; distance from dredging operation; control of drainage from the site; elevation; and the costs of site acquisition, preparation and revegetation.

Finding: This policy is not applicable to the proposed action as this is requesting disposal of dredged material in the water and not on land.

9. *Estuarine in-water disposal sites shall be in Development Aquatic areas identified as low in benthic productivity, unless the disposal is to provide fill material for an approved fill project, and where disposal at the site will not have adverse hydraulic effects. Estuarine in-water disposal sites shall only be designated and used when it is demonstrated that no feasible land or ocean disposal sites with less damaging environmental impacts can be identified and biological and physical impacts are minimal. An in-water disposal site shall not be used if sufficient sediment type and benthic data are not available to characterize the site.*

Finding: The proposed action is for estuarine in-water disposal within areas of the river that are deeper than 20 feet and contiguous with the FNC. During this disposal, benthic organisms could be temporarily buried or displaced by the in-water discharge. However, the mid-depth habitat created is expected to provide a suitable substrate for re-colonization by organisms from adjacent benthic communities. The dredged material would also have benthic organisms that would be relocated from the dredging areas and may re-establish at the placement site. Sand disposed of during in-water placement will be spread in thin layers to minimize mortality by burial. Monitoring of dredge material placements at Woodland, Martin, and Bachelor Islands in the LCR by researchers from Pacific Northwest National Laboratory (Nichole K Sather et al. 2022[30]) found that over a relatively short time the food web begins to reestablish with benthic invertebrates.

In-water placement sites are generally located in the flowlane where velocities are high, water is deeper than 20 feet, with naturally unstable or shifting substrate. Lower benthic productivity is expected at these depths. There have been multiple studies to support the conclusion that benthic densities are significantly lower in areas deeper than 20 feet and that benthic primary

[30] Sather, Nichole K, Kailan Mackereth, Jan Irvahn, Rachel Viera, and Jennifer Huckett. 2022. "Action Effectiveness Monitoring and Research of Dredged Material Placement at Woodland Islands," April.

production consists of shallower, subtidal and intertidal habitats. For example, the study "In-water restoration between Miller Sands and Pillar Rock Island, Columbia River: Environmental surveys, 1992-93" by Hinton, S.A., G.T. McCabe, Jr., and R.L. Emmett, 1995. In the Corps' most recent consultation with NMFS evaluating the potential effects of placement activities at seven material transfer sites in the flowlane adjacent to the FNC, NMFS included a table in their opinion that estimated the percentage of the flowlane subject to dredging and placement activities below 20-ft depth relative to the overall area of the flowlane and estimated that the area of habitat potentially affected ranged from 0-15.2%, with an average of roughly 9% per reach (NMFS 2023[LCBCUC(8]). NMFS ultimately concluded that the proposed action is not likely to jeopardize the continued existence of LCR Chinook salmon, Upper Columbia River (UCR) spring run Chinook salmon, Snake River (SR) spring/summer Chinook salmon, Upper Willamette River (UWR) Chinook salmon, SR fall-run Chinook salmon, CR chum salmon, LCR coho salmon, SR sockeye salmon, UCR steelhead, LCR steelhead, UWR steelhead, MCR steelhead, or SRB steelhead or destroy or adversely modify their designated critical habitat (NMFS 2023). NMFS also concurred with the Corps that adverse effects to green sturgeon and eulachon were unlikely (NMFS 2023).

Organisms common to areas of unstable substrates are adapted to physically stressful conditions and have life cycles that allow them to withstand the stresses imposed by dredged material placement activities (Vavrinec et al. 2007; Roegner and Fields 2015; Fields et al. 2019, Roegner et al. 2021). Dredged material discharged at placement sites that have a naturally unstable or shifting substrate due to wave or current action tends to be more quickly dispersed. Also, the Corps minimizes physical impacts by choosing placement sites with a similar substrate as the dredge material. Impacts to benthic organisms are minimized when sand is placed on a sandy bottom, thus avoiding harmful changes in substrate composition. Therefore, the Corps understands that the project sites will be low in benthic productivity and the proposal is compatible with provision 5.305(9).

10. *Flow lane disposal sites shall only be allowed in Development Aquatic areas within or adjacent to a channel. The Development Aquatic area adjacent to the channel shall be defined by a line 600 feet from either side of the channel or the 20-foot bathymetric contour, whichever is closer to the channel. Flowlane disposal within this area shall only be allowed where:*
    (a) sediments can reasonably be expected to be transported down-stream without excessive shoaling,
    (b) Interference with recreational and commercial fishing operations, including snag removal from gillnet drifts, will be minimal or can be minimized by applying specific restrictions on timing or disposal techniques,
    (c) adverse hydraulic effects will be minimal,
    (d) adverse effects on estuarine resources will be minimal, and
    (e) the disposal site depth is between 20 and 65 feet below MLLW.

Finding: This provision is intended to ensure that dredged material placement sites are located in particular areas to avoid adverse effects. The City of Warrenton defines the main navigation channel and a flowlane disposal area on each side of the channel (extending either 600 feet or to the 20-foot bathymetric contour, whichever is narrowest) as designated Development Aquatic. This proposal is seeking an exception to this requirement, mainly the qualifier "whichever is narrowest," in order to allow dredged material disposal to occur in areas contiguous with the FNC to the 20-foot bathymetric contour.

Regarding (a) downstream shoaling, analysis for hydraulics, sedimentation, and morphology change consist of areas within the CR, including in-water and beach nourishment placement locations. General shoaling metrics within the river are defined in terms of how and when shoals are formed by seasonal variation in river flow. The relevance of shoaling metrics is based on how and when the shoaling processes affect CR navigation, motivating the need for dredging or the imposition of navigation restrictions. The purpose of the action is to accommodate maintenance dredging of the CR FNCs. Any effects associated with the proposed action would be temporary, localized, and minor with respect to the hydraulics and sediment transport conditions of the Columbia River. Columbia River dredged sand can be remobilized after placement on the riverbed when river currents exceed 0.35 meter/sec (1.1 ft/sec). As river current speed increases beyond 0.35 m/sec, the associated sediment transport rate increases exponentially.

In-water placement occurs in locations that the Corps has determined will not result in excessive FNC shoaling from remobilized placed sediment. Dredged sediment is placed within the river thalweg to not harm living resources, not adversely affect other uses of the river, sustain the thalweg, and not rapidly return to the FNC. Success requires constant adaptation as the river continuously relocates the dredged sediment placed in-water each year. Placement areas are specified for each event based on an applied understanding of hydrodynamic and sediment transport processes informed by bathymetric depth surveys and river current velocity data from the Corps' Lower Columbia River adaptive hydraulics model. The placement location must be deep enough for the dredge or scow to safely access based on that vessel's draft below the water surface. Velocity data and bathymetric differencing and evaluation of bedforms can inform sediment movement after placement, to minimize movement into FNC shoals and support movement into areas to counteract riverbed erosion.

The proposed action would not (b) interfere with recreational or commercial fishing and will follow the work windows in the most current 2012, and 2021 and 2023 Biological Opinions from National Marine Fisheries Service (NMFS) for the ongoing O&M activities, and (c) would not have adverse hydraulic effects (explained above for 5.305(9)) or (d) adverse effects on estuarine resources. Previous responses within this application have described how the expanded flowlane area would remain compatible with the estuarine resources and the Corps will follow Best Management Practices for the protection of water quality as explained in Exhibit 9.

Regarding (e), DSL is proposing an amendment to this policy to permit in-water dredged material placement in depths 20 feet or greater and contiguous with the FNC.

The Corps contracted with several external partners to explicitly evaluate the potential effects of dredging and placement on the benthic environment. Studies investigating the entrainment risk to Dungeness crab across multiple age classes found that crab abundance was highly correlated with salinity and the risk of entrainment for crabs age 2+ to 3+ in summer decreased exponentially as you move upstream, such that locations above the Astoria Bridge had rates that were less than 6% of those noted at the MCR (Pierson et al. 2002, Pierson et al. 2005). In assessing the effects of sediment deposition on Dungeness crab and other epifauna based on lab studies, empirical data collected using video sleds, and models, the collective body of evidence suggests that burial of 10 cm or less has only a nominal effect on crabs and other species (Vavrinec et al. 2007; Roegner and Fields 2015); there does not appear to be significant, adverse, long-term effects to the epibenthic community at large (Fields et al. 2019, Roegner et al. 2021); and crabs that may be dislodged by the lateral surge of material plume typically return to areas within 10 minutes (Roegner et al. 2021). An evaluation of potential effects to white sturgeon similarly found no direct adverse effects, with some indication that some individuals are attracted to disposal areas in the short-term (Parsley et al. 2011).

The map provided as Exhibit 1 represents the expanded thalweg area within which the Corps believes sufficient capacity exists to perform flowlane dredged material disposal for a five year period. Of the approximately 23,000 acres represented by the proposed expanded thalweg area, the Corps estimates that 2,300 acres (10%) would be utilized for DMD each year. The thalweg map would be updated on a five-year basis.

11. *Beach nourishment sites shall only be designated on sandy beaches currently experiencing active erosion. Dredged material disposal at beach nourishment sites shall only be used to offset the erosion and not to create new beach or land areas. Beach nourishment sites shall not be designated in areas where placement or subsequent erosion of the dredged materials would adversely impact tidal marshes or productive intertidal or shallow subtidal areas. Designation of new beach nourishment sites shall require an exception to Statewide Planning Goal 16.*

Finding: This policy is not applicable to the proposed action as this is requesting disposal of dredged material in the water and not as beach nourishment.

12. *Dredged material disposal sites with adequate capacity to accommodate anticipated dredging needs for at least a five year period shall be identified and designated.*

Finding: The map provided as Exhibit 1 represents the expanded thalweg area within which the Corps believes sufficient capacity exists to perform flowlane dredged material disposal for a five-year period. Of the approximately 23,000 acres represented by the proposed expanded thalweg area, the Corps estimates that 2,300 acres (10%) would be utilized for DMD each year. The thalweg map would be updated on a five-year basis. This action is consistent with 5.305(12).

13. *In order to ensure the adequacy of identified dredged material disposal site capacities for anticipated five year disposal requirements, an analysis of the*

dredge material disposal site inventory shall be completed every five years. The analysis shall include:
(a) A determination of the sites utilized for dredged material disposal and the volume received by each site during the preceding period, noting also the project source of the dredged material and the interval separating the most recent from the next anticipated dredging event.
(b) A determination of the number and usable volume of sites remaining in the inventory, and the relationship between these sites and present or expected navigation-related dredging or water dependent development projects in the following five-year period.
(c) An analysis of the adequacy of the dredged material site inventory shall include notification of updating inventory information to affected property owners and local, state and federal agencies. Of particular importance, is the addition, and/or deletion, of dredged material disposal sites.
(d) The City of Warrenton shall cooperate with other jurisdictions and CREST on the Columbia River Estuary in monitoring of dredged material site availability and in dredged material disposal plan update.

Finding: This policy is not applicable to the proposed action as it is directed at the City of Warrenton and is for a long term and comprehensive look at all dredged material disposal sites and users. The proposed action is for one type of dredged material disposal.

Section 5.311 Fish and Wildlife Habitat

These policies apply to uses and activities with potential adverse impacts on fish or wildlife habitat, both in Columbia River estuarine aquatic areas and in estuarine shorelands.

1. *Endangered or threatened species habitat shall be protected from incompatible development.*

Finding: In the Corps' most recent consultation with NMFS evaluating the potential effects of dredge material placement activities at seven material transfer sites in the flowlane adjacent to the FNC, NMFS included a table in their opinion that estimated the percentage of the flowlane subject to dredging and placement activities below 20-ft depth relative to the overall area of the flowlane for the Columbia River between RM 3 and 145.3 segmented into nine reaches along its length, and estimated that the area of habitat potentially affected ranged from 0-15.2%, with an average of roughly 9% per reach (NMFS 2023). NMFS ultimately concluded that the proposed action is not likely to jeopardize the continued existence of LCR Chinook salmon, Upper Columbia River (UCR) spring run Chinook salmon, Snake River (SR) spring/summer Chinook salmon, Upper Willamette River (UWR) Chinook salmon, SR fall-run Chinook salmon, CR chum salmon, LCR coho salmon, SR sockeye salmon, UCR steelhead, LCR steelhead, UWR steelhead, MCR steelhead, or SRB steelhead or destroy or adversely modify their designated critical habitat (NMFS 2023). NMFS also concurred with the Corps that adverse effects to green sturgeon and eulachon were unlikely (NMFS 2023). The proposed action is consistent with 5.311(1).

Policies 5.311(2) and (3) are not applicable to the proposed action.

Section 5.331 Significant Areas

These policies are intended to protect certain shoreland and aquatic resources with estuary-wide significance. Significant shoreland resources are identified as such in the area and subarea description. Significant aquatic resources are found in Natural Aquatic areas. This subsection applies only to activities and uses that potential affect significant shoreland or aquatic resources. Other resources without estuary-wide significance are not covered by this subsection. Only those resource identified as significant under Statewide Planning Goal 17 are covered by these policies and standards.

1. *Significant estuarine aquatic and shoreland resources shall be protected from degradation or destruction by conflicting uses and activities.*

Finding: This expanded definition of flowlane disposal would include areas currently zoned as Aquatic Conservation. As described in the subareas of the Columbia River Estuary within the Warrenton Comprehensive Plan, the only place that is zoned Aquatic Natural that may coincide with the proposed expansion of flowlane disposal of dredged material is in the Youngs Bay subarea. In that area, the mud flats, tidal flats, and fringing marshes are designated Aquatic Natural. However, the area that is bounded by the authorized FNC to the north and the 20-foot contour line to the south is designated Aquatic Development. We believe that because this proposal is limited to the 20-foot contour line or deeper and contiguous with the FNC, it will not affect the area that is designated Aquatic Natural as described in the Comprehensive Plan. The other area designated Aquatic Natural within the City of Warrenton is in Alder Cove which would not be impacted by this proposal. Likewise, the proposal will not impact any significant shoreland areas as it is confined to the estuary waters.

Policies 5.331(2) and (3) are not applicable to the proposed action. The proposed action will not be impacting significant riparian vegetation, major marshes, significant wildlife habitat, or exceptional aesthetic resources.

Section 5.339 Federal Consistency

These policies establish procedures for ensuring that federal actions are consistent with this Comprehensive Plan.

1. *Not applicable.*
2. *Federal development projects and other activities that directly affect the estuary and shoreland area in the coastal zone shall be consistent to the maximum extent practicable with the mandatory enforceable policies of Warrenton Comprehensive Plan. Federal agencies address the consistency requirements by submitting a written consistency determination to the Oregon Department of Land Conservation and Development. The local government may review the consistency determination against its plan and communicate comments to Department of Land Conservation and Development. Department of Land Conservation and Development has the authority to make a final decision on the consistency determination. The federal agency has the option of applying for a local permit to demonstrate consistency with the Warrenton Comprehensive Plan.*

3. *Federal activities in the Columbia River Estuary that are most likely to directly affect the coastal zone and require a determination of consistency with the plan include, but are not limited to, the following:*
   (a) dredging or dredged material disposal associated with maintenance or construction of federal navigation projects;
   (b) maintenance or construction of other federal navigation improvements including jetties, grains, breakwaters and pile dikes;
   (c) maintenance or construction of federal flood control projects such as dikes and associated drainageways and structures, and shoreline stabilization projects;
   (d) docks and other in-water structures, dredging, and dredged material disposal associated with federal facilities such as Coast Guard bases and naval installations;
   (e) federal refuge improvements;
   (f) mitigation and restoration actions;
   (g) road construction in the coastal watershed;
   (h) waste discharge in the coastal watershed; and
   (i) land acquisition, disposal, or exchange.
   The consistency requirements apply to both planning and implementing these federal activities.

Finding: This application for a goal exception to expand the area for in-water disposal of dredged material is an attempt to make operations and maintenance dredging of the Columbia River by the Army Corps consistent to the maximum extent practicable with the enforceable policies of the Oregon Coastal Management Program that are within the jurisdiction of the City of Warrenton.

City of Warrenton Development Code Requirements

Chapter 16.232 Amendments to Comprehensive Plan Text and Map, Rezone, and Development Code

16.232.30 Quasi-Judicial Amendments, (B) Criteria for Quasi-Judicial Amendments. A recommendation or a decision to approve, approve with conditions or to deny an application for a quasi-judicial amendment shall be based on all of the following criteria:

1. *Demonstration of compliance with all applicable Comprehensive Plan policies and map designations. Where this criterion cannot be met, a Comprehensive Plan amendment shall be a pre-requisite to approval.*

Finding: See answers above for compliance with applicable comprehensive plan policies. Where not consistent, this application is seeking a goal exception to allow the disposal of dredged material in areas where that activity is not currently allowed in order to become consistent.

2. *Demonstration of compliance with all applicable standards and criteria of this Code, and other applicable implementing ordinances.*

Finding: See answers above and below. The application demonstrates compliance with all applicable standards and criteria of the development code or will be made so through the approval of this goal exception.

3. *Evidence of change in the neighborhood, or community, or a mistake or inconsistency in the Comprehensive Plan or land use district map regarding the property which is the subject of the application; and the provisions of Section 16.232.060, as applicable.*

Finding: See answers above about the need for an expanded area for dredged material disposal to accommodate ongoing maintenance of the FNC and the river's sediment budget, which demonstrates evidence of change in the estuary. Section 16.232.060 is not applicable to this proposal.

Chapter 16.76 Aquatic Conservation (A-2) District

Part of the proposal for the disposal of dredged material within the expanded flowlane/river thalweg comes into areas zoned by the City of Warrenton as A-2. The disposal of dredged material is not currently allowed in this zone which is the basis for this goal exception application.

16.76.040 Development Standards. The following standards are applicable in the A-2 zone:

A. All uses shall satisfy applicable Columbia River Estuary Shoreland and Aquatic Area Development Standards in Chapter 16.160.

B. A proposal involving several uses shall be reviewed in aggregate under the more stringent procedure.

C. All applicable policies in the City's Comprehensive Plan and goal exceptions shall be met.

D. A proposal which requires new dredging, fill, in-water structures, riprap, new log storage areas, water intake, in-water disposal of dredged material, beach nourishment, or other activities which could affect the estuary's physical processes or biological resources is subject to an impact assessment (Section 16.164.010).

E. All other applicable Development Code requirements shall also be satisfied.

F. ~~The maximum height of structures in the A-2 zone shall be 45 feet above MLLW.~~

G. ~~Uses that are not water-dependent shall be located on a floating structure or on pilings, and shall not increase the need for fill if in association with a water-dependent use located on fill.~~

H. ~~Uses that are not water-dependent shall not preclude or conflict with existing or probable future water-dependent development on the site or in the vicinity.~~

I. ~~Uses that are water-dependent and/or water-related must meet the criteria in Section 16.160.080.~~

J. Uses and activities permitted under Section 16.76.020 of this chapter are subject to the public notice provisions of Section 16.208.040 if an impact assessment is required pursuant to Sections 16.164.010 through 16.164.050, or if a determination of consistency with the purpose of the A-2 zone is required pursuant to Section 16.164.020, or if the Community Development Director determines that the permit decision will require interpretation or the exercise of factual, policy or legal judgment.

K. ~~All new sewer and water connections for a proposed development shall comply with all City regulations.~~

Finding: All criteria above are either addressed elsewhere in this application or are not applicable (strikethrough criteria are not applicable to the proposed action). See answers below for Chapter 16.160 and 16.164. See answers above that address all applicable Comprehensive Plan policies and goal exception criteria.

Chapter 16.80 Aquatic Natural (A-3) District

Part of the proposal for the disposal of dredged material within the expanded flowlane/river thalweg comes into areas zoned by the City of Warrenton as A-3 as shown on the city's current Zoning Map. Based on the aquatic zone descriptions for each subarea in the Comprehensive Plan, the applicant does not believe that the proposed goal exception area will fall within Aquatic Natural areas. Regardless, the criteria for this zone are addressed. The disposal of dredged material is not currently allowed in Aquatic Natural areas which is the basis for this goal exception application.

16.80.040 Development Standards.

The following standards are applicable in the A-3 zone:

A. All uses and activities shall satisfy applicable Columbia River Estuary Shoreland and Aquatic Area Development Standards in Chapter 16.160.

B. A proposal involving several uses shall be reviewed in aggregate under the more stringent procedure.

C. All applicable policies in the City's Comprehensive Plan, mediation panel agreement and goal exceptions shall be met.

D. All other applicable Development Code requirements shall also be satisfied.

E. A use which requires new dredging, fill, in-water structures, riprap, new log storage areas, water intake, in-water disposal of dredged material, beach nourishment, or other *activities which could affect the estuary's physical processes or biological resources is subject to an impact assessment (Section 16.164.010).*

F. ~~Uses that are not water-dependent shall be located either on a floating structure or on pilings, and shall not increase the need for fill if in association with a water-dependent use located on fill.~~

G. ~~Uses that are not water-dependent shall not preclude or conflict with existing or probable future water-dependent uses on the site or in the vicinity.~~

~~H. Maximum height of structures shall by 35 feet above MLLW~~

~~I. Uses that are water-dependent and/or water-related must meet the criteria in Section 16.160.080.~~

~~J.~~ Uses and activities permitted under Section 16.80.020 of this chapter are subject to the public notice provisions of Section 16.208.040 if an impact assessment is required pursuant to Sections 16.164.010 through 16.164.050, or if a determination of consistency with the purpose of the A-3 zone is required pursuant to Section 16.164.020, or if the Community Development Director determines that the permit decision will require interpretation or the exercise of factual, policy or legal judgment.

~~K. All new sewer and water connections for a proposed development shall comply with all City regulations.~~

Finding: All criteria above are either addressed elsewhere in this application or are not applicable (strikethrough criteria are not applicable to the proposed action). See answers below for Chapter 16.160 and 16.164. See answers above that address all applicable Comprehensive Plan policies and goal exception criteria.

Chapter 16.88 Flood Hazard Overlay (FHO) District

The area for the proposed goal exception is within the “AE” mapped flood hazard area.

16.88.040 Standards for Flood Hazard Reduction

E. Alteration of Watercourses.

1. No watercourse shall be altered until a maintenance plan is provided which assures that the flood-carrying capacity of altered or relocated portions of the watercourse is not diminished.

Finding: The proposed action is for in-water dredged material placement within Warrenton’s jurisdiction. The proposed flowlane placement in waters 20 feet or deeper is a relocation of shoal material dredged from the FNC to discrete morphological features that are also located within the active river floodway (like the FNC). No new sediment will be imported to the river under the proposed action. Implementation of in-water dredged material features is not considered an encroachment on the river’s floodway and is not anticipated to increase flood risk because the total volume of dredged material in the floodway remains the same and conveyance capacity of the LCR is not changed.

The Corps recently released a “Draft Integrated Material Management Plan and Environmental Impact Statement” (DMMP-EIS) for the purposes of maintaining the congressionally authorized channel dimensions of the Lower Columbia River FNC. Based on the hydraulic evaluation described in Appendix C.2 of the DMMP-EIS[31], changes to existing patterns of erosion, deposition, and flooding would not be expected. Any effects associated with the proposed action would be temporary, localized, and minor with respect to the flood carrying capacity of the river. Thus, there would be no direct or indirect impacts on the bank full flood carrying capacity as a result of the proposed action relative to the current baseline conditions. Therefore, the flood-carrying capacity of the LCR is not diminished. The applicable standards of 16.88.040 are met.

Chapter 16.104 Dredge Material Disposal Site Locations (DMD)

> *16.104.010 Purpose. The intent of this designation is to show the location of the dredged material disposal (DMD) sites in the City with respect to present and expected water-dependent development and navigational access requirements and to protect these sites for dredged material disposal operations.*
>
> *16.104.020 DMD Site Locations. The dredged material disposal site locations are shown on the DMD map of the Development Code and in the dredged material disposal (DMD) element of the Comprehensive Plan, and the CREST 2002 Management Plan as it references the City of Warrenton and its sites therein. Revisions to the DMD sites or to the DMD language within the Comprehensive Plan shall be through an adoption of an amendment to the Comprehensive Plan.*

Finding: This goal exception application is to designate an expanded area for in-water flowlane disposal of dredged material in depths greater than 20 feet and contiguous to the FNC, and to add this area to the list of sites designated as such. Exhibit 2 shows the map for this proposed disposal area for approximately five years.

Chapter 16.160 Columbia River Estuary Shoreland and Aquatic Area Development Standards

> *16.160.040 Dredging and Dredged Material Disposal*
>
> *C. Undesirable erosion, sedimentation, increased flood hazard, and other changes in circulation shall be avoided at the dredging and disposal site and in adjacent areas.*
>
> *D. The timing of dredging and dredged material disposal operations shall be coordinated with state and federal resource agencies, local governments, and private interests to protect estuarine aquatic and shoreland resources, minimize interference with commercial and recreational fishing, including snag removal from gillnet drifts, and*

[31] https://usace.contentdm.oclc.org/digital/collection/p16021coll7/id/26369

insure proper flushing of sediment and other materials introduced into the water by the project.

F. Adverse short-term effects of dredging and aquatic area disposal such as increased turbidity, release of organic and inorganic materials or toxic substances, depletion of dissolved oxygen, disruption of the food chain, loss of benthic productivity, and disturbance of fish runs and important localized biological communities shall be minimized.

Finding: The proposed action is compatible because timing for use of placement sites within the river thalweg is intended to protect estuarine aquatic and shoreland resources. For example, the Corps will follow the work windows in the most current 2012, 2021, and 2023 Biological Opinions from National Marine Fisheries Service (NMFS) for the ongoing O&M activities. The project will minimize interference with recreational or commercial fishing operations; river users would need to avoid dredge equipment in the same manner that they avoid other vessels. The 2014 draft *EA for Columbia River Federal Navigation Channel Operations and Maintenance Dredging and Dredged Material Placement Network Update, River Miles 3 to 106.5, Washington and Oregon* was available for public review from 3 April 2014 through 4 May 2014. During this public review period, the Corps received two written comment letters. No public comments were received related to timing of placement operations for these sites. The dredging contractor also submits a "Notice to Mariners" to the U.S. Coast Guard, who publishes the notice prior to and during dredging operations. Direct effects due to in-water disposal of the proposed action is described in 2.4.1 of the NMFS biological opinion. Studies by NMFS, the Corps, and others on the potential impact of placement to crab found the effects were negligible (i.e., Roegner et al. 2021). Commercial and sport fisheries for salmon will need to avoid dredges and dredge equipment for safe navigation. However, the area directly affected is small and does not appreciably diminish the available space for active fishing.

In-water placement occurs in locations that the Corps has determined will not result in excessive FNC shoaling from remobilized placed sediment. Dredged sediment is placed within the river thalweg to not harm living resources, not adversely affect other uses of the river, sustain the thalweg, and not rapidly return to the FNC. Success requires constant adaptation as the river continuously relocates the dredged sediment placed in-water each year. Placement areas are specified for each event based on an applied understanding of hydrodynamic and sediment transport processes informed by bathymetric depth surveys and river current velocity data from the Corps' Lower Columbia River adaptive hydraulics model. The placement location must be deep enough for the dredge to safely access based on that vessel's draft below the water surface. Velocity data and bathymetric differencing and evaluation of bedforms can inform sediment movement after placement, to minimize movement into FNC shoals and support movement into areas to counteract riverbed erosion.

Changes to existing patterns of erosion, deposition, and flooding would not be expected from the proposed action. Any effects associated with the proposed action would be temporary, localized, and minor with respect to the flood carrying capacity of the river. Thus, there would be no direct or indirect impacts on the bank full flood carrying capacity as a result of the proposed action relative to the current baseline conditions.

When disposing of dredged materials, the Corps implements best management practices to minimize effects to water quality, including sediment sampling, water quality monitoring, and turbidity monitoring and minimization measures. The Best Management Practices are further defined in the Determination of Compatibility, included as Exhibit 7.

Corps placement does not add to the contamination burden of the Columbia River, nor would it mobilize hazardous materials in the water column. Sediments were sampled and determined to be suitable for unconfined aquatic placement and exposure (Exhibit 4 PSET Documentation). The Corps performs regular dredged material evaluations in the FNC to determine whether sediments are suitable for unconfined in-water placement or exposure, according to the requirements of the Clean Water Act (CWA) or the Marine Protection, Research and Sanctuaries Act (MPRSA), as appropriate. The Corps characterizes sediments present within proposed dredge areas in accordance with national dredged material testing manual protocols (Ocean Testing Manual), Inland Testing Manual, and by using the Sediment Evaluation Framework for the Pacific Northwest (SEF). The Corps, as lead member of the regional Portland Sediment Evaluation Team (PSET), evaluates the discharge of dredged material through the SEF. The Oregon Department of Environmental Quality is also a member of PSET. This framework is based on applicable provisions of CWA Section 404 or MPRSA Section 103. A summary of the most recent results and suitability determinations for locations within Clatsop County (including within Warrenton) is below:

- Lower Columbia River FNC; deep draft channel and associated turning basins (RM 3 to RM 106.5): A total of 59 stations were sampled within this area. All sediment samples consisted of more than 97 percent coarse-grained sediments (gravel and sand) suitable for unconfined, aquatic placement. The total organic carbon (TOC) result for all samples is less than 0.2%.
- Skipanon FNC: Dredge prism sediments are predominantly silt (77-86%) with some clay (12-20%) and minor amounts of sand and gravels (<3%) suitable for unconfined, aquatic placement. TOC in the dredge prism sediments ranged from 2.14 to 2.79%. Total solids in the dredge prism sediments ranged from 35 to 42%.
- Tongue Point FNC: The outer shoal dredge prism was 96.4% sand and the inner shoal averaged 46.9% sand, 45.7% silt, and 7.3% clay suitable for unconfined, aquatic placement.

The Corps will continue to sample and evaluate sediment periodically in the future in accordance with the SEF. Dredged material would only be placed in water after the Corps, in coordination with PSET, determines that sediments are suitable for unconfined aquatic placement and unconfined aquatic exposure, in accordance with the SEF. Sediments that are tested and deemed to be unsuitable (that is, not suitable for unconfined in-water placement) would not be placed in water but would instead be placed in upland sites.

Past monitoring, both instrument and visual, has shown that turbidity quickly dissipates because the dredged material is predominately sand. Placement only occurs in areas that are deeper than 20 feet where little to no benthic productivity is occurring and where fish may migrate but would avoid any dredged material placement activity. Any juvenile fish in the general vicinity would be closer to the shoreline. The most recent dredged material suitability determinations are included as Exhibit 4.

The Corps contracted with several external partners to explicitly evaluate the potential effects of dredging and placement on the benthic environment. Studies investigating the entrainment risk to Dungeness crab across multiple age classes found that crab abundance was highly correlated with salinity and the risk of entrainment for crabs age 2+ to 3+ in summer decreased exponentially as you move upstream, such that locations above the Astoria Bridge had rates that were less than 6% of those noted at the MCR (Pierson et al. 2002 ; Pierson et al. 2005). In assessing the effects of sediment deposition on Dungeness crab and other epifauna based on lab studies, empirical data collected using video sleds and models, the collective body of evidence suggests that burial of 10 cm or less has only a nominal effect on crabs and other species (Vavrinec et al. 2007 ; Roegner and Fields 2015); there do not appear to be significant, adverse, long-term effects to the epibenthic community at large (Fields et al. 2019 ; Roegner et al. 2021); and crabs that may be dislodged by the lateral surge of material plume typically return to areas within 10 minutes (Roegner et al. 2021). An evaluation of potential effects to white sturgeon similarly found no direct adverse effects, with some indication that some individuals are attracted to disposal areas in the short-term (Parsley et al. 2011). In the Corps' most recent consultation with NMFS evaluating the potential effects of placement activities at seven material transfer sites in the flowlane adjacent to the FNC, NMFS included a table in their opinion that estimated the percentage of the flowlane subject to dredging and placement activities below 20-ft depth relative to the overall area of the flowlane and estimated that the area of habitat potentially affected ranged from 0-15.2%, with an average of roughly 9% per reach (NMFS 2023). NMFS ultimately concluded that the proposed action is not likely to jeopardize the continued existence of Lower Columbia River Chinook salmon, Upper Columbia River (UCR) spring run Chinook salmon, Snake River (SR) spring/summer Chinook salmon, Upper Willamette River (UWR) Chinook salmon, SR fall-run Chinook salmon, CR chum salmon, LCR coho salmon, SR sockeye salmon, UCR steelhead, LCR steelhead, UWR steelhead, MCR steelhead, or SR steelhead or destroy or adversely modify their designated critical habitat (NMFS 2023). NMFS also concurred with the Corps that adverse effects to green sturgeon and eulachon were unlikely (NMFS 2023).

For these reasons, the proposed action meets the applicable criteria in 16.160.040.

16.160.050 Dredged Material Disposal Standards

B. Proposals for in-water disposal of dredged materials, including flow lane disposal, beach nourishment, estuarine open-water disposal, ocean disposal, and agitation dredging, shall:

1. Demonstrate the need for the proposed action and that there are no feasible alternative disposal sites or methods that entail less damaging environmental impacts; and
2. Demonstrate that the dredged sediments meet state and federal sediment testing requirements and water quality standards (see Section 16.160.040(A)(5)); and
3. Not be permitted in the vicinity of a public water intake.

Finding: The section of this application related to "OAR 660-004-0020 Goal 2, Part II(c), Exception Requirements" describes the demonstrated need for the proposed action. Page 13 of this application, under the subsection titled "Areas that do not require a new exception cannot reasonably accommodate the use," contains information to justify why there are no feasible disposal alternatives. The answer above for 16.160.040 Dredging and Dredged Material Disposal describes how the proposed action meets state and federal sediment testing requirements and water quality standards. There are no public water intakes in the vicinity of the proposed action. The proposed action meets these criteria.

C. Proposals for in-water estuary disposal shall be coordinated with commercial fishing interests, including, but not limited to: gillnet drift captains at the dredging and disposal site, the Columbia River Fisherman's Protective Union, Northwest Gillnetters Association, and the state fishery agencies. In-water disposal actions shall avoid gillnet drifts whenever feasible. When it is not feasible to avoid gillnet drifts, impacts shall be minimized in coordination with fisheries interests through:
1. Disposal timing;
2. Gear placement;
3. Choice of disposal area within the drift; and
4. Disposal techniques to avoid snag placement.

Finding: The proposed project will minimize interference with recreational or commercial fishing operations; river users would need to avoid dredge equipment in the same manner that they avoid other vessels. The dredging contractor also submits a "Notice to Mariners" to the U.S. Coast Guard, who publishes the notice prior to and during dredging operations. Commercial and sport fisheries for salmon will need to avoid dredges and dredge equipment for safe navigation. However, the area directly affected is small and does not appreciably diminish the available space for active fishing.

D. Flow lane disposal, estuarine open water disposal and agitation dredging shall be monitored to assure that estuarine sedimentation is consistent with the resource capabilities and purpose of affected natural and conservation designations. The monitoring program shall be established prior to undertaking disposal. The program shall be designed to both characterize baseline conditions prior to disposal and monitor the effects of the disposal. The primary goals of the monitoring are to determine if the disposal is resulting in measurable adverse impacts and to establish methods to *minimize impacts. Monitoring shall include, at a minimum, physical measurements such as bathymetric changes and may include biological monitoring. Specific monitoring requirements shall be based on, at a minimum, sediment grain size at the dredging and disposal site, presence of contaminants, proximity to sensitive habitats and knowledge of resources and physical characteristics of the disposal site. The monitoring requirement shall be discontinued when adequate information has been gathered to determine impacts and establish an agreed-upon disposal volume and methodology. If the agreed-upon volume and methodology is altered, the monitoring requirement may be reestablished. Monitoring may be waived on small projects where the impacts would be undetectable. A decision to waive the requirement shall be made in coordination with state and federal regulatory agencies.*

Finding: When disposing of dredged materials, the Corps implements best management practices to minimize effects to water quality, including sediment sampling, water quality monitoring, and turbidity monitoring and minimization measures. The Best Management Practices are further defined in the Determination of Compatibility, included as Exhibit 7. Past monitoring, both instrument and visual, has shown that turbidity quickly dissipates because the dredged material is predominately sand.[32] Placement only occurs in areas that are deeper than 20 feet where little to no benthic productivity is occurring and where fish may migrate but would avoid any dredged material placement activity. Any juvenile fish in the general vicinity would be closer to the shoreline. The most recent dredged material suitability determinations are included as Exhibit 4. The Corps will continue to monitor the disposal of dredged material and a condition of their water quality certification with the Oregon Department of Environmental Quality contains a requirement to submit annual monitoring reports.

E. Flow lane disposal shall be in aquatic development areas identified as low in benthic productivity and use of these areas shall not have adverse hydraulic effects. Use of flow lane disposal areas in the estuary shall be allowed only when no feasible alternative land or ocean disposal sites with less damaging environmental impacts can be identified and the biological and physical impacts of flow lane disposal are demonstrated to be insignificant. The feasibility and desirability of alternative sites shall take into account, at a minimum:

1. *Operational constraints such as distance to the alternative sites;*
2. *Sediment characteristics at the dredging site;*
3. *Timing of the operation;*
4. *Environmental Protection Agency constraints on the use of designated ocean disposal sites;*
5. *The desirability of reserving some upland sites for potentially contaminated material only.*

---

[32] Source: Annual reports provided by USACE to ODEQ as condition of 401 certification (main channel meter-based monitoring from 2005 until 2014 and then visual monitoring thru 2023 and side channel meter-based monitoring thru 2023). Letter from USACE to ODEQ 10 May 2006 providing supporting documents for 401 certification amendment as requested by ODEQ.

Long term use of a flow lane disposal area may only be allowed if monitoring confirms that the impacts are not significant. Flow lane disposal is contingent upon demonstration that:

6. Significant adverse effects due to changes in biological and physical estuarine properties will not result; and

7. Flow lane disposal areas shall be shown able to transport sediment downstream without excessive shoaling, interference with recreational and commercial fishing operations, including the removal of snags from gillnet drifts, undesirable hydraulic effects, or adverse effects on estuarine resources (fish runs, spawning activity, benthic productivity, wildlife habitat, etc.).

Finding: The section of this application related to "OAR 660-004-0020 Goal 2, Part II(c), Exception Requirements" describes the demonstrated need for the proposed action. Page 13 of this application, under the subsection titled "Areas that do not require a new exception cannot reasonably accommodate the use," contains information to justify why there are no feasible disposal alternatives (such as upland and ocean disposal sites), which includes, but is not limited to, operational constraints. In-water placement occurs in locations that the Corps has determined will not result in excessive FNC shoaling from remobilized placed sediment. Dredged sediment is placed within the river thalweg to not harm living resources, not adversely affect other uses of the river, sustain the thalweg, and not rapidly return to the FNC. These standards for flowlane disposal of dredged material have been met.

16.160.080 Fish and Wildlife Habitat.

A. Projects affecting endangered, threatened or sensitive species habitat, as identified by the U.S. Fish and Wildlife Service or Oregon Department of Fish and Wildlife, shall be designed to minimize potential adverse impacts. This shall be accomplished by one or more of the following:

1. Soliciting and incorporating agency recommendations into local permit reviews.

2. Dedicating and setting aside undeveloped on-site areas for habitat.

3. Providing on or off-site compensation for lost or degraded habitat.

4. Retaining key habitat features (for example, roosting trees, riparian vegetation, feeding areas).

B. In-water construction activity in aquatic areas shall follow the recommendations of state and federal fisheries agencies with respect to project timing to avoid unnecessary impacts on migratory fish.

C. Uses and activities with the potential for adversely affecting fish and wildlife habitat may be approved only if the following impact mitigation actions are incorporated into the permit where feasible. These impact mitigation actions are listed from highest to lowest priority:

1. Avoiding the impact altogether by not taking a certain action or parts of an action.

2. Minimizing impacts by limiting the degree or magnitude of an action and its implementation.
3. Rectifying the impact by repairing, rehabilitating, restoring the affected environment (this may include removing wetland fills, rehabilitation of a resource use and/or extraction site when its economic life is terminated, etc.).
4. Reducing or eliminating the impact over time by preservation and maintenance operations.

Finding: State and federal fish and wildlife agencies have been consulted on the proposed action as undertaken by the Army Corps; agency comments have been incorporated. The Corps will follow the work windows in the most current 2012, 2021, and 2023 Biological Opinions from National Marine Fisheries Service (NMFS) for the ongoing O&M activities, including flowlane disposal.

As a matter of practice, the Corps only dredges the minimum area necessary to maintain the Columbia River FNCs' dimensions and placement sites are designed to be the smallest acreage needed to accommodate the fill. The placement of dredged material would occur in areas that minimize loss or disruption of fish and wildlife habitat and damage to estuarine resource properties. Biological resources within the Columba River system are diverse. There are four primary habitats that encompass the Lower Columbia River system: Estuarine, Riverine, Riparian, and Upland. Each of these habitats carries an intricate level of biologic complexity. The FNC O&M operates within each of the habitats to a varying degree. The Corps has already undergone consultation with the National Marine Fisheries Service (NMFS) and the US Fish and Wildlife Service (USFWS) for the current O&M dredging of FNCs in the Columbia River, which did evaluate disposal of dredged material deeper than 20ft and contiguous with the FNC. The Corps follows established BMPs to minimize adverse impacts to the aquatic and terrestrial environment; the most recent set of both dredging and placement BMPs were detailed in section 1.3 of Exhibit 3 that included an incidental take statement for salmon, steelhead, green sturgeon, and eulachon for inadvertent take occurring during proposed maintenance of the CR FNCs. These baseline activities associated with maintenance dredging of the CR FNCs have not changed; and implementation of these BMPs has been successful in minimizing potential adverse impacts to the aquatic environment. NMFS also issued a Biological Opinion on June 16, 2021 (2021 BiOp , Exhibit 5) and on February 16, 2023 (2023 BiOp, Exhibit 6). The Corps will follow the BMPs outlined in the 2012, 2021 and 2023 BiOps unless or until superseded by a later BiOp. The USFWS concurred with the Corps' determination that the action would have no effect on the following listed species: western snowy plover, northern spotted owl, short-tailed albatross, Oregon silverspot butterfly, water howellia, and yellow-billed cuckoo and "may affect, but is not likely to adversely affect" bull trout, marbled murrelet, and Columbian white-tailed deer (Service reference# 13420-2010-I-0165). The Corps will follow all of the reasonable and prudent measures in the associated biological opinions, and conservation measures that USACE included in the proposed action. Lastly, dredge-equipment limitations in this particular stretch of the Columbia River would not allow for material placement in areas shallower than 20 feet.

16.160.180 Water Quality Maintenance.

C. The potential adverse impacts on water quality of dredging, fill, in-water dredged material disposal, in-water log storage, water intake or withdrawal, and slip or marina development will be assessed during permit review. Parameters to be addressed include:

1. Turbidity.
2. Dissolved oxygen.
3. Biochemical oxygen demand.
4. Contaminated sediments.
5. Salinity.
6. Water temperature.
7. Flushing.

Finding: The Corps includes the above parameters in assessing where and how to place dredged material within the Columbia River estuary in accordance with other regulations, requirements, and best management practices. This standard has been met.

Chapter 16.164 Impact Assessment and Resource Capability Determination

16.164.010 Impact Assessment.

Oregon Statewide Planning Goal 16, dealing with estuarine resources, requires that actions which would potentially alter the estuarine ecosystem must be preceded by an assessment of potential impacts. The impact assessment need not be lengthy and complex, but it should enable reviewers to gain a clear understanding of the impacts expected.

16.164.030 Information Needed for an Impact Assessment.

Information needed to complete the impact assessment may be obtained from sources other than the permit application, such as a Federal Environmental Impact Statement. An assessment of impacts of aquatic area pesticide and herbicide application shall be provided by the Oregon Department of Agriculture and the Oregon Department of Environmental Quality. An assessment of the impacts of new point-source wastewater discharges into the Columbia River Estuary will be provided through the National Pollution Discharge Elimination System (NPDES) permit program. A complete impact assessment includes the following information:

A. Aquatic life forms and habitat, including information on both the extent of and impacts on habitat type and use, species present (including threatened or endangered species), seasonal abundance, sediments, and vegetation.

B. ~~Shoreland life forms and habitat, including information on both the extent of and impacts on habitat type and use, species present, (including threatened or endangered species), seasonal abundance, soil types and characteristics, and vegetation present.~~

C. Water quality, including information on sedimentation and turbidity, dissolved oxygen, biochemical oxygen demand, contaminated sediments, salinity, water temperatures, and expected changes due to the proposed use or activity.

D. Hydraulic characteristics, including information on water circulation, shoaling patterns, potential for erosion or accretion in adjacent areas, changes in flood levels, flushing capacity, and water flow rates.

E. Air quality, including information on quantities of particulates and expected airborne pollutants.

F. ~~Public access to the estuary and shoreline, including information on proximity to publicly-owned shorelands and public street ends; effect on public boat launches, marinas and docks; and impact on inventoried public access opportunities.~~

G. Navigation, including information on distance from navigation channels, turning basins and anchorages; proximity to range markers.

H. ~~Demonstration that proposed structures or devices are properly engineered.~~

I. Demonstration that the project's potential public benefits will equal or exceed expected adverse impacts.

J. ~~Demonstration that non-water dependent uses will not preempt existing or future water-dependent utilization of the area.~~

K. Determination of methods for mitigation and accommodation of the proposed development, based on subsections A through J of this section in order to avoid or minimize preventable adverse impacts.

Finding: The criteria in strikethrough are not applicable to this proposed action. The Corps finalized an Environmental Impact Statement for the Columbia River Improvement Project in 2003, which includes review of flowlane disposal within the river thalweg[33]. Additionally, the Corps issued a supplemental environmental assessment in 2014 for the Columbia River FNC operations and maintenance dredging and dredged material placement, which also includes the disposal of dredged material in the river thalweg[34]. These documents, as well as other sections of this application, include all the criteria as required above in A, C, D, E, and G for an impact assessment for this proposed action.

(I) As demonstrated throughout this application, the disposal of dredged material within the river thalweg has minimal impacts to the estuarine environment and includes some benefits to sustaining the river's sediment budget. Conversely, not being able to maintain the FNC at its authorized depths has cascading detrimental impacts to the economies of not only

[33] https://usace.contentdm.oclc.org/digital/collection/p16021coll7/id/727
[34] https://usace.contentdm.oclc.org/digital/collection/p16021coll7/id/4924

Washington and Oregon, but many other states and countries as well due to impacts to international shipping. Therefore, the public benefits outweigh the minimal adverse impacts.

(K) The Corps considers the thalweg to be the "action area" and includes the FNC out to the 20-ft depth contours on both sides of the FNC; this is where the river is moving most of the bed load sediment during the year. The river's thalweg is also where mobilized sediments interact with the river's morphology before migrating downslope toward the deepest part of the thalweg and into the FNC. The Corps has stated that its in-water placement practices strive to emulate natural processes by placing dredged sediment within the river's thalweg to allow sediments to be re-distributed back onto the river's morphology, sustaining the river's sediment budget, and maintaining habitats that rely on sediment.

The Corps states that the proposed expansion of the flowlane dredged material placement area within the river thalweg avoids the rapid return of dredged material to the FNC while facilitating reintroduction of dredged material into the river system and maintaining habitat complexity within the river system. Placing material in the thalweg keeps material in the river to stabilize the riverbed and protect habitat. Removing material to uplands or the ocean would remove that sediment from the system and the riverbed and habitat would degrade, losing islands, tidal shoals, lagoons, and the living resources that depend on that river morphology.

> *16.164.050 Resource Capability Determination.*
>
> *Some uses and activities may only be approved when consistent with the resource capabilities of the area and the purposes of the zone. This section describes procedures for making this determination. A completed resource capability determination consists of the following elements:*
>
> *A. Identification of the affected area's zone, and its purpose.*
>
> *B. Identification of the types and extent of estuarine resources present and expected adverse impacts. This information is included in the impact assessment.*
>
> *C. A determination of whether the use or activity is consistent with the resource capabilities of the affected zone. A use or activity is consistent with the resource capabilities of the area when either:*
>
> > *1. Impacts on estuarine resources are not significant; or*
> > *2. Resources of the area will be able to assimilate the use and activity and their effects and continue to function in a manner which:*
> >
> > > *a. In natural aquatic zones, protects significant wildlife habitats, natural biological productivity, and values for scientific research and education; or*
> > > *b. In conservation aquatic zones, conserves long-term use of renewable resources, natural biological productivity, recreation and aesthetic values and aquaculture.*

3. For temporary alterations, the resource capability determination must also include:

a. Determination that potential short-term damage to estuary and shoreland resources is consistent with the resource capabilities of the area; and

b. Determination that the area and affected resources can be restored to their original condition.

D. Determining Consistency with the Purpose of the Zone. Certain uses in the Aquatic Development (A-1), Aquatic Conservation (A-2), and Aquatic Natural (A-3) Zones may be permitted only if they are consistent with the purpose of the aquatic zone in which they occur. This determination is made as follows:

1. Identification of the affected zone, and its purpose.

2. Description of the proposal's potential impact on the purposes of the affected zone.

3. Determination that the proposal is either:

a. Consistent with the purpose of the affected zone; or

b. Conditionally consistent with the purpose of the affected zone; or

c. Inconsistent with the purpose of the affected zone.

Finding: (A) The proposed goal exception area includes zones identified by the city as Aquatic Conservation and Aquatic Natural (though as described in (D) below, the proposed action avoids the natural areas as described in the Comprehensive Plan). The purpose of both zones is described in the finding for (D) below.

(B) In the Corps' most recent consultation with the National Marine Fisheries Service (NMFS) evaluating the potential effects of placement activities at seven dredged material transfer sites in the flowlane adjacent to the FNC, NMFS included a table in their opinion that estimated the percentage of the flowlane subject to dredging and placement activities below 20-ft depth relative to the overall area of the flowlane and estimated that the area of habitat potentially affected ranged from 0-15.2%, with an average of roughly 9% per reach (NMFS 2023[35]). NMFS ultimately concluded that the proposed action is not likely to jeopardize the continued existence of Lower Columbia River Chinook salmon, Upper Columbia River (UCR) spring run Chinook salmon, Snake River (SR) spring/summer Chinook salmon, Upper Willamette River (UWR) Chinook salmon, SR fall-run Chinook salmon, CR chum salmon, LCR coho salmon, SR sockeye salmon, UCR steelhead, LCR steelhead, UWR steelhead, MCR steelhead, or SR steelhead or destroy or adversely modify their designated critical habitat (NMFS 2023). NMFS also concurred with the Corps that adverse effects to green sturgeon and eulachon were unlikely (NMFS 2023).

---

[35] NMFS. 2023. Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Lower Columbia River Federal Navigation Channel Dredged Material Transfer Sites (HUC170800060500, 170800030900, 170800030200). NMFS Consultation No. WCRO-2022-02520. 16 February 2023. https://doi.org/10.25923/djwp-c334.

(C) As demonstrated through the Biological Opinions issued for the Corps in 2012, 2021, and 2023, the proposed action is consistent with the resource capabilities of the affected zone because impacts on estuarine resources are not significant. See finding under 16.160.080 Fish and Wildlife Habitat, as well as Exhibits 3, 5, and 6, for additional details from the Biological Opinions.

(D) The city's development code states that "the purpose of the Aquatic Conservation Zone is to conserve designated areas for long-term uses of renewable resources that do not require major alterations of the estuary, except for the purpose of restoration. They are managed for the protection and conservation of the resources found in these areas. The Aquatic Conservation Zone includes areas needed for the maintenance and enhancement of biological productivity, recreational resources, aesthetic features and aquaculture. The Aquatic Conservation Zone includes areas that are smaller or of less biological importance than aquatic natural areas. Areas that are partially altered and adjacent to existing moderate intensity development which do not possess the resource characteristics of other aquatic areas are also included in this zone." The proposed action to allow the disposal of dredged material in this zone is consistent with the zone's purpose because it avoids the rapid return of dredged material to the FNC while facilitating reintroduction of dredged material into the river system and maintaining habitat complexity within the river system. Placing material in the thalweg keeps material in the river to stabilize the riverbed and protect habitat. Removing material to uplands or the ocean would remove that sediment from the system and the riverbed and habitat would degrade. The action also would be implemented so as to avoid or minimize any adverse impacts to existing habitats or species, as outlined in the Biologic Opinions.

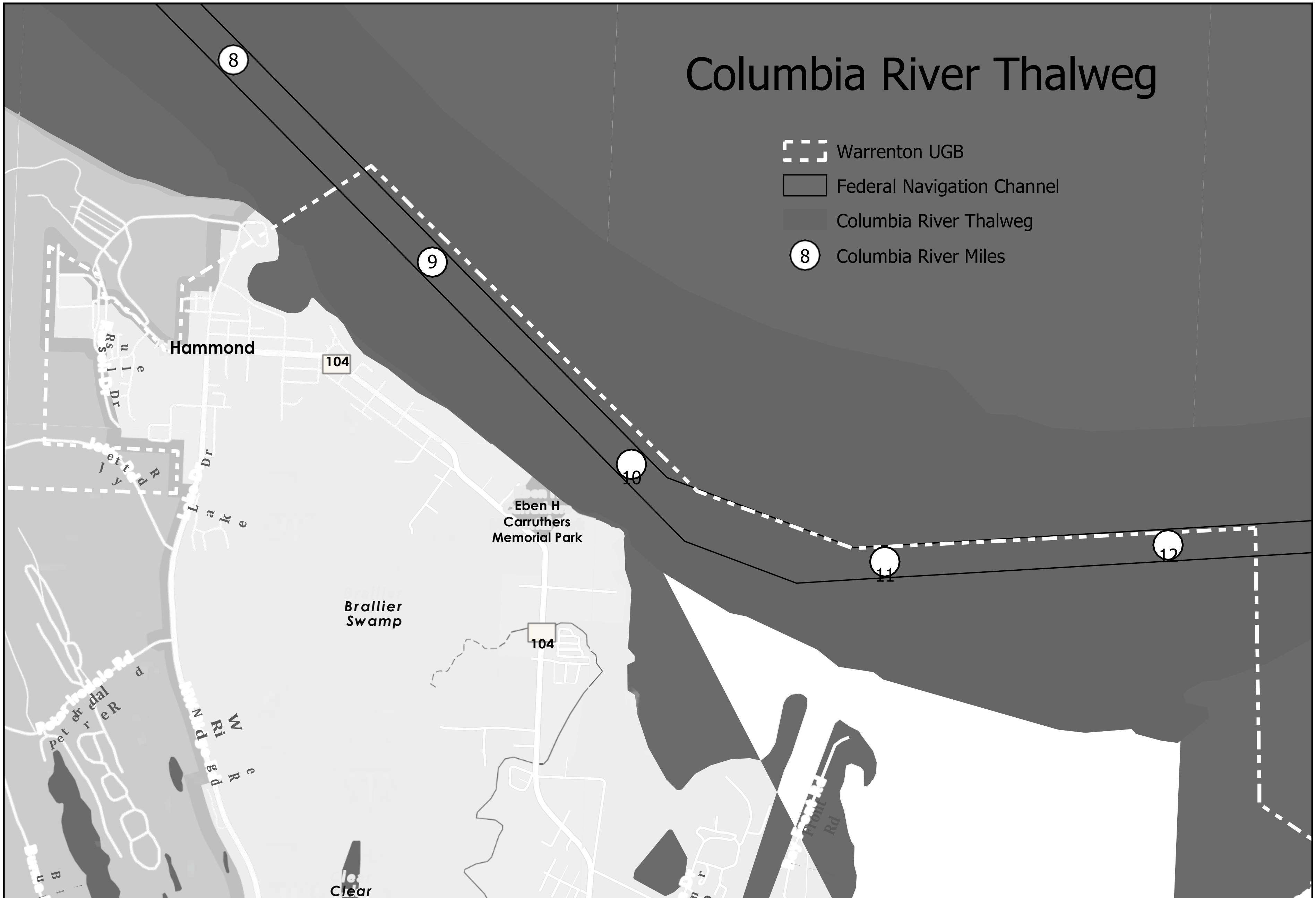
The city's development code states that "the purpose of the Aquatic Natural Zone is to assure the protection of significant fish and wildlife habitats; of continued biological productivity within the estuary; and of scientific, research, and educational needs. These areas are managed to preserve natural resources in recognition of dynamic, natural, geological, and evolutionary processes. Natural aquatic areas include all major tidal marshes, tide flats, and seagrass and algae beds. The designation is intended to preserve those natural aquatic resource systems existing relatively free of human influence." While the city's zoning map does identify some areas as Aquatic Natural that coincide with the approximate area of the river thalweg over a five-year period (Exhibit 2), the descriptions of the boundaries of the zones in estuary subareas of the city's Comprehensive Plan do not include the proposed goal exception area as Aquatic Natural. The goal exception area does not include any areas identified by the city as significant natural resources and does not include major tidal marshes, tide flats, or seagrass and algae beds. Therefore, this proposal is consistent with the purpose of the Aquatic Natural Zone by avoiding significant natural resource areas.

Exhibits

- Exhibit 1: Informational Map – 5-year Estimate of the Columbia River Estuary Thalweg Extent for Purposes of Proposed Flowlane Disposal.
- Exhibit 2: Informational Map – 5-year Estimate of the Columbia River Estuary Thalweg Extent for Purposes of Proposed Flowlane Disposal, City of Warrenton Urban Growth Boundary
- Exhibit 3: 2012 NOAA National Marine Fisheries Service Biological Opinion for Operations and Maintenance of the Columbia River Navigation Channel.
- Exhibit 4: Portland Sediment Evaluation Team Memorandum
- Exhibit 5: 2021 NOAA National Marine Fisheries Service Biological Opinion for Operations and Maintenance of the Columbia River Navigation Channel.
- Exhibit 6: 2023 NOAA National Marine Fisheries Service Biological Opinion for Operations and Maintenance of the Columbia River Navigation Channel.
- Exhibit 7: Determination of Compatibility, including Best Management Practices, for Columbia River Navigation Channel Operations and Maintenance.
- Exhibit 8: Visual Information Slides presented to Clatsop County by the US Army Corps of Engineers, January 2024.
- Exhibit 9: Best Management Practices, excerpt from Exhibit 7: Determination of Compatibility
- Exhibit 10: Corps 2023 application to Oregon DEQ for Section 401 Water Quality Certification
- Exhibit 11: 2014 USFWS Biological Assessment for the Continued Operations and Maintenance Dredging Program for the Columbia River Federal Navigation Channel

Columbia River Estuary Thalweg

CrediD: Portland District US Army Corps of Engineers Channels and Harbors Waterways Maintenance Section (MARCH 2024)



Projection:
Oregon Lambert (2992)

30/09/2024 rd DLCD

0 0.5 1 1.5 2

Miles

This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

Refer to NMFS No.:

2011/02095

July 11, 2012

Joyce E. Casey
Portland District, Corps of Engineers
CENWP-OP-GP
P.O. Box 2946
Portland, Oregon 97208-2946

Re: Reinitiation of Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Columbia River Navigation Channel Operations and Maintenance, Mouth of the Columbia River to Bonneville Dam, Oregon and Washington (HUCs 1708000605,1708000307, 1708000108)

Dear Ms. Casey:

On March 11, 2005, the National Marine Fisheries Service (NMFS) issued a biological opinion (opinion) on the effects of the Army Corps of Engineers (Corps) Columbia River Channel Operations and Maintenance Program, Mouth of the Columbia River to Bonneville Dam (refer to NMFS No.: 2004/011041). NMFS had previously issued an opinion to the Corps for the Columbia River Federal Navigation Channel Improvement Project on February 16, 2005 (refer to NMFS No.: 2004/01612). The March 11, 2005 opinion was due to expire on March 11, 2010, but was extended on April 21, 2010 (refer to NMFS No.: 2010/01697) until a new biological opinion was in place. Pursuant to 50 CFR 402.16 the Corps requested consultation for the Columbia River Channel Operations and Maintenance Program as: (a) the action was subsequently modified in a manner that has an effect to the listed species or designated critical habitat that was not considered in the biological opinion; and (b) eulachon and the southern green sturgeon have been listed and critical habitat for the two species has been designated.

The enclosed document contains an opinion prepared by the NMFS pursuant to section 7(a)(2) of the Endangered Species Act (ESA) based on a revised analysis of the effects of the proposed action in light of modification of the proposed action, the listing of eulachon (*Thaleichthys pacificus*) and the southern green sturgeon (*Acipenser medirostris*); as well as the designation of critical habitat for the eulachon and southern green sturgeon. In this opinion, NMFS concludes that the proposed action is not likely to jeopardize the continued existence of Lower Columbia River (LCR) Chinook salmon (*Oncorhynchus tshawytscha*), Upper Willamette River (UWR) spring-run Chinook salmon, Upper Columbia River (UCR) spring-run Chinook salmon, Snake River (SR) spring/summer run Chinook salmon, SR fall-run Chinook salmon, Columbia River chum salmon (*O. keta*), LCR coho salmon (*O. kisutch*), SR sockeye salmon (*O. nerka*), LCR steelhead (*O. mykiss*), UWR steelhead, Middle Columbia River (MCR) steelhead, UCR steelhead, Snake River Basin (SRB) steelhead, southern green sturgeon, or eulachon, or result in the destruction or adverse modification of designated critical habitats of any of those species, except for LCR coho salmon, for which critical habitat has not been proposed or designated.

In addition, NMFS concluded that the proposed action is not likely to adversely affect the leatherback sea turtle (*Dermochelys coriacea*), the Steller sea lion (*Eumetopias jubatus)*, the Southern Resident Killer Whale (*Orcinus orca*), humpback whales (*Megaptera novaeangliae*), blue whales (*Balaenoptera musculus*) sei whale (*Balaenoptera borealis*), fin whale (*Balaenoptera physalus*) and sperm whale (*Physeter macrocephalus*). The action area includes designated critical habitat for the leatherback sea turtle. NMFS concluded the proposed action is not likely to adversely affect the leatherback sea turtle designated critical habitat.

As required by section 7 of the ESA, NMFS is providing an incidental take statement (ITS) with the opinion. The incidental take statement describes reasonable and prudent measures NMFS considers necessary or appropriate to minimize the impact of incidental take associated with this action. The take statement sets forth nondiscretionary terms and conditions, including reporting requirements, that the Federal action agency and any person who performs the action must comply with to carry out the reasonable and prudent measures. Incidental take from actions that meet these terms and conditions will be exempt from the ESA take prohibition. NMFS has not yet promulgated an ESA section 4(d) rule prohibiting take of threatened Pacific eulachon. Anticipating that such a rule may be issued in the future, we have included a prospective incidental take exemption for eulachon. The elements of this ITS that relate to eulachon would take effect on the effective date of any future 4(d) rule prohibiting take of eulachon.

This document also includes the results of our analysis of the action's likely effects on essential fish habitat (EFH) pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and includes two conservation recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH. These conservation recommendations are a subset of the ESA Terms and Conditions. Section 305(b) (4) (B) of the MSA requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving these recommendations.

If the response is inconsistent with the EFH conservation recommendations, the Corps must explain why the recommendations will not be followed, including the scientific justification for any disagreements over the effects of the action and the recommendations. In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, in your statutory reply to the EFH portion of this consultation, we ask that you clearly identify the number of conservation recommendations accepted.

The enclosed opinion, incidental take statement, and EFH conservation recommendations completely replace those issued for this action on February 16, 2005, March 11, 2005 and April 21, 2010 which are withdrawn and now have no further effect.

Please direct questions regarding this opinion to Ken MacDonald, fishery biologist in the Oregon State Habitat Office, at 503.231.2243.

Sincerely,

for William W. Stelle, Jr.
Regional Administrator

cc: Gretchen Smith, U.S. Army Corps of Engineers, Portland District
Jessica Stokke, U.S. Army Corps of Engineers, Portland District
Ross Island Sand and Gravel CO.
HME Construction, Inc
Jeff Steyaert, Knife River
Bryan Wigginton, Northwest Aggregates Company

Endangered Species Act Biological Opinion
and
Magnuson-Stevens Fishery Conservation and Management Act
Essential Fish Habitat Response

for the

Reinitiation of Columbia River Navigation Channel Operations and Maintenance
Mouth of the Columbia River to Bonneville Dam, Oregon and Washington
(HUCS 1708000605, 1708000307, 1708000108)

NMFS Consultation Number: 2011/02095

Federal Action Agency: U. S. Army Corps of Engineers

Affected Species and Determinations:

ESA-Listed Species	ESA Status	Is the action likely to adversely affect this species or its critical habitat?	Is the Action likely to jeopardize this species?	Is the action likely to destroy or adversely modify critical habitat for this species?
Lower Columbia River Chinook salmon	T	Y	N	N
Upper Willamette River spring-run Chinook salmon	T	Y	N	N
Upper Columbia River Chinook salmon	E	Y	N	N
Snake River spring/summer run Chinook salmon	T	Y	N	N
Snake River fall-run Chinook salmon	T	Y	N	N
Columbia River chum salmon	T	Y	N	N
Lower Columbia River coho salmon	T	Y	N	N/A
Snake River sockeye salmon	E	Y	N	N
Lower Columbia River steelhead	T	Y	N	N
Upper Willamette River steelhead	T	Y	N	N
Middle Columbia River steelhead	T	Y	N	N
Upper Columbia River steelhead	T	Y	N	N
Snake River Basin steelhead	T	Y	N	N
Southern green sturgeon	T	N	N	N
Eulachon	T	Y	N	N
Leatherback sea turtle	E	N	N	N
Eastern Steller sea lion	T	N	N/A	N/A
Southern Resident Killer Whale	E	N	N/A	N/A
Humpback Whale	E	N	N/A	N/A
Blue Whale	E	N	N/A	N/A
Fin Whale	E	N	N/A	N/A
Sei Whale	E	N	N/A	N/A
Sperm Whale	E	N	N/A	N/A

Fishery Management Plan that Describes EFH in the Action Area	Would the action adversely affect EFH?	Are EFH conservation recommendations provided?
Pacific Coast Salmon	Y	Y
Pacific Coast Groundfish	Y	Y
Coastal Pelagic Species	Y	Y

Consultation
Conducted By: National Marine Fisheries Service
Northwest Region

Issued by: for William W. Stelle, Jr.
Regional Administrator

Date: July 11, 2012

TABLE OF CONTENTS

GLOSSARY

For purposes of this consultation –

Accretion means accumulation of sediment deposited by natural fluid flow processes.

Bar means a ridge or succession of ridges of sand or other substances, especially a formation extending across the mouth of a river or harbor that may obstruct navigation.

Beach erosion means carrying away of beach materials by wave action, tidal currents, littoral currents, or wind

Beach nourishment means process of replenishing a beach by artificial means, such as through deposition of dredged materials; also called beach replenishment or beach feeding.

Bedload means sand that rolls and bounces along the surface of the riverbed, usually downstream, although there may be a small displacement toward deeper water caused by the side slopes of the riverbed. In sandy riverbeds, bedload transport shapes the bed into a series of sand waves

Beneficial use means placement or use of dredged material for some productive purpose. Examples of beneficial uses include habitat development, beach nourishment, aquaculture, parks and recreation, shoreline stabilization, and erosion control

Biological or biochemical oxygen demand means the amount of dissolved oxygen needed by aerobic biological organisms in a body of water to break down organic material present in a given water sample at certain temperature over a specific time period

Deposition means deposit of sediment in an area through natural means, such as wave action or currents, or mechanical means.

Dredging means removal or redistribution of sediments from a watercourse.

Floodplain means a flat tract of land bordering a river, mainly in its lower reaches, and consisting of alluvium deposited by the river during flooding.

Freshet means high stream flow caused by rains or snowmelt and resulting in the sudden influx of a large volume of freshwater in the estuary.

Freshwater means water that is less than 0.5 part salt per thousand.

Intertidal means of or relating to the substrate that is exposed and flooded by tides; includes the associated splash zone.

In-water disposal means placement of dredged material along the riverbed in or adjacent to the navigational channel or in designated in-water sites; commonly referred to as flow-lane disposal.

In-water work means any part of an action that occurs below ordinary high or within the wetted channel, *e.g.*, excavation of streambed materials, fish capture and removal, flow diversion, streambank protection, and work area isolation.

Littoral means of, relating to, or situated or growing on or near a shore; especially of the sea.

Littoral cell means to assess the sedimentary budget the coast has to be divided into two separate morphologies, commonly known as littoral cells and compartments. The 165-km long Columbia River Littoral Cell mainly contains Columbia River sediments and is confined between the rocky headlands of Point Grenville to the north and Tillamook Head to the south (Peterson *et al*.1991 as cited in Sherwood *et al.* 2003).

Littoral current means a current running parallel to the beach and generally caused by waves striking the shore at an angle

Mean higher high water means the average height of the higher of two unequal daily high tides over 19 years.

Mean lower low water means the average height of the lower of two unequal daily low tides over 19 years

Navigational channels means channels in estuaries and other water bodies that are created, deepened, and maintained by dredging to enable vessels to navigate safely between, into and out of ports, harbors, and marinas without running aground.

Nearshore means an indefinite zone extending seaward from the shoreline well beyond the breaker zone.

Ocean-type means of or relating to salmonid juveniles that enter the estuary as fry or fingerlings and stay in the estuary for weeks or months before entering the ocean; examples are chum and subyearling Chinook.

Pelagic means pertaining to the open ocean.

Piling means a long, heavy timber or section of concrete or metal that is driven into the earth or bottom of a water body to serve as a structural support or protection.

Pile dike means two parallel rows of piling that are tied together and extend 300 to 500 feet into the river.

Plume means the layer of Columbia River water in the nearshore Pacific Ocean.

Polychlorinated biphenyls (PCBs) mean a group of synthetic, toxic industrial chemical compounds that are chemically inert and not biodegradable; they once were used in making paint and electrical transformers.

Polycyclic aromatic hydrocarbons (PAHs) means a group of more than 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat.

River Mouth means mouth of the Columbia River between river mile -3 and +3.

Salmonid means any member of the family Salmonidae, which includes the salmon, trout, char, whitefishes, and grayling of North America.

Sand means an unconsolidated mixture of inorganic soil (possibly including disintegrated shells and coral) consisting of small but easily distinguishable grains ranging in size from about 0.062 mm to 2.0 mm.

Sand waves means waves of sand on the bottom of a riverbed that move in response to river discharge and bedload transport. In the Columbia, sand waves cover the riverbed and are typically 4 to 8 feet high and 300 to 400 feet long. When the river discharge is less than 300,000 cfs, sand waves move only a few feet per day; however, when discharge exceeds 400,000 cfs, sand wave movement can reach 20 feet per day or more.

Sediment means material in suspension in water or recently deposited from suspension; in the plural, all kinds of deposits from the waters of streams, lakes, or seas.

Shoaling means a gradual decrease in water depth as the result of the accretion of sediments.

Smolts mean juvenile salmonids that have left their natal stream and are headed downriver toward the ocean.

Stream-type means of or relating to salmonid juveniles that rear in freshwater for a year or more before entering the ocean.

Turbidity means a condition in bodies of water where high sediment loads cause clouding of the water to varying extents; turbidity is an optical phenomenon and does not necessarily have a direct linear relationship to particulate concentration.

LIST OF ABBREVIATIONS

Ac	Acre
AMD	Advanced Maintenance Dredging
AUP	Annual Use Plan
BA	Biological Assessment
BMP	Best Management Practice
BOD	Biological or biochemical oxygen demand
CHART	Critical Habitat Analytical Review Team
Corps	Army Corps of Engineers
CRD	Columbia River Datum
cy	Cubic yards
DO	Dissolved oxygen
EFH	Essential Fish Habitat
EPA	U.S. Environmental Protection Agency
FNC	Columbia River Federal Navigation Channel
HAPC	Habitat Area of Particular Concern
HUC	Hydraulic Unit Code
LCR	Lower Columbia River
MCR	Middle Columbia River
mcy	Million cubic yards per year
MLLW	Mean lower low water
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NMFS	National Marine Fisheries Service
PCE	Primary constituent element
RM	River Mile
RSMP	Regional Sediment Management Plan
PAHs	Polycyclic aromatic hydrocarbons
PCBs	Polychlorinated biphenyls
SEF	Northwest Regional Sediment Evaluation Framework
SR	Snake River
SRB	Snake River Basin
TRT	Technical Review Team
UCR	Upper Columbia River
UWR	Upper Willamette River
VSP	Viable Salmonid Population
WLC	Willamette/Lower Columbia

1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3 below.

1.1 Background

The biological opinion (opinion) and incidental take statement portions of this document were prepared by the National Marine Fisheries Service (NMFS) in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531, *et seq*.), and implementing regulations at 50 CFR 402.

The NMFS also completed an Essential Fish Habitat (EFH) consultation. It was prepared in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801, *et seq*.) and implementing regulations at 50 CFR 600.

The opinion and EFH conservation recommendations are both in compliance with section 515 of the Treasury and General Government Appropriations Act of 2001 (Public Law 106-5444) ("Data Quality Act") and underwent pre-dissemination review.

1.2 Consultation History

On October 20, 2009, the NMFS received a biological assessment (BA) from the U.S. Department of the Army, Corps of Engineers, Portland District (Corps) requesting to reinitiate formal consultation for the continued maintenance dredging of the Columbia River Federal Navigation Channel (FNC), including advanced maintenance dredging, from the mouth of the Columbia River at river mile (RM) -3 to Bonneville Dam, at RM 145, eight side channels, and the disposal of dredged material (Corps 2009a).

At that time, the Corps was operating under an opinion due to expire on March 11, 2010 (refer to NMFS No.: 2004/01041, March 11, 2005). The maintenance dredging of the portion of the FNC that was deepened under the Columbia River Channel Improvement Project (CRCIP) was covered by another 2005 opinion (refer to NMFS No.: 2004/01612). The CRCIP opinion did not have an expiration date.

This opinion is intended to supersede both 2005 opinions regarding maintenance of the FNC from the River Mouth to Bonneville Dam and provide the Corps with a comprehensive, up-to-date analysis and guide all future maintenance actions.

The Corps (2009a) also included an assessment of four new beneficial use disposal sites designated in the ocean to improve sediment management at the mouth of the Columbia River (the River Mouth) that were later described in greater detail in *The Mouth of the Columbia River Regional Sediment Management Plan* (or RSMP) (LCSG 2011). The goal of the RSMP is to increase the beneficial use of dredged sediment at the River Mouth to better protect channel jetties, coastal beaches and nearshore habitats from erosion while avoiding and minimizing adverse environmental and navigational safety effects. These four new sites, together with three ocean sites already in use, provide a network of nearshore and intertidal sediment placement sites with greater flexibility to meet those needs. Further, the Corps proposed to continue to allow limited removal of sand by vendors for commercial use under license agreements with the Corps' Waterways Maintenance Section.

On April 21, 2010 NMFS received a letter from the Corps requesting reinitiation of consultation for the March 11, 2005 opinion. The reinitiation was requested as the March 11 2005 opinion was due to expire and the eulachon and southern green sturgeon were not listed at when the 2005 opinion was issued. In their letter the Corps also requested reinitiation of consultation for the CRCIP project. NMFS issued an incidental take statement for the continued Columbia River Channel Operations and Maintenance Program, Mouth of the Columbia River to Bonneville Dam (refer to NMFS No.: 2010/01697),to be effective while consultation proceeded. The Corps withdrew its October 20, 2009, request for consultation (Larson 2010) on November 1, 2010.

On February 2, 2011, NMFS received a letter and BA dated January 2011(Corps 2011a), from the Corps renewing its request for formal consultation on the effects of continued maintenance and operation of the FNC on 13 species of salmon and steelhead in the Columbia River Basin, the southern distinct population segment of green sturgeon (southern green sturgeon) (*Acipenser medirostris*), the southern distinct population segment of eulachon (eulachon) (*Thaleichthys pacificus*), marine mammals, marine turtles, and their designated critical habitats. The Corps amended the BA in April 2011, and subsequently withdrew the document submitted in February.

On April 27, 2011, the Corps requested consultation with the revised BA (Corps 2011b), which was then amended again in August 2011(Corps 2011c). On November 11 2011, NMFS received information describing the FNC history and authorizing legislation (Appendix 1: FNC History).

On November 15, 2011, NMFS received an email clarifying that the proposed Portland Harbor work was being withdrawn from the consultation (Smith 2011). NMFS and Corps representatives continued to work on refining the proposed action and describing potential effects of the action.

On March 5, 2012, the Corps provided NMFS a final revised proposed action (Smith 2012a). Consultation was initiated at this time.

On March 14, 2012, NMFS received from the Corps an analysis of the amount of area potentially impacted by dredging along with additional best management practices to reduce potential effects to eulachon (Smith 2012b).

On March 20, 2012, NMFS received clarification that the Portland Harbor area which is actually in the Willamette River, should not be included in this consultation but that the Portland - Vancouver Anchorage in the Columbia River is in the proposed action (Smith 2012c).

On January 5, and January 27, 2012, consistent with the Secretarial Order: American Indian Tribal Rights, Federal Tribal Trust Responsibilities and the Endangered Species Act (June 5,1997), NMFS sent letters to eight Indian Tribes within the Columbia River basin to initiate technical level meetings and if desired, formal government to government consultation between

NMFS and the Tribes. NMFS also sent a letter to the Columbia River Intertribal Fish Commission on February 3, 2012.

On January 27, 2012, a technical meeting between NMFS, the Corps, and biologists from the Oregon Department of Fish and Wildlife, the Washington Department of Fish and Wildlife and the Cowlitz Indian Tribe was held to discuss the current knowledge regarding eulachon in the Columbia River.

On February 24, 2012, NMFS participated in a conference call to discuss the proposed action and consultation with representatives of the Confederated Tribes of the Colville Reservation.

On March 5, 2012, NMFS participated in a second conference call to discuss the proposed action and consultation with representatives of the Yakama Nation.

A complete record of this consultation is on file at the Oregon State Habitat Office in Portland, Oregon.

1.3 Proposed Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration.

The Corps proposes to conduct operations and maintenance of the FNC (*i.e.*, dredging to maintain the authorized channel depth, and dredge material disposal) from the River Mouth to Bonneville Dam, including nine side channel projects and the Portland-Vancouver Anchorage, under its authorities at sections 102 and 103 of the Marine Protection Reserve and Sanctuaries Act of 1972, sections 401 and 404 of the Clean Water Act of 1977, and in accordance with Regulations 33 CFR 335.1 through 338. The proposed action includes use of four new ocean disposal sites; nearshore south jetty, south jetty intertidal, north head nearshore, and Benson Beach described in the RSMP (LCRSG 2011). Further, the Corps proposes to allow private vendors to remove sand from the Westport Slough, within the bounds of its authorized depth, for commercial use under a license agreement with the Corps' Waterways Maintenance Section. The proposed action does not include any further channel improvement or deepening, or maintenance of pile dikes, jetties, navigation locks, or other navigation structures.

The Corps has been responsible for maintaining safe navigation on the Columbia River since the 1877 (see Appendix 1). Maintenance dredging, designed to maintain authorized depths has been performed annually since 1906. During this time, the FNC has been dredged periodically to deepen or widen the channel as authorized by Congress. The channel has also been realigned and hydraulic control structures such as pile dikes and jetties have been constructed to improve navigation and reduce the need for maintenance dredging. A complete chronology of the development of the navigation channel and the Congressional authorizations is included in Appendix 1. The following descriptions in the proposed action include the currently authorized dimensions of the channel from the River Mouth to Bonneville Dam, the proposed dredging and disposal methods including best management practices (BMPs), and locations.

High flows during the winter and spring erode material from the main channel side slopes and mobilize bottom material creating sand waves along the bottom of the Columbia River. The sand waves in the Columbia River are typically 4 to 8 feet high and 300 to 400 feet long creating shoals in the shipping channel. The Corps performs hydrographic surveys year-round on a monthly basis to determine the exact locations requiring dredging and what disposal capacity is available in the dredged material disposal sites. In addition, the Columbia River Pilots will call the Corps to report any problem areas they encounter while transiting the river. Some areas of shoaling become apparent during the winter months but most areas of obstructive shoaling are generally not known until the water levels begin to recede in late spring.

The Corps prepares an Annual Use Plan (AUP) in consultation with EPA to establish the year's operation and the day-to-day decision framework for the dredging season. The AUP takes into account the previous year's use of the material placement sites at River Mouth, along with current survey data gathered each spring. The plan provides a structure for the most effective use of the disposal sites given their current capacity, and the anticipated amount of dredging needed each year. Future placement of material from the Columbia River in the ocean will be included in the AUP.

The Corps evaluates sediments from the FNC to determine if they are acceptable (any pollutants are within acceptable levels, see Section 2.3.3.5) for in-water disposal according to the requirements of the Clean Water Act and the Marine Protection, Research, and Sanctuaries Act. The Corps began collecting sediment quality data in the late 1970s. A tiered sediment evaluation framework has been used since 1986. The tiered framework allows for consistent design of testing programs to maintain statutory compliance while minimizing excessive testing of low-risk projects. The most recent version of this framework is the 2009 Northwest Regional Sediment Evaluation Framework (SEF). Previous to the SEF, the 1998 Dredge Material Evaluation Framework (DMEF) for the Lower Columbia River (LCR) Management Area was in effect. The SEF is a regional manual developed jointly by a variety of Federal and State agencies. If sediments are determined unsuitable for open water disposal, then disposal is limited to confined disposal and is subject to all environmental regulations governing the disposal of sediments not suitable for unconfined disposal.

Project sediment testing is typically performed on the mainstem Columbia River on a 10-year rotational cycle, unless some event occurs that would warrant more frequent sampling. The 10-year rotation allows the continued, even management of both budget and labor while providing sufficiently current sediment quality information to allow dredging to proceed unobstructed. Projects dredged less frequently, such as the side channel projects, are evaluated, sampled, and tested as required by the SEF. Corps staff collects most sediment samples, though contracts also are used in specific cases when special equipment is required to collect samples. Contract laboratories conduct physical, chemical and biological analyses. Complete past and present chemical evaluations on all Columbia River dredging projects, as well as the SEF manual, are available from the Corps Portland District.

During the dredging season the equipment is typically operated seven days a week, 24 hours a day, with four to eight hours of downtime every seventh day for a crew change. The schedule however may be interrupted for equipment repairs and maintenance, unfavorable weather or wave conditions, and to take on fuel and supplies.

1.3.1 Types of Dredges

Two general types of dredging equipment will be used under the proposed action, hydraulic dredges and mechanical dredges. Hydraulic dredging will involve either a hopper dredge or a pipeline dredge. Mechanical dredging includes clamshell dredging or backhoe dredging.

Hopper dredges currently handle about 8.0 million cubic yards per year (mcy) of material from the navigation channel. Hopper dredges provide flexibility for dredging operations because of their maneuverability. They are most often used on small-volume sand wave shoals in the river and on large shoals in the estuary and at the mouths of rivers.

Pipeline dredges are used for large cutline shoals and areas with continuous sand wave shoals. Pipeline dredging in the Columbia River is typically used to remove material from the navigation channel between RM 21 to 106.5. Only the shoals that have formed in a reach are dredged, not the entire reach. A typical shoal would include an area 250 to 300 feet wide by 2,000 to 4,000 feet long. Although many reaches of the navigation channel are annually dredged by pipeline, other reaches may require dredging on a less frequent basis depending upon the hydrographic surveys.

Clamshell dredging is performed using a bucket operated from a crane or derrick that is mounted on a barge or operated from shore. Sediment from the bucket is usually placed on a barge for offloading and disposal to an upland or in-water site. Because clamshell dredges are not self-propelled, they are not typically used in high traffic areas; rather, they are used in tighter spaces such as around docks and piers. Clamshell dredges can be used in restricted areas and shallow areas where draft restrictions may limit other dredges. Clamshell dredges equipped with special buckets are often regarded as being particularly useful in silts or contaminated materials. Clamshell dredges are often used in areas with debris concerns which could damage other dredges. Also, a clamshell may be used if the placement site is very far from the dredging area, because multiple barges can be used to cycle to and from the placement area and keep the dredge working continuously. Clamshell dredges are primarily used for the side-channel projects related to the FNC.

Backhoe dredging is performed using a bucket on the end of a backhoe arm. Although the backhoe is typically mounted on a barge, it also could be a land-based piece of equipment. Backhoes can be used in both shallow- and deep-draft channels. Sediments removed by backhoe are usually placed on a barge for offloading and disposal to an upland or in-water site. Backhoe dredges are often used to remove clays, rock, hard-packed materials, and fine-grained sediments, but also may be used in certain locations to remove sands. Like clamshell dredges, backhoes are often used in restricted areas near docks and in shallow-draft projects.

1.3.2 Advanced Maintenance Dredging (Routine)

Advanced maintenance dredging (AMD) is the practice of dredging deeper and wider than the FNC boundaries. The authority for AMD is included in the dredging authorization. The objective of AMD is to create an area for shoaling to develop below the authorized depth or outside the channel width to maximize time between dredging events and provide safe and adequate depths for vessels throughout the year.

AMD is practiced at the River Mouth, on the FNC and the side channel projects. The amount of AMD varies with the type of shoal and dredge. According to the Corps (2011c), a review of AMD practices found five feet of AMD depth to be sufficient on the FNC from the River Mouth to Vancouver, Washington. For all of the side-channel projects being addressed in Corps (2011c), as well as the main Columbia River navigation channel above Vancouver, WA, the AMD depth is two feet. However, over-depth dredging alone is not well suited for maintaining cutline shoals that have material moving in from the side slopes of the channel. Consequently, the AMD for cutline shoals is done up to 100 feet outside the channel width on the main Columbia River navigation channel and side channel projects to intercept material moving toward the navigation channel. Over-width dredging can occur on one or both sides of the channel depending upon shoaling patterns. AMD is not done to full depth or width at each shoal. The amount of AMD is based on the shoaling history of a particular area.

To minimize the potential effects to eulachon, The Corps plans to complete the estimated AMD during the primary dredging season of June 1 to December 15 (Section 1.3.6). However, there may be years where the dredging season will need to be extended past December 15. For example, the high-water event in 2011 caused such a significant increase in shoaling that AMD could not be completed until the end of January 2012. Similar high-water events causing significant shoaling occurred in 1996 and 1997.

1.3.3 Dredging of Shoals Outside the Primary Dredging Season (Non-Routine)

The Corps performs AMD in the FNC during the routine dredging season with the purpose of maximizing time between dredging events. However, the Columbia River FNC is still in the process of stabilizing after deepening to 43 feet. The Corps anticipated that once the 43-foot channel was created, a longer dredging season would be needed because AMD would not maintain the channel as effectively as before construction. The assumption was verified in 2011 when AMD could not handle all the shoaling that developed as a result of winter storms and the spring freshet. Advanced maintenance channels were filled by winter shoaling before the spring freshet resulting in severe deep vessel draft restrictions. The Corps anticipates AMD only during the primary dredging season will not be sufficient to maintain the FNC (Smith 2012d).

Since shoaling reaches will be variable from season to season until the river system reaches equilibrium, it is very likely that there will be a need for an unknown amount of dredging actions outside the routine dredging season to maintain the 43-foot channel depth throughout the year. The non-routine dredging is needed when:

- Shoaling forms above the authorized channel depth, the Corps plans to dredge such shoals at any time of year to lift or prevent imminent draft restrictions.
- AMD areas are filled by shoaling during winter storms; the Corps will dredge those shoals prior to the spring freshet so that shoaling associated with the freshet develops below the authorized depth and prevent draft restrictions.

1.3.4 Description of Disposal Operations

The Corps has four options for disposal sites: Upland, in-water disposal, beach nourishment, or ocean. Material dredged at the River Mouth is disposed in the ocean disposal sites. From RM 3 to Bonneville Dam, the decision to dispose of material in-water, for beach nourishment or an upland site depends upon the type of dredge used and both the availability and access to the disposal site.

Upland Disposal. Upland disposal is accomplished when using clamshell, hopper, and pipeline dredges. Clamshell-dredged material deposited onto a barge can be off-loaded at a transfer point to be taken to an upland site. Hopper and pipeline dredges pump dredged material in a sand and water slurry directly into a diked, upland site near the dredging area. Discharge of water from upland sites back into the river is controlled by the use of weirs and will follow the conditions of the state water quality certification.

The upland sites (Table 2) have typically been used every two to five years, but some may be used annually for future maintenance of the navigation channel. In 2011, 559,046 cy were disposed on upland sites.

Table 1. BMPs for dredging.

BMP	Justification	Duration	Management Decision
Hopper Dredging			
Drag or cutterheads will be buried in the substrate and will not exceed an elevation of 3 feet off the bottom for when cleaning the hopper or reverse purging dragheads (Smith 2012j).	Reduce entrainment of juvenile salmon during normal dredging operations.	Continuous during dredging operations.	Maintain until new information becomes available that would warrant change.
Dredging in shallow water areas (less than 20 feet) outside of the Columbia River mainstem should occur only during the recommended ESA in-water work periods for the Columbia River as listed in Section 1.3.7.	The top 20 feet of the water column is considered salmon migratory habitat. Dredging or disposal in these areas could delay migration or reduce or eliminate food sources.	Continuous during dredging and disposal operations.	Maintain until new information becomes available that would warrant change.
Pipeline Dredging			
Dragheads or cutterheads will be buried in the substrate and will not exceed an elevation of 3 feet off the bottom for when cleaning the hopper or reverse purging dragheads.	Reduce entrainment of juvenile salmon during normal dredging operations.	Continuous during dredging operations.	Maintain until new information becomes available that would warrant change.
Dredging in shallow water areas (less than 20 feet) only during the recommended ESA in-water work periods for the Columbia River as listed in Section 1.3.7.	The top 20 feet is considered salmon migratory habitat. Dredging or disposal in these areas could delay migration or reduce or eliminate food sources.	Continuous during dredging and disposal operations.	Maintain until new information becomes available that would warrant change.
General Provisions for All Dredging			
The contractor shall not release any trash, garbage, oil, grease, chemicals, or other contaminants into the waterway.	Protection of water resources.	Life of contract or action.	If material is released, it shall be immediately removed and the area restored to a condition approximating the adjacent undisturbed area. Contaminated ground shall be excavated and removed and the area restored as directed. Any in-water release shall be immediately reported to the nearest U.S. Coast Guard Unit for appropriate response.
The contractor, where possible, will use or propose for use materials that may be considered environmentally friendly in that waste from such materials is not regulated as a hazardous waste or is not considered harmful to the environment. If hazardous wastes are generated, disposal shall be done in accordance with 40 CFR parts 260-272 and 49 CFR parts 100-177.	Disposal of hazardous waste.	Life of contract or action.	If material is released, it shall be immediately removed and the area restored to a condition approximating the adjacent undisturbed area. Contaminated ground shall be excavated and removed and the area restored as directed. Any in-water release shall be immediately reported to the nearest U.S. Coast Guard Unit for appropriate response.

Table 2. Upland Disposal Sites.

Upland Disposal Site	State	RM	Upland Disposal Site	State	RM
West Sand Island	OR	3	Mount Solo	WA	62.0
Rice Island	OR/WA	21.0	Lord Island (East End)	OR	63.5
Pillar Rock Island	OR	27.2	Dibblee Point	OR	64.8
Skamokawa Vista Park	WA	33.4	Howard Island	WA	68.7
Welch Island	OR	34.0	Cottonwood Island	WA	70.1
Tenasillahe Island	OR	38.3	Port of Kalama Property	WA	71.9
Ostervold Road	WA	38.7	Sandy Island	OR	75.8
Upstream of Coffeepot Island	WA	42.5	Lower Deer Island	OR	77.0
Fort James	OR	42.9	Martin Bar	WA	82.0
Property on Puget Island	WA	44.0	Austin Point	WA	86.5
Brown Island	WA	46.3	Fazio Sand & Gravel	WA	97.1
Crims Island	OR	57.0	Gateway	WA	101.0
Hump Island	WA	59.7	West Hayden Island	OR	105.0

Beach Nourishment. The combination of river flows, waves, and tidal effects erodes material from the shoreline. Replacement of this material on a regular basis is known as beach nourishment. In the last five years, the Corps has placed an average of 100,000 to 500,000 cubic yards (cy) of material annually at beach nourishment sites.

The beach nourishment/shoreline disposal process involves pumping dredged material through a floating discharge pipe from the pipeline dredge to an existing shoreline. The dredge first pumps a landing on the shoreline to establish a point from which further material placement occurs. Dredged material is pumped in a sand and water slurry (about 20 percent sand) and as it exits the shore pipe, the sand settles out on the shoreline while the water returns to the river. Settling rates of Columbia River sands are very quick and turbidity from the operation is minimal. After sufficient sand has settled out and begins to increase in height, it is moved by bulldozers to match the elevation of the existing shoreline at approximately the high water line. During beach nourishment, a temporary sand berm is constructed to retain sand on the beach during pump-out; otherwise, much of the sand would immediately be lost to the river. The temporary berms typically are approximately 5 feet high and 12 feet wide at the base. The berms are built gradually by earth-moving equipment as pump-out continues and are created from existing beach sand, pumped sand, or both.

A typical shoreline disposal operation lasts from 5 to 15 days and the width of the shoreline created is approximately 100 to 150 feet. The process continues by adding to the shore pipe and proceeding longitudinally along the shoreline. The length of shoreline replaced is dependent on the quantity of material to be dredged from the shoal in the channel. After disposal, the slope of the shoreline is groomed to a steepness of 10 to 15 percent to prevent the possibility of creating areas where juvenile fish could be stranded from vessel wakes on the new shoreline. Disposal of material for beach nourishment will always occur at the sand/water interface, not in open water.

The Corps has proposed to place dredge sediment at three beach nourishment sites (Table 3). The volume of material that might be placed at each of the beach nourishment site is difficult to predict due to the recent deepening of the Columbia River navigation channel and due to the variable use of a given site; which could range from no use, to annual use, to use once every three to five years. Further, the reduction of upland disposal resulting from placement of dredged material at beach nourishment sites is also difficult to predict. Approximately 227,586 cy of material was disposed at beach nourishment sites in 2011.

Table 3. Beach Nourishment Sites.

Potential Site	State	River Mile	Current Use
Miller Sands	OR	23.5	Yes
Skamokawa Vista Park	WA	33.4	Yes
Sand Island at St. Helens	OR	86.2	Yes

In-Water Disposal. Most in-water disposal occurs in the flowlane, within or directly adjacent to the navigation channel, by hopper or pipeline dredges, or by bottom-dump barges used with clamshell dredges. The average annual quantity of material disposed in the flowlane is 4.3 mcy. In-water dredged material disposal is done throughout the deep-draft Columbia River navigation channel from RM 3 to RM 145. The disposal sites vary depending on the condition of the channel each year. As deeper flowlane areas are filled with dredged material, new deep areas are formed elsewhere as a result of natural river processes. The maintenance activities generally use flowlane sites from 20 to 65 feet in depth with occasional exceptions when disposal may occur in flowlane sites greater than 65 feet in depth.

Hopper dredges collect material in the hopper of the vessel until it is near capacity. When filled, the vessel moves to a flowlane site. As the dredge is running, the hopper doors open and the material is discharged at varying rates depending upon how far the hopper doors are opened. The dredge releases the material gradually while moving to avoid mounding. Flowlane discharge from pipeline dredges differs from hoppers in that material is continuously discharged during dredging operations. Placement of material at flowlane sites is done using a down-pipe with a diffuser plate at the end. This down-pipe extends 20 feet below the water surface to minimize or avoid impacts to migrating juvenile salmonids. During placement of dredged material, the down-pipe will be moved often so that mounding on the bottom is minimized.

Harrington Sump is a designated in-water dredged material disposal site along Rice Island from RM 20 to 22. This site is used by hopper dredges and sometimes by pipeline dredges for disposal of dredged material when performing maintenance dredging at Tongue Point Crossing and Miller Sands Channel. Portions of the sump may be dredged annually to provide new capacity. The sump is dredged to 48 feet below MLLW with a pipeline dredge and the material is pumped to Rice Island. On average, a total of approximately 0.2 to 1 mcy of sand is removed from Harrington Sump each time it is dredged.

BB-3 is downstream of RM 3, near the end of Jetty A. The center of the 1,200-foot by 1,050-foot disposal site is at 46° 15’ 38” N, 124° 02’ 18” W. This site is primarily used when dredging side channel projects such as Baker Bay. The site may receive 100,000 to 150,000 cy of material annually.

Area D is within the Columbia River estuary north of the main Columbia River navigation channel at approximately RM 7. The center of the 2,000-foot wide by 5,000-foot long disposal site is at 46° 14’28”N, 123°58’36”W. It is estimated that the 24- to 45-foot deep site will not receive more than 3.5 mcy of material over a 5-year period.

Ocean Disposal. Material dredged from the River Mouth is typically disposed of in the ocean. Material dredged from the Columbia River between RM 3 and RM 30 may also be placed in the ocean. Maintaining the FNC including the construction of jetties at the River Mouth has disrupted the routing of sediment in the Columbia River littoral cell resulting in a depletion of sediment within the cell (LCSG 2011). The depletion in sediment is resulting in beach erosion, loss of habitat associated with the natural sediment composition and potentially undermining the jetties which would severely disrupt navigation. Both the states of Washington and Oregon consider moving naturally deposited sediment from the River Mouth and depositing it outside the littoral cell to be a waste of the sand resource.

According to the BA, the Corps estimates that up to 5.5 mcy of material may be placed annually in RSMP ocean disposal sites using government and contract hopper dredges. Ocean disposal will occur at three existing sites; the Shallow Water Site, the North Jetty Site and Deep Water Site, and four proposed new sites: the South Jetty Nearshore Site, the South Jetty Intertidal Site, the North Head Nearshore Site and the Benson Beach Site. The Corps (2011c) includes coordinates for these sites which are incorporated by reference. The actual coordinates could vary slightly over time through an adaptive management process. At the Benson Beach site, dredged materials will be placed directly onshore via pump-ashore dispersal hopper dredge with the intent of minimizing erosion at Benson Beach and allow for beach accretion. The materials would be naturally and mechanically distributed. The intent is for natural wave action to disperse the sediment within the littoral cell.

The Corps has proposed to use different BMPs to reduce the impact of each type of dredge material disposal (Table 4).

Table 4. BMPs for dredged material disposal.

BMP	Justification	Duration	Management Decision
Flow Lane Disposal			
Dispose of material in a manner that prevents mounding of the disposal material.	Spreading the material out will reduce the depth of the material on the bottom, which will reduce the impacts to fish and invertebrate populations.	Life of contract or action.	Maintain until new information becomes available that would warrant change.
Maintain discharge pipe of pipeline dredge at or below 20 feet of water depth during disposal.	This measure reduces the impact of disposal and increased suspended sediment and turbidity to migrating juvenile salmonids, as they are believed to migrate principally in the upper 20 feet of the water column.	Continuous during disposal operations.	Maintain until new information becomes available that would warrant change.
Upland Disposal			
Berm upland disposal sites to maximize the settling of fines in the runoff water.	This action reduces the potential for increasing suspended sediments and turbidity in the runoff water	Continuous during disposal operations.	Maintain until new information becomes available that would warrant change.
New sites will have a minimum 300 foot buffer from shoreline or other aquatic habitat feature. Existing sites may not have this habitat buffer but currently provide limited habitat value.	Maintains important habitat functions.	Life of contract or action.	Maintain until new information becomes available that would warrant a change.
Shoreline Disposal			
Grade disposal site to a slope of 10 to 15 percent, with no swales, to reduce the possibility of stranding of juvenile salmonids.	Ungraded slopes can provide conditions on the shoreline that will create small pools or flat slopes that strand juvenile salmonids when washed up by wave action.	Continuous during disposal operations.	Maintain until new information becomes available that would warrant change.
Ocean Disposal			
Dispose in accordance with the site management and monitoring plan.	This action minimizes conflicts with users and impacts to ocean resources.	Continuous during dredging operations.	Maintain until new information becomes available that would warrant change.

BMP	Justification	Duration	Management Decision
General Provisions For All Disposal			
Dispose of hazardous waste.	The contractor, where possible, will use or propose for use materials that may be considered environmentally friendly in that waste from such materials is not regulated as a hazardous waste or is not considered harmful to the environment. If hazardous wastes are generated, disposal of this material will be done in accordance with 40 CFR parts 260-272 and 49 CFR parts 100-177.	Life of contract or action.	If material is released, it will immediately be removed and the area restored to a condition approximating the adjacent undisturbed area. Contaminated ground will be excavated and removed, and the area restored as directed. Any in-water discharge will be immediately reported the nearest U.S. Coast Guard Unit for appropriate response.

In addition to the BMPs for dredging and disposal, the potential impacts to ESA-listed fish due to the proposed action are minimized by the in-water work periods (Section 1.3.6). The Corps also requires a Spill Control Plan including the procedures, instructions, and reports to be used in the event of an unforeseen spill of a substance regulated by 40 CFR 68, 40 CFR 302, 40 CFR 355 and regulated under state or local laws and regulations.

1.3.5 Description of Activities Proposed by Reach

The following section describes the dredging and disposal methods used by the Corps to maintain the FNC, and the authorized channel dimensions for each river reach. Depths are referenced to either Mean Low Low Water (MLLW) or Columbia River Datum (CRD). MLLW is a tidal reference datum used downstream of RM 21+20 at Miller Sands. CRD is also known as the approximate low water plane, and is the reference datum used upstream of RM 21+20.

Mouth of the Columbia River (River Mouth) (RM -3 to +3). The River Mouth channel is where the Columbia River empties into the Pacific Ocean between Oregon and Washington. The River Mouth project provides an entrance channel to access the deep-draft (43 feet) Columbia River navigation channel to Portland, Oregon, other Washington and Oregon ports, and the Columbia/Snake River inland waterway. The River Mouth channel decreases tide-caused delays for commercial ships crossing the sand bar and shoals found at the mouth of the river. It also provides improved safety by reducing the possibility of commercial ship grounding, and allows for compatible use by commercial and non-commercial vessels. The authorized River Mouth channel is 2,640 feet wide and extends from deep water in the ocean, at approximately RM -3 upstream to RM +3. The River Mouth channel connects with the existing 43-foot deep FNC at RM 3. The northern side of the channel is 2,000 feet wide and is maintained to a depth of -55 feet MLLW. The southern 640 feet is maintained to -48 feet MLLW.

Most of the shoaling occurs from RM -2.0 to +2.5 where an average of 4.5 mcy of sediment is dredged each year. The volume dredged is dependent upon the flows in the Columbia River. During a high-flow year, less shoaling occurs and during a drought year, more shoaling occurs.

For example, the amount dredged after the 1996 flood was only 1.9 mcy. Material is dredged using medium-sized hopper dredge due to the sea, tidal, and weather conditions experienced at the River Mouth.

<u>Columbia River Upstream of River Mouth to Vancouver, Washington (RM 3 to 106.5)</u>. The Corps annually dredges material from shoaling areas in the Columbia River to maintain the authorized navigation channel. The authorized channel is 43 feet deep and 600 feet wide from RM 3.0 to 101.4; 43 feet deep and 500 feet wide from RM 101.4 to 105.5; 43 feet deep and 400 feet wide in the downstream 1.5 miles of Oregon Slough; and 35 feet deep from RM 105.5 to 106.5 (from the Burlington Northern and Santa Fe Railway Bridge to the Interstate 5 Bridge). Shoaling occurs at various locations within the navigation channel. At each location, a dredge may spend anywhere from 3 days to 3 weeks removing sand from the navigation channel, depending on the size of the shoal. At any time, there may be three or more dredges working at the same time, but in different locations. Timing of dredging in the main channel is relatively inflexible due to the nature of the riverine shoaling process.

Pipeline, hopper, and mechanical dredges may be used depending on several factors including dredge availability, size and location of the shoal, and disposal options available. Disposal areas include shoreline, upland, flowlane and in-water sites. Material dredged between RM 3 to 30 may be disposed in the ocean sites. The amount of dredging required varies annually and is dependent on the amount of shoaling present in the channel.

The Corps also proposes shifting the channel 300 feet to the west at approximately RM 10+15 and 300 feet to the east at approximately RM 4+10 on a continuous bearing through the existing centerline at RM 7. The proposed realignment has been discussed with the Coast Guard and the Columbia River Bar Pilots since 2006. The realignment is likely to reduce future maintenance dredging as the channel will be moved away from shoal areas at RM 5 and RM 9. The realignment will improve transit between the River Mouth and the Columbia River by changing the channel alignment from a curve to tangent lines (Smith 2012g).

<u>Vancouver, Washington to Bonneville Dam (RM 106.5 to 145)</u>. The main navigation channel from Vancouver, Washington (RM 106.5) to Bonneville Dam (RM 145) is authorized to a depth of -27 feet CRD. Based on the draft requirements of current users, the channel is maintained below Bonneville Dam to -17 feet CRD. The Corps has performed maintenance dredging using a hopper dredge at two or more locations every year.

<u>Portland/Vancouver Anchorage Project</u>. Anchorage Area "A" is between river miles 102+36.5 and 103+03.5 on the Oregon side of the river adjacent to the -43 feet CRD Federal navigation channel. The anchorage area is 2,000 feet long and varies between 370 to 550 feet wide. This site is used as a deep-draft anchorage. The site will be maintained to -43 feet CRD. If dredging is necessary, a disposal site will be identified, and the necessary environmental clearances will be obtained. No dredging has been required to maintain this anchorage since it has been authorized, the area is naturally deep and no infill has occurred to date.

Anchorage Area "B" is between RMs 103+31 and 103+51 on the Oregon side of the river. The anchorage is approximately 500 feet outside of the -43 feet CRD Federal navigation channel.

The anchorage varies in width from 10 to 550 feet wide and is 2,000 feet long at the longest point. This site is used for light laden or empty vessels. The site will be maintained to -25 feet CRD. If dredging is necessary, a disposal site will be identified, and the necessary environmental clearances will be obtained. No dredging has been required to maintain this anchorage since it has been authorized because the area is naturally deep and no infill has occurred to date.

Side Channels. The Corps is authorized to maintain a number of side-channel projects. Depths and frequency of dredging at these locations vary and are project dependent. The following side-channel projects are maintained by the Corps and are included in the proposed action.

Baker Bay. The West Channel through Baker Bay begins outside the 43-foot FNC in the Columbia River near RM 2.5 and continues along the western edge of the bay for 3 miles to the entrance of Ilwaco Boat Basin. The authorized channel depth is 16 feet below MLLW. The channel width is 200 feet for the first 0.5 miles, then 150 feet for the remaining distance. The Federally maintained channel ends at the turning and mooring basin, which is maintained by local interests. Dredging is typically done using a clamshell dredge, but a hopper or pipeline dredge have been used previously and may be used in the future. Dredged material is placed either in the Columbia River flowlane, BB-3, Area D, or on West Sand Island.

Chinook Channel. The channel leading into Chinook, Washington begins near RM 5 in the Columbia River north of the FNC, and continues to the Port of Chinook. It is a long, narrow channel through an area of extreme shoaling. The authorized depth is 10 feet below MLLW and the width is 150 feet. The two mile long channel ends at the turning and mooring basin, which is maintained by local interests. The Chinook Channel is maintained by clamshell dredge, although it is also possible that a hydraulic dredge may be used. Material removed from this channel may be placed in disposal site Area D or in the flowlane.

Hammond Boat Basin. The Hammond Boat Basin is seven miles from the mouth of the Columbia River on the Oregon side. It was constructed in 1982. The access channel leading into the boat basin is authorized at 10 feet below MLLW and is 1,300 feet long and 100 feet wide. Primarily small boats use the channel. The Columbia River Bar Pilots moor one of their pilot boats in the basin. This boat basin has been maintained historically by pipeline dredge and was last dredged in 1982. Approximately 18,000 cy of material was placed in an upland disposal site near the boat basin. Future maintenance will most likely be by pipeline dredge with associated upland or flowlane disposal, or by clamshell dredge with associated flowlane disposal in the Columbia River.

Skipanon Channel Skipanon Channel begins near RM 10 in the Columbia River and runs up the Skipanon River to Warrenton, Oregon. The channel is authorized to a depth of 30 feet below MLLW, but current users require a depth of only 16 feet. The channel width is 200 feet for the first 1.5 miles, and then it opens up into a turning basin with a width varying from 225 to 475. Shoaling occurs in the turning basin area and from sands that encroach across the mouth of the river. Skipanon Channel is maintained by both hopper and clamshell dredges. A hopper dredge maintains the outer entrance of the channel, and clamshell dredges remove material from throughout the entire channel. Sediment in the Skipanon Channel is primarily sandy silt with 76 percent fines. Dredged material is placed in the flowlane of the Columbia

River downstream of the entrance to Skipanon Channel or at Area D. This project is typically dredged once every five years although Skipanon Channel was last dredged in 2003 when 15,366 cy were removed.

Skamokawa Creek. The channel leading into Skamokawa, Washington begins outside the 43-foot FNC in the Columbia River from RM 33 to 34 and continues toward the town of Skamokawa, ending at the downstream entrance to Brooks Slough. The authorized depth is 6.5 feet below CRD. The area has not been dredged by the Corps since 1992. Material would be placed in the Columbia River flowlane. This area is planned to be dredged once every five years although the channel was last dredged by local interests in 1993 when approximately 5,000 cy of material was dredged and disposed of by flowlane at the mouth of Skamokawa Creek. There has been no subsequent dredging.

Wahkiakum Ferry Channel. The Wahkiakum Ferry Channel runs between Puget Island and Westport Slough near RM 43 in the Columbia River. The channel is authorized to a depth of 9 feet below CRD and a width of 200 feet. Sediment in the Wahkiakum Ferry Channel is predominately sand with about 1.2 percent fines. Future dredging will be done by clamshell dredge with flowlane disposal of the material in the Columbia River or in an upland site. It is anticipated that the ferry channel may be dredged two or three times every five years as funding becomes available.

Westport Slough. Westport Slough is proposed to be dredged to a depth of 20 feet below CRD per the request of river users to allow ocean-going barge access. Westport Slough is authorized to a depth of 28 feet below CRD and a width of 200 feet, but is currently maintained to a depth of 9 feet below CRD for the Wahkiakum Ferry. Future dredging will be done by clamshell or pipeline dredge with flowlane disposal of the material in the Columbia River or in an upland site. It is anticipated that Westport Slough may be dredged two or three times every five years as funding becomes available.

Old Mouth Cowlitz River The Old Mouth Cowlitz River is at RM 67 on the north side of the mainstem Columbia River at Longview, Washington. The site is no longer an active component of the Cowlitz River drainage and serves as an access channel for chip barges at the local Longview Fibre paper mill. The Project channel into the Old Mouth Cowlitz River is authorized at a depth of 8 feet below CRD and 150 feet wide. It runs from deep water in the Columbia River to a point approximately 3,800 feet upstream. The channel has been dredged historically by pipeline, clamshell, and agitation dredging (a type of dredging which is no longer used). Future maintenance will be done using a clamshell dredge with placement of the dredged material in the flowlane of the Columbia River. Dredging occurred three times in the last five years by a private contractor for Longview Fibre. It is anticipated that this area will be dredged two or three times every five years, as funding becomes available.

Upstream Entrance to Oregon Slough The upstream entrance to Oregon Slough (RM 102.5) has been dredged historically by pipeline and clamshell dredges. Future dredging will be done using a clamshell dredge. Placement of the dredged material is in the flowlane of the Columbia River. The upstream entrance to Oregon Slough was last dredged in 2001 when a clamshell dredge removed 55,799 cy. However, it is anticipated that the upstream entrance to

Oregon Slough may be dredged once every five years. The authorized depth is 10 feet below CRD. Advanced maintenance dredging is authorized and commonly practiced. The Upstream Entrance to Oregon Slough is proposed as a side channel project, and the downstream 1.5 miles of Oregon Slough is part of the Columbia River 43-foot FNC.

1.3.6 In-Water Work Periods

The normal operating season for routine AMD and in-water placement for dredging in the River Mouth and Columbia River is June 1 and through December 15. Additional timing restrictions limit dredging in some locations to specific times of the year:

- Use of the South Jetty Nearshore Site for disposal will occur after August 15 when the Oregon crab season ends.
- Until the new 43-foot channel stabilizes, non-routine dredging and in-water placement is likely to be required between December 16 and May 31 to address shoals that significantly obstruct navigation if they are left to the next primary dredging season, such as:
  - Shoals at any location from RM 3-RM 106.5 that are presently or imminently causing draft restrictions will be dredged at any time to provide safe and adequate depths for waterborne commerce.
  - Shoals which require dredging prior to the spring freshet to provide an area for spring freshet shoaling to develop below the authorized depth and prevent draft restrictions will be dredged between April 15 and the start of the routine dredging season (June 1).
- All side channels will be dredged between August 1 and December 15.
- If non-routine dredging is needed near or downstream of the mouth of the Cowlitz River (RM 63-70) between December 16 and May 31 there will be no in-water placement of dredged material.
- When alternate sites are available, there will be no in-water placement near the mouths of the Kalama River (RM 71-75) and Lewis River (RM 85-89) between December 16 and May 31 (Smith 2012m).
- Annual dredging and in-water placement required to calibrate equipment and test dredge repairs will occur between December 16 and May 31. The test and calibration dredging with in-water placement will occur above RM 89, most likely over several days in February and March.
- Dredging and in-water placement between RM 106.5 to RM 145 will be conducted between August 1 and September 30.

1.3.7 Interrelated Interdependent Actions

Based on the review of the BA, the past opinions (NMFS 2005a and 2005b) and continuing discussions with the Corps during the consultation, NMFS considered whether the following actions may be interrelated or interdependent to the continued maintenance of the FNC and concluded that they are not:

- Willamette River Navigation Channel Deepening. This action cannot occur until an approved Superfund plan is in place for the Portland Harbor, but such a plan is only in the investigation phase. Therefore, it is unclear what conditions, if any, would make this action go forward in the future.
- Development of Port Activities and Deep Draft Vessels. These activities depend on private decisions that are currently too speculative to consider, and the current FNC has independent utility regardless of future port or vessel configurations.
- Non-indigenous Species Introductions. This is not an action; it is an environmental baseline condition and, possibly, an indirect effect of the FNC.
- Commercial Dredging for Sand. This is being considered as part of the proposed action, not as a separate action.
- Pile Dike, Buoy and Channel Marker Maintenance. These are explicitly not part of the proposed action and would be necessary regardless of FNC maintenance.
- Development of future upland, in-water or shoreline placement sites. These are Federal actions that would require a separate consultation when they are proposed.
- Ship Strikes. This is not an action; it is an environmental baseline condition and, possibly, an indirect effect of the FNC.

1.4 Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02).

The action area for this Project is defined as the downstream end of the River Mouth at RM -3 and upstream to Bonneville Dam (RM 145) (Figure 1). The lateral extension of the action area extends 300 feet shoreward of mean higher high water (MHHW) as well as a fan-shaped area of the Pacific Ocean extending out 6 miles from the mouth of the river to include the ocean disposal sites.

The action area is occupied by 13 species of anadromous salmonids, the southern green sturgeon, eulachon, seven marine mammals, and the leatherback sea turtle (*Dermochelys coriacea*) listed under the ESA. The action area also includes designated critical habitat for 12 species of anadromous salmonids, the southern green sturgeon, the southern eulachon and leatherback sea turtle; and proposed critical habitat for coho salmon (*O. kisutch*) (Table 5). The action area is considered EFH for Chinook and coho salmon, Pacific Coast Groundfish, and Coastal Pelagic Species. The LCR near the River Mouth is considered a Habitat Area of Particular Concern (HAPC) for Pacific Coast Groundfish (Section 3.1).

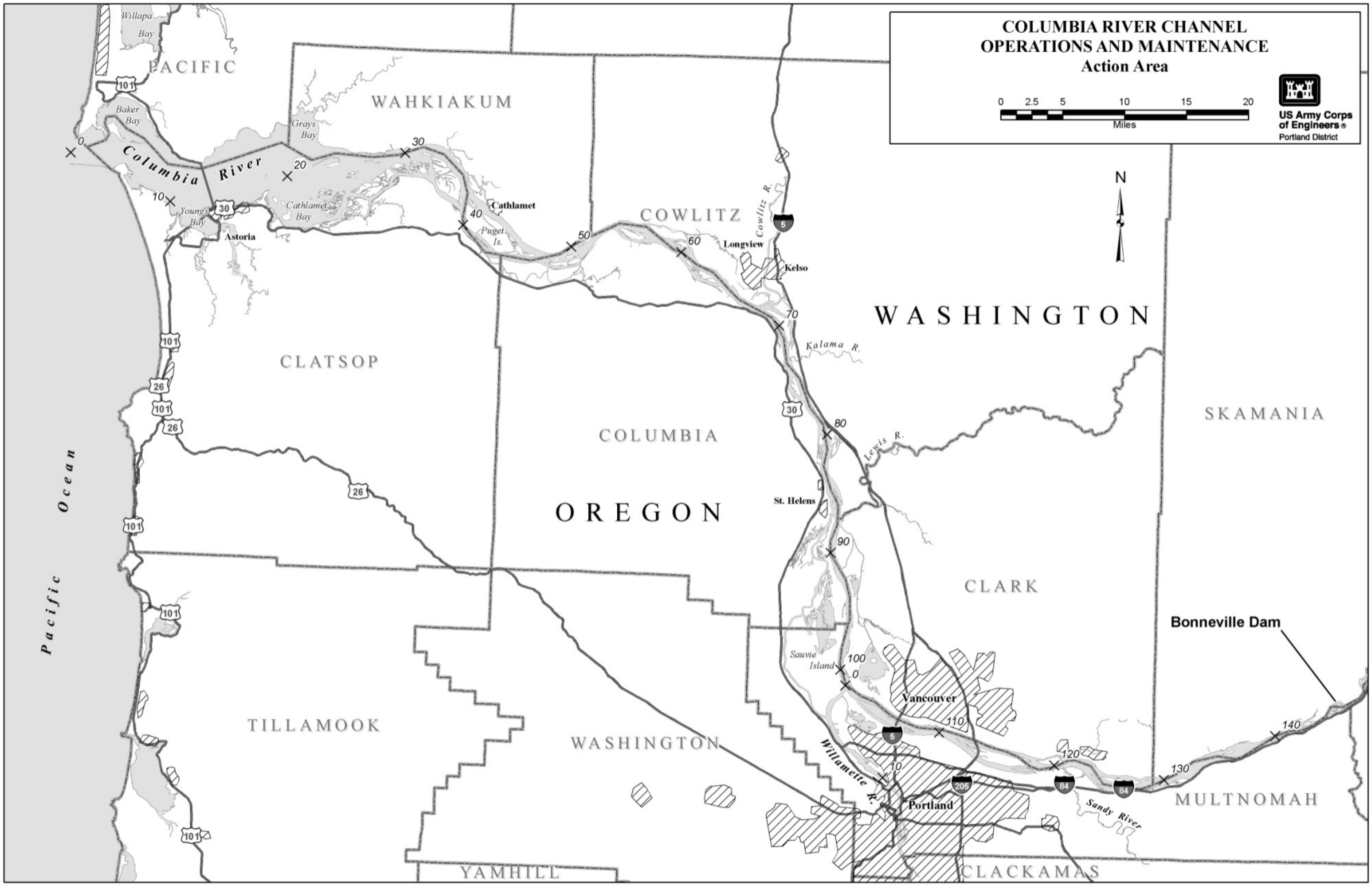


Figure 1. Action Area

Table 5. Federal Register notices for final rules that list threatened and endangered species, designate critical habitats, or apply protective regulations to listed species considered in this consultation. Listing status: "T" means listed as threatened under the ESA; "E" means listed as endangered; "P" means proposed.

Species	Listing Status	Critical Habitat	Protective Regulations
Marine and Anadromous Fish			
Chinook salmon (*Oncorhynchus tshawytscha*)			
Lower Columbia River	T 8/15/11; 76 FR 50448	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Willamette River	T 8/15/11; 76 FR 50448	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Columbia River spring-run	E 8/15/11; 76 FR 50448	9/02/05; 70 FR 52630	ESA section 9 applies
Snake River spring/summer run	T 8/15/11; 76 FR 50448	10/25/99; 64 FR 57399	6/28/05; 70 FR 37160
Snake River fall-run	T 8/15/11; 76 FR 50448	12/28/93; 58 FR 68543	6/28/05; 70 FR 37160
Chum salmon *(O. keta*)			
Columbia River	T 8/15/11; 76 FR 50448	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Coho salmon (*O. kisutch*)			
Lower Columbia River	T 8/15/11; 76 FR 50448	N/A	6/28/05; 70 FR 37160
Sockeye salmon (*O. nerka*)			
Snake River	E 8/15/11; 76 FR 50448	12/28/93; 58 FR 68543	ESA section 9 applies
Steelhead (*O. mykiss*)			
Lower Columbia River	T 8/15/11; 76 FR 50448	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Willamette River	T 8/15/11; 76 FR 50448	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Middle Columbia River	T 8/15/11; 76 FR 50448	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Columbia River	T 8/15/11; 76 FR 50448	9/02/05; 70 FR 52630	2/01/06; 71 FR 5178
Snake River Basin	T 8/15/11; 76 FR 50448	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Green sturgeon (*Acipenser medirostris*)			
Southern	T 4/07/06; 71 FR 17757	10/09/09; 74 FR 52300	6/02/10; 75 FR 30714
Eulachon (*Thaleichthys pacificus*)			
Eulachon	T 3/18/10; 75 FR 13012	10/20/11; FR 65324	Not applicable
Marine Mammals			
Steller sea lion (*Eumetopias jubatus*)			
Eastern	T 5/5/1997; 63 FR 24345	8/ 27/93; 58 FR 45269	11/26/90; 55 FR 49204
Humpback whale (*Megaptera novaeangliae*)			
	E 12/02/70; 35 FR 18319	Not applicable	ESA section 9 applies
Killer whale (*Orcinus orca*)			
Southern Resident	E 11/18/05; 70 FR 69903	11/29/06; 71 FR 69054	ESA section 9 applies
Blue whale (*Balaenoptera musculus*)			
	E 06/02/1970; 35 FR 8491	Not applicable	ESA section 9 applies
Fin Whale (*Balaenoptera physalus*)			
	E 11/18/05; 70 FR 69903	Not Applicable	ESA section 9 applies
Sei whale (***Balaenoptera borealis***)			
	E 12/02/70; 35 FR 18319	Not applicable	ESA section 9 applies
Sperm whale (*Physeter macrocephalus*)			
	E 12/02/70; 35 FR 18319	Not applicable	ESA section 9 applies
Marine Turtles			
Leatherback turtle (*Dermochelys coriacea*)			
	E 6/02/70 ; 39 FR 19320	3/23/79; 44 FR 17710 1/26/12; 77 FR 4170	ESA section 9 applies

2. ENDANGERED SPECIES ACT BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat on which they depend. Section 7(a)(2) of the ESA requires Federal agencies to consult with the U.S. Fish and Wildlife Service, NMFS, or both, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their designated critical habitat. Section 7(b)(3) requires that at the conclusion of consultation, the Service provide an opinion stating how the agencies' actions will affect listed species or their critical habitat. If incidental take is expected, section 7(b)(4) requires the provision of an incidental take statement specifying the impact of any incidental taking, and including reasonable and prudent measures to minimize such impacts.

2.1 Introduction to the Biological and Conference Opinion

Section 7(a)(2) of the ESA requires Federal agencies, in consultation with NMFS, to insure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. The jeopardy analysis considers both survival and recovery of the species. The adverse modification analysis considers the impacts to the conservation value of the designated critical habitat.

"To jeopardize the continued existence of a listed species" means to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02).

This opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statutory provisions of the ESA to complete the following analysis with respect to critical habitat (Hogarth 2005).

We will use the following approach to determine whether the proposed action described in Section 1.3 is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Identify the rangewide status of the species and critical habitat likely to be adversely affected by the proposed action.
- Describe the environmental baseline for the proposed action.
- Analyze the effects of the proposed actions.
- Describe any cumulative effects.
- Integrate and synthesize the above factors to assess the risk that the proposed action poses to species and critical habitat.
- Reach jeopardy and adverse modification conclusions.
- If necessary, define a reasonable and prudent alternative to the proposed action.

2.2 Rangewide Status of the Species and Critical Habitat

The summaries that follow describe the status of the ESA-listed species, and their designated critical habitats, that occur within the geographic area of this proposed action and are considered in this opinion. More detailed information on the status and trends of these listed resources, and their biology and ecology, can be found in the listing regulations and critical habitat designations published in the Federal Register (Table 5, above).

Climate change is likely to play an increasingly important role in determining the abundance of ESA-listed species, and the conservation value of designated critical habitats, in the Pacific Northwest. These changes will not be spatially homogeneous across the Pacific Northwest. Areas with elevations high enough to maintain temperatures well below freezing for most of the winter and early spring would be less affected. Low-lying areas that historically have received scant precipitation contribute little to total streamflow and are likely to be more affected.

During the last century, average regional air temperatures increased by 1.5°F, and increased up to 4°F in some areas (USGCRP 2009). Warming is likely to continue during the next century as average temperatures increase another 3 to 10°F (USGCRP 2009). Overall, about one-third of the current cold-water fish habitat in the Pacific Northwest is likely to exceed key water temperature thresholds by the end of this century (USGCRP 2009).

Precipitation trends during the next century are less certain than for temperature but more precipitation is likely to occur during October through March and less during summer months, and more of the winter precipitation is likely to fall as rain rather than snow (ISAB 2007, USGCRP 2009). Where snow occurs, a warmer climate will cause earlier runoff so stream flows in late spring, summer, and fall will be lower and water temperatures will be warmer (ISAB 2007, USGCRP 2009).

Higher winter stream flows increase the risk that winter floods in sensitive watersheds will damage spawning redds and wash away incubating eggs (USGCRP 2009). Earlier peak stream flows will also flush some young salmon and steelhead from rivers to estuaries before they are physically mature, increasing stress and the risk of predation (USGCRP 2009). Lower stream flows and warmer water temperatures during summer will degrade summer rearing conditions, in part by increasing the prevalence and virulence of fish diseases and parasites (USGCRP 2009). Other adverse effects are likely to include altered migration patterns, accelerated embryo development, premature emergence of fry, variation in quality and quantity of tributary rearing habitat, and increased competition and predation risk from warm-water, non-native species (ISAB 2007).

The earth's oceans are also warming, with considerable interannual and inter-decadal variability superimposed on the longer-term trend (Bindoff *et al*. 2007). Historically, warm periods in the coastal Pacific Ocean have coincided with relatively low abundances of salmon and steelhead, while cooler ocean periods have coincided with relatively high abundances (Scheuerell and Williams 2005, Zabel *et al*. 2006, USGCRP 2009). Ocean conditions adverse to salmon and steelhead may be more likely under a warming climate (Zabel *et al*. 2006).

2.2.1 Status of the Species

Climate change, as described in Section 2.2, is likely to adversely affect the size and distribution of populations of ESA-listed anadromous fish in the Pacific Northwest. The size and distribution of the populations considered in this opinion generally have declined over the past few decades due to natural phenomena and human activity, including the operation of hydropower systems, over-harvest, hatcheries, and habitat degradation. Enlarged populations of terns, seals, sea lions, and other aquatic predators in the Pacific Northwest have been identified as factors that may be limiting the productivity of some Pacific salmon and steelhead populations (Ford 2011).

The summaries that follow describe the status of the 13 ESA-listed salmon and steelhead species, the southern green sturgeon and eulachon that occur within the geographic area of this proposed action and are considered in this opinion. More detailed information on the status and trends of these listed resources, and their biology and ecology, can be found in the listing regulations and critical habitat designations published in the Federal Register (Table 5, above). The species considered in this opinion are: Snake River Basin (SRB) steelhead (*Oncorhynchus mykiss*), Upper Columbia River (UCR) steelhead, Lower Columbia River (LCR) steelhead, Middle Columbia River (MCR) steelhead, Upper Willamette River (UWR) steelhead, Snake River (SR) spring/summer run Chinook salmon (*O. tschawytscha*), SR fall-run Chinook salmon, UCR spring-run Chinook salmon, UWR spring-run Chinook salmon, , LCR Chinook salmon, Columbia River chum salmon (*O.keta*), SR sockeye salmon (*O.nerka*), LCR coho salmon (*O.kisutch*), southern green sturgeon (*Acipenser medirostris*), and eulachon (*Thaleichthys pacificus*).

The status of salmon and steelhead species and critical habitat sections below are organized under five recovery domains (Table 6) to better integrate recovery planning information that NMFS is developing on the conservation status of the species and critical habitats considered in this consultation. Recovery domains are the geographically-based areas that NMFS is using to prepare multi-species recovery plans. A recovery team has not yet been convened for eulachon, a species under the jurisdiction of NMFS' Northwest Region.

Table 6. Recovery planning domains identified by NMFS and their ESA-listed salmon and steelhead species considered in this opinion.

Recovery Domain	Species
Willamette-Lower Columbia (WLC)	LCR Chinook salmon UWR Chinook salmon CR chum salmon LCR coho salmon LCR steelhead UWR steelhead
Interior Columbia (IC)	UCR spring-run Chinook salmon SR spring/summer Chinook salmon SR fall-run Chinook salmon SR sockeye salmon UCR steelhead MCR steelhead SRB steelhead

For each recovery domain, a technical review team (TRT) appointed by NMFS has developed, or is developing, criteria necessary to identify independent populations within each species, recommended viability criteria for those species, and descriptions of factors that limit species survival. Viability criteria are prescriptions of the biological conditions for populations, biogeographic strata, and evolutionarily significant units (ESU) that, if met, would indicate that an ESU will have a negligible risk of extinction over a 100-year time frame.

Note that, for Pacific salmon, NMFS uses its 1991 ESU policy, that states that a population or group of populations will be considered a Distinct Population Segment if it is an Evolutionarily Significant Unit. An ESU represents a distinct population segment of Pacific salmon under the Endangered Species Act that: (1) is substantially reproductively isolated from conspecific populations, and (2) represents an important component of the evolutionary legacy of the species. The species *O. mykiss* is under the joint jurisdiction of NMFS and the Fish and Wildlife Service, so in making its listing January, 2006 determinations NMFS elected to use the 1996 joint FWS NMFS DPS policy for this species.

The definition of a population used by each TRT to analyze salmon and steelhead is set forth in the "viable salmonid population" document prepared by NMFS for use in conservation assessments of Pacific salmon and steelhead (McElhany *et al*. 2000). That document defines population viability in terms of four variables: abundance, population growth rate (productivity), population spatial structure, and genetic diversity.

Abundance is of obvious importance since, in general, small populations are at greater risk of extinction than large populations, primarily because many processes that affect population dynamics are likely to operate differently in small populations than in large populations (Shaffer 1987, McElhany *et al*. 2000).

Population growth rate, the productivity over the entire life cycle, and factors that affect population growth rate provide information about how well a population is performing in the various habitats it occupies during the life cycle. Examining population growth rate allows one to assess if populations are able to replace themselves. Populations that consistently fail to replace themselves are at greater risk of extinction than populations that are consistently at or above replacement levels.

Spatial structure refers to the distribution of individuals within a population at a certain life stage throughout the available habitats, recognizing the abiotic and biotic processes that give rise to that structure. McElhany *et al.* (2000) gave two main reasons why spatial structure is important to consider when evaluating population viability: (1) Overall extinction risk at longer time scales may be affected in ways not apparent from short-term observations of abundance and productivity, because of a time lag between changes in spatial structure and the resulting population-level effects, and (2) spatial population structure affects the ability of a population to respond to changing environmental conditions and therefore influence evolutionary processes. Maintaining spatial structure within a population, and its associated benefits to viability, requires appropriate habitat conditions and suitable corridors linking the habitat and the marine environment to be consistently available.

Diversity relates to the variability of phenotypic characteristics such as life histories, individual size, fecundity, run timing, and other attributes exhibited by individuals and populations, as well as the genetic diversity that may underlie this variation. There are many reasons diversity is important in a spatially and temporally varying environment. Three key reasons are: (1) Diversity allows a species to use a wide array of environments, (2) diversity protects a species against short-term spatial and temporal changes in the environment, and (3) genetic diversity provides the raw material for surviving long-term environmental change (McElhany *et al.* 2000).

Although the TRTs operated from the common set of biological principals described in McElhany *et al.* (2000), they worked semi-independently from each other and developed criteria suitable to the species and conditions found in their specific recovery domains. All of the criteria have qualitative as well as quantitative aspects. The diversity of salmonid species and populations makes it impossible to set narrow quantitative guidelines that will fit all populations in all situations. For this and other reasons, viability criteria vary among species, mainly in the number and type of metrics and the scales at which the metrics apply (*i.e.*, population, major population group (MPG), or ESU) (Busch *et al.* 2008).

Overall viability risk scores (high to low) are based on combined ratings for the abundance and productivity (A/P) and spatial structure and diversity (SS/D) metrics. Note that the WLC-TRT provided ratings for diversity and spatial structure risks. The IC-TRT provided spatial structure and diversity ratings combined as an integrated SS/D risk. WLC scores (Table 7) are based on population persistence established by McElhany *et al.* (2006). IC-TRT viability criteria were based on (McElhany *et al.* 2000 and 2006), as well as the results of previous applications in other TRTs and a review of specific information available relative to listed IC ESU populations (IC-TRT 2007). The A/P score considers the TRT's estimate of a populations' minimum threshold population, natural spawning abundance and the productivity of the population. Productivity over the entire life cycle and factors that affect population growth rate provide information on how well a population is "performing" in the habitats it occupies during the life cycle. Estimates of population growth rate that indicate a population is consistently failing to replace itself are an indicator of increased extinction risk. The four metrics (abundance, productivity, spatial structure, and diversity) are not independent of one another and their relationship to sustainability depends on a variety of interdependent ecological processes (Wainwright *et al.* 2008).

Table 7. Population persistence categories from McElhany *et al.* (2006). A low or negligible risk of extinction is considered "viable" (Ford 2011). Population persistence categories correspond to: 4 = very low (VL), 3 = low (L), 2 = moderate (M), 1 = high (H), and 0 = very high (VH) in Oregon populations, which corresponds to "extirpated or nearly so" (E) in Washington populations (Ford 2011).

Population Persistence Category	Probability of population persistence in 100 years	Probability of population extinction in 100 years	Description
0	0-40%	60-100%	Either extinct or "high" risk of extinction
1	40-75%	25-60%	Relatively "high" risk of extinction in 100 years
2	75-95%	5-25%	"Moderate" risk of extinction in 100 years
3	95-99%	1-5%	"Low" (negligible) risk of extinction in 100 years
4	>99%	<1%	"Very low" risk of extinction in 100 years

Integrated SS/D risk combines risk for likely, future environmental conditions, and diversity (McElhany *et al.* 2000, McElhany *et al.* 2007, Ford 2011). Diversity factors include:

- Life history traits: Distribution of major life history strategies within a population, variability of traits, mean value of traits, and loss of traits.
- Effective population size: One of the indirect measures of diversity is effective population size. A population at chronic low abundance or experiencing even a single episode of low abundance is at a higher extinction risk because of loss of genetic variability, inbreeding and the expression of inbreeding depression, or the effects of mutation accumulation.
- Impact of hatchery fish: Interbreeding of wild populations and hatchery origin fish are a significant risk factor to the diversity of wild populations if the proportion of hatchery fish in the spawning population is high and their genetic similarity to the wild population is low.
- Anthropogenic mortality: The susceptibility to mortality from harvest or habitat alterations will differ depending on size, age, run timing, disease resistance or other traits.
- Habitat diversity: Habitat characteristics have clear selective effects on populations, and changes in habitat characteristics are likely to eventually lead to genetic changes through selection for locally adapted traits. In assessing risk associated with altered habitat diversity, historical diversity is used as a reference point.

The boundaries of each population were defined using a combination of genetic information, geography, life-history traits, morphological traits, and population dynamics that indicate the extent of reproductive isolation among spawning groups. To date, the TRTs have divided the 13 species of salmon and steelhead considered in this opinion into a total of 189 populations. The overall viability of a species is a function of the viable salmonid population (VSP) attributes of its constituent populations. Until a viability analysis of a species is completed, the VSP guidelines recommend that all populations should be managed to retain the potential to achieve viable status to ensure a rapid start along the road to recovery, and that no significant parts of the species are lost before a full recovery plan is implemented (McElhany *et al.* 2000).

The size and distribution of the populations considered in this opinion generally have declined over the last few decades due to natural phenomena and human activity, including climate change (as described in Section 2.2), the operation of hydropower systems, over-harvest, effects of hatcheries, and habitat degradation. Enlarged populations of terns, seals, California sea lions, and other aquatic predators in the Pacific Northwest may be limiting the productivity of some Pacific salmon and steelhead populations (Ford 2011). Viability status is described below for each of the populations considered in this opinion. Information regarding the southern DPS eulachon (eulachon), with is presented with the Willamette and Lower Columbia (WLC) recovery domain.

Willamette-Lower Columbia Recovery Domain. Species in the Willamette-Lower Columbia (WLC) Recovery Domain include LCR Chinook salmon, UWR Chinook salmon, CR chum salmon, LCR coho salmon, LCR steelhead, UWR steelhead, southern green sturgeon, and eulachon. The WLC-TRT has identified 107 demographically independent populations of Pacific salmon and steelhead (Table 8). These populations were further aggregated into strata, groupings above the population level that are connected by some degree of migration, based on ecological subregions. All 107 populations use parts of the mainstem of the Columbia River and the Columbia River estuary for migration, rearing, and smoltification.

Table 8. Populations in the WLC recovery domain. Combined extinction risks for salmon and steelhead based on analysis of Oregon populations only.

Species	Populations
LCR Chinook salmon	32
UWR Chinook salmon	7
CR chum salmon	17
LCR coho salmon	24
LCR steelhead	26
UWR steelhead	4

LCR Chinook Salmon. This species includes all naturally-spawned populations of Chinook salmon in the Columbia River and its tributaries from its mouth at the Pacific Ocean upstream to a transitional point between Washington and Oregon east of the Hood River and the White Salmon River; the Willamette River to Willamette Falls, Oregon, exclusive of spring-run Chinook salmon in the Clackamas River; and progeny of seventeen artificial propagation programs. LCR Chinook populations exhibit three different life history types base on return timing and other features: fall-run (a.k.a. "tules"), late-fall-run (a.k.a. "brights"), and spring-run. The WLC-TRT identified 32 historical populations of LCR Chinook salmon; seven in the Coast Range, six in the Columbia Gorge, and 19 in the Cascade Range (Table 9).

Table 9. LCR Chinook salmon strata, ecological subregions, run timing, populations, and scores for the key elements (A/P, diversity, and spatial structure) used to determine current overall viability risk (Ford 2011). Risk ratings range from very low (VL), low (L), moderate (M), high (H), to very high (VH) in Oregon populations. VH corresponds to "extirpated or nearly so" (E) in Washington populations.

Stratum		Spawning Population (Watershed)	A/P	Diversity	Spatial Structure	Overall Viability Risk
Ecological Subregion	**Run Timing**					
Coast Range	Fall	Grays River (WA)	E	E	L	E
		Elochoman River (WA)	E	H	L	E
		Mill, Germany, and Abernathy creeks (WA)	E	H	L	E
		Young Bay (OR)	H to VH	H	L	VH
		Big Creek (OR)	H to VH	H	L to M	VH
		Clatskanie River (OR)	H	M to H	L	VH
		Scappoose River (OR)	H to VH	M to H	L to M	VH
Columbia Gorge	Spring	White Salmon River (WA)	E	E	E	E
		Hood River (OR)	VH	VH	L	VH
	Fall	Upper Gorge (OR)	E	H	H	VH
		Upper Gorge (WA)	H to VH	H	L to M	E
		White Salmon River (WA)	E	H	H	E
		Lower Gorge (OR)	H to VH	H	L to M	VH
		Lower Gorge (WA)	E	H	H	E
		Hood River (OR)	H to VH	H to VH	L	VH
Cascade Range	Spring	Upper Cowlitz River (WA)	E	M	H	E
		Cispus River (WA)	E	M	H	E
		Tilton River (WA)	E	E	E	E
		Toutle River (WA)	E	H	L	E
		Kalama River (WA)	E	H	L	E
		Sandy River (OR)	M to H	L to M	M	M
		Lewis (WA)	E	M	H	E
	Fall	Lower Cowlitz River (WA)	E	M	M	E
		Upper Cowlitz River (WA)	E	M	E	E
		Lewis River (WA)	E	L	M	E
		Salmon Creek (OR)	E	M	M	E
		Sandy River (OR)	H to VH	H	L	VH
		Toutle River (WA)	E	M	M	E
		Coweeman River (WA)	E	L	M	E
		Kalama River (WA)	E	M	L	E
		Clackamas River (OR)	H to VH	H	L	H
		Washougal River (WA)	E	M	M	E
	Late Fall	Lewis River (WA)	VL	L	L	VL
		Sandy River (OR)	L	L to M	L	L

A/P ratings for most LCR Chinook salmon populations are currently “high” risk to “extirpated or nearly so.” Spatial structure was generally rated “low” to “moderate” risk for most populations. Other than the Sandy River, Oregon LCR Chinook salmon populations were rated “high” or “very high” risk for diversity. In 2005, diversity risk for Clackamas River and Lower Gorge tributary fall Chinook salmon was rated “moderate”; now the risk is rated “high.” Most Washington LCR Chinook salmon populations are currently at “moderate” or “high” risk for diversity (Table 9).

Of the 32 historical populations in the ESU, 28 are extirpated or at “very high” risk. Based on the recovery plan analyses, all of the tule populations are “very high” risk except one that is considered at “high” risk. The modeling conducted in association with tule harvest management suggests that three of the populations (Coweeman, Lewis and Washougal) are at a somewhat lower risk. However, even these more optimistic evaluations suggest that the remaining 18 populations are at substantial risk because of very low natural origin spawner abundance (<100/population), high hatchery fraction, habitat degradation and harvest impacts. Overall, the new information does not indicate a change in the biological risk category since the last status review (Ford 2011).

Limiting factors and threats to LCR Chinook salmon include (LCFRB 2010, NOAA Fisheries 2011):

- Degraded estuarine and near-shore marine habitat resulting from cumulative impacts of land use and flow management by the Columbia River hydropower system Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas, stream substrate, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, and development.
- Reduced access to spawning and rearing habitat mainly as a result of tributary hydropower projects
- Hatchery-related effects
- Harvest-related effects on fall Chinook salmon
- An altered flow regime and Columbia River plume has altered the temperature regime and estuarine food web, and has reduced ocean productivity
- Reduced access to off-channel rearing habitat in the LCR
- Reduced productivity resulting from sediment and nutrient-related changes in the estuary
- Juvenile fish strandings that result from ship wakes
- Contaminants affecting fish health and reproduction

CR Chum Salmon. This species includes all naturally-spawned populations of chum salmon in the Columbia River and its tributaries in Washington and Oregon, and progeny of three artificial propagation programs. The WLC-TRT identified 17 historical populations of CR chum salmon and aggregated these into four strata (Myers *et al.* 2006; Table 10). Unlike other species in the WLC recovery domain, CR chum salmon spawning aggregations were identified in the mainstem Columbia River. These aggregations generally were included in the population associated with the nearest river basin. Three strata and eight historical populations of CR chum salmon occur within the action area (Table 10); of these, only the Lower Gorge population is characterized as “viable”(Ford 2011).

Table 10. CR chum salmon strata, ecological subregions, run timing, populations, and scores for the key elements (A/P, diversity, and spatial structure) used to determine current overall viability risk (Ford 2011). Risk ratings are very low (VL), low (L), moderate (M), high (H), and "extirpated or nearly so" (E).

Stratum		Spawning Population (Watershed)	A/P	Diversity	Spatial Structure	Overall Viability Risk
Ecological Subregion	Run Timing					
Coast Range	Fall	Young's Bay (OR)	*	*	*	*
		Grays River (WA)	VL	L	M	M
		Big Creek (OR)	*	*	*	*
		Elochoman River (WA)	E	E	L	E
		Clatskanie River (OR)	*	*	*	*
		Mill, Abernathy and Germany creeks (WA)	E	E	L	E
		Scappoose Creek (OR)	*	*	*	*
Columbia Gorge	Fall	Lower Gorge (OR)	*	*	*	*
		Lower Gorge (WA)	VL	VL	L	L
		Upper Gorge (OR)	*	*	*	*
		Upper Gorge (WA)	E	E	H	E
Cascade Range	Summer	Cowlitz River (WA)	E	E	H	E
	Fall	Cowlitz River (WA)	E	E	L	E
		Kalama River (WA)	E	E	L	E
		Salmon Creek (WA)	E	E	H	E
		Lewis River (WA)	E	E	L	E
		Clackamas River (OR)	*	*	*	*
		Washougal River (WA)	E	E	L	E
		Sandy River (OR)	*	*	*	*

* No viability risk was completed for Oregon chum salmon populations. Oregon rivers have occasional reports of a few chum salmon. Populations are functionally extinct, or the risk of extinction is very high.

The vast majority (14 out of 17) chum salmon populations remain "extirpated or nearly so". The Grays River and Lower Gorge populations showed a sharp increase in 2002, but have since declined back to relatively low abundance levels in the range of variation observed over the last several decades. Chinook and coho salmon populations in the Lower Columbia and Willamette similarly increased in the early 2000s, then declined to typical recent levels, suggesting the increase in chum salmon is related to ocean conditions. The Grays and Lower Gorge populations were rated "very low" risk for A/P, but all other populations were rated "extirpated or nearly so." Spatial structure was rated "low" for seven populations, one has moderate risk and three have a "high" risk. Diversity risk was "high" for all populations except Grays ("moderate") and Lower Gorge ("very low"). Recent data on the Washougal/mainstem Columbia population are not available, but they likely follow a pattern similar to the Grays and Lower Gorge populations. Overall, the new information considered does not indicate a change in the biological risk category since the last status review (Ford 2011).

Limiting factors and threats to CR chum salmon include (LCFRB 2010, NOAA Fisheries 2011):

- Degraded estuarine and nearshore marine habitat resulting from cumulative impacts of land use and flow management by the Columbia River hydropower system
- Degraded freshwater habitat, in particular of floodplain connectivity and function, channel structure and complexity, stream substrate, and riparian areas and large wood recruitment as a result of cumulative impacts of agriculture, forestry, and development
- Degraded stream flow as a result of hydropower and water supply operations
- Loss of access and loss of some habitat types as a result of passage barriers such as roads and railroads
- Reduced water quality
- Current or potential predation from hatchery-origin salmonids, including coho salmon
- An altered flow regime and Columbia River plume has altered the temperature regime and estuarine food web, and has reduced ocean productivity
- Reduced access to off-channel rearing habitat in the LCR
- Reduced productivity resulting from sediment and nutrient-related changes in the estuary
- Juvenile fish strandings that result from ship wakes
- Contaminants affecting fish health and reproduction

LCR Coho Salmon. This species includes all naturally-spawned populations of chum salmon in the Columbia River and its tributaries in Washington and Oregon, and progeny of three artificial propagation programs. The WLC-TRT identified 17 historical populations of CR chum salmon and aggregated these into four strata (Myers *et al.* 2006; Table 10). Unlike other species in the WLC recovery domain, CR chum salmon spawning aggregations were identified in the mainstem Columbia River. These aggregations generally were included in the population associated with the nearest river basin. Three strata and eight historical populations of CR chum salmon occur within the action area (Table 10); of these, only the Lower Gorge population is characterized as “viable”(Ford 2011).

Table 11. LCR coho salmon strata, ecological subregions, run timing, populations, and scores for the key elements (A/P, diversity, and spatial structure) used to determine current overall viability risk (Ford 2011). Risk ratings range from very low (VL), low (L), moderate (M), high (H), to very high (VH) in Oregon populations. VH corresponds to “extirpated or nearly so” (E) in Washington populations.

Stratum		Spawning Population (Watershed)	A/P	Diversity	Spatial Structure	Overall Viability Risk
Ecological Subregion	Run Type					
Coast Range	N*	Young’s Bay (OR)	VH	VH	L	VH
		Big Creek (OR)	VH	H	L to M	VH
		Clatskanie River (OR)	H to VH	M	L	H
		Scappoose River (OR)	M to H	M	L to M	M
		Grays River (WA)	E	E	L	E
		Elochoman Creek (WA)	E	E	L	E
		Mill, Germany, and Abernathy Creeks (WA)	E	H	L	E
Columbia Gorge	N	Lower Gorge Tributaries (OR)	VH	H	L to M	VH
		Lower Gorge Tributaries (WA)	E	E	M	E
	S**	Upper Gorge Tributaries (WA)	E	E	M	E
		Hood River (OR)	VH	H	L	H
Cascade Range	N	Lower Cowlitz River (WA)	E	M	M	E
		Coweeman River (WA)	E	M	L	E
		Salmon Creek (WA)	E	E	M	E
	N and S	Upper Cowlitz River (WA)	E	H	M	E
		Cispus River (WA)	E	H	M	E
		Tilton River (WA)	E	H	M	E
		South Fork Toutle River (WA)	E	M	L	E
		North Fork Toutle River (WA)	E	H	M	E
		Kalama River (WA)	E	M	L	E
		North Fork Lewis River (WA)	E	H	H	E
		East Fork Lewis River (WA)	E	M	L	E
		Washougal River (WA)	E	H	L	E
		Clackamas River (OR)	M	L to M	L	M
		Sandy River (OR)	H	L to M	M to H	H

*“Type N” are late-run fish that tend to undertake oceanic migrations to the north of the Columbia River, extending as far as northern British Columbia and southeast Alaska.
**“Type S” are early coho salmon that spawn in the upper reaches of larger rivers in the LCR and in most rivers inland of the Cascade Crest that tend to migrate to the south of the Columbia River.

Limiting factors and threats to LCR coho salmon include (LCFRB 2010, NOAA Fisheries 2011):

- Degraded estuarine and near-shore marine habitat resulting from cumulative impacts of land use and flow management by the Columbia River hydropower system.
- Fish passage barriers that limit access to spawning and rearing habitats.
- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas and large wood supply, stream substrate, stream flow, and

water quality have been degraded as a result of cumulative impacts of agriculture, forestry, and development.

- Hatchery-related effects.
- Harvest-related effects.
- An altered flow regime and Columbia River plume has altered the temperature regime and estuarine food web, and has reduced ocean productivity.
- Reduced access to off-channel rearing habitat in the LCR.
- Reduced productivity resulting from sediment and nutrient-related changes in the estuary.
- Juvenile fish strandings that result from ship wakes.
- Contaminants affecting fish health and reproduction.

LCR Steelhead. This species includes all naturally-spawned steelhead populations below natural and manmade impassable barriers in streams and tributaries to the Columbia River between and including the Cowlitz and Wind rivers, Washington; in the Willamette and Hood rivers, Oregon; and progeny of ten artificial propagation programs; but excluding all steelhead from the upper Willamette River basin above Willamette Falls, Oregon, and from the Little and Big White Salmon rivers, Washington.

Summer steelhead return to freshwater long before spawning. Winter steelhead, in contrast, return from the ocean much closer to maturity and spawn within a few weeks. Summer steelhead spawning areas in the Lower Columbia River are found above waterfalls and other features that create seasonal barriers to migration. Where no temporal barriers exist, the winter-run life history dominates Four strata and 23 historical populations of LCR steelhead occur within the action area (Table 12).

Table 12. LCR steelhead strata, ecological subregions, run timing, populations, and scores for the key elements (A/P, diversity, and spatial structure) used to determine current overall viability risk (Ford 2011). Risk ratings range from very low (VL), low (L), moderate (M), high (H), to very high (VH) in Oregon populations. VH corresponds to “extirpated or nearly so” (E) in Washington populations.

Stratum		Population (Watershed)	A/P	Diversity	Spatial Structure	Overall Viability Risk
Ecological Subregion	Run Timing					
Columbia Gorge	Summer	Wind River (WA)	VL	L	VL	L
		Hood River (OR)	H	M	L	VH
	Winter	Lower Gorge (OR) Lower Gorge (WA)	H H	L M	L VL	M to H H
		Upper Gorge (OR) Upper Gorge (WA)	M H	M to H M	L M	VH E
		Hood River (OR)	M	M	L	M
West Cascade Range	Summer	Kalama River (WA)	L	M	VL	M
		North Fork Lewis River (WA)	E	E	E	E
		East Fork Lewis River (WA)	E	M	VL	E
		Washougal River (WA)	M	M	VL	M
	Winter	Cispus River (WA)	E	M	M	E
		Tilton river (WA)	E	H	M	E
		Upper Cowlitz River (WA)	E	M	M	E
		Lower Cowlitz River (WA)	H	M	M	H
		North Fork Toutle River (WA)	E	L	L	E
		South Fork Toutle River (WA)	M	L	VL	M
		Coweeman River (WA)	H	VL	VL	H
		Kalama River (WA)	H	L	VL	H
		North Fork Lewis River (WA)	E	M	M	E
		East Fork Lewis River (WA)	M	M	VL	M
		Salmon Creek (WA)	E	M	VL	E
		Washougal River (WA)	H	M	VL	H
		Sandy River (OR)	H	M	M to H	VH
		Clackamas River (OR)	L	L to M	L	L to M

All of the populations increased in abundance during the early 2000s, generally peaking in 2004. Most populations have since declined back to levels within one standard deviation of the long term mean. Exceptions are the Washougal summer-run and North Fork Toutle winter-run, which are still higher than the long term average, and the Sandy, which is lower. In general, the populations do not show any sustained dramatic changes in abundance or fraction of hatchery origin spawners since the 2005 status review (Ford 2011).

Limiting factors and threats to LCR steelhead include (LCFRB 2010, NOAA Fisheries 2011):

- Degraded estuarine and nearshore marine habitat resulting from cumulative impacts of land use and flow management by the Columbia River hydropower system.

- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas and recruitment of large wood, stream substrate, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, and development.
- Reduced access to spawning and rearing habitat mainly as a result of tributary hydropower projects and lowland development.
- Avian and marine mammal predation in the lower mainstem Columbia River and estuary.
- Hatchery-related effects.
- An altered flow regime and Columbia River plume has altered the temperature regime and estuarine food web, and has reduced ocean productivity.
- Reduced access to off-channel rearing habitat in the LCR.
- Reduced productivity resulting from sediment and nutrient-related changes in the estuary.
- Juvenile fish strandings that result from ship wakes.
- Contaminants affecting fish health and reproduction.

UWR Chinook Salmon. This species includes all naturally spawned populations of spring-run Chinook salmon in the Clackamas River; in the Willamette River and its tributaries above Willamette Falls, Oregon; and progeny of seven artificial propagation programs. All seven historical populations of UWR Chinook salmon identified by the WLC-TRT occur within the action area and are contained within a single ecological subregion, the western Cascade Range (Table13); only the McKenzie population is characterized as a low extinction risk (Ford 2011).

Table 13. Scores for the key elements (A/P, diversity, and spatial structure) used to determine current overall viability risk for UWR Chinook salmon (ODFW and NMFS 2011). All populations are in the Western Cascade Range ecological subregion. Risk ratings range from very low (VL), low (L), moderate (M), high (H), to very high (VH).

Population (Watershed)	A/P	Diversity	Spatial Structure	Overall Extinction Risk
Clackamas River	M	M	L	M
Molalla River	VH	H	H	VH
North Santiam River	VH	H	H	VH
South Santiam River	VH	M	M	VH
Calapooia River	VH	H	VH	VH
McKenzie River	VL	M	M	L
Middle Fork Willamette River	VH	H	H	VH

Consideration of data collected since the last status review in 2005 has confirmed the high fraction of hatchery origin fish in all of the populations of this species (even the Clackamas and McKenzie rivers have hatchery fractions above WLC-TRT viability thresholds). All of the UWR Chinook salmon populations have “moderate” or “high” risk ratings for diversity. The Clackamas and McKenzie river populations currently have the best risk ratings for A/P, spatial structure, and diversity. Clackamas River Chinook salmon have a “low” risk rating for spatial structure.

The new data have also highlighted the substantial risks associated with pre-spawning mortality. Although recovery plans are targeting key limiting factors for future actions, there have been no significant on-the-ground-actions since the last status review to resolve the lack of access to historical habitat above dams nor have there been substantial actions removing hatchery fish from the spawning grounds. Overall, the new information does not indicate a change in the biological risk category since the last status review (Ford 2011).

Limiting factors and threats to UWR Chinook salmon include (ODFW and NMFS 2011, NOAA Fisheries 2011):

- Significantly reduced access to spawning and rearing habitat because of tributary dams
- Degraded freshwater habitat, especially floodplain connectivity and function, channel structure and complexity, and riparian areas and large wood recruitment as a result of cumulative impacts of agriculture, forestry, and development
- Degraded water quality and altered temperature as a result of both tributary dams and the cumulative impacts of agriculture, forestry, and urban development
- Hatchery-related effects
- Anthropogenic introductions of non-native species and out-of-ESU races of salmon or steelhead have increased predation on, and competition with, native UWR Chinook salmon
- Ocean harvest rates of approximately 30%

UWR Steelhead. This species includes all naturally-spawned steelhead populations below natural and manmade impassable barriers in the Willamette River, Oregon, and its tributaries upstream from Willamette Falls to the Calapooia River. The WLC-TRT identified five historical populations of UWR steelhead, all with winter-run timing (Myers *et al.* 2006). One stratum and four extant populations of UWR steelhead occur within the action area (Table 14). Historical observations, hatchery records, and genetics suggest that the presence of UWR steelhead in many tributaries on the west side of the upper basin is the result of recent introductions. Nevertheless, the WLC-TRT recognized that although these UWR steelhead do not represent a historical population, the west side tributaries may provide juvenile rearing habitat or may be temporarily (for one or more generations) colonized during periods of high abundance. Hatchery summer-run steelhead that are released in the subbasins are from an out-of-basin stock, not part of the DPS. Additionally, stocked summer steelhead that have become established in the McKenzie River were not considered in the identification of historical populations (ODFW *et al.* 2011).

Table 14. Scores for the key elements (A/P, diversity, and spatial structure) used to determine current overall viability risk for UWR steelhead (ODFW and NMFS 2011). All populations are in the Western Cascade Range ecological subregion. Risk ratings range from very low (VL), low (L), moderate (M), high (H), to very high (VH).

Population (Watershed)	A/P	Diversity	Spatial Structure	Overall Extinction Risk
Molalla River	VL	M	M	L
North Santiam River	VL	M	H	L
South Santiam River	VL	M	M	L
Calapooia River	M	M	VH	M

Since the last status review in 2005, UWR steelhead initially increased in abundance but subsequently declines and current abundance is at the levels observed in the mid-1990s when the DPS was first listed. The DPS appears to be at lower risk than the UWR Chinook salmon ESU, but continues to demonstrate the overall low abundance pattern that was of concern during the last status review. The elimination of winter-run hatchery release in the basin reduces hatchery threats, but non-native summer steelhead hatchery releases are still a concern for species diversity. Overall, the new information considered does not indicate a change in the biological risk category since the last status review (Ford 2011).

Limiting factors and threats to UWR steelhead (ODFW and NMFS 2011, NOAA Fisheries 2011) include:

- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas and large wood recruitment, and stream flow have been degraded as a result of cumulative impacts of agriculture, forestry, and development
- Degraded water quality and altered temperature as a result of both tributary dams and the cumulative impacts of agriculture, forestry, and urban development
- Reduced access to spawning and rearing habitats mainly as a result of artificial barriers in spawning tributaries
- Hatchery-related effects: impacts from the non-native summer steelhead hatchery program
- Anthropogenic introductions of non-native species and out-of-ESU races of salmon or steelhead have increased predation and competition on native UWR steelhead.

Eulachon. The southern distinct population segment of eulachon occurs in four salmon recovery domains: Puget Sound, the Willamette and Lower Columbia, Oregon Coast, and Southern Oregon/Northern California Coasts. The ESA-listed population of eulachon includes all naturally-spawned populations that occur in rivers south of the Nass River in British Columbia to the Mad River in California. Core populations for this species include the Fraser River, Columbia River and (historically) the Klamath River. Eulachon leave saltwater to spawn in their natal streams late winter through early summer, and typically spawn at night in the lower reaches of larger rivers fed by snowmelt. After hatching, larvae are carried downstream and widely dispersed by estuarine and ocean currents. Eulachon movements in the ocean are poorly known although the amount of eulachon bycatch in the pink shrimp fishery seems to indicate that the distribution of these organisms overlap in the ocean.

In the early 1990s, there was an abrupt decline in the abundance of eulachon returning to the Columbia River with no evidence of returning to their former population levels since then (Drake *et al.* 2008). Persistent low returns and landings of eulachon in the Columbia River from 1993 to 2000 prompted the states of Oregon and Washington to adopt a Joint State Eulachon Management Plan in 2001 that provides for restricted harvest management when parental run strength, juvenile production, and ocean productivity forecast a poor return (WDFW and ODFW 2001). Despite a brief period of improved returns in 2001-2003, the returns and associated commercial landings have again declined to the very low levels observed in the mid-1990s (JCRMS 2010), and since 2005, the fishery has operated at the most conservative level allowed in the management plan (JCRMS 2010). Large commercial and recreational fisheries have occurred in the Sandy River in the past. The most recent commercial harvest in the Sandy River was in 2003. No commercial harvest has been recorded for the Grays River from 1990 to the present, but larval sampling has confirmed successful spawning in recent years (USDC 2011).

The primary factors responsible for the decline of the southern DPS of eulachon are changes in ocean conditions due to climate change (Gustafson *et al.* 2010, Gustafson *et al*. 2011), particularly in the southern portion of its range where ocean warming trends may be the most pronounced and may alter prey, spawning, and rearing success. Additional factors include climate-induced change to freshwater habitats, dams and water diversions (particularly in the Columbia and Klamath Rivers where hydropower generation and flood control are major activities), and bycatch of eulachon in commercial fisheries (NOAA Fisheries 2011).

Other limiting factors include (Gustafson *et al.* 2010, Gustafson *et al*. 2011):

- Adverse effects related to dams and water diversions
- Artificial fish passage barriers
- Increased water temperatures, insufficient streamflow
- Altered sediment balances
- Water pollution
- Over-harvest
- Predation

***Southern Green Sturgeon*.**

Spatial Structure and Diversity. Two DPSs have been defined for green sturgeon (*Acipenser medirostris*), a northern DPS (spawning populations in the Klamath and Rogue rivers) and a southern DPS (spawners in the Sacramento River). Southern green sturgeon includes all naturally-spawned populations of green sturgeon that occur south of the Eel River in Humboldt County, California. When not spawning, this anadromous species is broadly distributed in nearshore marine areas from Mexico to the Bering Sea. Although it is commonly observed in bays, estuaries, and sometimes the deep riverine mainstem in lower elevation reaches of non-natal rivers along the west coast of North America, the distribution and timing of estuarine use are poorly understood. Recovery scenarios are currently being developed for this species.

Limiting factors. The principal factor for the decline of southern green sturgeon is the reduction of its spawning area to a single known population limited to a small portion of the Sacramento River. It is currently at risk of extinction primarily because of human-induced ‘‘takes’’ involving elimination of freshwater spawning habitat, degradation of freshwater and estuarine habitat quality, water diversions, fishing, and other causes (USDC 2010). Adequate water flow and temperature are issues of concern. Water diversions pose an unknown but potentially serious threat within the Sacramento and Feather Rivers and the Sacramento River Delta. Poaching also poses an unknown but potentially serious threat because of high demand for sturgeon caviar. The effects of contaminants and nonnative species are also unknown but potentially serious threats. As mentioned above, retention of green sturgeon in both recreational and commercial fisheries is now prohibited within the western states, but the effect of capture/release in these fisheries is unknown. There is evidence of fish being retained illegally, although the magnitude of this activity likely is small (NOAA Fisheries 2011)

Interior Columbia Recovery Domain. Species in the Interior Columbia (IC) recovery domain include UCR spring-run Chinook salmon, SR spring/summer-run Chinook salmon, SR fall-run Chinook salmon, SR sockeye salmon, UCR steelhead, MCR steelhead, and SRB steelhead. The IC-TRT identified 82 populations of those species based on genetic, geographic (hydrographic), and habitat characteristics (Table 15). In some cases, the IC-TRT further aggregated populations into “major groupings” based on dispersal distance and rate, and drainage structure, primarily the location and distribution of large tributaries (IC-TRT 2003). All 82 populations identified use the lower mainstem of the Snake River, the mainstem of the Columbia River, and the Columbia River estuary, or part thereof, for migration, rearing, and smoltification.

Table 15. Populations of ESA-listed salmon and steelhead in the IC recovery domain.

Species	Populations
UCR spring-run Chinook salmon	3
SR spring/summer-run Chinook salmon	28
SR fall-run Chinook salmon	1
SR sockeye salmon	1
UCR steelhead	4
MCR steelhead	17
SRB steelhead	24

The IC-TRT also recommended viability criteria that follow the VSP framework (McElhany *et al.* 2006) and described biological or physical performance conditions that, when met, indicate a population or species has a 5% or less risk of extinction over a 100-year period (IC-TRT 2007; see also NRC 1995).

UCR Spring-run Chinook Salmon. This species includes all naturally-spawned populations of Chinook salmon in all river reaches accessible to Chinook salmon in Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam (excluding the Okanogan River), the Columbia River upstream to Chief Joseph Dam, and progeny of six artificial propagation programs. The IC-TRT identified four independent populations of UCR spring-run Chinook salmon in the upriver tributaries of Wenatchee, Entiat, Methow, and Okanogan (extirpated), but no major groups due to the relatively small geographic area affected (IC-TRT 2003, Ford 2011) (Table 16).

Table 16. Scores for the key elements (A/P, diversity, and SS/D) used to determine current overall viability risk for spring-run UCR Chinook salmon (Ford 2011). Risk ratings range from very low (VL), low (L), moderate (M), high (H), to very high (VH) and extirpated (E).

Population	A/P	Diversity	Integrated SS/D	Overall Viability Risk
Wenatchee River	H	H	H	H
Entiat River	H	H	H	H
Methow River	H	H	H	H
Okanogan River				E

The UCR spring-run Chinook salmon is not currently meeting the viability criteria (adapted from the IC-TRT) in the Upper Columbia Recovery Plan. A/P remains at "high" risk for each of the three extant populations in this MPG/ESU (Table 16). The 10 year geometric mean abundance of adult natural origin spawners has increased for each population relative to the levels for the 1981 2003 series, but the estimates remain below the corresponding IC-TRT thresholds. Estimated productivity (spawner to spawner return rate at low to moderate escapements) was on average lower over the years 1987 2009 than for the previous period. The combinations of current abundance and productivity for each population result in a "high" risk rating. The composite SS/D risks for all three of the extant populations in this MPG are at "high" risk. The spatial processes component of the SS/D risk is "low" for the Wenatchee River and Methow River populations and "moderate" for the Entiat River (loss of production in lower section increases effective distance to other populations). All three of the extant populations in this MPG are at "high" risk for diversity, driven primarily by chronically high proportions of hatchery origin spawners in natural spawning areas and lack of genetic diversity among the natural origin spawners (Ford 2011).

Increases in natural origin abundance relative to the extremely low spawning levels observed in the mid-1990s are encouraging; however, average productivity levels remain extremely low. Overall, the viability of Upper Columbia Spring Chinook salmon ESU has likely improved somewhat since the last status review, but the ESU is still clearly at "moderate-to-high" risk of extinction (Ford 2011).

Limiting factors and threats to the UCR spring-run Chinook salmon ESU include (UCSRB 2007, NOAA Fisheries 2011):

- Mainstem Columbia River hydropower–related adverse effects: upstream and downstream fish passage, ecosystem structure and function, flows, and water quality
- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas and large woody debris recruitment, stream flow, and water

quality have been degraded as a result of cumulative impacts of agriculture, forestry, and development

- Degraded estuarine and nearshore marine habitat
- Hatchery related effects: including past introductions and persistence of non-native (exotic) fish species continues to affect habitat conditions for listed species
- Harvest in Columbia River fisheries

SR Spring/summer-run Chinook Salmon. This species includes all naturally-spawned populations of spring/summer-run Chinook salmon in the mainstem Snake River and the Tucannon River, Grande Ronde River, Imnaha River, and Salmon River subbasins; and progeny of fifteen artificial propagation programs. The IC-TRT identified 28 extant and 4 extirpated populations of SR spring/summer-run Chinook salmon, and aggregated these into major population groups (IC-TRT 2003, Ford 2011). Each of these populations faces a "high" risk of extinction (Ford 2011) (Table 17).

Table 17. SR spring/summer-run Chinook salmon ecological subregions, populations, and scores for the key elements (A/P, diversity, and SS/D) used to determine current overall viability risk for SR spring/summer-run Chinook salmon (Ford 2011). Risk ratings range from very low (VL), low (L), moderate (M), high (H), to very high (VH) and extirpated (E).

Ecological Subregions	Spawning Populations (Watershed)	A/P	Diversity	Integrated SS/D	Overall Viability Risk
Lower Snake River	Tucannon River	H	M	M	H
	Asotin River				E
Grande Ronde and Imnaha rivers	Wenaha River	H	M	M	H
	Lostine/Wallowa River	H	M	M	H
	Minam River	H	M	M	H
	Catherine Creek	H	M	M	H
	Upper Grande Ronde R.	H	M	H	H
	Imnaha River	H	M	M	H
	Big Sheep Creek	*	*	*	E
	Lookingglass Creek	*	*	*	E
South Fork Salmon River	Little Salmon River	*	*	*	H
	South Fork mainstem	H	M	M	H
	Secesh River	H	L	L	H
	EF/Johnson Creek	H	L	L	H
Middle Fork Salmon River	Chamberlin Creek	H	L	L	H
	Big Creek	H	M	M	H
	Lower MF Salmon	H	M	M	H
	Camas Creek	H	M	M	H
	Loon Creek	H	M	M	H
	Upper MF Salmon	H	M	M	H
	Pistol Creek	*	*	*	E
	Sulphur Creek	H	M	M	H
	Bear Valley Creek	H	L	L	H
	Marsh Creek	H	L	L	H
Upper Mainstem Salmon	N. Fork Salmon River	H	L	L	H
	Lemhi River	H	H	H	H
	Pahsimeroi River	H	H	H	H
	Upper Salmon-lower mainstem	H	L	L	H
	East Fork Salmon River	H	H	H	H
	Yankee Fork	H	H	H	H
	Valley Creek	H	M	M	H
	Upper Salmon main	H	M	M	H
	Panther Creek	*	*	*	E

* Insufficient data.

Population level status ratings remain at high risk across all MPGs within the ESU, although recent natural spawning abundance estimates have increased, all populations remain below minimum natural origin abundance thresholds (Table 17). Spawning escapements in the most recent years in each series are generally well below the peak returns but above the extreme low levels in the mid 1990s. Relatively low natural production rates and spawning levels below minimum abundance thresholds remain a major concern across the ESU.

The ability of SR spring/summer-run Chinook salmon populations to be self-sustaining through normal periods of relatively low ocean survival remains uncertain. Factors cited by Good *et al.* (2005) remain as concerns or key uncertainties for several populations. Overall, the new information considered does not indicate a change in the biological risk category since the last status review (Ford 2011).

Limiting factors and threats to the SR spring/summer-run Chinook salmon ESU include (NOAA Fisheries 2011):

- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas and large wood supply, stream substrate, elevated water temperature, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, and development
- Mainstem Columbia River and Snake River hydropower impacts
- Harvest-related effects
- Predation

SR Fall-run Chinook Salmon. This species includes all naturally-spawned populations of fall-run Chinook salmon in the mainstem Snake River below Hells Canyon Dam, and in the Tucannon River, Grande Ronde River, Imnaha River, Salmon River, and Clearwater River, and progeny of four artificial propagation programs. The IC-TRT identified three populations of this species, although only the lower mainstem population exists at present, and it spawns in the lower main stem of the Clearwater, Imnaha, Grande Ronde, Salmon and Tucannon rivers. The extant population of Snake River fall-run Chinook salmon is the only remaining population from an historical ESU that also included large mainstem populations upstream of the current location of the Hells Canyon Dam complex (IC-TRT 2003, Ford 2011).

The recent increases in natural origin abundance are encouraging. However, hatchery origin spawner proportions have increased dramatically in recent years – on average, 78% of the estimated adult spawners have been hatchery origin over the most recent brood cycle. The apparent leveling off of natural returns in spite of the increases in total brood year spawners may indicate that density dependent habitat effects are influencing production or that high hatchery proportions may be influencing natural production rates. The A/P risk rating for the population is "moderate." The population is at moderate risk for diversity and spatial structure. Overall, the new information considered does not indicate a change in the biological risk category since the last status review (Ford 2011). Given the combination of current A/P and SS/D ratings summarized above, the overall viability rating for Lower SR fall Chinook salmon would be rated as "maintained." "Maintained" population status is for populations that do not meet the criteria for a viable population but do support ecological functions and preserve options for ESU/DPS recovery.

Limiting factors and threats to SR fall-run Chinook salmon include (NOAA Fisheries 2011):

- Degraded freshwater habitat: Floodplain connectivity and function, and channel structure and complexity have been degraded as a result of cumulative impacts of agriculture, forestry, and development
- Harvest-related effects
- Lost access to historic habitat above Hells Canyon and other Snake River dams
- Mainstem Columbia River and Snake River hydropower impacts
- Hatchery-related effects
- Degraded estuarine and nearshore habitat

SR Sockeye Salmon. This species includes all anadromous and residual sockeye salmon from the Snake River basin, Idaho, and artificially-propagated sockeye salmon from the Redfish Lake captive propagation program. The IC-TRT identified historical sockeye salmon production in at least five Stanley Basin and Sawtooth Valley lakes and in lake systems associated with Snake River tributaries currently cut off to anadromous access (*e.g.*, Wallowa and Payette Lakes), although current returns of SR sockeye salmon are extremely low and limited to Redfish Lake (IC-TRT 2007).

This species is still at extremely high risk across all four basic risk measures (abundance, productivity, spatial structure and diversity. Although the captive brood program has been successful in providing substantial numbers of hatchery produced *O. nerka* for use in supplementation efforts, substantial increases in survival rates across life history stages must occur in order to re-establish sustainable natural production (Hebdon *et al.* 2004, Keefer *et al.* 2008). Overall, although the risk status of the SR sockeye salmon ESU appears to be on an improving trend, the new information considered does not indicate a change in the biological risk category since the last status review (Ford 2011).

The key factor limiting recovery of SR sockeye salmon ESU is survival outside of the Stanley Basin. Portions of the migration corridor in the Salmon River are impeded by water quality and temperature (Idaho Department of Environmental Quality 2011). Increased temperatures likely reduce the survival of adult sockeye returning to the Stanley Basin. The natural hydrological regime in the upper mainstem Salmon River Basin has been altered by water withdrawals. In most years, sockeye adult returns to Lower Granite suffer catastrophic losses (*e.g.*, > 50% mortality in one year; Reed *et al.* 2003) before reaching the Stanley Basin, although the factors causing these losses have not been identified. In the Columbia and lower Snake River migration corridor, predation rates on juvenile sockeye salmon are unknown, but terns and cormorants consume 12% of all salmon smolts reaching the estuary, and piscivorous fish consume an estimated 8% of migrating juvenile salmon (NOAA Fisheries 2011).

MCR Steelhead. This species includes all naturally-spawned steelhead populations below natural and artificial impassable barriers in streams from above the Wind River, Washington, and the Hood River, Oregon (exclusive), upstream to, and including, the Yakima River, Washington, excluding steelhead from the Snake River basin; and progeny of seven artificial propagation programs. The IC-TRT identified 17 extant populations in this DPS (IC-TRT 2003). The populations fall into four major population groups: the Yakima River Basin (four extant populations), the Umatilla/Walla Walla drainages (three extant and one extirpated populations); the John Day River drainage (five extant populations) and the Eastern Cascades group (five extant and two extirpated populations) (Table 18) (NMFS 2009a, Ford 2011).

Table 18. Ecological subregions, populations, and scores for the key elements (A/P, diversity, and SS/D) used to determine current overall viability risk for MCR steelhead (NMFS 2009, Ford 2011). Risk ratings range from very low (VL), low (L), moderate (M), high (H), to very high (VH) and extirpated (E). Maintained (MT) population status indicates that the population does not meet the criteria for a viable population but does support ecological functions and preserve options for recovery of the DPS.

Ecological Subregions	Population (Watershed)	A/P	Diversity	Integrated SS/D	Overall Viability Risk
Cascade Eastern Slope Tributaries	Fifteenmile Creek	L	L	L	Viable
	Klickitat River	M	M	M	MT?
	Eastside Deschutes River	L	M	M	Viable
	Westside Deschutes River	H	M	M	H*
	Rock Creek	H	M	M	H?
	White Salmon				E*
	Crooked River				E*
John Day River	Upper Mainstem	M	M	M	MT
	North Fork	VL	L	L	Highly Viable
	Middle Fork	M	M	M	MT
	South Fork	M	M	M	MT
	Lower Mainstem	M	M	M	MT
Walla Walla and Umatilla rivers	Umatilla River	M	M	M	MT
	Touchet River	M	M	M	H
	Walla Walla River	M	M	M	MT
Yakima River	Satus Creek	M	M	M	Viable (MT)
	Toppenish Creek	M	M	M	Viable (MT)
	Naches River	H	M	M	H
	Upper Yakima	H	H	H	H

* Re-introduction efforts underway (NMFS 2009).

There have been improvements in the viability ratings for some of the component populations, but the MCR steelhead DPS is not currently meeting the viability criteria (adopted from the IC-TRT) in the MCR steelhead recovery plan (NMFS 2009a). In addition, several of the factors cited by Good *et al.* (2005) remain as concerns or key uncertainties. Natural origin spawning estimates of populations have been highly variable with respect to meeting minimum abundance thresholds. Straying frequencies into at least the Lower John Day River population are high. Returns to the Yakima River basin and to the Umatilla and Walla Walla Rivers have been higher over the most recent brood cycle, while natural origin returns to the John Day River have decreased. Out-of-basin hatchery stray proportions, although reduced, remain very high in the

Deschutes River basin. Overall, the new information considered does not indicate a change in the biological risk category since the last status review (Ford 2011).

The limiting factors and threats to MCR steelhead include (NMFS 2009a, NOAA Fisheries 2011):

- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas, fish passage, stream substrate, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, tributary hydro system activities, and development
- Mainstem Columbia River hydropower–related impacts
- Degraded estuarine and nearshore marine habitat
- Hatchery-related effects
- Harvest-related effects
- Effects of predation, competition, and disease

UCR Steelhead. This species includes all naturally-spawned steelhead populations below natural and manmade impassable barriers in streams in the Columbia River Basin upstream from the Yakima River, Washington, to the U.S.-Canada border, and progeny of six artificial propagation programs. Four independent populations of UCR steelhead were identified by the IC-TRT in the same upriver tributaries as for UC spring-run Chinook salmon (*i.e.*, Wenatchee, Entiat, Methow, and Okanogan; Table 19) and, similarly, no major population groupings were identified due to the relatively small geographic area involved (IC-TRT 2003, Ford 2011). All extant populations are considered to be at high risk of extinction (Table 19; Ford 2011).

Table 19. Summary of the key elements (A/P, diversity, and SS/D) and scores used to determine current overall viability risk for UCR steelhead populations (Ford 2011). Risk ratings range from very low (VL), low (L), moderate (M), high (H), to very high (VH).

Population (Watershed)	A/P	Diversity	Integrated SS/D	Overall Viability Risk
Wenatchee River	H	H	H	H
Entiat River	H	H	H	H
Methow River	H	H	H	H
Okanogan River	H	H	H	H

UCR steelhead populations have increased in natural origin abundance in recent years, but productivity levels remain low. The proportions of hatchery origin returns in natural spawning areas remain extremely high across the DPS, especially in the Methow and Okanogan River populations. The modest improvements in natural returns in recent years are probably primarily the result of several years of relatively good natural survival in the ocean and tributary habitats. With the exception of the Okanogan population, the Upper Columbia populations rated as “low” risk for spatial structure. The “high” risk ratings for SS/D are largely driven by chronic high levels of hatchery spawners within natural spawning areas and lack of genetic diversity among the populations. Overall, the new information considered does not indicate a change in the biological risk category since the last status review (Ford 2011).

The limiting factors and threats to the UCR steelhead DPS include (UCSRB 2007, NOAA Fisheries 2011):

- Mainstem Columbia River hydropower–related adverse effects.
- Impaired tributary fish passage.
- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas and large woody debris recruitment, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, and development.
- Effects of predation, competition, and disease mortality: Fish management, including past introductions and persistence of non-native (exotic) fish species continues to affect habitat conditions for listed species.
- Hatchery-related effects.
- Harvest-related effects.

SRB Steelhead. This species includes all naturally-spawned steelhead populations below natural and manmade impassable barriers in streams in the Snake River basin of southeast Washington, northeast Oregon, and Idaho, and progeny of six artificial propagation programs. The IC-TRT identified 25 historical populations in five major groups (Table 20) (Ford 2011, IC-TRT 2011,).

Table 20. Ecological subregions, populations, and scores for the key elements (A/P, diversity, and SS/D) used to determine current overall viability risk for SRB steelhead (Ford 2011, NMFS 2011). Risk ratings range from very low (VL), low (L), moderate (M), high (H), to very high (VH). Maintained (MT) population status indicates that the population does not meet the criteria for a viable population but does support ecological functions and preserve options for recovery of the DPS.

Ecological subregions	Spawning Populations (Watershed)	A/P	Diversity	Integrated SS/D	Overall Viability Risk*
Lower Snake River	Tucannon River	**	M	M	H
	Asotin Creek	**	M	M	MT
Grande Ronde River	Lower Grande Ronde	**	M	M	Not rated
	Joseph Creek	VL	L	L	Highly viable
	Upper Grande Ronde	M	M	M	MT
	Wallowa River	**	L	L	H
Clearwater River	Lower Clearwater	M	L	L	MT
	South Fork Clearwater	H	M	M	H
	Lolo Creek	H	M	M	H
	Selway River	H	L	L	H
	Lochsa River	H	L	L	H
Salmon River	Little Salmon River	**	M	M	MT
	South Fork Salmon	**	L	L	H
	Secesh River	**	L	L	H
	Chamberlain Creek	**	L	L	H
	Lower MF Salmon	**	L	L	H
	Upper MF Salmon	**	L	L	H
	Panther Creek	**	M	H	H
	North Fork Salmon	**	M	M	MT
	Lemhi River	**	M	M	MT
	Pahsimeroi River	**	M	M	MT
	East Fork Salmon	**	M	M	MT
	Upper Main Salmon	**	M	M	MT
Imnaha	Imnaha River	M		M	MT

* Uncertainty due to a lack of population-specific data.

** Insufficient data.

The level of natural production in the two populations with full data series and the Asotin Creek index reaches is encouraging, but the status of most populations in this DPS remains highly uncertain. Population-level natural origin abundance and productivity inferred from aggregate data and juvenile indices indicate that many populations are likely below the minimum combinations defined by the IC-TRT viability criteria. The relative proportion of hatchery fish in natural spawning areas near major hatchery release sites is highly uncertain. There is little evidence for substantial change in ESU viability relative to the previous BRT and IC-TRT reviews. Overall, therefore, the new information considered does not indicate a change in the biological risk category since the last status review (Ford 2011).

Limiting factors and threats to the SRB steelhead DPS include (IC-TRT 2006, NOAA Fisheries 2011):

- Mainstem Columbia River hydropower–related adverse effects
- Impaired tributary fish passage
- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas and large woody debris recruitment, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, and development
- Impaired water quality and increased water temperature
- Related harvest effects, particularly for B-run steelhead
- Predation
- Genetic diversity effects from out-of-population hatchery releases

Threats from natural or man-made factors have worsened in the past 5 years, primarily due to four factors: small population dynamics, climate change, multi-year drought, and poor ocean survival conditions (NOAA Fisheries 2011).

2.2.2 Status of Critical Habitat

The action area for this consultation has been designated as critical habitat for all salmon and steelhead species considered in this consultation except LCR coho salmon. The area has also been designated as critical habitat for eulachon and southern green sturgeon.

The status of critical habitat was based primarily on a watershed-level analysis of conservation value that focused on the presence of listed ESA-listed species and physical features (*i.e.*, the primary constituent elements (PCEs) that are essential to their conservation. The analysis for the 2005 designations of salmon and steelhead species was completed by Critical Habitat Analytical Review Teams (CHARTs) that focused on large geographical areas corresponding approximately to recovery domains (NOAA Fisheries 2005). The CHARTs completed assessed factors of PCEs for species of ESA-listed salmon and steelhead in the Willamette-Lower Columbia, and Interior Columbia recovery domains. Each CHART consisted of Federal biologists and habitat specialists from NMFS, the Fish and Wildlife Service, the Forest Service, and the Bureau of Land Management, with demonstrated expertise regarding salmon and steelhead habitat and related protective efforts within that domain. NMFS has designated critical habitat for all salmon species considered in this opinion, except LCR coho salmon for which critical habitat has not been proposed or designated.

Each watershed was ranked using a conservation value attributed to the quantity of stream habitat with PCEs, the present condition of those PCEs, the likelihood of achieving PCE potential (either naturally or through active restoration), support for rare or important genetic or life history characteristics, support for abundant populations, and support for spawning and rearing populations. In some cases, our understanding of these interim conservation values has been further refined by the work of TRTs and other recovery planning efforts that have better explained the habitat attributes, ecological interactions, and population characteristics important to each species.

Climate change, as described in Section 2.2, is likely to reduce the conservation value of designated critical habitats in the Pacific Northwest. Other influences on the conservation value of critical habitats in the various recovery domains are discussed below.

Eulachon Critical Habitat. Critical habitat for eulachon includes portions of 16 rivers and streams in California, Oregon, and Washington (USDC 2011). All of these areas are designated as migration and spawning habitat for this species. In Oregon, 24.2 miles of the lower Umpqua River, 12.4 miles of the lower Sandy River, and 0.2 miles of Tenmile Creek have been designated. The mainstem Columbia River from the mouth to the base of Bonneville Dam, a distance of 143.2 miles is also designated as critical habitat.

Table 21 delineates the designated physical and biological features for eulachon. The physical or biological features of freshwater spawning and incubation sites, include water flow, quality and temperature conditions and suitable substrate for spawning and incubation, as well as migratory access for adults and juveniles. These features are essential to conservation because without them the species cannot successfully spawn and produce offspring. The physical or biological features of freshwater migration corridors associated with spawning and incubation sites include water flow, quality and temperature conditions supporting larval and adult mobility, abundant prey items supporting larval feeding after the yolk sac is depleted, and free passage (no obstructions) for adults and juveniles. These features are essential to conservation because they allow adult fish to swim upstream to reach spawning areas and they allow larval fish to proceed downstream and reach the ocean.

Table 21. Physical and Biological Features of critical habitats designated for eulachon and corresponding species life history events.

Primary Constituent Elements		Species Life History Event
Site Type	Site Attribute	
Freshwater spawning and incubation	Flow Water quality Water temperature Substrate	Adult spawning Incubation
Freshwater migration	Flow Water quality Water temperature Food	Adult and larval mobility Larval feeding

The range of eulachon in the Pacific Northwest completely overlaps with the range of several ESA-listed stocks of salmon and steelhead as well as green sturgeon. Although the habitat requirements of these fishes differ somewhat from eulachon, efforts to protect habitat generally focus on the maintenance of watershed processes that would be likely to benefit eulachon. The BRT identified dams and water diversions as moderate threats to eulachon in the Columbia and Klamath rivers where hydropower generation and flood control are major activities. Degraded water quality is common in some areas occupied by southern DPS eulachon. In the Columbia and Klamath systems, large-scale impoundment of water has increased winter water temperatures, potentially altering the water temperature during eulachon spawning periods (Gustafson *et al.* 2010). Numerous chemical contaminants are also present in spawning rivers, but the exact effect these compounds have on spawning and egg development is unknown (Gustafson *et al.* 2010). The BRT identified dredging as a low to moderate threat to eulachon in the Columbia River. Dredging during eulachon spawning would be particularly detrimental because eggs could be destroyed by mechanical disturbance or smothered by in-water disposal of dredged materials.

The LCR mainstem provides spawning and incubation sites, and a large migratory corridor to spawning areas in the tributaries. Before the construction of Bonneville Dam, eulachon ascended the Columbia River as far as Hood River, Oregon. Major tributaries that support spawning runs include the Grays, Skamokawa, Elochoman, Kalama, Lewis, and Sandy rivers.

Salmon and Steelhead Critical Habitat. Each CHART assessed biological information pertaining to areas under consideration for designation as critical habitat to identify the areas occupied by listed salmon and steelhead, determine whether those areas contained PCEs essential for the conservation of those species (Table 22-23), and whether unoccupied areas existed within the historical range of the listed salmon and steelhead that are also essential for conservation. The CHARTs assigned a 0 to 3 point score for the PCEs in each HUC5 watershed for:

Factor 1. Quantity,
Factor 2. Quality – Current Condition,
Factor 3. Quality – Potential Condition,
Factor 4. Support of Rarity Importance,
Factor 5. Support of Abundant Populations, and
Factor 6. Support of Spawning/Rearing.

Thus, the quality of habitat in a given watershed was characterized by the scores for Factor 2 (quality - current condition), which considers the existing condition of the quality of PCE's in the HUC5 watershed; and Factor 3 (quality – potential condition), which considers the likelihood of achieving PCE potential in the HUC5 watershed, either naturally or through active conservation/restoration, given known limiting factors, likely biophysical responses, and feasibility.:

Each CHART then scored each habitat area based on the quantity and quality of the physical and biological features; rated each habitat area as having a ''high,'' ''medium,'' or ''low'' conservation value; and identified management actions that could affect habitat for salmon and steelhead.

Table 22. PCEs of critical habitats designated for ESA-listed salmon and steelhead species considered in the opinion (except SR spring/summer-run Chinook salmon, SR fall-run Chinook salmon, and SR sockeye salmon), and corresponding species life history events.

Primary Constituent Elements		Species Life History Event
Site Type	Site Attribute	
Freshwater spawning	Substrate Water quality Water quantity	Adult spawning Embryo incubation Alevin growth and development
Freshwater rearing	Floodplain connectivity Forage Natural cover Water quality Water quantity	Fry emergence from gravel Fry/parr/smolt growth and development
Freshwater migration	Free of artificial obstruction Natural cover Water quality Water quantity	Adult sexual maturation Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration
Estuarine areas	Forage Free of artificial obstruction Natural cover Salinity Water quality Water quantity	Adult sexual maturation and "reverse smoltification" Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration
Nearshore marine areas	Forage Free of artificial obstruction Natural cover Water quantity Water quality	Adult growth and sexual maturation Adult spawning migration Nearshore juvenile rearing
Offshore marine areas	Forage Water quality	Adult growth and sexual maturation Adult spawning migration Subadult rearing

Table 23. PCEs of critical habitats designated for SR spring/summer-run Chinook salmon, SR fall-run Chinook salmon, SR sockeye salmon, and corresponding species life history events.

Primary Constituent Elements		Species Life History Event
Site	Site Attribute	
Spawning and juvenile rearing areas	Access (sockeye) Cover/shelter Food (juvenile rearing) Riparian vegetation Space (Chinook, coho) Spawning gravel Water quality Water temp (sockeye) Water quantity	Adult spawning Embryo incubation Alevin growth and development Fry emergence from gravel Fry/parr/smolt growth and development
Adult and juvenile migration corridors	Cover/shelter Food (juvenile) Riparian vegetation Safe passage Space Substrate Water quality Water quantity Water temperature Water velocity	Adult sexual maturation Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration
Areas for growth and development to adulthood	Ocean areas – not identified	Nearshore juvenile rearing Subadult rearing Adult growth and sexual maturation Adult spawning migration

Willamette-Lower Columbia Recovery Domain. Critical habitat for salmonids has been designated in the WLC recovery domain for UWR spring-run Chinook salmon, LCR Chinook salmon, LCR steelhead, UWR steelhead, and CR chum salmon. In addition to the Willamette and Columbia River mainstems, important tributaries on the Oregon side of the WLC include Youngs Bay, Big Creek, Clatskanie River, and Scappoose River in the Oregon Coast subbasin; Hood River in the Gorge; and the Sandy, Clackamas, Molalla, North and South Santiam, Calapooia, McKenzie, and Middle Fork Willamette rivers in the West Cascades subbasin.

Land management activities have severely degraded stream habitat conditions in the Willamette River mainstem above Willamette Falls and associated subbasins. In the Willamette River mainstem and lower sub-basin mainstem reaches, high density urban development and widespread agricultural effects have reduced aquatic and riparian habitat quality and complexity, and altered sediment and water quality and quantity, and watershed processes. The Willamette River, once a highly braided river system, has been dramatically simplified through channelization, dredging, and other activities that have reduced rearing habitat by as much as 75%. In addition, the construction of 37 dams in the basin blocked access to more than 435 miles of stream and river spawning habitat. The dams alter the temperature regime of the Willamette River and its tributaries, affecting the timing and development of naturally-spawned eggs and fry. Logging in the Cascade and Coast Ranges, and agriculture, urbanization, and gravel mining on valley floors have contributed to increased erosion and sediment loads throughout the WLC domain.

The mainstem Willamette River has been channelized and stripped of large wood. Development began to encroach on the riparian forest beginning in the 1870s (Sedell and Froggatt 1984). Gregory *et al.* (2002a) calculated that the total mainstem Willamette River channel area decreased from 41,000 to 23,000 acres between 1895 and 1995. They noted that the lower reach, from the mouth of the river to Newberg (RM 50), is confined within a basaltic trench, and that due to this geomorphic constraint, less channel area has been lost than in upstream areas. The middle reach from Newberg to Albany (RM 50 to 120) incurred losses of 12% primary channel area, 16% side channels, 33% alcoves, and 9% islands. Even greater changes occurred in the upper reach, from Albany to Eugene (RM 187). There, approximately 40% of both channel length and channel area were lost, along with 21% of the primary channel, 41% of side channels, 74% of alcoves, and 80% of island areas.

The banks of the Willamette River have more than 96 miles of revetments; approximately half were constructed by the Corps. Generally, the revetments were placed in the vicinity of roads or on the outside bank of river bends, so that while only 26% of the total length is revetted, 65% of the meander bends are revetted (Gregory *et al.* 2002b). The majority of dynamic sections have been armored, reducing adjustments in channel bed and sediment storage by the river, and thereby diminishing both the complexity and productivity of aquatic habitats (Gregory *et al.* 2002c).

Riparian forests have diminished considerably in the lower reaches of the Willamette River (Gregory *et al.* 2002d). Sedell and Froggatt (1984) noted that agriculture and cutting of streamside trees were major agents of change for riparian vegetation, along with snagging of large wood in the channel. The reduced shoreline, fewer and smaller snags, and reduced riparian forest comprise large functional losses to the river, reducing structural features, organic inputs from litter fall, entrained allochthonous materials, and flood flow filtering capacity. Extensive changes began before the major dams were built, with navigational and agricultural demands dominating the early use of the river. The once expansive forests of the Willamette River floodplain provided valuable nutrients and organic matter during flood pulses, food sources for macroinvertebrates, and slow-water refugia for fish during flood events. These forests also cooled river temperatures as the river flowed through its many channels.

Gregory *et al.* (2002d) described the changes in riparian vegetation in river reaches from the mouth to Newberg, from Newberg to Albany, and from Albany to Eugene. They noted that the riparian forests were formerly a mosaic of brush, marsh, and ash tree openings maintained by annual flood inundation. Below the City of Newberg, the most noticeable change was that conifers were almost eliminated. Above Newberg, the formerly hardwood-dominated riparian forests along with mixed forest made up less than half of the riparian vegetation by 1990, while agriculture dominated. This conversion has reduced river shading and the potential for recruitment of wood to the river, reducing channel complexity and the quality of rearing, migration and spawning habitats.

Hyporheic flow in the Willamette River has been examined through discharge measurements and found to be significant in some areas, particularly those with gravel deposits (Wentz *et al.* 1998, Fernald *et al.* 2001). The loss of channel complexity and meandering that fosters creations of gravel deposits decreases the potential for hyporheic flows, as does gravel mining. Hyporheic flow processes water and affects its quality on reemerging into the main channel, stabilizing variations in physical and chemical water characteristics. Hyporheic flow is important for ecological functions, some aspects of water quality (such as temperature and dissolved oxygen), and some benthic invertebrate life stages. Alcove habitat, which has been limited by channelization, combines low hydraulic stress and high food availability with the potential for hyporheic flows across the steep hydraulic gradients in the gravel separating them from the main channel (Fernald *et al.* 2001).

On the mainstem of the Columbia River, hydropower projects, including the Federal Columbia River Hydropower System (FCRPS), have significantly degraded salmon and steelhead habitats (Bottom *et al.* 2005, Fresh *et al.* 2005, NMFS 2006, and LCFRB 2010). The series of dams and reservoirs that make up the FCRPS block an estimated 12 million cubic yards of debris and sediment that would otherwise naturally flow down the Columbia River and replenish shorelines along the Washington and Oregon coasts.

Industrial harbor and port development are also significant influences on the Lower Willamette and Lower Columbia rivers (Bottom *et al.* 2005, Fresh *et al.* 2005, NMFS 2006, and LCFRB 2010). Since 1878, 100 miles of river channel within the mainstem Columbia River, its estuary, and Oregon's Willamette River have been dredged as a navigation channel by the Corps. Originally dredged to a 20-foot minimum depth, the Federal navigation channel of the Lower Columbia River is now maintained at a depth of 43 feet and a width of 600 feet. The Lower Columbia River supports five ports on the Washington State side: Kalama, Longview, Skamania County, Woodland, and Vancouver. In addition to loss of riparian habitat, and disruption of benthic habitat due to dredging, high levels of several sediment chemicals, such as arsenic and polycyclic aromatic hydrocarbons (PAHs), have been identified in Lower Columbia River watersheds in the vicinity of the ports and associated industrial facilities.

The most extensive urban development in the Lower Columbia River subbasin has occurred in the Portland/Vancouver area. Outside of this major urban area, the majority of residences and businesses rely on septic systems. Common water quality issues with urban development and residential septic systems include higher water temperatures, lowered dissolved oxygen, increased fecal coliform bacteria, and increased chemicals associated with pesticides and urban runoff.

The Columbia River estuary has lost a significant amount of the tidal marsh and tidal swamp habitats that are critical to juvenile salmon and steelhead, particularly small or ocean-type species (Bottom *et al.* 2005, Fresh *et al.* 2005, NMFS 2006, and LCFRB 2010). Edges of marsh areas provide sheltered habitats for juvenile salmon and steelhead where food, in the form of amphipods or other small invertebrates which feed on marsh detritus, is plentiful, and larger predatory fish can be avoided. Historically, floodwaters of the Columbia River inundated the margins and floodplains along the estuary, allowing juvenile salmon and steelhead access to a wide expanse of low-velocity marshland and tidal channel habitats. In general, the riverbanks were gently sloping, with riparian and wetland vegetation at the higher elevations of the river floodplain becoming habitat for salmon and steelhead during flooding river discharges or flood tides. Sherwood *et al.* (1990) estimated that the Columbia River estuary lost 20,000 acres of tidal swamps, 10,000 acres of tidal marshes, and 3,000 acres of tidal flats between 1870 and 1970. This study further estimated an 80% reduction in emergent vegetation production and a 15% decline in benthic algal production.

Habitat and food-web changes within the estuary, and other factors affecting salmon population structure and life histories, have altered the estuary's capacity to support juvenile salmon (Bottom *et al.* 2005, Fresh *et al.* 2005, NMFS 2006, and LCFRB 2010). Diking and filling activities have reduced the tidal prism and eliminate emergent and forested wetlands and floodplain habitats. These changes have likely reduced the estuary's salmon-rearing capacity. Moreover, water and sediment in the Lower Columbia River and its tributaries have toxic contaminants that are harmful to aquatic resources (LCREP 2007). Contaminants of concern include dioxins and furans, heavy metals, polychlorinated biphenyls (PCBs) and organochlorine pesticides such as DDT. Simplification of the population structure and life-history diversity of salmon possibly is yet another important factor affecting juvenile salmon viability. Restoration of estuarine habitats, particularly diked emergent and forested wetlands, reduction of avian predation by terns, and flow manipulations to restore historical flow patterns have likely begun to enhance the estuary's productive capacity for salmon, although historical changes in population structure and salmon life histories may prevent salmon from making full use of the productive capacity of estuarine habitats.

The WLC Recovery Domain CHART determined that very few watersheds have PCEs in good to excellent condition (3), with no potential for additional improvement for salmon or steelhead. Only the upper McKenzie River and its tributaries were rated "3" with no potential for improvement for Chinook salmon PCEs. Most HUC5 watersheds are in fair-to-poor (score 1) or fair-to-good (score 2) condition. However, most watersheds with currently low or moderate habitat quality have some (score 1), or high (score 2), potential for improvement (Table 24).

Table 24. **Willamette-Lower Columbia Recovery Domain:** Current and potential quality of HUC_5 watersheds identified as supporting historically independent populations of ESA-listed Chinook salmon (CK), chum salmon (CM), and steelhead (ST) (NOAA Fisheries 2005). Watersheds are ranked primarily by "current quality" and secondly by their "potential for restoration."

Current PCE Condition	Potential PCE Condition
3 = good to excellent	3 = highly functioning, at historical potential
2 = fair to good	2 = high potential for improvement
1 = fair to poor	1 = some potential for improvement
0 = poor	0 = little or no potential for improvement

Watershed Name(s) and HUC_5 Code(s)	Listed Species	Current Quality	Restoration Potential
Columbia Gorge #1707010xxx			
Wind River (511)	CK/ST	2/2	2/2
East Fork Hood (506), & Upper (404) & Lower Cispus (405) rivers	CK/ST	2/2	2/2
Plympton Creek (306)	CK	2	2
Little White Salmon River (510)	CK	2	0
Grays Creek (512) & Eagle Creek (513)	CK/CM/ST	2/1/2	1/1/2
White Salmon River (509)	CK/CM	2/1	1/2
West Fork Hood River (507)	CK/ST	1/2	2/2
Hood River (508)	CK/ST	1/1	2/2
Unoccupied habitat: Wind River (511)	Chum conservation value "Possibly High"		
Cascade and Coast Range #1708000xxx			
Lower Gorge Tributaries (107)	CK/CM/ST	2/2/2	2/3/2
Lower Lewis (206) & North Fork Toutle (504) rivers	CK/CM/ST	1/3/1	2/1/2
Salmon (101), Zigzag (102), & Upper Sandy (103) rivers	CK/ST	2/2	2/2
Big Creek (602)	CK/CM	2/2	2/2
Coweeman River (508)	CK/CM/ST	2/2/1	2/1/2
Kalama River (301)	CK/CM/ST	1/2/2	2/1/2
Cowlitz Headwaters (401)	CK/ST	2/2	1/1
Skamokawa/Elochoman (305)	CK/CM	2/1	2
Salmon Creek (109)	CK/CM/ST	1/2/1	2/3/2
Green (505) & South Fork Toutle (506) rivers	CK/CM/ST	1/1/2	2/1/2
Jackson Prairie (503) & East Willapa (507)	CK/CM/ST	1/2/1	1/1/2
Grays Bay (603)	CK/CM	1/2	2/3
Upper Middle Fork Willamette River (101)	CK	2	1
Germany/Abernathy creeks (304)	CK/CM	1/2	2
Mid-Sandy (104), Bull Run (105), & Lower Sandy (108) rivers	CK/ST	1/1	2/2
Washougal (106) & East Fork Lewis (205) rivers	CK/CM/ST	1/1/1	2/1/2
Upper Cowlitz (402) & Tilton rivers (501) & Cowlitz Valley Frontal (403)	CK/ST	1/1	2/1
Clatskanie (303) & Young rivers (601)	CK	1	2
Rifle Reservoir (502)	CK/ST	1	1
Beaver Creek (302)	CK	0	1
Unoccupied Habitat: Upper Lewis (201) & Muddy (202) rivers; Swift (203) & Yale (204) reservoirs	CK & ST Conservation Value "Possibly High"		

Watershed Name(s) and HUC5 Code(s)	Listed Species	Current Quality	Restoration Potential
Willamette River #1709000xxx			
Upper (401) & South Fork (403) McKenzie rivers; Horse Creek (402); & McKenzie River/Quartz Creek (405)	CK	3	3
Lower McKenzie River (407)	CK	2	3
South Santiam River (606)	CK/ST	2/2	1/3
South Santiam River/Foster Reservoir (607)	CK/ST	2/2	1/2
North Fork of Middle Fork Willamette (106) & Blue (404) rivers	CK	2	1
Upper South Yamhill River (801)	ST	2	1
Little North Santiam River (505)	CK/ST	1/2	3/3
Upper Molalla River (905)	CK/ST	1/2	1/1
Abernethy Creek (704)	CK/ST	1/1	1/2
Luckiamute River (306) & Yamhill (807) Lower Molalla (906) rivers; Middle (504) & Lower (506) North Santiam rivers; Hamilton Creek/South Santiam River (601); Wiley Creek (608); Mill Creek/Willamette River (701); & Willamette River/Chehalem Creek (703); Lower South (804) & North (806) Yamhill rivers; & Salt Creek/South Yamhill River (805)	CK/ST	1	1
Hills (102) & Salmon (104) creeks; Salt Creek/Willamette River (103), Hills Creek Reservoir (105), Middle Fork Willamette/Lookout Point (107); Little Fall (108) & Fall (109) creeks; Lower Middle Fork of Willamette (110), Long Tom (301), Marys (305) & Mohawk (406) rivers	CK	1	1
Willamina Creek (802) & Mill Creek/South Yamhill River (803)	ST	1	1
Calapooia River (303); Oak (304) Crabtree (602), Thomas (603) & Rickreall (702) creeks; Abiqua (901), Butte (902) & Rock (903) creeks/Pudding River; & Senecal Creek/Mill Creek (904)	CK/ST	1/1	0/1
Row River (201), Mosby (202) & Muddy (302) creeks, Upper (203) & Lower (205) Coast Fork Willamette River	CK	1	0
Unoccupied habitat in North Santiam (501) & North Fork Breitenbush (502) rivers; Quartzville Creek (604) and Middle Santiam River (605)	CK & ST Conservation Value "Possibly High"		
Unoccupied habitat in Detroit Reservoir/Blowout Divide Creek (503)	Conservation Value: CK "Possibly Medium"; ST Possibly High"		
Lower Willamette #1709001xxx			
Collawash (101), Upper Clackamas (102), & Oak Grove Fork (103) Clackamas rivers	CK/ST	2/2	3/2
Middle Clackamas River (104)	CK/ST	2/1	3/2
Eagle Creek (105)	CK/ST	2/2	1/2
Gales Creek (002)	ST	2	1
Lower Clackamas River (106) & Scappoose Creek (202)	CK/ST	1	2
Dairy (001) & Scoggins (003) creeks; Rock Creek/Tualatin River (004); & Tualatin River (005)	ST	1	1
Johnson Creek (201)	CK/ST	0/1	2/2
Lower Willamette/Columbia Slough (203)	CK/ST	0	2

Interior Columbia Recovery Domain. Critical habitat has been designated in the IC recovery domain, which includes the Snake River Basin, for SR spring/summer-run Chinook salmon, SR fall-run Chinook salmon, UCR spring-run Chinook salmon, SR sockeye salmon, MCR steelhead, UCR steelhead, and SRB steelhead.

Habitat quality in tributary streams in the IC recovery domain varies from excellent in wilderness and roadless areas to poor in areas subject to heavy agricultural and urban development (Wissmar *et al.* 1994, NMFS 2009a). Critical habitat throughout much of the IC recovery domain has been degraded by intense agriculture, alteration of stream morphology (*i.e.*, channel modifications and diking), riparian vegetation disturbance, wetland draining and conversion, livestock grazing, dredging, road construction and maintenance, logging, mining, and urbanization. Reduced summer stream flows, impaired water quality, and reduction of habitat complexity are common problems for critical habitat in developed areas.

Migratory habitat quality in this area has been severely affected by the development and operation of the FCRPS dams and reservoirs in the mainstem Columbia River, Bureau of Reclamation tributary projects, and privately owned dams in the Snake and Upper Columbia River basins. For example, construction of Hells Canyon Dam eliminated access to several likely production areas in Oregon and Idaho, including the Burnt, Powder, Weiser, Payette, Malheur, Owyhee, and Boise river basins (Good *et al.* 2005), and Grand Coulee and Chief Joseph dams completely block anadromous fish passage on the upper mainstem Columbia River. Hydroelectric development modified natural flow regimes, resulting in higher water temperatures, changes in fish community structure leading to increased rates of piscivorous and avian predation on juvenile salmon and steelhead, and delayed migration for both adult and juveniles. Physical features of dams such as turbines also kill migrating fish. In-river survival is inversely related to the number of hydropower projects encountered by emigrating juveniles.

Similarly, development and operation of extensive irrigation systems and dams for water withdrawal and storage in tributaries have altered hydrological cycles. A series of large regulating dams on the middle and upper Deschutes River affect flow and block access to upstream habitat, and have extirpated one or more populations from the Cascades Eastern Slope major population (IC-TRT 2003). Similarly, operation and maintenance of large water reclamation systems such as the Umatilla Basin and Yakima Projects have significantly reduced flows and degraded water quality and physical habitat in this domain.

Many stream reaches designated as critical habitat in the IC recovery domain are over-allocated under state water law, with more allocated water rights than existing streamflow. Withdrawal of water, particularly during low-flow periods that commonly overlap with agricultural withdrawals, often increases summer stream temperatures, blocks fish migration, strands fish, and alters sediment transport (Spence *et al.* 1996). Reduced tributary stream flow has been identified as a major limiting factor for all listed salmon and steelhead species in this recovery domain except SR fall-run Chinook salmon and SR sockeye salmon (NMFS 2007, NOAA Fisheries 2011).

Many stream reaches designated as critical habitat are listed on the state of Oregon's Clean Water Act section 303(d) list for water temperature. Many areas that were historically suitable rearing and spawning habitat are now unsuitable due to high summer stream temperatures. Removal of riparian vegetation, alteration of natural stream morphology, and withdrawal of water for agricultural or municipal use all contribute to elevated stream temperatures. Contaminants such as insecticides and herbicides from agricultural runoff and heavy metals from mine waste are common in some areas of critical habitat.

The IC Recovery Domain is a very large and diverse area. The CHART determined that few watersheds have PCEs in good to excellent condition (score 3), with no potential for additional improvement for Chinook salmon or steelhead. In Washington, the Upper Methow, Lost, White and Chiwawa watersheds were rated "3" for current and potential quality. In Oregon, only the Lower Deschutes, Minam, Wenaha, and Upper and Lower Imnaha Rivers HUC5 watersheds were rated "3" with no potential for improvement. In Idaho, a number of watersheds in the Upper Middle Salmon, Upper Salmon/Pahsimeroi, Middle Fork Salmon, Little Salmon, Selway, and Lochsa rivers were rated "3" for current and potential quality for steelhead PCEs. Additionally, several Lower Snake River HUC5 watersheds in the Hells Canyon area, straddling Oregon and Idaho, were highly rated. However, most HUC5 watersheds in the recovery domain are in fair-to-poor (score 1) or fair-to-good (score 2) condition. Most watersheds with currently low or moderate habitat quality have some (1), or high (2), potential for improvement (Table 25).

Table 25. **Interior Columbia Recovery Domain:** Current and potential quality of HUC_5 watersheds identified as supporting historically independent populations of ESA-listed Chinook salmon (CK) and steelhead (ST) (NOAA Fisheries 2005). Watersheds are ranked primarily by "current quality" and secondly by their "potential for restoration."

Current PCE Condition	Potential PCE Condition
3 = good to excellent	3 = highly functioning, at historical potential
2 = fair to good	2 = high potential for improvement
1 = fair to poor	1 = some potential for improvement
0 = poor	0 = little or no potential for improvement

Watershed Name and HUC_5 Code(s)	Listed Species	Current Quality	Restoration Potential
Upper Columbia # 1702000xxx			
White (101), Chiwawa (102), Lost (801) & Upper Methow (802) rivers	CK/ST	3	3
Upper Chewuch (803) & Twisp rivers (805)	CK/ST	3	2
Lower Chewuch River (804); Middle (806) & Lower (807) Methow rivers	CK/ST	2	2
Salmon Creek (603) & Okanogan River/Omak Creek (604)	ST	2	2
Upper Columbia/Swamp Creek (505)	CK/ST	2	1
Foster Creek (503) & Jordan/Tumwater (504)	CK/ST	1	1
Upper (601) & Lower (602) Okanogan River; Okanogan River/Bonaparte Creek (605); Lower Similkameen River (704); & Lower Lake Chelan (903)	ST	1	1
Unoccupied habitat in Sinlahekin Creek (703)	ST Conservation Value "Possibly High"		
Upper Columbia #1702001xxx			
Entiat River (001); Nason/Tumwater (103); & Lower Wenatchee River (105)	CK/ST	2	2
Lake Entiat (002)	CK/ST	2	1
Columbia River/Lynch Coulee (003); Sand Hollow (004); Yakima/Hansen Creek (604), Middle Columbia/Priest Rapids (605), & Columbia River/Zintel Canyon (606)	ST	2	1
Icicle/Chumstick (104)	CK/ST	1	2
Lower Crab Creek (509)	ST	1	2
Rattlesnake Creek (204)	ST	0	1
Yakima #1703000xxx			
Upper (101) & Middle (102) Yakima rivers; Teanaway (103) & Little Naches (201) rivers; Naches River/Rattlesnake Creek (202); & Ahtanum (301) & Upper Toppenish (303) & Satus (305) creeks	ST	2	2
Umtanum/Wenas (104); Naches River/Tieton River (203); Upper Lower Yakima River (302); & Lower Toppenish Creek (304)	ST	1	2
Yakima River/Spring Creek (306)	ST	1	1

Watershed Name and HUC_5 Code(s)	Listed Species	Current Quality	Restoration Potential
Lower Snake River #1706010xxx			
Snake River/Granite (101), Getta (102), & Divide (104) creeks; Upper (201) & Lower (205) Imnaha River; Snake River/Rogersburg (301); Minam (505) & Wenaha (603) rivers	ST	3	3
Grande Ronde River/Rondowa (601)	ST	3	2
Big (203) & Little (204) Sheep creeks; Asotin River (302); Catherine Creek (405); Lostine River (502); Bear Creek (504); & Upper (706) & Lower (707) Tucannon River	ST	2	3
Middle Imnaha River (202); Snake River/Captain John Creek (303); Upper Grande Ronde River (401); Meadow (402); Beaver (403); Indian (409), Lookingglass (410) & Cabin (411) creeks; Lower Wallowa River (506); Mud (602), Chesnimnus (604) & Upper Joseph (605) creeks	ST	2	2
Ladd Creek (406); Phillips/Willow Creek (408); Upper (501) & Middle (503) Wallowa rivers; & Lower Grande Ronde River/Menatche Creek (607)	ST	1	3
Five Points (404); Lower Joseph (606) & Deadman (703) creeks	ST	1	2
Tucannon/Alpowa Creek (701)	ST	1	1
Mill Creek (407)	ST	0	3
Pataha Creek (705)	ST	0	2
Snake River/Steptoe Canyon (702) & Penawawa Creek (708)	ST	0	1
Flat Creek (704) & Lower Palouse River (808)	ST	0	0
Upper Salmon and Pahsimeroi #1706020xxx			
Germania (111) & Warm Springs (114) creeks; Lower Pahsimeroi River (201); Alturas Lake (120), Redfish Lake (121), Upper Valley (123) & West Fork Yankee (126) creeks	ST	3	3
Basin Creek (124)	ST	3	2
Salmon River/Challis (101); East Fork Salmon River/McDonald Creek (105); Herd Creek (108); Upper East Fork Salmon River (110); Salmon River/Big Casino (115), Fisher (117) & Fourth of July (118) creeks; Upper Salmon River (119); Valley Creek/Iron Creek (122); & Morgan Creek (132)	ST	2	3
Salmon River/Bayhorse Creek (104); Salmon River/Slate Creek (113); Upper Yankee Fork (127) & Squaw Creek (128); Pahsimeroi River/Falls Creek (202)	ST	2	2
Yankee Fork/Jordan Creek (125)	ST	1	3
Salmon River/Kinnikinnick Creek (112); Garden Creek (129); Challis Creek/Mill Creek (130); & Patterson Creek (203)	ST	1	2
Road Creek (107)	ST	1	1
Unoccupied habitat in Hawley (410), Eighteenmile (411) & Big Timber (413) creeks	Conservation Value for ST "Possibly High"		

Watershed Name and HUC5 Code(s)	Listed Species	Current Quality	Restoration Potential
Middle Salmon, Panther and Lemhi #1706020xxx			
Salmon River/Colson (301), Pine (303) & Moose (305) creeks; Indian (304) & Carmen (308) creeks, North Fork Salmon River (306); & Texas Creek (412)	ST	3	3
Deep Creek (318)	ST	3	2
Salmon River/Cow Creek (312) & Hat (313), Iron (314), Upper Panther (315), Moyer (316) & Woodtick (317) creeks; Lemhi River/Whimpey Creek (402); Hayden (414), Big Eight Mile (408), & Canyon (408) creeks	ST	2	3
Salmon River/Tower (307) & Twelvemile (311) creeks; Lemhi River/Kenney Creek (403); Lemhi River/McDevitt (405), Lemhi River/Yearian Creek (406); & Peterson Creek (407)	ST	2	2
Owl (302) & Napias (319) creeks	ST	2	1
Salmon River/Jesse Creek (309); Panther Creek/Trail Creek (322); & Lemhi River/Bohannon Creek (401)	ST	1	3
Salmon River/Williams Creek (310)	ST	1	2
Agency Creek (404)	ST	1	1
Panther Creek/Spring Creek (320) & Clear Creek (323)	ST	0	3
Big Deer Creek (321)	ST	0	1
Mid-Salmon-Chamberlain, South Fork, Lower, and Middle Fork Salmon #1706020xxx			
Lower (501), Upper (503) & Little (504) Loon creeks; Warm Springs (502); Rapid River (505); Middle Fork Salmon River/Soldier (507) & Lower Marble Creek (513); & Sulphur (509), Pistol (510), Indian (511) & Upper Marble (512) creeks; Lower Middle Fork Salmon River (601); Wilson (602), Upper Camas (604), Rush (610), Monumental (611), Beaver (614), Big Ramey (615) & Lower Big (617) creeks; Middle Fork Salmon River/Brush (603) & Sheep (609) creeks; Big Creek/Little Marble (612); Crooked (616), Sheep (704), Bargamin (709), Sabe (711), Horse (714), Cottonwood (716) & Upper Chamberlain Creek (718); Salmon River/Hot Springs (712); Salmon River/Kitchen Creek (715); Lower Chamberlain/McCalla Creek (717); & Slate Creek (911)	ST	3	3
Marsh (506); Bear Valley (508) Yellow Jacket (604); West Fork Camas (607) & Lower Camas (608) creeks; & Salmon River/Disappointment Creek (713) & White Bird Creek (908)	ST	2	3
Upper Big Creek (613); Salmon River/Fall (701), California (703), Trout (708), Crooked (705) & Warren (719) creeks; Lower South Fork Salmon River (801); South Fork Salmon River/Cabin (809), Blackmare (810) & Fitsum (812) creeks; Lower Johnson Creek (805); & Lower (813), Middle (814) & Upper Secesh (815) rivers; Salmon River/China (901), Cottonwood (904), McKenzie (909), John Day (912) & Lake (913) creeks; Eagle (902), Deer (903), Skookumchuck (910), French (915) & Partridge (916) creeks	ST	2	2
Wind River (702), Salmon River/Rabbit (706) & Rattlesnake (710) creeks; & Big Mallard Creek (707); Burnt Log (806), Upper Johnson (807) & Buckhorn (811) creeks; Salmon River/Deep (905), Hammer (907) & Van (914) creeks	ST	2	1
Silver Creek (605)	ST	1	3
Lower (803) & Upper (804) East Fork South Fork Salmon River; Rock (906) & Rice (917) creeks	ST	1	2

Watershed Name and HUC_5 Code(s)	Listed Species	Current Quality	Restoration Potential
Little Salmon #176021xxx			
Rapid River (005)	ST	3	3
Hazard Creek (003	ST	3	2
Boulder Creek (004)	ST	2	3
Lower Little Salmon River (001) & Little Salmon River/Hard Creek (002)	ST	2	2
Selway, Lochsa and Clearwater #1706030xxx			
Selway River/Pettibone (101) & Gardner (103) creeks; Bear (102), White Cap (104), Indian (105), Burnt Knob (107), Running (108) & Goat (109) creeks; & Upper Selway River (106); Gedney (202), Upper Three Links (204), Rhoda (205), North Fork Moose (207), Upper East Fork Moose (209) & Martin (210) creeks; Upper (211), Middle (212) & Lower Meadow (213) creeks; Selway River/Three Links Creek (203); & East Fork Moose Creek/Trout Creek (208); Fish (302), Storm (309), Warm Springs (311), Fish Lake (312), Boulder (313) & Old Man (314) creeks; Lochsa River/Stanley (303) & Squaw (304) creeks; Lower Crooked (305), Upper Crooked (306) & Brushy (307) forks; Lower (308), Upper (310) White Sands, Ten Mile (509) & John's (510) creeks	ST	3	3
Selway River/Goddard Creek (201); O'Hara Creek (214) Newsome (505) creeks; American (506), Red (507) & Crooked (508) rivers	ST	2	3
Lower Lochsa River (301); Middle Fork Clearwater River/Maggie Creek (401); South Fork Clearwater River/Meadow (502) & Leggett creeks; Mill (511), Big Bear (604), Upper Big Bear (605), Musselshell (617), Eldorado (619) & Mission (629) creeks, Potlatch River/Pine Creek (606); & Upper Potlatch River (607); Lower (615), Middle (616) & Upper (618) Lolo creeks	ST	2	2
South Fork Clearwater River/Peasley Creek (502)	ST	2	1
Upper Orofino Creek (613)	ST	2	0
Clear Creek (402)	ST	1	3
Three Mile (512), Cottonwood (513), Big Canyon (610), Little Canyon (611) & Jim Ford (614) creeks; Potlatch River/Middle Potlatch Creek (603); Clearwater River/Bedrock (608), Jack's (609) Lower Lawyer (623), Middle Lawyer (624), Cottonwood (627) & Upper Lapwai (628) creeks; & Upper (630) & Lower (631) Sweetwater creeks	ST	1	2
Lower Clearwater River (601) & Clearwater River/Lower Potlatch River (602), Fivemile Creek (620), Sixmile Creek (621) and Tom Taha (622) creeks	ST	1	1
Mid-Columbia #1707010xxx			
Wood Gulch (112); Rock Creek (113); Upper Walla Walla (201), Upper Touchet (203), & Upper Umatilla (301) rivers; Meacham (302) & Birch (306) creeks; Upper (601) & Middle (602) Klickitat River	ST	2	2
Glade (105) & Mill (202) creeks; Lower Klickitat River (604); Mosier Creek (505); White Salmon River (509); Middle Columbia/Grays Creek (512)	ST	2	1
Little White Salmon River (510)	ST	2	0
Middle Touchet River (204); McKay Creek (305); Little Klickitat River (603);Fifteenmile (502) & Fivemile (503) creeks	ST	1	2
Alder (110) & Pine (111) creeks; Lower Touchet River (207), Cottonwood (208), Pine (209) & Dry (210) creeks; Lower Walla Walla River (211); Umatilla River/Mission Creek (303) Wildhorse Creek (304); Umatilla River/Alkali Canyon (307); Lower Butter Creek (310); Upper Middle Columbia/Hood (501); Middle Columbia/Mill Creek (504)	ST	1	1
Stage Gulch (308) & Lower Umatilla River (313)	ST	0	1

Watershed Name and HUC_5 Code(s)	Listed Species	Current Quality	Restoration Potential
John Day #170702xxx			
Middle (103) & Lower (105) South Fork John Day rivers; Murderers (104) & Canyon (107) creeks; Upper John Day (106) & Upper North Fork John Day (201) rivers; & Desolation Creek (204)	ST	2	2
North Fork John Day/Big Creek (203); Cottonwood Creek (209) & Lower NF John Day River (210)	ST	2	1
Strawberry (108), Beech (109), Laycock (110), Fields (111), Mountain (113) & Rock (114) creeks; Upper Middle John Day River (112); Granite (202) & Wall (208) creeks; Upper (205) & Lower (206) Camas creeks; North Fork John Day/Potamus Creek (207); Upper Middle Fork John Day River (301) & Camp (302), Big (303) & Long (304) creeks; Bridge (403) & Upper Rock (411) creeks; & Pine Hollow (407)	ST	1	2
John Day/Johnson Creek (115); Lower Middle Fork John Day River (305); Lower John Day River/Kahler Creek (401), Service (402) & Muddy (404) creeks; Lower John Day River/Clarno (405); Butte (406), Thirtymile (408) & Lower Rock (412) creeks; Lower John Day River/Ferry (409) & Scott (410) canyons; & Lower John Day River/McDonald Ferry (414)	ST	1	1
Deschutes #1707030xxx			
Lower Deschutes River (612)	ST	3	3
Middle Deschutes River (607)	ST	3	2
Upper Deschutes River (603)	ST	2	1
Mill Creek (605) & Warm Springs River (606)	ST	2	1
Bakeoven (608) & Buck Hollow (611) creeks; Upper (701) & Lower (705) Trout Creek	ST	1	2
Beaver (605) & Antelope (702) creeks	ST	1	1
White River (610) & Mud Springs Creek (704)	ST	1	0
Unoccupied habitat in Deschutes River/McKenzie Canyon (107) & Haystack (311); Squaw Creek (108); Lower Metolius River (110), Headwaters Deschutes River (601)	ST Conservation Value "Possibly High"		

Southern DPS Green Sturgeon. A team similar to the CHARTs, referred to as a Critical Habitat Review Team (CHRT), identified and analyzed the conservation value of particular areas occupied by southern green sturgeon, and unoccupied areas they felt are necessary to ensure the conservation of the species (USDC 2009). The CHRT did not identify those particular areas using hydrologic unit code (HUC) nomenclature, but did provide geographic place names for those areas, including the names of freshwater rivers, the bypasses, the Sacramento-San Joaquin Delta, coastal bays and estuaries, and coastal marine areas (within 110 m depth) extending from the California/Mexico border north to Monterey Bay, California, and from the Alaska/Canada border northwest to the Bering Strait; and certain coastal bays and estuaries in California, Oregon, and Washington.

For freshwater rivers north of and including the Eel River, the areas upstream of the head of the tide were not considered part of the geographical area occupied by the southern DPS. However, the critical habitat designation recognizes not only the importance of natal habitats, but of habitats throughout their range. Critical habitat has been designated in coastal U.S. marine waters within 60 fathoms depth from Monterey Bay, California (including Monterey Bay), north to Cape Flattery, Washington, including the Strait of Juan de Fuca, Washington, to its United States boundary; the Sacramento River, lower Feather River, and lower Yuba River in California; the Sacramento-San Joaquin Delta and Suisun, San Pablo, and San Francisco bays in California; the lower Columbia River estuary; and certain coastal bays and estuaries in California (Humboldt

Bay), Oregon (Coos Bay, Winchester Bay, Yaquina Bay, and Nehalem Bay), and Washington (Willapa Bay and Grays Harbor) and freshwater (USDC 2009). Table 26 below delineates PCEs for southern green sturgeon.

Table 26. PCEs of critical habitat designated for southern green sturgeon and corresponding species life history events

Primary Constituent Elements		Species Life History Event
Site Type	**Site Attribute**	
Freshwater riverine system	Food resources Migratory corridor Sediment quality Substrate type or size Water depth Water flow Water quality	Adult spawning Embryo incubation, growth and development Larval emergence, growth and development Juvenile metamorphosis, growth and development
Estuarine areas	Food resources Migratory corridor Sediment quality Water flow Water depth Water quality	Juvenile growth, development, seaward migration Subadult growth, development, seasonal holding, and movement between estuarine and marine areas Adult growth, development, seasonal holding, movements between estuarine and marine areas, upstream spawning movement, and seaward post-spawning movement
Coastal marine areas	Food resources Migratory corridor Water quality	Subadult growth and development, movement between estuarine and marine areas, and migration between marine areas Adult sexual maturation, growth and development, movements between estuarine and marine areas, migration between marine areas, and spawning migration

The CHRT identified several activities that threaten the PCEs in coastal bays and estuaries and necessitate the need for special management considerations or protection. The application of pesticides is likely to adversely affect prey resources and water quality within the bays and estuaries, as well as the growth and reproductive health of southern green sturgeon through bioaccumulation. Other activities of concern include those that disturb bottom substrates, adversely affect prey resources, or degrade water quality through re-suspension of contaminated sediments. Of particular concern are activities that affect prey resources. Prey resources are affected by: commercial shipping and activities generating point source pollution and non-point source pollution that discharge contaminants and result in bioaccumulation of contaminants in green sturgeon; disposal of dredged materials that bury prey resources; and bottom trawl fisheries that disturb the bottom (but result in beneficial or adverse effects on prey resources for green sturgeon). In addition, petroleum spills from commercial shipping activities and proposed alternative energy hydrokinetic projects are likely to affect water quality or hinder the migration of green sturgeon along the coast (USDC 2009).

2.3 Environmental Baseline

The "environmental baseline" includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

2.3.1 Species Environmental Baseline - Salmon and Steelhead

The action area includes what is known as the Columbia estuary. The estuary is the portion of the Columbia River under tidal influence from the River Mouth at RM 0.0 to Bonneville Dam (RM 145) where flow and habitat are influenced by tidal actions (ISAB 2000, Bottom *et al.* 2005). Salt water intrusion usually does not extend more than RM 23 (near Harrington Point); however at the lowest flows salt intrusion can extend to Pillar Point (RM 28) (Neal 1972 as cited in ISAB 2000). The term Columbia River estuary, estuary and Lower Columbia River are used interchangeably in this opinion.

The action area also extends beyond the River Mouth into the Pacific Ocean nearshore environment and into what is known as the Columbia River plume. The Columbia River enters the Pacific through a relatively narrow opening, shooting a powerful jet of water, or plume, into the North Pacific that can be traced southward to San Francisco, California (Bottom *et al.* 2005).

All ESA-listed salmonids must pass through the estuary twice; once as juveniles outmigrating to the Pacific Ocean and again as adults when they return to spawn. The majority of adult salmon and steelhead move through the River Mouth from early spring through autumn but upstream migrating adults are present year around. Adult salmon and steelhead are generally found in mid-channel, throughout the water column to depths of 50 feet, but are usually within the upper 25 feet of the water column (NMFS 2011a). There is some limited LCR Chinook salmon and Columbia River chum salmon spawning in the mainstem Columbia River between RM 113 to RM 142.

The Columbia River estuary serves three primary roles for outmigrating juveniles as they transition from shallow, freshwater environments to the ocean: (1) A place where juvenile fish can gradually acclimate to salt water; (2) a feeding area; and (3) a refuge from predators while fish acclimate to salt water. While the estuarine processes that affect salmon survival are not well defined it appears that duration of estuarine residency, total growth in the estuary, and size at ocean entry are key determinants of salmon survival (Bottom *et al.* 2005).

Salmon species are grouped into two juvenile life history strategies based upon how long they rear in freshwater, when they out-migrate, and how long they spend in estuarine habitats (Table 26). A salmon population is referred to as ocean-type if most individuals migrate to the sea after spending only a short period (or no time) rearing in freshwater. These populations are associated with extensive use of estuarine and ocean habitats for rearing. Stream-type populations migrate to sea after rearing for at least a year in freshwater. The different life histories use different habitats; therefore the effects to the different species due to changes in estuary habitat or the plume may affect species in different ways depending upon the life history strategy (Bottom *et al*. 2005, Fresh *et al.* 2005).

Table 27. A summary of the juvenile characteristics of stream and ocean life history types (Adapted from Fresh *et al.* 2005)

Stream-Type Fish	Ocean-Type Fish
Species	
Coho Salmon	Coho salmon
Some Chinook Populations	Some Chinook populations
Steelhead	Chum
Sockeye	Pink
Attributes	
Long freshwater rearing (>1 yr.)	Short freshwater rearing
Shorter ocean residence	Longer ocean residence
Short estuarine residence	Longer estuarine residence
Larger size at time of estuarine entry	Smaller size at time of estuarine entry
Mostly use deeper, main channel estuarine habitats	Mostly use shallow water estuarine habitats, especially vegetated ones

Even within the ocean-type and stream type life histories there is variability, especially within the ocean-type depending upon the size of fish, the time of entry to the estuary, and the length of time spent in the estuary. Fresh *et al.* (2005) define six general life history strategies that historically used the estuary: (1) Early fry, (2) late fry, (3) early fingerling, (4) late fingerling, (5) subyearling, and (6) yearling. Fry are defined as fish less than 60 millimeters (mm) when they enter the estuary. Early fry generally enter the estuary in March and April and late fry in May and June. Fingerlings are larger than fry when entering the estuary indicating some degree of freshwater rearing but they have not yet begun the physiological transition to a smolt. Early fingerlings enter the estuary between January and July and late fingerlings enter from August to December.

The highest densities of subyearling salmon and steelhead in the estuary occur in the spring when all species are present with the second highest densities occurring in the winter and lowest densities in the summer and fall. Juvenile densities of 0.07 fish/square meter (m^2) have been recorded in the spring, dropping to approximately 0.02 fish/m^2 in the winter and less than 0.005 fish/m^2 in the summer and fall, presumably due to high water temperatures (25ºC) and low water-surface elevations (Johnson *et al* 2011). Juvenile Chinook and coho salmon may be present throughout the year while chum salmon are present during the winter and spring months. Steelhead juveniles have been observed during the spring, fall and winter periods (Johnson *et al* 2011). Yearlings rear for at least one year in freshwater before migrating to the ocean, spending less time in the estuary than either fry or fingerlings.

Subyearlings generally rear in freshwater for less than a year, spend little time in the estuary and smolt as they out-migrate during their first year. In this opinion when referring to the juveniles of the ocean-type life history collectively the term subyearling will be used.

Regardless of the residence time of an individual fish, juvenile salmon may be found in the estuary all year as different species and life history types move downstream from multiple upstream sources (Bottom *et al.* 2005, Johnson *et al.* 2011).

The estuary is important to the survival and recovery of all Columbia River ESA-listed salmonids, particularly to ocean-type salmon. These populations may be particularly sensitive to ecosystem changes because of their longer residence times in the estuary and dependence on this portion of the river for growth and survival. Ocean-type ESA listed salmon species in the Columbia River include three Chinook species (Lower Columbia River, Snake River fall, and Upper Willamette River) and Columbia River chum salmon. Ocean-type salmon migrate downstream to and through the estuary, generally leaving the spawning area where they hatched within days to months following their emergence from the gravel. Consequently, the ocean-type fish commonly spend weeks to months rearing within the action area before reaching the size at which they migrate to the ocean.

Young salmonids must undergo a physiological transition and develop enough strength, energy, and reserve capacity to adapt to and survive the physical and biological challenges of the ocean environment. Juvenile salmonids appear to reach the threshold for this transitional state at a size of 70 to 100 mm.

The earliest ocean-type migrants can be as small as 30 to 40 mm fork length (*i.e.*, from snout to fork in the tail) when they arrive because some of these fish hatch only a short distance upstream from the action area (or in the case of some LCR Chinook and chum within the action area). Later spring migrants are generally larger, ranging up to 50 to 80 mm. Subyearlings from the mid-Columbia and Snake Rivers tend to be substantially larger (70 to 100 mm) by the time they reach the Lower Columbia River. The larger juveniles from the Snake River can likely use a greater range of depth and current velocities than the juveniles from of the LCR.

As discussed in Bottom *et al*. (2005), subyearling salmon tend to inhabit shallow waters while migrating through the estuary until they reach a size that they can exploit deeper channels and open water habitat and associated prey. Chum salmon and Chinook salmon fry between 30-60 mm occupy tidal wetland sloughs and side channels, mud and sand flats or beaches. Chum fry often move to deeper offshore waters at 55-60 mm while Chinook fry and fingerlings may remain in estuarine marsh and other shallow-water habitats until they exceed 100 mm.

Subyearlings are commonly found within a few meters of the shoreline at water depths of less than one meter but have been observed at depths of 20 feet (NMFS 2005b, Bottom *et al.* 2005, Fresh *et al.* 2005). Although subyearlings may move over deeper water between rearing areas, they generally remain close to the water surface and near the shoreline during rearing, favoring water no more than 2 meters deep and currents below 0.3 meters per second. Subyearlings seek lower energy areas where waves and currents do not require them to expend considerable energy to remain in position while they consume invertebrates that live on or near the substrate. These areas are characterized by relatively fine grain substrates. However, it is not uncommon to find young salmonids in areas with steeper and harder substrates, such as sand and gravel.

Stream-type juvenile salmon migrating to the ocean as yearlings are generally present in the action area from March through June with peak abundances in April and June although some yearlings may appear in February (Fresh *et al.* 2005, Johnson *et al.* 2011) (Figure 2). Larger yearlings are actively migrating as smolts and spend little time in shallow estuarine habitats. The yearlings primarily use deepwater channels, although they may be found in side channels and shallow-water areas (Bottom *et al.* 2005, Fresh *et al.* 2005, Johnson *et al.* 2011). The yearling salmonids can be found to depths over 30 feet but usually within the upper 20 feet (Fredrick 2012). NMFS (2005a) reviewed the results of a hydroacoustic study that found during the greatest ESA-listed salmonid abundance in the Lower Columbia River, only 0.0017% were within three feet of the FNC bottom where dredging would occur during daylight hours; 0.0249% where beside the dredging zone during evening hours; and 0.0107% at night Yearling steelhead are generally migrating higher in the water column and yearling Chinook salmon in deeper portions of the water column.

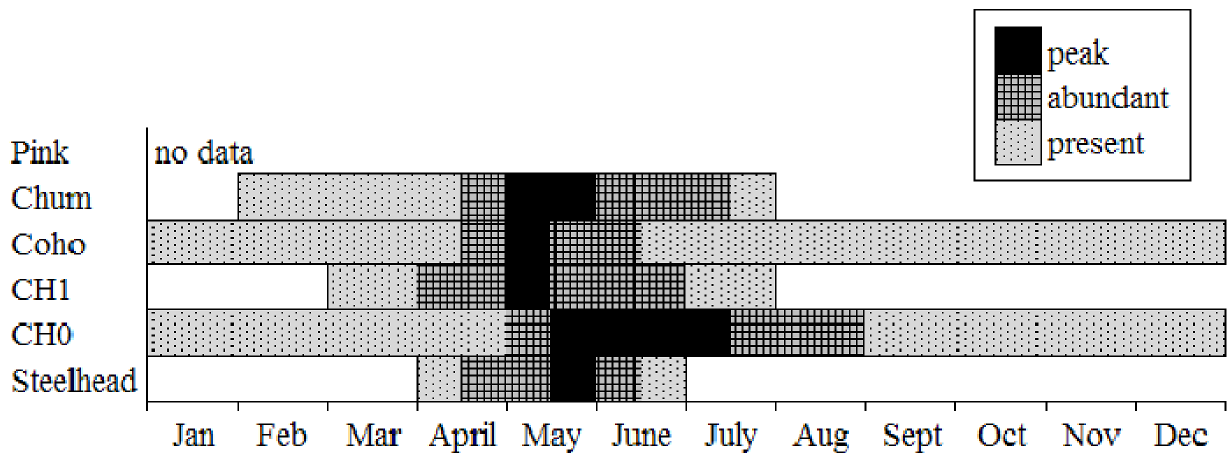


Figure 2. General trends in presence and abundance of juvenile salmonids in the LCR estuary at and downstream of Jones Beach (river kilometer [RKM] (75); (Table obtained from NMFS (2011a).

Recovery plans for ESA listed salmonids identify key threats and limiting factors for the recovery of the species. Limiting factors are defined in LCR recovery plan (NMFS 2010a, NMFS 2011b) as the physical, biological, or chemical conditions and associated ecological processes and interactions (*e.g.*, population size, habitat connectivity, water quality, water quantity) experienced by the fish that may influence the VSP parameters (*i.e*. abundance, productivity, spatial structure, and diversity). Threats are defined as the human actions, past or present (*e.g*. habitat alterations, hydro system operations, fishing, hatchery operations, and predation) that cause or contribute to limiting factors. Limiting factors or threats to salmon and steelhead were briefly discussed in Section 2.2.2 of this opinion. Limiting factors and threats to salmon and steelhead that are common to multiple populations within the Lower Columbia, and are directly or indirectly related to the maintenance of the FNC (the proposed action, dredging, is identified as a threat) include: the loss of complex habitats through channelization, diking and other development practices; the hydropower system and flood control especially as related to changes in the hydrograph and sediment routing; impaired water quality due to toxins; avian predation; and stranding. These limiting factors and threats will be discussed in more detail in Section 2.3.4 of this opinion.

2.3.2 Species Environmental Baseline - Eulachon

The southern DPS of eulachon is composed of those eulachon populations south of the Skeena River (inclusive), British Columbia. The Columbia River and its tributaries support the largest eulachon population in the world. Eulachon regularly spawn in the mainstem Columbia River and in the Cowlitz River with spawning also occurring in the following Columbia River tributaries: Grays River (common use), Skamokawa Creek (infrequent use), Elochoman River (periodic use), Kalama River (common use), Lewis River (common use), and Sandy River (common use in large run years). During years of low abundance, all spawning may occur in the mainstem Columbia and during large returns they may spawn in all of the LCR tributaries (Gustafson *et al*. 2010). Before the construction of Bonneville Dam, eulachon were reported to spawn up to the Hood River. During times of great abundance eulachon migrate up to Bonneville Dam and may ascend above Bonneville Dam by passing through the ship locks (Gustafson *et al*. 2010).

Adult eulachon weigh an average of 0.1 pounds each and are 15 to 20 cm long with a maximum recorded length of 30 cm. Eulachon are an important link in the food chain between zooplankton and larger organisms. Small salmon and other fish feed on eulachon larvae near river mouths. As eulachon mature, they are eaten by a wide variety of predators (Gustafson *et al.* 2010). The majority of adult eulachon return to the Columbia River at age 3, although some have been reported to be up to nine years old.

Eulachon typically enter the Columbia River system from mid-December to May with peak entry and spawning during February and March (Gustafson *et al*. 2010). However, eulachon have historically appeared in Portland markets as early as November 23. It is important to note that commercial landings occur when eulachon are of sufficient abundance to be economically harvested and as such some fish likely have entered the river prior to the commencement of commercial fishing (Reynolds 2012). Generally, eulachon spawning occurs in the LCR and downstream tributaries early in the run and progresses upstream. For example, using the average dates of commercial harvest as an indicator of run timing, the average dates of initial landings in the commercial fishery in the Cowlitz River are January 25, the Greys River February 20, the Kalama River April 1, and March 21 in the Sandy River (Reynolds 2012).

It appears that eulachon spawning is mainly confined to coastal rivers that have a distinct spring freshet, often draining major glaciers or snowpacks. In many rivers, eulachon spawning appears to be timed so that egg hatching will coincide with peak spring river discharge (Gustafson *et al.* 2010). Eulachon eggs, averaging one mm in size, are broadcast over and attach to a variety of substrates from sand to pea-sized gravel.

Mature eggs are reported to have an outer sticky membrane that turns inside out after the broadcast spawned eggs are fertilized. The eggs have a short stalk which serves to adhere the egg to particles of sand or other substrates. There is some indication that in rivers with a high sand bedload the eggs will be encrusted in sand particles and thus possibly protected from abrasion (Romano 2012). The eulachon eggs appear to develop while being actively carried downstream by river currents. One study indicates that eulachon eggs would hatch in 30–40 days, given the usual water temperatures in February and March in the Cowlitz River (Gustafson *et al.* 2010).

Young eulachon appear to be feeble swimmers and are rapidly carried downstream to estuarine portions of rivers and inlets within hours or days of hatching. In the Columbia River, larval eulachon are usually near the bottom during their downstream migration but may be found throughout the water column (Romano 2011). The small, four to six millimeter larval eulachon may be retained for weeks or months in estuaries feeding on pelagic plankton after the yolk sac is depleted. Due to their small size, eulachon larvae may not be physiologically capable to imprint on the freshwater natal spawning river. Eulachon larvae may spend weeks to months in the estuarine environments where they grow significantly in size and may develop the capacity to imprint on large estuaries and eventually home to these areas as adults. These considerations suggest that large river estuaries, inlets, and fjords may serve as the smallest stock structure unit for eulachon (see Gustafson *et al.* 2010).

The marine distribution of eulachon is poorly understood. There is no directed harvest of eulachon in the ocean and the species is not actively monitored or managed, resulting in little available information. Eulachon appear to inhabit a wide range of depths. They are reported to be present in coastal, open marine waters of the continental shelf between 20 m and 150 m depth. Eulachon have been caught at depths of 500 m in Alaskan waters. Research trawl surveys in British Columbia indicate that most eulachon were taken at around 100 m depth, although some were taken as deep as 500 m and some at less than 10 m. Eulachon have been harvested in the otter trawl fishery off the mouth of the Columbia River as the fish are returning to spawn (Gustafson *et al.* 2010). Eulachon often occur as bycatch in West Coast groundfish fisheries and more commonly in the California and Oregon ocean shrimp fishery (Gustafson *et al.* 2010). In their study of juvenile salmon distribution off the Columbia River, Emmett *et al.* (2004) found eulachon were the dominant forage fish found in subsurface waters (12 to 24 meters).

Specific threats to the persistence of eulachon in the LCR include the modification of freshwater habitat due to dams and water diversions, sediment dredging, shoreline construction and chemical contaminants (Gustafson *et al.* 2010).

Hydroelectric dams block access to historical eulachon spawning grounds and affect the quality of spawning substrates through flow management, reduced delivery of coarse sediments, and siltation. As will be discussed in Section 2.3.4, the operation of dams on the mainstem Columbia River and tributaries have significantly altered the natural flow regime. The magnitude of the spring freshet has been reduced and the timing of the spring freshet occurs earlier than before development. The presence of the dams and changes in the flow regime has also reduced the transport of sands and gravels to the lower river affecting the quantity and quality of estuarine habitat. Bonneville Dam greatly impedes eulachon migration to historical spawning habitat in the Hood River and possibly the Klickitat River. Dams on the Cowlitz and Lewis River have also blocked access to eulachon habitat (Gustafson *et al.* 2010).

2.3.3 Species Environmental Baseline – Green Sturgeon

Green sturgeon occupy freshwater rivers from the Sacramento River up through British Columbia, Canada but spawning has been confirmed in only three rivers, the Rogue River in Oregon and the Klamath and Sacramento Rivers in California. The green sturgeon are comprised of at least two distinct species under ESA: (1) A northern species consisting of populations originating from coastal watersheds northward of and including the Eel River; and (2) a southern species consisting of populations originating from coastal watersheds south of the Eel River, with the only known spawning population in the Sacramento River (74 CFR 52300). The southern green sturgeon was listed as threatened under the ESA on April 7, 2006 (71FR 17757).

Like all sturgeons, green sturgeon are anadromous, but they are also the most marine oriented sturgeon species (Adams *et al*. 2007). Green sturgeon spawn from March to July, with peak activity from mid-April to mid-June. Juvenile green sturgeon rear and feed in fresh and estuarine waters from one to four years prior to dispersing into marine waters as subadults. Green sturgeon spend a large portion of their lives in coastal marine waters as subadults (sexually immature) and adults (sexually mature). The subadults and adults occupy coastal estuaries adjacent to their natal rivers, as well as throughout the West coast marine waters within 110 m depth (74 CFR 52300) often traveling up to nearly 1000 km (Moser and Lindley 2007). While in the ocean green sturgeon migrate in deep waters with occasional rapid vertical assents (Kelly *et al.* 2006)

Green sturgeon individuals from both the northern and southern species use the Columbia River estuary (Lindley *et al.* 2011). Green sturgeon can be found in the Columbia River estuary from the River Mouth to Bonneville Dam during the summer and early autumn, with higher concentrations in the lower portions of the estuary. Lindley *et al* (2011) observed green sturgeon entering the Columbia River in May with peak abundance in August. The studied fish had moved out the river by the end of September. However Moser and Lindley (2007) report green sturgeon may be present in the Columbia River until October.

Compared to the white sturgeon (*A. transmountanus*) little is known about the green sturgeon (Kelly *et al.* 2006). Green sturgeon feeding habits are poorly understood though they are believed to feed primarily on benthic organisms similar to other sturgeon (Kelly *et al.* 2006) Citing earlier stomach analysis studies, Kelly *et al.*(2006) report juvenile green sturgeon in San Francisco Bay feed primarily on benthic crustaceans, clams, annelid worms, crabs and fishes. Green sturgeon in Willapa Bay, Washington, were found to feed on burrowing shrimp (Moser and Lindley 2007). Adult green sturgeon diet is not well understood but in the Sacramento-San Joaquin delta adult green sturgeon feed on benthic invertebrates including shrimp, mollusks, amphipods and small fish (Adams *et al.* 2002).

The specific green sturgeon habitat preferences in the Columbia estuary are also not well known although green sturgeon may be found throughout the LCR (Rien 2012). Green sturgeon in the Rogue River preferred sites that were greater than 5 m deep with low current, low gradient reaches or off-channel coves during the summer months (Erickson *et al.* 2002). Erickson *et al*. (2002) suggest the fish hold in the deep pools to conserve energy and feed on readily available food resources. In the LCR, white sturgeon tracking studies indicate the fish occupied shallower areas during the night but that they were active during all times of the day. Green sturgeon may act like white sturgeon or as suggested by Moser and Lindley (2007), green sturgeon may respond to the tidal cycle moving into bottom sediment as it becomes available in high tide. While green sturgeon are thought to primarily feed on the bottom, Kelly *et al.* (2006) observed that when moving directionally, the fish tended to swim in the upper 2 m of the water column and rarely were below 5m.

The population abundance and status of the southern green sturgeon in not well understood although the species is considered to become an endangered species in the near future (Adams *et al*. 2002 and Adams *et al*. 2007). The loss of spawning habitat in the Sacramento River, entrainment into water diversions and contamination of the Sacramento River are also considered threats to the species (Adams *et al*. 2007, 71 FR 17757). Harvest in commercial and sport fisheries targeting other species (Moser and Lindley 2002, Adams et al 2007). As will be discussed in Section 2.3.4 of this opinion, wetland filling, dredging of shipping lanes and anchorages, dredge spoil disposal, and municipal and industrial effluent discharge are human activities that may be detrimental to the species (Lindley *et al* 2011).

2.3.4 Environmental Baseline – Habitat

The action area includes critical habitat for Columbia River salmon, steelhead, eulachon, and southern green sturgeon. As discussed in Section 2.2.2, critical habitat includes PCEs or essential features that are essential to various life histories of the ESA listed fish The use and application of the terms PCEs and physical and biological features are nearly identical, therefore the term PCEs will be used when discussing the Primary Constituent Elements of salmon and steelhead critical habitat and the Physical and Biological Features of eulachon critical habitat in the following narrative. The term used in the critical habitat designation will be used in any tables referring to critical habitat.

Tables 28-31 list the PCEs for Columbia River eulachon, salmon and steelhead that will be discussed in the following environmental baseline and the proposed action effects assessment. The impacts to critical habitat within the LCR due to creation of the FNC for commercial shipping, flood control, urban and agricultural development, and the Federal hydropower system were briefly discussed in Section 2.2.2. The following narrative will provide more detail with an emphasis on the elements of the habitat baseline and critical habitat potentially affected by the proposed action.

Table 28. Physical and Biological Features of critical habitats designated for eulachon and corresponding species life history events most germane to the proposed action.

Physical and Biological Features		**Species Life History Event**
Site Type	**Site Attribute**	
Freshwater spawning and incubation	Water quality Substrate	Adult spawning Incubation
Freshwater migration	Water quality Food	Adult and larval mobility Larval feeding

Table 29. PCEs of critical habitats designated for ESA-listed salmon and steelhead species considered in the opinion (except SR spring/summer-run Chinook salmon, SR fall-run Chinook salmon, SR sockeye salmon), and corresponding species life history events most germane to the proposed action.

Primary Constituent Elements		Species Life History Event
Site Type	Site Attribute	
Freshwater spawning (LCR Chinook and CR chum)	Substrate Water quality	Adult spawning Embryo incubation Alevin growth and development
Freshwater rearing	Floodplain connectivity Forage Natural cover Water quantity	Fry emergence from gravel Fry/parr/smolt growth and development
Freshwater migration	Free of artificial obstruction Natural cover Water quality	Adult sexual maturation Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration
Estuarine areas	Forage Free of artificial obstruction Natural cover Water quantity	Adult sexual maturation and "reverse smoltification" Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration
Nearshore marine areas	Forage Natural cover Water quality	Adult growth and sexual maturation Adult spawning migration Nearshore juvenile rearing

Table 30. PCEs of critical habitats designated for SR spring/summer-run Chinook salmon, SR fall-run Chinook salmon, SR sockeye salmon, and corresponding species life history events most germane to the proposed action.

Primary Constituent Elements		Species Life History Event
Site	Site Attribute	
Adult and juvenile migration corridors	Cover/shelter Food (juvenile) Safe passage Space Substrate Water quality	Adult sexual maturation Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration

Table 31 PCEs of critical habitat designated for southern green sturgeon and corresponding Species life history events most germane to the proposed action.

Primary Constituent Elements		Species Life History Event
Site Type	Site Attribute	
Estuarine areas	Food resources Migratory corridor Sediment quality Water depth Water quality	Subadult growth, development, seasonal holding, and movement between estuarine and marine areas Adult growth, development, seasonal holding, movements between estuarine and marine areas.
Coastal marine areas	Food resources Migratory corridor Water quality	Subadult growth and development, movement between estuarine and marine areas, and migration between marine areas Adult sexual maturation, growth and development, movements between estuarine and marine areas, migration between marine areas.

The Columbia River estuary is a former river valley that was carved to 360 feet below current sea level during the last ice age. As sea levels subsequently rose during the end of the ice age, the floor of the valley was submerged and began to fill with sediments; initially from eastern drainages and then from the Cascade Range. The Missoula Floods, which occurred roughly 15,000 to 13,000 years ago, filled the valley with sand. The continued rapid sea level rise increased the size of the estuary and allowed further accumulation of mud and sand. The rate of sea level rise declined about 9,500 years ago and the former river valley had filled with sediments. Suspended sediment and bed load sand from the Columbia River was transported through the estuary to marine areas via tidal action and spring freshets, with some suspended sediment being deposited in floodplains and peripheral bays (Petersen *et al.* 2003 as cited in NMFS 2011b).

Development of the estuary to facilitate shipping and the construction of 11 major dams and 162 smaller dams with reservoirs throughout the basin has altered the natural flow regime. The development has changed seasonal flow rates, reduced sediment transport and discharge to the nearshore ocean environment, and degraded water quality and aquatic habitat within the estuary (ISAB 2000).

Dams on the mainstem Columbia River and tributaries regulate the flow and have changed the hydrograph. Diking and development of wetlands, the development and deepening of the FNC, and the use of jetties to stabilize dredged channels have profoundly altered aquatic habitat in the Columbia River estuary. Construction of the FNC and lower Willamette River navigation channels was authorized in 1878 with a minimum depth of 20 feet. Over the next 100 years the channel was expanded to a 40-foot deep and 600-foot wide channel (NMFS 2005a) and more recently to the current 43- foot depth with a 5-foot allowable over-depth for a total of 48 feet (NMFS 2005b). The FNC has been realigned and hydraulic control structures, such as in-water fills, channel constrictions, and pile dikes, have been built to improve navigation and reduce maintenance dredging. Most of the present-day pile dike system was built in the periods of 1917-23 and 1933-39, with an additional 35 pile dikes constructed between 1957 and 1967. The existing navigation channel pile dike system consists of 256 pile dikes, totaling 45.5 miles (NMFS 2005b). Creation of the dikes, navigation structures and artificial islands has facilitated increased numbers of avian predators such as Caspian terns (*Sterna caspia*), the double-crested cormorant (*Phalacrocorax auritus*) and Brandt's cormorants (*P. penicillatus*).

After reviewing the PCEs of critical habitat, limiting factors and threats to ESA listed species and past opinions (NMFS 2005a and NMFS 2005b) NMFS determined the habitat components most likely to be affected by the proposed action include the physical structure of habitat and prey base, sediment and turbidity, contaminants, avian predation and stranding of juvenile salmon on beaches by ship wakes. Consistent with Fresh *et al*. (2005), the existing habitat environmental baseline for salmon, steelhead and eulachon will be described in the context of three geographical areas within the action area; the Columbia River estuary (RM +3 to RM 145), the River Mouth and nearshore environment (RM -3 to +3), and the Columbia River plume. In addition to describing the general environmental baseline within the three geographic areas, sediment/turbidity, contaminants, avian predation and ship wake stranding will be discussed.

Columbia River Estuary (RM +3 to RM 145) The Columbia River has the largest annual discharge of any river on the Pacific coast of North America and is the second largest river in the United States. The Columbia River drains an area of 259,000 square miles flowing 1,243 miles from its headwaters in British Columbia to its mouth in the Pacific Ocean near Astoria, Oregon (ISAB 2000) The river strongly affects regional seawater properties of the northeast Pacific Ocean contributing between 60% (winter) to 90% (summer) of the total freshwater input between San Francisco and the Strait of Juan de Fuca (Bottom *et al.* 2005).

Climate changes have influenced river-flow since the pre-development period, but changes in flow due to development have had the greatest influence on the current hydrograph. The magnitude of the spring-freshet flow has decreased by more than 40% with the development of hydropower and irrigation. Approximately 75% of this loss is due to flow regulation, with irrigation withdrawal accounting for approximately 20%, and climate change for approximately 5% (Bottom *et al.* 2005). The timing of maximum spring-freshet flow also has changed due to hydropower and irrigation development, flood control and climate warming, resulting in an approximate two-week shift to earlier in the year (mean pre-development date of 12 June compared to modern mean date of 29 May). The spring freshet has become longer, weaker, and earlier while winter flows are less sharply peaked than before flow regulation (Bottom *et al*. 2005). The total discharge has also changed from the pre-development period. The annual average flow at the mouth has been reduced from about 8,500 cubic meters per second (m3s-1) to less than 7,000 m3s-1, with climate change and water withdrawal each responsible for approximately 50% of the reduction (Bottom *et al* 2005).

The historical peak flows transported greater amounts of sediment and caused more flooding of wetlands resulting in a more complex ecosystem than the present (ISAB 2000). There has been a major loss of emergent marsh, tidal swamp, and forested wetlands in the Columbia River estuary. It is estimated that 43% of tidal marshes and 77% of tidal swamps have been lost since 1870 due to dikes and filling (Fresh et *al.* 2005). Suppression of winter- and spring- freshet flows combined with flood control dikes and wetland reclamation below Bonneville Dam has greatly reduced overland flows and isolated the historic tidal and floodplain habitats from the river. The creation of dikes severs the connection between floodplain and marsh habitats with the river, eliminating juvenile fish access to these habitats and preventing the export of organic matter important to the food web (Fresh *et al.* 2005). Historic flooding provided juvenile salmonids access to a wide expanse of low velocity marshland and tidal channel habitats (Bottom *et al* 2005). These habitats provided feeding and resting areas during the freshet season and supported a variety of salmon life history strategies that are no longer present in the river (Bottom *et al.* 2005, Fresh *et al* 2005). Lindley *et al* (2011) state wetland filling may also be detrimental to green sturgeon populations but no Columbia River specific information was presented.

Marshes, tidal creeks and the associated channel networks may be particularly important to small subyearling salmonids as sources of invertebrate prey, sources and sinks for detritus, and as potential refuge from predators (Bottom *et al.* 2005, Johnson *et al.* 2011). The historic wetlands were an important source of macrodetritus that is consumed by salmonid and green sturgeon prey species. With the loss of wetlands and the associated macrodetritus, the food-web has changed from a macrodetritus to a microdetritus base favoring organisms not typically consumed by salmonids. The microdetritus favors production of organisms that are prey for forage fishes such as northern anchovy (*Engraulis mordax*), Pacific herring (*Clupea harengus pallasi*) and longfin smelt (*Spirinchus thaleichthys*) which in turn are consumed by salmon in the nearshore ocean. The net effects to salmonid carrying capacity from these food web changes is not fully understood (Bottom *et al.* 2005) although Johnson *et al.*(2011) found available food does not appear to be limiting the growth and survival of juvenile salmonids. The effects on green sturgeon due to changes in the food web are also not understood.

The shallow marsh habitats are primarily important for the species exhibiting the ocean-type life history, although stream-type Chinook salmon do use marsh and forested wetland habitats (Fresh *et al*. 2005). While the outmigrating yearling salmonids are not reliant on the shallow water habitats to the degree of ocean-type salmonids, the export of prey and materials supporting aquatic food webs from the shallow, tidal freshwater habitats likely benefits all juvenile salmonid life history forms (Johnson *et al.* 2011). Green sturgeon may also move with the tide into the shallower waters to feed. Gustafson *et al.* (2010) identified the loss of nutrient outflow from marshes and swamps as a potential threat to eulachon in the Columbia River. The combination of floodplain diking and hydrologic changes has created a fundamental shift in the physical state of the Columbia River estuary ecosystem (Fresh *et al* 2005).

River Mouth and Nearshore Environment (RM -3 to +3) As described in the Corps (2011c), the Columbia littoral cell extends from Tillamook Head, Oregon north to Point Greenville, Washington. The littoral cell environment is comprised of wide, sandy shelves, and dune fields backed by sea cliffs. Climate, environmental, and anthropogenic factors have modified the movement of sediment throughout the region. Shoreline erosion has increased due to an increase in wave action and the reduction of sediment input to the littoral cell.

The Oregon shore of the River Mouth consists of a coastal plain called the Clatsop Spit, while the Washington shore at Cape Disappointment is a narrow, rocky headland. The River Mouth experiences large waves, and strong nearshore currents. The strong currents combined with an asymmetric, changing bottom create a dynamic environment at the River Mouth.

The north and south jetties were constructed at the River Mouth to create hydraulic controls to maintain a fixed navigation channel for commercial traffic at the interface of the Columbia River and the Pacific Ocean. The north jetty is approximately 2.5 miles long and was constructed between 1915 and 1917. The south jetty is approximately 6.6 miles long; the first 4.5 miles constructed between 1885 and 1895, with the last 2.1 miles constructed between 1913 and 1914 (NMFS 2005a). Construction of the jetties narrowed a broad and treacherously variable five-mile wide inlet into a stable two-mile wide inlet allowing a suitable navigation channel (LCSG 2011) The jetties modified the already complex and agitated wave environment at the River Mouth; affecting nearshore circulation patterns, shoreline accretion and erosion rates. The changes to the Columbia River flow regime and River Mouth have reduced sediment transport (see sediment/turbidity below) into to the littoral cell depleting accreted sediment around the jetty shoals resulting in a rapidly degrading nearshore environment (LCSG 2011). The continued reduction in sediment input to the littoral cell may result in significant ecosystem and physical effects including potential jetty failure. Additionally, the jetties have restricted the marine flow of nutrients into the estuary (NMFS 2011b).

Salmon and steelhead occur near the River Mouth throughout the year. Adult occurrence is primarily correlated with their period of upstream migration. Juvenile salmon may be present in the lower estuary during rearing as described in Section 2.3.1.1 and during outmigration. Peak times juvenile salmonids are present near the river mouth are March through mid-July depending upon the species. Green sturgeon are also found at the River Mouth and may be present from May through October.

At the River Mouth, there is more wave and current energy than other portions of the estuary. Yearling salmon and steelhead tend to be actively migrating through the River Mouth spending little time in the vicinity and are oriented towards the navigation channel. Subyearling salmon tend to occupy shallower areas than yearlings and may spend up to several days at the River Mouth and move with the tides (see NMFS 2011a).

Columbia River Plume The Columbia River plume is a freshwater/saltwater interface where freshwater exiting the Columbia River meets and rises above the denser saltwater of the

Pacific Ocean. The plume's location varies seasonally with discharge, prevailing near-shore winds, and ocean currents. In summer, the plume extends far to the south and offshore along the Oregon coast. During the winter, it shifts northward and inshore along the Washington coast. Strong density gradients between ocean and plume waters create fronts where organic matter and organisms are concentrated (Fresh *et al.* 2005).

While juvenile salmonid use of the plume is not completely understood, the plume is the first area salmon encounter during ocean entry and changes in plume structure may significantly influence the distribution and survival of salmon (De Robertis *et al*. 2005). The Columbia River plume may serve juvenile salmon in several ways including; distributing juvenile salmon in the coastal environment away from predation pressure closer to the shore, concentrating food resources, and providing cover from predators in the more turbid, low salinity waters (Fresh *et al.* 2005). When flows are high, such as in May and June, juveniles are found further offshore in low saline waters than when flows are lower. During years of a reduced freshet juvenile salmon are more localized around the mouth of the Columbia River (Fresh *et al.* 2005). De Robertis *et al*. (2005) report that during the two years of their study there was substantial interannual variability in the distribution patterns, growth and feeding of juvenile salmon in the vicinity of the Columbia River plume. Higher river flows and a larger plume resulted in greater prey availability, and better juvenile fish condition. The densities of juvenile salmonids were higher in the plume during the time of outmigration than in the adjacent higher salinity ocean waters.

The plume provides a high turbidity refuge from predation, provides fronts and eddies where prey become concentrated and facilitates primary production during the spring freshet (Fresh *et al*. 2005). Emmett *et al*.(2004) found age 1.0 Chinook salmon were found more often in turbid waters and Hongsheng *et al.* (2007) found juvenile salmon tended to be found in areas of the ocean with high levels of chlorophyll *a* which generally are relatively turbid. During years of low flows the amount of chlorophyll *a* observed within the plume was much lower than that observed when more normal flows occurred (Thomas *et al.* 2003 cited in Fresh *et al* 2005).

Emmett *et al.* (2004) found yearling Chinook and coho salmon off the Columbia River were distributed primarily within the upper 12 meters of the water column. Significant numbers of sub-yearling Chinook salmon appear to be "flushed" into the plume during the ebb tide, however Emmett *et al.* (2004) citing past studies, speculate that these fish probably swim to shallow, nearshore waters just off the surf zone. The subyearling fish may also inhabit the surf zone of dissipative sandy beaches (see Marin Jarrin *et al*. 2009). Dissipative beaches as described in Marin Jarrin *et al.* (2009) are flat beaches in which wave energy is dissipated in the surf zone rather than reflected from the beach face.

The change to the Columbia River flow regime has likely reduced the plume size, shape and intensity including; the surface area volume and the extent and distance of plume waters offshore. These changes probably have the most effect on populations expressing the stream-type or yearling life history although much is still uncertain (Fresh *et al.* 2005).

The plume also provides important habitat for forage fish preyed upon by salmon and steelhead. Emmett *et al* (2004) found Pacific herring, whitebait smelt (*Allosmerus elongates*) and northern anchovy to be common in the surface waters of the plume with eulachon the most dominant forge species in subsurface waters (12-24 meters).

Green sturgeon spend a significant amount of time in the marine environment. Green sturgeon adults and subadults utilize the action area for foraging, growth and development and as a migration corridor.

Sediment and turbidity. Sediment transport processes are important determinates of habitat conditions for salmon and other species in the estuary. The fine sediment supply (silts and clays) include an organic component that supports a detritus-based food web that provides the bulk of estuarine secondary production. Turbidity caused by fine sediment may protect juvenile salmonids from predators but excessive levels may cause injury to juveniles and damage spawning habitat.

Most of the estuary's sediments are composed of sand, with silt and clay sediments dominating the peripheral bays (Bottom *et al.* 2005). The sediment transport regime of the Columbia River is sensitive to changes in the annual flow cycle (Bottom *et al.* 2005). Sediment transport varies with the power of flow so decreased flows and a decrease in the incidence of high flow days decreases the total amount of sediment transport (Fresh *et al* 2005). Sediment transport, especially transport of sand, has been decreased due to climate change and human factors. The diminished transport of sand is primarily the result of a reduction in the spring freshet due to power generation, flood control and irrigation (Bottom *et al.* 2005). It is estimated that the annual average change in sediment transport at Vancouver, Washington for 1945-1999 has been approximately 50-60% of the pre-development transport with a greater reduction in sands and gravels (>70%) than for silts and clays (Bottom *et al.* 2005). Coarse sands and gravels are important for natural habitat creation in the estuary. The consequences of reduced sediment transport through the Columbia River estuary and plume are not currently known, however the magnitude of the decrease has likely impacted habitat forming processes.

Sherwood *et al.* (1990) estimate that between 1909 and 1982 one-third to one-half of the annual fluvial sediment supply to the estuary was removed each year. While there has been a decrease in sediment delivery there is still considerable sand in the LCR that is transported as bedload during high flows. The Corps (2011c) describes sand waves downstream of Vancouver, Washington as generally large, six to 12 feet high and up to 500 feet long. In the lower reaches of the estuary bedload transport is not only influenced by river bathymetry and discharge but by ocean waves and tidal currents. Main channel sand waves from RM 18 to RM 25 are downstream oriented but become progressively smaller moving downstream. Between RM 12 and RM 18 sand waves are generally less than 50 feet long but can be oriented either upstream or downstream depending on flow conditions. Downstream of RM 12 the main channel sand waves are small and reverse direction with the tide. In more shallow areas adjacent to the main channel between RM 7 to RM 12 small, downstream sand waves can form even when the main channel sand waves are reversing. Small, reversing sand waves have been found at the River Mouth during both high and low discharge seasons.

According to the Corps (2011c), flow regulation has reduced the two-year recurrence interval peak discharge from 580,000 cfs to 360,000 cfs. The bedload transport rate at discharges below

300,000 is low and sand wave movement along the river bottom is only a few feet per day. When flows exceed 400,000 cfs the bedload transport rate increases and sand waves can move downstream at 20 feet per day.

Suspended sediment loads and turbidity conditions in the LCR are characterized in the Corps (2011c). Suspended sediment concentrations range from less than 10 milligrams/liter (mg/l) at 100,000 cfs; about 20 mg/l at 200,000 cfs; from 20 to 50 mg/l at 300,000 cfs and 20 to 60 mg/l at 400,000 cfs. Levels of turbidity generally follow the hydrograph with turbidity rising during the spring freshet and winter floods. Turbidity levels are below 10 nephelometric turbidity units (NTU) most of the year and only exceed 20 NTU during high flows although turbidity can exceed 70.0 NTUs during flood flows. Tidal hydraulics influence turbidity by creating a traveling zone of higher turbidity referred to as the estuarine turbidity maximum (ETM) that is associated with the upstream portion of the salt wedge. The ETM shifts with the tide and river discharge. The decrease in sediment transport during the freshet season may have reduced turbidity making juvenile salmonids more visible to predators (Bottom *et al.* 2005, Fresh *et al.* 2005).

Increased suspended sediments and turbidity can affect all life stages of fish that prefer clear over turbid water. Excessive fine sediment in the channel substrate can reduce the survival of embryos and emerging fry (Chapman 1988) and adversely affect the growth and survival of juvenile salmonids (Suttle *et al*. 2004).

Suspended sediment and turbidity can affect primary production by reducing light transmission resulting in decreased phytoplankton and periphyton abundance (Spence *et al.* 1996). If the suspended sediment results in an increased amount of sediment deposited on the natural substrate the diversity and benthic community can be changed. Increased deposition of fine sediment can reduce the diversity of aquatic insects especially if fine sediment is deposited on gravel (Spence *et al.* 1996 Newcombe and MacDonald 1991). The particulate material in suspended sediment can physically abrade and mechanically disrupt fish gills and reduce the ability of site feeding such as salmonids to capture prey (see Wilbur and Clark 2001).

An indirect effect of turbidity is an increase in biological oxygen demand when sediments with a high organic content are mobilized. That is as organic material, especially fine material is mobilized in the water column dissolved oxygen is used to decompose the material.

Bjornn and Reiser (1991) in their review of the habitat requirements of salmonids summarized the results of studies regarding decreases in dissolved oxygen (DO) and salmonid life history functions: including swimming performance; migration; fish embryo development and survival; and growth rates. The potential harmful effects to salmonids due to reduced DO are increased with increasing water temperatures. As water temperatures rise DO becomes less soluble in water while at the same time the metabolic needs of aquatic organisms for oxygen increase.

Steelhead and coho salmon embryos and alevins need dissolved oxygen to average 8 mg/l to survive well. In their review, Bjornn and Reiser (1991) found rainbow trout survived laboratory tests at DO concentrations less than 2 mg/l but growth rates are probably limited by concentrations less than 5 mg/l. The review stated that salmonids would not be impaired at concentrations near 8 mg/l (76-95% saturation) and initial symptoms of DO deprivation would occur at about 6 mg/l (57-72% saturation). Adult salmonid migration ceased when DO fell below 4.5 mg/l and did not resume until DO levels rose above 5 mg/l. In summary, salmonids may be able to survive when DO concentrations are relatively low (5 mg/l), but growth, food conversion efficiency, and swimming performance will be adversely affected (Bjornn and Reiser 1991).

Dissolved oxygen concentrations in the LCR range between 9.0 and 15.8 mg/l (ODEQ 2008a and ODEQ 2008b). In the shallow water areas inhabited by subyearling salmon the lowest dissolved oxygen concentrations coincide with high summer water temperatures (Johnson *et al* 2011).

Contaminants The survival and productivity of both ocean-type and stream-type salmonid populations may be affected by exposure to waterborne and sediment associated contaminants. Stream-type salmonid ESUs are most affected by short-term exposure to currently used pesticides and dissolved metals that disrupt olfactory function; interfering with feeding, predator avoidance, imprinting, and homing (Fresh *et al.* 2005).

Degradation of water quality in the Columbia River estuary began in the early 1800s due to agriculture, logging, mining, industrial discharges, and storm water runoff. The estuary includes the major urban areas of Portland, Oregon and Vancouver, Washington with numerous small cities such as Longview, Washington and Astoria, Oregon. The Portland and Vancouver sewage treatment plants and sewer overflows in the Willamette River and the Columbia Slough are major sources of effluent into the estuary (Fresh *et al* 2005) although the city of Portland is in the final stages of upgrading the sewage treatment system. Contaminants may also be transported from areas upstream of Bonneville Dam such as the Yakima River, Lake Roosevelt, and other tributaries.

Fresh *et al*. (2005) summarize a number of studies identifying potentially toxic contaminants detected in the estuary. Currently used water-soluble pesticides present in the water column include simazine, atrazine, chlorpyrifos, metoachlor, diazinon, and carbaryl. The greatest concentrations and detection frequencies have been at the Willamette/Columbia River confluence with frequent detections also at the Beaver Army Terminal (RM 53.8). Trace metals that have been detected include iron and manganese (especially near the Willamette/Columbia River confluence) and high levels of arsenic. The presence of the trace materials can be due to both natural and anthropogenic sources. Probably most pertinent to the proposed action, a number of contaminants have been found in Columbia estuary sediments including trace metals (cadmium, copper, and zinc), dioxins, furans, chlorinated pesticides and other chlorinated compounds (*e.g*. dieldrin, lindane, chlordane, PCBs), DDT and its metabolites, polycylic aromatic hydrocarbons (PAHs), and other semivolatile compounds. Many of these compounds are rarely detected in the water column but tend to bind to organic carbon or particulate materials associated with fine-grained sediment in the streambed or in suspension. The Columbia River is currently classified under the Clean Water Act, section 303(d) as water quality limited for DDE (a DDT metabolite), PCB and arsenic (ODEQ 2008a and ODEQ 2008b).

The fine-grained sediments that adsorb these contaminants are usually deposited in areas of slower water velocities such as backwater areas associated with side channels and along the river's margins. There is little deposition of fine grain material in the FNC due to high river velocities. In most cases within the estuary PCB and DDT concentrations have been within guidelines for protecting aquatic life however a few hotspots for these chemicals have been identified near Longview, Washington, West Sand Island, the Astoria Bridge, and Vancouver, Washington. Concentrations of PAHs considered to be hazardous to humans and aquatic life have been detected in the lower Willamette River in the Portland area (outside the action area) (see Fresh *et al*. 2005).

Mobilization and transport of suspended sediment during extreme stream flow events or when the substrate is disturbed, such as through dredging, can make the adsorbed contaminants available to aquatic organisms. The exposure and potential effects of these compounds likely varies with life history type. Stream-type species that have a short residency in the estuary as they migrate are less likely to accumulate high levels of bioaccumulative, sediment derived, contaminants such as PCBs and DDTs. They may be susceptible to short-term exposure to contaminants such as organophosphate pesticides and dissolved metals in the water column (Fresh *et al.* 2005).

The longer residence time within the estuary places the ocean-type species at a higher risk of exposure to bioaccumulative toxins (DDT and PCBs) that they may absorb through their diet. The risk may be greatest for those ocean-type, naturally produced wild salmon that are commonly found in side-channels, tidal marshes and forested marsh habitats where fine sediments are most likely to accumulate (Fresh *et al* 2005).

Fresh *et al*. (2005) report studies have shown juvenile salmon exposure levels for some contaminants in the estuary are approaching concentrations that could affect their health and survival. PCBs have been found in juvenile fish exceeding levels that may cause health effects. Potentially toxic concentrations of DDT have been detected in juvenile Chinook salmon at sites sampled between East and West Sand Islands, Desdemona Sands and west Trestle Bay in the LCR. There is additional concern as DDT could work additively with other contaminants to interrupt reproductive processes or other physiological functions. Salmonid prey species such as invertebrates are quite susceptible to impact by DDT. Dissolved metals and current use pesticides are also a potential hazard to fish. A number of pesticides and copper have been found to disrupt olfactory function in salmon that can adversely alter normal anti-predator responses or homing behavior.

The true magnitude of potential effects to salmonids in the Columbia estuary from contaminants is not fully understood (Fresh *et al.* 2005). Studies in Puget Sound have found contaminated sites similar to those in the LCR. Those studies have shown adverse effects to juvenile salmon due to immunosuppression, reduced disease resistance, and reduced growth rates (Fresh *et al.*2005).

Contaminants are a concern for eulachon and green sturgeon as well. Eulachon have been found to carry high levels of chemical pollutants (EPA 2002), and although it has not been demonstrated that high contaminant loads in eulachon have increased mortality or reduced reproductive success, such effects have been shown in other fish species. The resuspension of harmful contaminants during dredging has been identified as a threat to eulachon in the Columbia River (Gustafson *et al.* 2010).

While green sturgeon spend more time in the marine environment than white sturgeon and therefore are less exposed to contaminants in freshwater, there is some degree of risk to green sturgeon from contaminants particularly in the Sacramento River system (17 FR17757).

The proposed action (Section 1.3) describes the Corps sediment monitoring program that is implemented to determine if sediments to be dredged from the FNC and side channels meet the requirements for in-water disposal according to the Clean Water Act and the Marine Protection, Research and Sanctuaries Act. As reported in the Corps (2011c), the most recent testing for sediment borne contaminants in the FNC was completed in 2008-2009. The analysis showed no significant changes from previous sampling efforts. The sampling confirmed that 95% of the material to be dredged in the FNC is sand. Twenty-three samples were tested for metals and none exceeded the SEF screening level for in-water disposal. Pesticides and PCBs were found in four of 23 samples but none exceeded the screening level. PAHs were detected in all of the 23 samples submitted for chemical analysis but concentrations were also below the screening level (Corps 2009b). Similar results were reported for sediment sampling between Vancouver, Washington and The Dalles, Oregon (Corps 2009c). The results of both sampling efforts determined the FNC sediment meets the SEF standards for dredging and unconfined in-water placement. Under the SEF (2009), further characterization is not required for a period of 10 years (2019).

NMFS (2011a) and the Corps (2011c) report that in 2000, the Corps contracted a sediment analysis at the River Mouth. The analysis indicates >99% of the substrate consists of sand. Some of the sediment samples were analyzed for physical and chemical contamination with no contaminants detected at or near the SEF levels. In 2008, surface grab samples were collected from sites sampled during the 2000 study. No chemical analyses were conducted but the physical results from the two studies were compared. The mean percent sand for the 2000 samples was 98.11% and for the 2008 study 98.45% mean percent sand.

The greatest level of concern that dredging may potentially expose aquatic life to sediment bound contaminants is when the fine-grained sediments in the side channels are disturbed. Below is a summary provided in the Corps (2011c) discussing the containment loads in the side channels based upon the most recent sampling.

Baker Bay West Channel. Sediment analysis in 2009 detected low levels of metals in all samples analyzed and low levels of chemical contaminants including total DDT, PCB, PAH and phthalates. All contaminant levels were below SEF screening levels and the material was determined to be suitable for unconfined in-water disposal without further testing.

Chinook Channel. Chinook channel sediments have been sampled in 1980, 1986, 1987, 1992, 1997, 2004, 2006 and 2008. Levels of metals were consistent with historical data and no pesticides, PCBs, chlorinated hydrocarbons, phenols, phthalates were detected. The material was determined to be suitable for unconfined in-water placement.

Hammond Boat Basin. Sediment samples were last collected from the Hammond Boat Basin in 1994. The analysis showed that there was little change in metals and PAHs since the previous testing in 1987. At that time it was determined that in-water or upland disposal would not result in unacceptable water column, benthic toxicity, or benthic bioaccumulation impacts. As stated in the Corps (2011c) a new sediment analysis is required before future dredging to ensure that the sediment is in compliance with more recent SEF (2009) requirements.

***Skipanon Channel*.** DDT contamination was detected in 2001 sediment sampling. Due to that result, bioassay analyses were conducted on sediment sampled in 2003. One sample exceeded existing screening levels and material in the area of the sample was determined unacceptable for in-water placement. The sediment from other areas sampled within Skipanon channel was determined to be suitable for unconfined, in-water placement. As stated in the BA, a new sediment analysis is required before future dredging to ensure that the sediment is in compliance with more recent SEF (2009) requirements.

***Skamokawa Creek*.** Analysis of sediment sampled in 2003 resulted in no exceedences of the screening levels in place at that time. As stated in the BA, a new sediment analysis is required before future dredging to ensure that the sediment is in compliance with more recent SEF (2009) requirements.

***Wahkiakum Ferry*.** Sediment at the Wahkiakum Ferry site was sampled in 1994 and again in 2005. In both cases all material was determined to be suitable for unconfined in-water placement based on the existing criteria.

Westport Slough. Chemical analyses of sediment samples conducted in 2006 indicated very low levels of PCBs, pesticides, PAHs, phenol and hexachlorobutadiene. All the samples were below 2006 screening standards and determined to be suitable for unconfined in-water placement.

Old Mouth Cowlitz. The Old Mouth Cowlitz side channel was last sampled for contaminated sediments in 2006. Only very low levels of contaminants were detected and all were well below SEF (2009) screening levels. The results were consistent with historic data and all samples were determined to be suitable for unconfined, in-water placement.

***Upstream Entrance to Oregon Slough*.** When last sampled in 2001, sediment in the Upstream Entrance to Oregon Slough were determined to be suitable for unconfined, in-water placement as defined by the existing screen criteria. As stated in the Corps (2011c) a new sediment analysis is required before future dredging to ensure that the sediment is in compliance with more recent SEF (2009) requirements.

***Portland-Vancouver Anchorage*.** There has been no recent Portland-Vancouver Anchorage sediment contaminant testing.

Avian Predation. Predation is a major source of mortality for all salmonid populations. Predation on salmonids may have increased from historical levels due to both native and introduced predators. Native predators include California sea lions (*Zalophus californianus*), Steller sea lions, northern pikeminnow (*Ptychocheilus oregonensis*), double-crested cormorants and Caspian terns. The smallmouth bass (*Micropterus salmoides*) is a common non-native predator. The increased avian predation by Caspian terns and to some extent double-crested cormorants can be attributed to the creation and maintenance of the FNC.

Caspian terns have a worldwide distribution. The western North American population more than doubled between 1980 and 1999 substantially due to an increase in human-created, high quality nest sites. Before 1984, there was no known Caspian tern nesting in the Columbia River estuary. Caspian tern nesting now occurs in the estuary as the birds were drawn to islands created or augmented with material dredged from the FNC. The birds first established a nest site on material newly deposited on East Sand Island when approximately 1,000 pairs apparently moved from Willapa Bay. The birds then moved to man-made Rice Island in 1986. The Caspian tern nesting population in the estuary has since expanded to between 9,000 and 10,000 pairs. By 2001, the majority of Caspian terns on the west coast were nesting on East Sand Island (Fresh *et al.* 2005).

Caspian tern nesting begins soon after the birds' arrival in the estuary in March through April. The birds prefer to nest on islands with barren sands to avoid predators. The arrival of the piscivorous birds coincides with the outmigration of many salmonid populations. When the terns were nesting on Rice Island, over 80% of their diet during the peak outmigration of steelhead, yearling Chinook salmon, and coho salmon consisted of the juvenile salmonids (Fresh *et al*. 2005). Stream-type juvenile salmonids are most vulnerable to predation by Caspian terns because the juveniles migrate through low turbidity, deep-water habitats near the tern nesting islands. Efforts to relocate the terns from Rice Island downstream to East Sand Island, which has an abundance of alternative prey including Pacific herring and anchovies, have reduced the tern consumption of juvenile salmonids.

The Corps in 1999 initiated actions to relocate the terns. The actions included installing silt fence on the Rice Island nesting site to reduce suitable nesting habitat, limited hazing, constructing suitable habitat on East Sand Island and using calls and decoys to attract the birds. The relocation efforts have been successful as all Caspian terns in the Columbia River estuary have nested on East Sand Island since 2001. Vegetation has over grown the Rice Island site and the Corps continues hazing as necessary to preclude Caspian terns from nesting on Rice Island, Miller Sands Spit, and Pillar Point (NMFS 2005b). The relocation efforts appear to have been successful in reducing salmonid mortality due to Caspian terns. Fresh *et al.* (2005 citing Collis *et al* 2001a and Roby *et al* 2003), reports that salmonid consumption by Caspian terns was estimated at 7.3 million smolts in 2000 which was 4.4 million less than 1999 and by 2001 had dropped to 5.9 million smolts. The Caspian tern consumption rate of smolts remained somewhat steady through 2006, as according to the Corps (2011c), between 5.8 and 7.5 million smolts are estimated to have been consumed by terns in 2006. In 2009 and 2010 tern consumption has remained steady between 6.5 and 5 million smolts respectively. In 2011, 7,000 tern pairs are estimated to have consumed 4.8 million smolts (Bird Research Northwest 2012).

Predation on juvenile salmonids by double–crested cormorants has been an increasing concern. The East Sand Island breeding population of double-crested cormorants has increased from zero in 1977 to 91 pairs in 1989, 4,500 pairs in 1997 and was estimated at 11,000 pairs by 2003. Double crested cormorant breeding population on East Sand Island increased to 12,000 and 14,000 breeding pairs consuming 11.2 and 18 million smolts in 2009 and 2010 respectively. The

East Sand Island now supports the largest double-crested cormorant nesting colony on the west coast of North America (Lyons *et al* 2011). In 2011, 13,000 double-crested cormorant pairs consumed an estimated 22.6 million smolts. A nearby colony of Brandt's cormorants has also increased to 510 breeding pairs (Bird Research Northwest 2012).

Pile dikes constructed for the FNC provide resting, loafing and feeding platforms for the birds. In 2000, the Corps installed avian spike strips (bird excluders) on nine dikes between RM 22.75 and RM 38.26. Bird excluders were placed on an additional eight dikes between RM 4.01 and RM 51.2 in 2001. Monitoring showed the excluders were effective in reducing the number of cormorants foraging near the dikes upstream of RM 22.75. The excluders also worked in downstream areas, where installed, but the birds merely shifted to pile dikes without the excluders. The excluders were not installed on the remaining pile dikes in the lower river due to concerns regarding the small Brandt's cormorant colony and the presence of brown pelicans. Subsequently, the installation of the bird excluders was determined to be not cost effective due to the rising double-crested cormorant population and the birds are not reliant on the structures for loafing or perching as they will forage in open water (NMFS 2005b). The Corps is currently preparing a double-crested cormorant management plan.

Stranding. Large, deep-draft vessels produce wakes that have been observed to strand juvenile salmon on beaches and have been identified as a threat to recovery of several salmon species (NMFS 2011b). This threat is most detrimental to ocean-type fry that are less than 60 mm long, rear inches from shore and may become stranded as waves recede from the shore. The extent of this problem is unclear but there have been three studies suggesting that under certain conditions, deep-draft vessels can produce wakes that strand juvenile fish (Pearson and Skalski 2010 and NMFS 2011b). Pearson and Skalski (2010) observed 126 vessels passing in the lower Columbia of which 46 resulted in stranding events at three beach sites. Subyearling Chinook salmon were the most common species stranded.

No single factor appears to be the cause of juvenile salmon stranding. Larger, fast traveling ships increase the incidence of stranding as they produce greater extent of drawdown and run-up along the beach. Tides are another factor. Lower tidal heights tend to increase the stranding as wave height tends to decrease with increasing tidal height (Pearson and Skalski 2010). Other factors that increase the potential for stranding include beaches with low slopes and distance to the FNC; as the closer a beach is to the FNC, the greater potential for stranding. Naturally, fish presence and use of the near-beach habitat is another important factor.

NMFS (2011b) reports that a study examining wave characteristics and beach geomorphology in the LCR estimated approximately 33 miles of shoreline, between the River Mouth and Vancouver, Washington, exhibit traits that may cause stranding. The study however did not look at fish densities adjacent to the beaches. Restoring some manmade beaches to more natural conditions may help reduce the incidence of stranding (Pearson and Skalski 2010).

Disposal of dredge material at beach nourishment sites could increase the incidence of stranding if habitat is provided for juvenile salmonids and the resulting beaches have low slopes that are geomorphically conducive to stranding.

2.3.4 Environmental Baseline Summary

The development of the Columbia River including the construction of the FNC, dams throughout the Columbia River basin, flood control structures, urban development and climate change have impacted the PCE of critical habitat for green sturgeon, eulachon, and the 13 species of salmon considered in this opinion. The combined effect of flow and habitat changes on estuarine habitat has been to reduce the amount of shallow-water habitat (especially vegetated habitat such as swamps and marshes). The changes that have occurred that reduce stream flows and sediment routing into the ocean have impacted the nearshore ocean environment and have unknown effects on the extent of plume habitat. The habitat changes and development of the Columbia River for hydropower have altered the food-web in the estuary but the potential impacts to ESA listed species are not fully understood. However, the available prey base does not appear to be limiting the growth and survival of juvenile salmon and steelhead. The changes to the estuary habitat have been most pronounced on salmon expressing ocean-type life histories that rely on the shallow water habitats. Flow changes affecting the plume and avian predation are probably more significant for stream-type salmonids. The potential impacts to eulachon due to changed habitat conditions in the Columbia River estuary are poorly understood.

Contaminants in the sediment and water column are a concern for the salmon and steelhead species as well as eulachon and green sturgeon. The small ocean-type juveniles are also susceptible to beach stranding as they are washed ashore by ship wakes.

Bonneville Dam and dams on Columbia River tributaries below Bonneville Dam have blocked eulachon access to historical spawning habitat. The alteration of flows, reduced nutrient outflow from marshes, and swamps, and exposure to contaminants has likely diminished the habitat quality for eulachon.

The development and maintenance of the FNC has contributed to limiting factors and threats to both individuals and PCEs of critical habitat that inhibit the recovery of the ESA listed species identified in Section 2.2.2 of this opinion (Tables 32, 33 and 34).

Table 32. Limiting Factors and Threats identified in Section 2.2.2 and Gustafson (2010) related to the FNC that may affect Eulachon Physical and Biological Features

Physical and Biological Features	Limiting Factor or Threat
Freshwater spawning rearing and incubation Freshwater Migration	Altered sediment balances, Water pollution Dredging

Table 33. Limiting Factors and Threats identified in Section 2.2.2 related to the FNC that may affecting the Estuarine and Neashore PCEs for ESA-listed salmon and steelhead species considered in the opinion (except SR spring/summer-run Chinook salmon, SR fall-run Chinook salmon, SR sockeye salmon),

Limiting Factor or Threat	Species
Degraded estuarine and near-shore marine habitat	LCR Chinook salmon, UCR spring-run Chinook salmon, SR fall-run Chinook salmon, CR chum; LCR coho salmon; LCR, MCR steelhead
Degraded freshwater habitat; reduced complexity and access to off-channel rearing habitat in the LCR	LCR Chinook salmon, CR chum, LCR coho salmon, LCR steelhead
Reduced productivity resulting from sediment and nutrient-related changes in the estuary	LCR Chinook salmon, CR chum, LCR coho salmon, LCR steelhead
Juvenile fish strandings that result from ship wakes	LCR Chinook salmon, CR chum, LCR coho salmon
Contaminants affecting fish health and reproduction	LCR Chinook salmon, CR chum, LCR coho salmon, LCR steelhead
Avian predation	LCR, MCR UCR and SRB steelhead

Table 34 Threats identified in Section 2.2,.2 and Lindley *et al* (2011) related to the FNC That may affect the Estuarine and Coastal Marine Area PCEs for Green Sturgeon

Primary Constituent Elements		Threat
Site Type	Site Attribute	
Estuarine areas	Food resources Migratory corridor Sediment quality Water quality	Disturbance of bottom substrates adversely affecting prey resources. Disposal activities burying food resources. Re-suspension of contaminated sediments. Wetland filling Disposal activities burying green sturgeon.
Coastal marine areas	Food resources Migratory corridor Water quality	Disposal activities burying food resources Disposal activities burying green sturgeon

2.4 Effects of the Action on the Species and its Designated Critical Habitat

"Effects of the action" means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.

The following effects analysis was conducted based on the dredging program in 2011, the one year of information available since completion of the 43 foot FNC. NMFS believes 2011 provides a good indication of potential future impacts as 2011 was a high flow year with significant shoaling. The 2011 discharge was the 13th highest flow year since 1989 placing it almost exactly at the 10% exceedence level, meaning that only one in ten years was as high (Domingue 2012). Therefore, the 2011 dredging should be represent a high level of potential future impacts and may be indicative of future impacts given potential changes in the hydrograph due to climate change. The Corps also proposes to shift the channel approximately 300 feet to the west at approximately RM 10+15 and 300 feet to the east at approximately RM 4+10. The proposed shift is still within the authorized channel. Little change in overall channel morphology is expected as the area is within a wide reach of the River so any additional channel adjustment is expected to be minimal; and therefore the effects of the shift are not expected to be significantly different than the effects due to the 2011 operations.

2.4.1 Direct Effects – Entrainment and Burial

Entrainment occurs when organisms are trapped during the uptake of sediments and water by dredging machinery. The potential for entrainment depends upon the likelihood of fish occurring during the dredge period, the dredge depth, fish densities at the time and location of dredging operations, how the dredge is operated, and the species' life stage. Juvenile salmonids, green sturgeon and eulachon adults, eggs and larvae may be entrained by pumps used to intake water during dredging or disposal. Burial may occur if fish are trapped when the dredge material is deposited within the flow lane. Chinook and chum salmon spawning and incubation in the Columbia River are not likely to be affected due to the in-water work period limits dredging and in-water disposal between Columbia River RM 106.5 and RM 145 to between August 1 and September 30, prior to spawning.

Salmon and Steelhead. Adult salmon and steelhead may be migrating upstream through the River Mouth and estuary at any time of the year with the majority of fish moving through the area between early spring and autumn. The adult fish are generally migrating mid-channel and may be found throughout the water column, usually within the upper 25 feet but may be found to depths of 50 feet. Adult fish are primarily migrating above the depths dredges are operated but it would not be uncommon for adult fish to be found at the dredging depth. Adult salmon and steelhead are strong swimmers however and should be able to avoid dredges, discharge plumes and burial, NMFS is confident any potential for adult fish to be entrained or buried by the dredges is discountable.

Dredging in the FNC is most likely to affect outmigrating yearling salmonids (smolts) while subyearling salmonids are most susceptible to potential entrainment in the side channels.

Effects to yearling salmonids (smolts.) NMFS (2009b and 2011a) reviewed the information regarding entrainment of juvenile salmon and steelhead due to dredging in the

Columbia River. Those studies included Buell (1992) and R2 (1999). Buell 1992 implemented a study to determine the potential for entrainment if a dredging operation continued past an in-water work period ending March 31, thus during the smolt migration. Buell (1992) conducted their study between RM 102.2 and 102.5 of the Columbia River. Dredging 700,000 cy of material between March 24 and April 10 resulted in no salmonids entrained. They also reported on a study in the Fraser River, Canada, where in certain areas, under certain conditions, salmon smolts were entrained by hopper dredge operations. Most of the fish were entrained during start up and clearing operations when the dredge was operated near the water surface. The Fraser River entrainment problem was greatly reduced by conducting startup and clearing operations within five feet of the channel bottom. Timing recommendations were also made to avoid areas where juvenile salmon were known to concentrate. Buell (1992) added the most important precaution to avoid entraining salmon is to engage startup and clearing operation near the bottom.

The R2 (1999) study included a sample site between Columbia River RM 70.7 and 71.9 in May. Out of 42 samples, two salmonids were entrained. The study included another Columbia River site and sites in five coastal rivers. The two fish entrained in the Columbia River were the only salmonids entrained out of 391 samples in their study. The R2 (1999) report also cited a study in Grays Harbor, Washington where 798 samples resulted in the entrainment of one chum salmon.

In addition to entrainment, juvenile salmonids could potentially be buried during in-water disposal. Both hopper and pipeline dredges will dispose material within the flowlane in waters at least 20 feet deep. Pipeline dredges continually discharge the material during operations through a downpipe with a diffuser at the end. The downpipe extends 20 feet below the surface and is moved during discharge to minimize mounding. Hopper dredges operate until the hopper is near capacity. The vessel then moves to the placement area where disposal occurs while the vessel is moving. The rate of disposal depends upon how many hopper doors are open or, with split hull hoppers how far the hull is opened. Dredges normally draw between 19 to 20 feet when fully loaded rising to about 13 to 22 feet when empty.

Depending upon the vessel disposal from the hopper dredged result in a discharge plume of 1,134 ft^2 (0.03 acres) per minute to 4,806 ft^2 (0.11 acres) per minute (Smith 2012c). Disposal from the hopper dredges takes approximately five minutes.

The Corps assessed the potential effects of the discharge plume from a hopper dredge on smolt-sized fish for the previous dredging operations and maintenance consultation (Corps 2005, NMFS 2005b). Material discharged from a hopper dredge creates a plume as it falls through the water. As the plume descends it is diluted by mixing with the river water, spreading out along the bottom until the energy is expended. The downward velocity is greatest as the initial material is released. The density and velocity diminish as the material is released during the five minutes of discharge. The first layer of the plume hits the bottom two to three seconds after release.

As the plume mixes with water, the density and downward acceleration decrease. According to the Corps analysis, a six-inch fish will experience a sustained downward force if it resists being entrained by the plume. If a fish does not resist the force it would most likely displaced by the leading edge or boundary layer of the plume. The Corps analysis also states the boundary layer will likely prevent a fish from becoming caught in the plume and that even if a fish is entrained by the plume the boundary layer established as the plume hits the bottom will displace the fish laterally, preventing the fish from directly impacting on the bottom. This suggests that fish are likely to be injured rather than killed by entrainment in the plume. However, there is still considerable uncertainty regarding the effects of this type of entrainment.

Outmigrating smolts may be present in the LCR in February with peak abundances occurring in April and June. The smolts tend to be found in the deeper channels such as the FNC and side channels. The migrating smolts can be found at depths over 30 feet but are generally higher in the water column. Outmigrating steelhead are usually found in the upper portions of the water column while Chinook salmon smolts will migrate deeper in the water column.

The FNC normal or routine dredging operating season is June 1 through December 31; however non-routing dredging may occur any time of the year. Therefore dredging is likely to occur when the smolts are present in the FNC. In 2011, the only year of dredging since completion of the 43 foot deep channel, dredging occurred in during the smolt out migration in March and May as well as June for a total of 23.6 days.

Based upon the above mentioned entrainment studies, the potential number of smolts entrained by dredging operations is likely to be very small in any one year but over the time period of this consultation (50 years) the potential for entrainment of a small number of smolts cannot be discounted. NMFS also is of the opinion that some smolts, again a very few in any one year, are likely to be buried or injured upon impact with the bottom by the initial discharge of the disposal.

NMFS cannot accurately quantify the number of smolts likely to be killed or injured in any one year as the abundance and distribution of smolts at a dredging site at the time of operations is not known. However, based on previous estimates (NMFS 2005a and 2005b), the very small number of smolts that may be killed or injured will not appreciably reduce the abundance of any affected population. NMFS (2005a) reviewed the results of a hydroacoustic study that found during the greatest ESA-listed salmonid abundance in the Lower Columbia River, only 0.0017% were within three feet of the FNC bottom where dredging would occur during daylight hours; 0.0249% were beside the dredging zone during evening hours; and 0.0107% at night.

NMFS, using a dredging impact analysis provided by the Corps, conducted an analysis (impact analysis) to better quantify the potential duration, frequency, intensity and severity of dredging effects on both smolts and habitat. The analysis is documented in Appendix 2 of this document. The Corps divides the FNC into river segments to manage the dredging operations (Table 35).

Table 35. River Segments and Main Tributaries.

River Segment	Channel	Length*		Tributaries
		D/S RM	U/S RM	
1	43-foot	3	25.2	Grays River (RM 22)
2	43-foot	25.2	48.2	-
3	43-foot	48.2	67.1	-
4	43-foot	67.1	83.8	Cowlitz (RM 68) & Kalama (RM 73)
5	43-foot	83.8	97.8	Lewis (RM 87)
6	43-foot	97.8	105.3	-
7	17-foot	105.3	125.3	Sandy (RM 120)
8	17-foot	125.3	136.4	-
9	17-foot	136.4	145.3	-

* D/S RM means downstream river mile; U/S means upstream river mile.

The Corps provided information describing the dredge and disposal production rates as well as the area impacted per minute for both dredging and disposal from different vessels. The Corps also provided a history of the 2011 dredging and disposal operations as well as the dimensions of the navigation channel needing dredging, the area of the navigation channel that does not need dredging, the flowlane and total channel area. NMFS is assuming that the total area of the navigation channel and flowlane deeper than 20 feet is within the main river flow that outmigrating smolts are most likely to occupy. NMFS calculated the percentage of the smolt habitat potentially affected compared to the total habitat area likely to be occupied by smolts (Table 36).

Table 36. Estimated Lower Columbia Smolt Migratory Corridor (estimated smolt habitat equals the sum of the flowlane used for placement + the flowlane not used for placement)

River Segment	Area of navigation channel that needs dredging to maintain depth (acres)	Area of flow lane deeper than -20-ft contour used for placement (acres)	Area of navigation channel that does NOT need dredging to maintain depth (acres)	Area of flow lane deeper than -20-ft contour NOT used for placement (acres)	Total Estimated Smolt Migratory Habitat (acres)	Estimated Percent Habitat Potentially Affected
1	1,208	138	1,790	23,383	23,521	6%
2	885	358	1,110	8,631	8,989	14%
3	438	330	1,270	4,870	5,200	15%
4	412	248	1,222	4,393	4,641	14%
5	315	193	955	3,158	3,351	15%
6	42	28	656	2,113	2,141	3%
7	81	110	910	3,200	3,310	6%
8	12	28	438	2,123	466	9%
9	1	0	339	1,220	1,220	0.08%

Up to 15% of the available smolt habitat could potentially be affected by dredging and flowlane disposal activities (Table 36). However, only a portion of the available habitat is affected by dredging and disposal during the smolt outmigration, so equating the potential harm from dredging and flowlane disposal to the total potentially occupied habitat affected overestimates the duration, frequency, intensity, and severity of potential effects to smolts. In addition, the vessels are not actively dredging or disposing material 24-hours a day, so the effects only occur over a fraction of the time that smolts may be present in the habitat. Using the cycle times provided by the Corps and the amount of dredging that occurred in 2011, NMFS assessed the relative potential for smolts to be entrained or buried based upon the amount of potentially occupied habitat affected by dredging and disposal activities that occurred during the 2011 outmigration relative to the total potentially occupied habitat; and the amount of time dredging and disposal activities occurred compared to the total time (March – June) smolts are likely to have been present.. Tables 37 and 38 display the percentage of smolt rearing and migration habitat where fish would be exposed to the risk of entrainment and burial at any one time during the migration period each year.

Table 37. Dredging Impacts to Smolt Outmigration Habitat March-June 2011(% Affected= affected area per dredging minute x total dredging minutes)/total habitat area available per minute x total minutes).

River Segment	Affected Area per Dredging Minute (acres)	Total Dredging Time 2011 (min)	Total Area (acres)	Total Time available 2011 (min)	% Affected/Total
1	0.07	1,045	23,521	175,680	.002%
2	0.06	16,840	8,989	175,680	.064%
3	0.03	1,152	5,200	175,680	.004%
5	0.04	909	3,351	175,680	.006%
6	0.002	23,421	2,720	175,680	.01%
7					
8					
9					

Table 38. Disposal Impacts to Smolt Outmigration Habitat March-June 2011(% Affected= affected area per disposal minute x total disposal minutes)/total habitat area available per minute x total minutes).

River Segment	Affected Area per Disposal Minute (acres)	Total Disposal Time 2011 (min)	Total Area (acres)	Total Time available 2011 (min)	% Affected/Total
1	0.67	88	23,521	175,680	.001%
2	0.66	1,416	8,989	175,680	.059%
3	0.62	96	5,200	175,680	.007%
5	0.64	76	3,351	175,680	.008%
6	0.019	308	2,720	175,680	.001%
7					
8					
9					

Thus, the amount of area impacted compared to the available habitat and time of the impacts compared to the total time of smolt outmigration (Tables 37 and 38) results in a very low potential for the smolts to be entrained (.002% - .064%) or buried (.001% - .059%) in the reaches actually dredged during the 2011 outmigration period. It is also worth noting that there was no dredging activity in river segments 7, 8, and 9 during the outmigration. Stated slightly differently, the area affected by dredging at any one time during the duration of the proposed action is extremely small when compared to the total amount of habitat available to the affected species within the action area. The chance that individual fish will be within this area and killed or injured by entrainment is small but not discountable. This conclusion is supported by the results of the Buell (1992) and R2 (1999) studies. Since only a small number of smolts are likely to be entrained or buried during any given year, the proposed action will not cause appreciably reductions in population abundance or productivity for any of the affected salmon steelhead species.

A similar analysis was completed to estimate the potential impact to smolts at the River Mouth. Information regarding the 2011 dredging operation at the River Mouth (RM -3 to RM +3) was provided to NMFS in Smith (2012n) and Smith (2012o). At the River Mouth, the smolts are primarily outmigrating through the FNC. Therefore, the amount of potentially occupied smolt habitat is approximately six miles multiplied by the width of the FNC, 2,640 feet or 1,920 acres. As with the other river segments, the whole FNC is not dredged each year and most of the shoaling at the River Mouth occurs between RM -2.0 to RM +2.5 (Corps 2011c). Dredging the River Mouth typically begins in mid-June or early July (Smith 2012o). In 2011, the River Mouth was dredged in June by the *Essayons* for 126 hours and 49 minutes. The remainder of the River Mouth dredging occurred in and in August and September outside the primary smolt migration time period. Conducting an analysis similar to that outlined in Appendix 2 to assess the potential for smolts to be entrained, the relative amount of area impacted by the June dredging operation compared to the total habitat potentially occupied by smolts and the time the smolts may be present was .001% (Table 39)

Table 39. Dredging Impacts to River Mouth Smolt Outmigration Habitat -June 2011(% Affected= affected area per dredging minute x total dredging minutes)/total habitat area available per minute x total minutes)*.

Affected Area per Dredging Minute (acres)	Total Dredging Time 2011 (min)	Total Area Smolt Habitat (acres)	Total Time available June, 2011 (min)	% Affected/Total
0.07	7,609	1,920	43,200	.001

*According to Smith (2012n and 2012o) in 2012 the River mouth was dredged in August through October, although dredging could start in June. For this analysis it was assumed the *days of Essayons* operation at the River Mouth are assumed to have occurred in June

NMFS believes the potential for smolts to be buried by disposal activities at the River Mouth is discountable (see ocean disposal discussion below).

In summary, we believe there is a very small potential for an unquantifiable number of individual salmonid smolts to be entrained or buried in one year. The potential for smolts to be entrained or buried is minimized do to the very small amount of potential occupied habitat affected (Tables 37 – 39) and due to:

- Studies indicating very few smolts are likely to be entrained during Columbia River dredging operations.
- The very small percentage of time and area dredging and disposal occur compared to the amount of potentially occupied habitat and time the smolts may be migrating.
- BMPs that call for dragheads and cutterheads to be buried in the substrate during operations and raised no more than three feet off the bottom if reverse purging or cleaning is necessary.
- The whole water column is not affected by the discharge plume during disposal. The bottom of the hoppers are 19 to 20 feet below the surface when the material with the greatest discharge velocity is released and pipeline dredge downpipes will be at least 20 feet deep when discharging.
- Most of the dredging operations occur after the smolt outmigration is complete and there is to be no dredging and disposal between RM 106.5 to RM 145 during the smolt outmigration.

Yearling salmon may be affected by ocean disposal of the dredged material. The outmigrating smolts are most likely to be in the vicinity of the Deep Water disposal site within the Columbia River plume. The fish are likely to be spread out in the plume and we cannot predict how many fish may be present in the vicinity of the disposal site in any one year. The yearling Chinook and coho salmon are found primarily within the upper 12 meters of the water column. The Deep Water site lies 6 miles off shore in waters 190 to 300 feet deep. The 5.0 square nautical mile placement area is extremely small compared to the area of available habitat. We believe the potential for yearling salmonids to be killed or injured during ocean disposal is discountable due to:

- The small area affected compared to the potentially occupied off shore habitat.
- The Deep Water site is only to be used when the other off shore sites are at capacity or weather conditions prevent their use.
- The depth of the water should allow for any fish encountering the initial disposal plume to be dispersed out of the disposal plume by boundary forces or able to escape as the downward acceleration slows before they impact the bottom.

Effects to Sub-Yearling Salmonids. The proposed action includes dredging in nine Columbia River side channels. The dredging depths for the side channels range from 9 to 20 feet deep (Table 40). Yearling salmon generally do not spend significant amounts of time rearing in side channels except during their outmigration from streams that are tributary to the side channels. The proposed action in-water work period for the side channels is from August 1 through December 15, so the potential impacts to yearling salmon and steelhead outmigrating as smolts is likely to be very small as few if any smolts are likely to be present. The side channel projects may directly impact subyearling salmon that favor the shallow water habitats.

Table 40. Side channel dredging (Smith 2012f).

River Segment	Side Channel	Project Depth (feet)	Total Dredging/shoaling acres
1	Baker Bay West Channel (RM 2.5)	16	42.4
1	Chinook Channel (RM 5)	10	25.6
1	Hammond Boat Basin (RM 7)	10	2.4
1	Skipanon Channel (RM 10)	16	42.0
2	Skamokawa Creek (RM 33)	6.5	4.0
2	Wahkiakum Ferry Channel (RM 43)	9	5.2
2	Westport Slough (RM 43)	20	12.0
3	Old Mouth Cowlitz (RM 67)	8	5.2
7	Upstream Entrance to Oregon Slough (RM 109)	10	13.8

Subyearling salmon tend to inhabit shallow waters such as tidal wetlands side channels, mud and sand flats and beaches until they attain sufficient size to exploit deeper channels and open water habitat. The subyearling fish are commonly found near the shoreline in low velocity currents at depths from 1 to 2 meters although they have been observed at depths of 20 feet.

The highest densities of juvenile salmonids occupying shallow-water habitats occur in the spring (0.07 fish/m^2) when all species are present with the second highest densities occurring in the winter (0.02 fish/m^2) and lowest densities in the summer and fall (less than 0.005 fish/m^2). Chinook and coho salmon are found year-round, chum salmon in the winter and spring and juvenile steelhead are the least common salmonid observed in the Columbia River shallow-water habitats. The spring is when the average size of the fish was smallest while in winter there was a bimodal size distribution of larger and smaller fish (Johnson *et al* 2011).

Dredging during the August 1 through December 15 side channel in-water work period will occur when the subyearling salmon densities in shallow-water habitat are the lowest; although there is a movement of fingerling Chinook salmon into the estuary during August that tapers off through the fall (Fresh *et al* 2005). This is especially true near the Cowlitz River as the peak subyearling outmigration occurs in August (West 2012a and West 2012b). The juvenile salmon in the estuary in November and December tend to be larger fish, approaching 100 mm mean length (Johnson *et al* 2011). The larger juveniles are more likely to occupy the more open water habitats of the side channels and main FNC adjacent to the shallow water habitats. The Johnson *et al* (2011) study was focused on shallow water habitats using beach seines, so how well the above densities reflect the potential densities in the more open portions of the side channels is uncertain.

Not all the side channels require dredging on an annual basis. Skipanon was last dredged in 2003, Skamokawa Creek in 1993, Wahkiakum Ferry Channel Westport Slough and Old Mouth Cowlitz River are likely to require dredging two or three times every five years and the Upstream Entrance to Oregon Slough was last dredged in in 2001. Clamshells are typically used to dredge the side channels although hopper and pipeline dredges may also be used.

Disposal of material from the side channels occurs in the Columbia River flowlane, Area D, BB-3 or at upland sites. The disposal areas are locations where the potential occupancy by subyearling salmon is very low and thus the potential for subyearling salmon to be killed or injured by disposal is discountable.

Eulachon. The potential impacts of dredging on eulachon is a concern. Entrainment of eulachon by dredging has been documented at the River Mouth (Corps 2007). Gustafson *et al.* (2010) citing Romano *et al* (2002) and Anderson (2009) discusses potential threats of dredging activities in the Cowlitz and Columbia Rivers. The risk to eulachon due to dredging depends upon the timing, location, and life stage of eulachon present. According to the information presented in Gustafson *et al* (2010), the Washington Department of Fish and Wildlife considers dredging to be a low risk to adult eulachon and larvae in the mainstem Columbia; however, the risk to eggs from dredging and disposal is considered risk. It has been suggested eulachon eggs may not survive along the bottom of the FNC due to the dynamic nature of the substrate. However, eulachon are adapted to glacial rivers with high sand loads and there is some indication that the eggs may become encrusted in sand particles offering some protection (Romano 2012).

NMFS convened a meeting with biologists from the Oregon and Washington Departments of Fish and Wildlife and Cowlitz Indian Tribe to discuss the current state of knowledge regarding Columbia River eulachon on January 27, 2012. During the meeting, some concern was expressed regarding the potential entrainment of adult eulachon by hopper and pipeline dredges; however, the greatest concern was over entrainment and burial of larvae and eggs during dredging and disposal operations. The biologists present at the meeting could not identify specific portions of the river more likely to be occupied by eulachon. The fish spawn in the mainstem Columbia River, Grays River, Skamokawa Creek, Elochoman River, Kalama River, Lewis River and Sandy River. Current knowledge suggests the eggs and larvae can be present throughout the water column. The consensus method to avoid killing or injuring eulachon expressed at the meeting is to avoid dredging and disposal operations when any life stage is potentially present within the action area.

Eulachon typically enter the Columbia River from mid-December through May but the fish have appeared as early as November. Spawning occurs soon after the fish arrive. The average initial commercial landing date is January 25 in the Cowlitz River and March 21 in the Sandy River and April 1 in the Kalama River. The eggs are believed to hatch in 30-40 days so it is reasonable to expect some life stage to be present from February through May.

NMFS has no way to estimate how many eulachon, especially eggs and larvae may be killed by dredging and disposal. Therefore, NMFS conducted an impact analysis similar to that completed for salmon and steelhead smolts. The analysis was based upon the 2011 dredging activities. The Corps proposed in-water work period for routine operations ends December 15 (Smith 2012b), prior to the normal peak migration. However, non-routine dredging can occur at any time outside the routine in-water period. Acknowledging that in some years there may be an uncertain portion of the eulachon spawning population entering the Columbia River in late November, the analysis was based upon the 2011 activities from December through May to account for the time eulachon adults and eggs are most likely to be present. NMFS believes the December – May period provides a conservative (for the fish) approach to assessing the potential impacts. The full analysis is documented in Appendix 2.

Since eulachon eggs and larvae and potentially adults may be spread throughout the Columbia River, the total river channel was considered to be potential habitat (Table 41).

Table 41. Federal Navigation Channel and Potential Eulachon Habitat.

River Segment	Area of navigation channel that needs dredging to maintain depth (acres)	Area of flow lane deeper than -20 ft contour used for placement (acres)	Total Estimated Eulachon Habitat (acres)(From Table A2-9	% Potentially Affected Area
1	1,208	138	76,100	2%
2	885	358	23,220	5%
3	438	330	9,690	8%
4	412	248	6,840	10%
5	315	193	5,060	10%
6	42	28	2,720	3%
7	81	110	10,350	2%
8	12	28	6,200	1%
9	1	0	2,780	.04%

Table 41 indicates that up to 10% of the available habitat potentially occupied by eulachon during dredging and disposal may be affected resulting in some killed or injured eulachon of some life stage. The greatest potential impacts occur in river segments 4 and 5 coinciding with the mouths of the Cowlitz, Kalama and Lewis rivers, important spawning streams.

The whole river channel is not dredged, nor is the dredging and disposal activity continuous during operations. As with the smolt analysis, NMFS assessed the potential for dredging and disposal impacts to eulachon individuals based upon the amount of potentially occupied habitat impacted and time those impacts occurred between December and May, relative to the total potentially occupied habitat and total time some eulachon life stage, particularly adults or eggs may be present (Tables 42 and 43).

Table 42. Dredging Impacts to Eulachon Habitat December-May2011 (% Affected= affected area per dredging minute x total dredging minutes)/total habitat area available per minute x total minutes).

River Segment	Affected Area per Dredging Minute (acres)	Total Dredging Time 2011 (min)	Total Area (acres)	Total Time available 2011 (min)	% Affected/Total
1	0.07	1,045	76,100	262,080	.0004
2	0.06	15,985	23,220	262,080	.0158
3	0.03	1,152	9,690	262,080	.0014
4	0.003	18,265	6,840	262,080	.0003
5	0.06	624	5,060	262,080	.0028
6	0.002	25,403	2,720	262,080	.0071

Table 43. Disposal Impacts to Eulachon Habitat December-May 2011(% Affected= affected area per dredging minute x total dredging minutes)/total habitat area available per minute x total minutes)

River Segment	Affected Area per Disposal Minute (acres)	Total Disposal Time 2011 (min)	Total Area (acres)	Total Time available 2011 (min)	% Affected/Total
1	0.67	88	76,100	262,080	.0003
2	0.66	1,344	23,220	262,080	.0146
3	0.62	96	9,690	262,080	.0023
4	0.03	18,265	6,840	262,080	.0334
5	0.66	204	5,060	262,080	.0102
6	0.55	341	2,720	262,080	.0263

The potential for directly killing or injuring eulachon occurs only during active dredging and disposal. The above analysis shows the potential impacts that may result in killed or injured eulachon due to dredging (.0003 % to .0158%) and disposal (.003% to .0334%) is very small compared to the amount of time and area eulachon may be present. Therefore, we assume the potential population effects are proportional to the total impact resulting in a very small percentage of the population being killed or injured.

The small percentage of fish potentially killed or injured is likely to be less than indicated by the analysis as the whole water column is not affected by the activities. Adult fish migrating in the upper water column are unlikely to be affected by dredging or disposal. Likewise, larval fish drifting in the upper water column are unlikely to be affected by the proposed action. BMPs that call for dragheads and cutterheads to be buried in the substrate during operations and raised no more than three feet off the bottom if reverse purging or cleaning is necessary help limit the potential impacts. The bottom of the hoppers are 19-20 feet below the surface when the material with the greatest discharge velocity is released and pipeline dredge downpipes will be at least 20 feet deep when discharging.

The proposed in-water work periods also help minimize the potential direct effects to eulachon including:

- The normal operating season is June 1 through December 15 so routine dredging avoids most of the returning adults and much of the potential for eggs and larvae to be impacted.
- Dredging and in-water placement between RM 106 to RM 145 will be conducted between August 1 and September 30 thus protecting any spawning and rearing fish within that river segment including the Sandy River.
- All side channels will be dredged between August 1 and December 15 avoiding most potential for impacts due to side channel activities however there is still potential to kill or injure some eulachon in the early portions of the spawning run.
- No in-water placement if non-routine dredging is required near or just downstream of the mouth of the Cowlitz River (RM 63-70) between December 16 and May 31 will help avoid impacts to adult eulachon entering the Cowlitz River and eggs and larvae being transported out of the Cowlitz River.
- No in-water placement near the mouths of the Kalama River (RM 71-75) and Lewis River (RM 85-89) when alternative site are available will help protect eulachon utilizing those streams if alternative sites are available.
- Testing and calibrating dredges with in-water placement between December 16 and May 31 will occur above RM 89 will protect most of the eulachon population.

Eulachon are common within the Columbia River in waters below 12 meters deep and therefore may be affected by ocean disposal of the dredged material at the Deep Water Site. However, the fish are likely to be spread out in the plume and nearshore area. NMFS cannot predict how many fish may be present in the vicinity of the disposal site in any one year. The Deep Water site lies in waters 190 to 300 feet deep. The 5.0 square nautical mile placement area is extremely small compared to the area of available habitat. NMFS believes the potential for eulachon to be killed or injured during ocean disposal is very small due to:

- The small area impacted compared to the potentially occupied offshore habitat.
- The Deep Water Site is only to be used when the other off shore sites lack capacity or weather conditions prevent their use.
- The depth of the water should allow for any fish encountering the initial disposal plume to be dispersed out of the disposal plume by boundary forces or able to escape as the downward acceleration slows before they impact the bottom.

Green Sturgeon Lindley *et al* (2012) include the dredging of shipping lanes and anchorages, and dredge spoil disposal as human activities that may have detrimental impacts on green sturgeon although such activities were not identified as a principal factor for the southern green sturgeon population decline (71 FR 17757). Buell (1992) noted white sturgeon were commonly entrained during their Columbia River entrainment and mortality study. The entrainment rate was highest when the dredge was operating in a “sturgeon hole” ranging from 63 to 71 feet (deeper than dredging in the FNC). Although there was a significant entrainment, the mortality rate was only 3.4% (Buell 1992).

The fish entrained in the Buell (1992) study ranged in size from about 4.5 inches to approximately 31 inches fork length (FL) with the vast majority less than approximately 26 inches FL. Based on recent tagging studies, the majority of the green sturgeon tagged in the Columbia may be significantly larger than the white sturgeon entrained in the Buell (1992). Fifty nine green sturgeon were tagged in the Columbia River in 2011. The fish ranged between approximately 35 inches FL to about 55 inches FL with an average length of 52 inches FL (Woodbury 2012a). The green sturgeon in the Columbia River may be large enough to escape from the dredges although actual entrainment rates for Columbia River dredging operations are unknown. One may assume that because the green sturgeon have migrated from the Sacramento River, the fish would tend to be relative large and strong swimmers. However. the smaller green sturgeon tagged in 2011 are close to the largest fish entrained in the Buell (1992) study and close to the size sturgeon provided in photographs that have been entrained during dredging operations in the eastern United States (Woodbury 2012b) suggesting at least the smaller green sturgeon in the Columbia River may be susceptible to entrainment.

Woodbury (2012c) provided data from a dredge entrainment study in San Francisco Bay, CA where soupfin sharks (*Galeorhinus galeus*) up to about 30 inches total length were entrained, again indicating at least the smaller green sturgeon in the Columbia River could be entrained. The behavior of fish that live along the bottom also may make green sturgeon susceptible to entrainment as opposed to pelagic fish such as salmon that will swim away from danger; the more demersal species may "freeze" along the bottom (Woodbury 2012d).

The actual effects of dredging and flowlane disposal on green sturgeon in the Columbia River are not known. Based upon the above information, the potential for entrainment of at least the smaller green sturgeon cannot be discounted as the routine dredging season overlaps the time when green sturgeon are in the Columbia River. The effects of flowlane and ocean disposal however based upon the studies of disposal on other bottom-dwelling fish in the LCR and ocean disposal sites (Corps 2007) and a study conducted by Parsley *et a*l (2011), NMFS believes the strong swimming green sturgeon should not be adversely affected during disposal and can escape becoming buried.

Parsley *et a*l (2011) did a study of flowlane disposal operations on the behavior of seven white sturgeon before, during and after a series of hopper dredge disposal operations in the lower Columbia River. The fish were between 19 inches and 39 inches FL. The results of the study indicated the disposal had little effect on the fish. The study findings indicated that hopper dredge disposal did result in a slight increase in individual fish activity that could indicate disturbance. However, the increased activity may have been due to the fish investigating the disposed material as a potential food source. Anglers often fish for white sturgeon that congregate near the dredges during operations; termed the 'dredge bite' (Parsley *et al.* 2011).

Green sturgeon may also be stuck by the propellers of dredge vessels causing injury or death. Woodbury (2012e) provided a photograph of a white sturgeon stuck by the propeller of the *Essayons* in San Pablo Bay, CA. How often such events occur is not known and NMFS is not aware of any documentation of ship strikes in the Columbia River during dredging operations. Green sturgeon may be particularly vulnerable as they tend to swim in the upper 2 m to 5 m of the water column in fresh water during directional movement (Kelly *et al* 2006). The potential for a dredge vessel propeller to strike a green sturgeon is probably greatest during freshwater dredge and disposal activities as green sturgeon tracked in the ocean did not appear to move at the surface although did make occasional rapid vertical ascents (see Kelly *et al.* 2006).

NMFS has no information to accurately estimate the number of green sturgeon harmed or killed by dredging and disposal. Therefore, we conducted an impact analysis similar to that completed for salmon and steelhead smolts and eulachon. Green sturgeon enter the Columbia River in May and can be present in the River through October therefore the potential to entrain green sturgeon is during the May through October time period. The Corps proposed action in-water work period for routine operations begins June 1 and runs through the summer into early fall therefore green sturgeon will occur in the action area during dredge and disposal operations. Non-routine dredging may also occur in May when green sturgeon are first entering the Columbia River. The impact analysis was based upon the 2011 activities from May through October for dredging operations in the Columbia River. The full analysis is documented in Appendix 2.

Table 44. Federal Navigation Channel and Potential Green Sturgeon Habitat.

River Segment	Area of navigation channel that needs dredging to maintain depth (acres)	Area of flow lane deeper than -20-ft contour used for placement (acres)	Total Estimated Green Sturgeon Habitat (acres)(From Table A2-9	% Potentially Affected Area
1	1,208	138	76,100	2%
2	885	358	23,220	5%
3	438	330	9,690	8%
4	412	248	6,840	10%
5	315	193	5,060	10%
6	42	28	2,720	3%
7	81	110	10,350	2%
8	12	28	6,200	1%
9	1	0	2,780	.04%

As displayed in Table 44, between .04% and 10% or potential green sturgeon habitat, depending upon the river segment, may be impacted if the whole FNC was dredged. However, as was discussed in the above smolt assessment, the whole FNC is not dredged every year and the potential habitat impacts as well as the potential for green sturgeon to be entrained during dredging only occurs during the time the area and time the dredges are actually operating. NMFS believes green sturgeon in the Columbia River should be able to avoid burial during disposal activities so the following impact analysis only considers the relative potential for entrainment. The time period for the assessment is May through October.

Table 45 Dredging Impacts to Green Sturgeon Habitat May - October 2011 (% Affected= affected area per dredging minute x total dredging minutes)/total habitat area available per minute x total minutes).

River Segment	Affected Area per Dredging Minute (acres)	Total Dredging Time 2011 (min)	Total Area (acres)	Total Time available 2011 (min)	% Affected/Total
1	.04	26,530	76,100	264,960	.005
2	.023	132,459	23,220	264,960	.05
3	.033	10,433	9,690	264,960	.013
4	.015	8,962	6,840	264,960	.007
5	.062	9,52	5,060	264,960	.004
6	.002	23,421	2,720	264,960	.006
7	.03	2,784	10,350	264,960	.003
8	.03	1,008	6,200	264,960	.002

The above analysis shows the potential impacts that may result in killed or injured green sturgeon due to dredging operations ranges between .002% an 0.5% of the total potentially occupied habitat when green sturgeon are expected to be present.

As for the analysis of the potential to impact outmigrating smolts, the information provided by (Smith 2012n) and (Smith 2012o) was used to estimate the relative potential for green sturgeon to be entrained at the River Mouth. Assuming the green sturgeon could occupy all the available river habitat, the potentially occupied area is the six mile length of the FNC multiplied by the total width at the River Mouth, approximately two miles, for a total potentially occupied area of 7,680 acres. In 2011, the River Mouth was dredged in June by the *Essayons* for 126 hours and 49 minutes. The remainder of the River Mouth dredging occurred using a contract hopper dredge for a total of 48 hours of dredging time in August and September with no dredging during July and October. We conducted an analysis similar to that outlined in Appendix 2 to assess the potential for green sturgeon to be entrained, by comparing the amount of area impacted by the June, August and September dredging operation compared to the total habitat potentially occupied by green sturgeon and the total time during June, August and September.

Table 46. Dredging Impacts River Mouth Green Sturgeon Habitat -June – October 2011 (% Affected= affected area per dredging minute x total dredging minutes)/total habitat area available per minute x total minutes).

Affected Area per Dredging Minute (acres)	Total Dredging Time 2011 (min)	Total Area Green Sturgeon Habitat (acres)	Total Time available June, August, September 2011 (min)	% Affected/Total
0.11	34,654	7,680	131,040	.4

The above analysis shows the potential impacts that may result in killed or injured green sturgeon due to dredging is very small (0.08%) compared to the amount of time and area where green sturgeon may be present. Also, the total abundance of southern green sturgeon is low and members of this species disperse throughout areas of California, the Pacific Northwest and Canada during the spring and summer. Therefore, the total number of individuals expected to be in the Columbia River during dredging is expected to be relatively low. This further reduces the likelihood that green sturgeon will be entrained during dredging or disposal. The total number of fish expected to be killed or injured by the proposed action should not exceed more than a few individuals at most. This analysis may need to be repeated in the future if more information regarding green sturgeon habitat preferences in the Columbia River becomes available.

2.4.2 Habitat Effects

Dredging and disposal operations in the FNC, as described in Section 2.4.1, may directly kill or injure eulachon or juvenile salmonids. Additionally, the proposed action may affect salmonids green sturgeon and eulachon by diminishing the quality and function of critical habitat and contributing to limiting factors and threats. The environmental baseline described the current condition of habitat components within the action area that the proposed action may affect. Those habitat components were then confirmed as the appropriate ones to assess for the effects of the proposed action on ESA-listed fish by reviewing the effects of dredging documented in previous Columbia River dredging consultations (NMFS 2005a, NMFS 2005b, NMFS 2009), and the potential threats to ESA-listed fish and habitat that have been identified due to dredging (Gustafson *et al.* 2010 and NMFS 2011b).

Physical Habitat and Prey Base. The FNC substrate is composed primarily of sand. The transport and deposition of sand and coarse gravel is important for creating aquatic habitat in the LCR. The transport of sand and coarse gravel through the river system has been decreased by greater than 70% due to climate changes and human factors that have reduced the magnitude of the spring freshet. The extent of shallow-water habitat in the LCR has been reduced due to decreased transport of sand, the creation of the FNC including the construction of pile dikes, as well as diking for flood control, and filling. The changes to the spring freshet and construction of jetties at the River Mouth have also depleted the sediment within the Columbia River littoral cell. The loss of sediment contributes to beach erosion, and loss of habitat associated with the natural sediment composition in the nearshore environment. There is still a substantial amount of sand in the river channel and the transport of the material, though reduced, still creates a dynamic environment. Large sand waves create shoals during high flows and even during low fall flows the substrate within the FNC is constantly moving (Meyer 2012).

NMFS (2011b) identified reducing the export of sand and gravels during dredging by using dredged material beneficially as a management action to diminish a threat to salmon and steelhead recovery. Most of the sand dredged in the Columbia River FNC is maintained within the system. Of the close to 8 mcy of material dredged in 2011, only about 10% was disposed in upland sites and thus lost to the system The bulk of the material was disposed in the flowlane with a small amount disposed on beaches (Smith 2012c). The material dredged from the River Mouth is typically disposed in the ocean. Four new nearshore disposal sites in combination with three existing near shore sites have been identified as part of the proposed action. The nearshore sites are to be used for dredge disposal as a beneficial use of the material in the littoral cell and nearshore environment and may help restore nearshore habitat. The disposal of dredge material at the Deep Water Site, where it would be lost to the littoral cell, is only to occur if the nearshore sites are at capacity or conditions prevent safe disposal nearshore.

Dredging the FNC is not likely to significantly impact the physical habitat. Salmonids are not closely associated with the bottom substrate and tend to migrate through the area quickly. Eulachon eggs and larvae may be found throughout the water column therefore dredging the FNC impacts a very small amount of the available eulachon habitat. Green sturgeon may be found along the bottom of the FNC. Dredging the FNC moves material in the channel and deepens the channel but does not fundamentally alter the substrate composition or green sturgeon habitat other than deepening the channel. The physical habitat impacts are short-term, limited in extent.

As discussed in Section 2.4.1, dredging the side channels has the potential to affect the rearing habitat for subyearling salmonids. The subyearling salmonids make extensive use of the shallow water areas. The geographic extent of the potential impact to shallow water habitat is limited. Dredging the side channels potentially disturbs and deepens 153 acres of shallow-water habitat out of approximately 88,000 acres of shallow water habitat in the LCR. Additionally, most of the side channels are not dredged every year allowing the habitat to recover thus reducing the duration and severity of the disturbance. The in-water work period proposed by the Corps helps minimize effects to shallow water habitat. The side channel disturbance occurs in the summer and late fall when juvenile salmonid densities are relatively low, although the peak Chinook salmon fingerling movement into the LCR fingerling Chinook salmon occurs in August. The proposed action in-water work period allows for some level of recovery prior to the higher densities of fish occupying the habitat in the spring.

The construction of the FNC, including pile dike fields, has contributed to the loss of shallow-water habitat. The Corps does not propose restoration of any habitat influenced by the construction of pile dike fields in the proposed action. However the Corps, the Bonneville Power Administration and the U.S. Bureau of Reclamation are implementing habitat restoration management actions as required in the opinion for operation of the Federal Columbia River Power System (FCRPS) (refer to NMFS consultation number: 2005/05883). The FCRPS includes three reasonable and prudent alternatives (RPA) (numbers 36, 37, and 38) to improve juvenile salmonid habitat in the Columbia River estuary and RPA 38 is titled Piling and Piling Dike Removal Program. A number of restoration actions have been implemented through the FCRPS and the Lower Columbia salmon recovery plan (Smith and Marcoe 2012) and restoration efforts, are likely to continue for some time. The amount of habitat ultimately restored will depend upon the degree to which landowners are willing to allow restoration efforts on their properties, public safety concerns and navigation constraints.

Loss of the prey base (benthic invertebrates) is another potential indirect effect associated with any changes to the physical habitat due to dredging and disposal operations. Dredging and disposal can potentially disrupt the food web in the estuary and thus impact green sturgeon and juvenile salmonid growth and survival. Dredging may disrupt the food web for ESA listed species by removing and altering the substrate and associated species composition. Dredging will also entrain benthic fauna that is consumed by juvenile salmon and green sturgeon.

ESA-listed salmon with ocean-type life histories and green sturgeon are the most dependent upon the estuary, rearing in the LCR for up to several months. NMFS (2005a and 2005b) determined the greatest potential effects to the food web for salmonids would be likely to occur in the more productive, shallow draft side channels where subyearling salmon are likely to occur. The shallow water areas also produce food sources that are used by outmigrating yearling salmon in the main FNC. The deeper waters of the FNC and the associated coarse, mobile substrate is not considered to be highly productive or supply an important prey base for juvenile salmonids.

As described in previous opinions (NMFS2005a and NMFS 2005b) dredging, as proposed by the Corps, is not likely to significantly affect the prey base for ESA listed salmonids. And while not assessed in the earlier opinions, the prey base for green sturgeon is also not likely to be significantly affected. Maintenance dredging in the side channels may temporarily reduce the suitability of sediment and hinder prey species recolonization by reducing the organic matter content of the sediment and altering the sediment size. The tube-dwelling amphipods, midges, other insects, and crustaceans inhabiting the side channels are able to rapidly recolonize a site after disturbance through active movement or passive drift; however recolonization may take 6 to 12 month (NMFS 2005b). Therefore, some juvenile salmonid prey species in the disturbed area, up to approximately 153 acres of habitat, may be temporarily lost until recolonization occurs.

Beach nourishment may also alter the substrate and impact the prey base if the material used is different than the natural material at the site. There may also be a loss of prey if benthic organisms are buried during disposal. The three identified beach nourishment sites in the Columbia River are highly disturbed, erosive areas with little or no benthic prey populations and subsequently few salmonids (Corps 2001, ODEQ 2008b); therefore the effects to the physical habitat and prey base due to beach nourishment is likely to be insignificant.

The potential reduction in salmonid prey base is likely to be insignificant because:

- The growth and survival of juvenile salmonids in the estuary is not limited by food.
- The FNC is not a productive food source for juvenile salmonids.
- The intensity and severity of the effects to the salmonid prey base in shallow-water are relatively low as:
    - The area of side channels that may be dredged is very small relative to the amount of productive shallow water habitat, only about 153 acres of 88,000 acres of shallow water habitat.
    - Most of the side channels are not dredged on an annual basis allowing the impacted areas to recover.

Bottom fish and invertebrates that may be consumed by green sturgeon are commonly entrained during dredging operations (Buell 1992, Woodbury 2012c) and bottom dwelling organisms may be buried during disposal. NMFS is confident the potential effects to the green sturgeon prey base during dredging and disposal in the FNC are insignificant because:

- The area dredged and used for disposal activities is small compared to the total habitat occupied by green sturgeon prey.

- Disposal activities are expected to have minor, short term impacts on benthic species' populations (Corps 2007).

The proposed action also includes dredging the River Mouth (RM -3 to RM +3) and ocean disposal. DeRobertis *et al*. (2005) found juvenile chum salmon in the Columbia plume fed exclusively on planktonic prey including small copepods, northern anchovy (*Engraulis mordax*) and sanddab (*Citharichthys* spp) eggs, larval euphausids, and larvaceans. Depending upon the study year, yearling coho salmon fed primarily on Dungeness crab (*Cancer magister*) megalopae, other crab megalopae, adult euphausids, and amphipods. In other years, yearling coho salmon primarily consumed fish with less planktonic prey. Yearling Chinook salmon diets were comprised primarily of fishes but also included Dungeness crab megalopae, amphipods and pteropods (DeRobertis *et al*. 2005). Eulachon are planktivorous, feeding on a variety of phytoplankton and zooplankton such as polychaete larvae, early planktonic stages of barnacles and copepods, amphipods, crustaceans, cumaceans (Gustafson *et al* 2010). Larval eulachon are often still consuming their yolk sacs while drifting downriver toward the Pacific Ocean.

Dredging the River between RM -3 and RM +3 is not likely to have any significant effect on fish species or the food web (LCSG 2011). The Corps has conducted numerous studies regarding the potential effects of dredging at the River Mouth including the disposal of material in the ocean (Corps 2007). The area offshore of the River Mouth as well as in the River Mouth is inhabited by benthic communities typical of those found in similar shallow-water, sand-bottom habitats including polychaetes (marine annelid worms), molluscs, and crustaceans. The species in these communities have adapted to high energy environments by evolving to be highly motile rapid burrowers, quick tube builders, or rapid colonizers and will rapidly recover from dredge disposal (Corps 2007). LCSG (2011) states disposal in the new nearshore disposal locations should have inconsequential effects on benthic invertebrates as long as the sediment is dispersed, and, as is the case with the proposed action, is similar in size to the native sediments. Increasing the sand to the littoral cell through the ocean disposal could be beneficial to some species (LCSG 2011).

The potential effects to the Dungeness crab population from dredge and disposal operations are a concern, primarily for commercial reasons (LCSG 2011), but as mentioned, crab larvae (megalopae) can be an important food source for juvenile salmon in the ocean environment. Dungeness crab are found in the nearshore environment including at all the disposal sites, and in the Columbia River up to about RM 17.

Dungeness crabs may be vulnerable to entrainment and burial during dredge and disposal operations. Corps (2007) reports young-of-the-year crab are most often entrained whereas older crabs were entrained in lesser numbers. Dungeness crab are also susceptible to injury from burial. Dungeness crab are able to survive burial but the depth, sex and age of the crabs are important variables determining their survival. However, no significant effects to Dungeness crab population abundance that would affect the salmonid prey base are likely as the amount of Dungeness crab habitat affected is a very small fraction of the available coastal habitat (LCSG 2011).

Green sturgeon feeding habits are poorly understood but in the ocean it is assumed, as discussed in Section 2.3.3, that sturgeon are feeding on benthic organisms including crabs, other invertebrates and fish. The total area potentially affected by ocean disposal is very small compared to the total area of habitat that may be occupied by green sturgeon and their prey; and ocean disposal is not expected to significantly affect benthic species populations (Corps 2007, LCSG 2011).

Dredging and disposal activities that may impact the physical habitat and prey base could contribute to the limiting factors and threats identified in Tables 32-34 including:

- Dredging and altered sediment balances (eulachon).
- Degraded estuarine and near-shore marine habitat (salmonids)
- Degraded freshwater habitat including reduced complexity and access to off-channel rearing habitat in the LCR (salmonids)
- Reduced productivity resulting from sediment and nutrient-related changes in the estuary (salmonids).
- Disturbance of bottom substrates adversely affecting prey resources (green sturgeon)
- Disposal activities burying food resources (green sturgeon).

However, NMFS is confident, based upon the above analysis, that the Corps' proposed action to maintain the FNC will not significantly affect the physical habitat or prey base for ESA-listed salmonids, eulachon, or green sturgeon. Upland disposal, approximately 10% of the dredged material in 2011, will result in some loss of sand within the river system but the extent to which the lost material will affect habitat forming processes is unknown. The proposed action is consistent with the management recommendation to reduce the export of sand and gravels via dredge operations by using dredged materials beneficially as the majority of the dredged material is disposed within the system. Overall, the effects to the physical habitat and prey base are geographically limited compared to the available habitat and the adverse effects are of short duration.

Suspended Sediment/Turbidity. Dredging and disposal operations can increase suspended sediments. Not all sediment is captured by the dredges; some will be redeposited on the bottom while some will be suspended in the water column increasing turbidity (Hayes *et al.* 2000). In-water disposal such as ocean disposal and flowlane disposal deposit the dredge material directly into the water column and thus are potentially the greatest contributors of suspended sediment and turbidly due to dredging. Beach nourishment and upland disposal may also increase turbidity as deposited material washes back into the water.

Little is known concerning the biological responses of fish to suspended sediment doses associated with dredging and much of the available information concerns salmonids (Wilber and Clarke 2001). Eulachon are known to spawn, and larvae survive, in naturally turbid glacial rivers. While turbidity from dredging may be a threat to eulachon, and turbidity from dredging has been found to be potentially harmful to fish with similar egg and larval life histories (Wilber and Clark 2001).

Green sturgeon are found near the bottom of the FNC, however, we do not believe green sturgeon will be significantly affected by suspended sediment and turbidity generated during dredge and disposal operations. Green sturgeon are naturally found in the main Columbia River channel near the bottom. Flow velocities along the bottom of the FNC range from 5 ft./sec. to 10 feet/sec. with moving sand waves. The suspended sediment and associated turbidity plumes produced by dredging and disposal should rapidly be dispersed and settle to background levels. Parsley *et al.* (2011) did not specifically quantify suspended sediment produced during hopper disposal but based upon the response of the tagged white sturgeon the disposal did not significantly affect the fish.

With no other specific information, the primary focus of the following discussion will be on the effects of increased suspended sediment and turbidity on salmonid growth and survival.

Increased suspended sediments and turbidity can affect all life stages of fish that prefer clear over turbid water. The particulate material in suspended sediment can physically abrade and mechanically disrupt fish gills and reduce the ability of site feeding species such as salmonids to capture prey (see Wilber and Clarke 2001).

The potential effects of increased suspended sediment on the growth and survival of juvenile salmonids depends not only on the amount of suspended sediment generated in an aquatic environment but the dosage. The dosage is the concentration combined with the exposure or the amount of time a fish is exposed to elevated levels of suspended sediment (Newcombe and MacDonald 1991). The type of dredge, characteristics of the substrate and environmental conditions including local hydrodynamics all influence the potential sediment dosage that may be experienced by aquatic species (Wilber and Clark (2001).

Increased suspended sediment can result in four general responses by salmonids; no response, behavioral, sublethal, or lethal responses (Suttle *et al*. 2004, Wilbur and Clarke 2001, Servizi and Martens 1992, Newcombe and Jensen 1996, Newcombe and MacDonald 1991). Wilber and Clarke (2001) describe behavioral and sublethal responses as:

- Behavioral responses include alarm reaction, the abandonment of cover, and avoidance response.
- Sublethal responses include short-term reduction in feeding rates, or success, minor physiological stress such as increased coughing or respiration rates, moderate physiological stress, moderate habitat degradation, impaired homing, and indications of major physiological stress such as long-term reduction in feeding rate or success.

Generally speaking, mechanical dredges (*e.g.* bucket or clamshell) increase suspended sediment concentrations more than hydraulic (hopper or cutterhead) dredges. Mechanical dredges generate suspended sediment through impact and withdrawal of the bucket from the bottom, the material washing from the bucket as it moves through the water column and above the water surface, and the loss of water when the material is loaded onto the barge. Suspended sediment concentrations of 1,100 mg/l extending as far as 1,000 meters along the bottom of a clamshell dredge may occur (Wilber and Clark 2001).

Hydraulic dredges mix water with sediment to form a slurry that is either pumped through a pipeline or into a hopper bin. Turbidity produced by a cutterhead (pipeline) dredge depends upon the rate of the cutterhead rotation, the vertical thickness of the dredge cut and the swing rate of the dredge. The maximum suspended sediment concentrations produced by pipeline dredges are generally less than 500 mg/l and bottom suspended sediment plumes are usually no more than 500 meters from the dredge.

Hopper dredges generate suspended sediment and bottom turbidity as the dragheads are pulled through the bottom sediments. Surface turbidity may occur if the hoppers overflow during loading in order to increase the sediment load in the hopper bins. Suspended sediment plumes may extend 1,200 meters along the bottom at concentrations as great as 800 mg/l (Wilbur and Clark 2001).

Simple sediment severity models have been developed to help managers estimate potential impacts of suspended sediment on freshwater fishes (see Wilber and Clark 2011). The sediment severity models however have not always provided accurate predictions of the response of fish to sediment in natural settings, potentially over stating effects at least at a population level. Smedley *et al* (2011) in their study of streams draining agricultural areas in Canada found the sediment dosage (or severity of ill effects) models did not provide good predictor of fish population response to sediment. Natural variability in flow and sediment regimes are not easily incorporated into the models and other indicators such as water temperature and avoidance behavior may play a role in observed fish population responses. The suspended sediment caused by dredging may also be substantially less than concentrations caused by major storms. Estimates of suspended sediments displaced by major storms in the Thames River, Connecticut were nearly an order of magnitude greater than that produced by dredging (Bohlen *et al.* 1979 as cited in Wilbur and Clark 2001).

The potential effects to salmonids and other fish due to suspended sediment depends whether the exposure is continuous or intermittent (Wilber and Clark 2001). Suspended sediment doses as a result of hopper dredges may be similar to the intermittent exposures due to tidal flushing as the hopper dredge operation is discontinued to off-load the material. Flowlane disposal would be likely to result in greater suspended sediment than the actual dredging. Flowlane disposal from a pipeline dredge may result in a continuous exposure while the dredge is operating, although stream current and tidal flushing may alleviate the exposure to sediment plumes (Wilber and Clark 2001). In areas with little flow, a fluff zone in which the settling of particles is inhibited as the concentration of suspended sediment lower in the water column increases may develop. In some situations, a fluff zone may continue to exist for a few weeks after the end of dredge operations (Wilber and Clark 2001).

Wilber and Clark (2001) stated that under most dredging scenarios, fishes and other motile organisms encounter suspended sediment plumes for exposures of minutes to hours unless the organism is attracted to the plume. Wilber and Clark (2001) estimated that the most likely suspended sediment doses encountered by out-migrant salmonids would be up to 1,000 mg/l for one day. Such dosages primarily result in sublethal responses but mortality may occur at concentrations above about 500 mg/l for a day. Exposures at concentrations from about 100 mg/l to almost 1,000 mg/l for less than two hours may result in either behavioral or sublethal responses. Concentrations of around 50 mg/l and higher up to about 1,000 mg/l for 2 hours may result in behavioral or sublethal responses.

Natural suspended sediment concentrations in the LCR range from less than 10 mg/l at 100,000 cfs; about 20 mg/l at 200,000 cfs; from 20 to 50 mg/l at 300,000 cfs and 20 to 60 mg/l at 400,000 cfs. Levels of turbidity generally follow the hydrograph with turbidity rising during the spring freshet and winter floods. Turbidity levels are below 10 nephelometric turbidity units (NTU) most of the year and only exceed 20 NTU during high flows, although they can exceed 70.0 NTUs during flood flows.

The Corps (2001) estimated sand resuspended during dredging would redeposit on the substrate in one to two minutes. The resuspended sediment from hopper dredge overflow is mostly fine sediment and individual particles may remain in suspension up to four months depending on flow condition. The actual increase in suspended sediment due to maintenance dredging the FNC will depend on the number of dredges (there was no estimate provided for mechanical dredges) working at one time but is generally estimated to be less than 2 mg/l when flow is at 100,000 cfs (Corps 2001).

The Corps (2001) also discussed potential suspended sediment and turbidity increases due to disposal. Flowlane disposal by hopper dredges will begin in the bottom 19 -29 feet of the water column. Subsequent suspended sediment concentrations are estimated to be between zero and 20 mg/l diminishing to background levels as the predominately sandy material settles and the turbidity plume is dispersed downstream (Corps 2001). The Corps (2001) did not anticipate salmonids to be greatly affected by pipeline disposal. The Corps assessment was based on a pipeline discharge 20 feet or more below the water surface. The bulk of the disposed material is sand likely to settle to the substrate in about five minutes while any fine material would remain in the water column. The total downstream suspended sediment increase at a river discharge of 100,000 cfs was estimated to be only 1 mg/l.

Shoreline disposal or beach nourishment involves a pipeline discharging a water/sediment slurry on to a beach. The beach is built out into the river with the return water flowing into the river. Suspended sediment increases adjacent to the beach and dissipates as it is dispersed downstream. The Corps (2001) reported increased turbidity of 5 to 15 NTUs 50 feet offshore from a beach nourishment site. The increased NTUs were estimated to equal increased suspended sediment from 10 to 30 mg/l based upon the relationship between NTUs and silt/clay concentrations observed in the Columbia River (Corps 2001). The increased turbidity and suspended sediment was not likely to be detrimental to fish as the turbidity plume will diminish to background levels as it moves downstream. Also, the beach nourishment sites are highly disturbed, erosive areas with little or benthic productivity and subsequently few salmonids (Corps 2001). Corps (2001) expected no turbidity increase from upland disposal at that time due to the use of settling ponds.

Dredging at the River Mouth and associated ocean disposal are not likely to expose ESA listed fish to adverse concentrations of suspended sediment or turbidity. The dredged material at the River Mouth is primarily sand that will rapidly settle or be dispersed in the naturally turbid and dynamic nearshore environment. Dredge material disposed at the Deep Water Site will also rapidly settle to the bottom and while in suspension will be diluted by the volume of ocean water.

Water quality standards for turbidity allow no more than a ten percent cumulative increase in natural stream turbidity relative to a control point upstream of a turbidity causing activity.

Limited exceedences may be allowed to accommodate essential dredging (ODEQ 2008b). Monitoring results of the FNC maintenance operations appear to support the Corps (2001) estimates that suspended sediment and turbidity levels created by the operations are small and short term with the largest potential increases occurring during beach nourishment. No turbidity increases due to dredging operations have been recorded at the River Mouth (ODEQ 2008a). ODEQ (2008b) reports that in two years of turbidity monitoring during dredging in the FNC the water quality criteria for turbidity were exceeded 12 times in 336 turbidity measurements. No turbidity exceedences were recorded by Corps in the 2011 (Casey 2012).

Based upon the above analysis, we believe the potential increased suspended sediment and turbidity during dredging and disposal in the FNC will be short term and localized. Fish caught directly in a discharge plume may experience short-term behavioral responses. Generally the short term effects are likely to be infrequent and limited in area. The effects to eulachon are unknown. The Corps (2001) estimates of suspended sediment created by maintaining the FNC are one to two orders of magnitude below the dosage where sublethal or lethal effects to salmonids are likely to occur. The increase turbidity due to dredging the FNC is likely to be negligible compared to the naturally variable turbidity levels in the Columbia River (ODEQ 2008a and ODEQ 2008b). Some minor short term water quality standards for turbidity are likely to be exceeded, but within the allowances for dredging (ODEQ 2008b).

Short term behavioral or sublethal responses due to suspended sediment created by channel maintenance operations in the FNC are not likely to injure or kill any individual fish. Any sublethal responses are likely to be limited to a short term reduction in feeding rates or minor physiological stress such as increased coughing or respiration rates. The number of fish potentially affected is unquantifiable. The potential for adverse effects is further reduced in that the initial discharge plume from a hopper dredge will begin 19 to 29 feet below the surface and pipeline dredges are required to discharge below depths of twenty feet. Juvenile outmigrating salmonids are generally higher in the water column. The potential for adverse effects is further diminished in that most routine dredging occurs after the main smolt outmigration and ends before the usual peak migration of eulachon into the Columbia River and non-routine dredging affects a small part of the habitat potentially occupied by ESA-listed species for a small amount of time (see Section 2.4.1).

Adult salmon and steelhead may be migrating upstream during dredging operations. Effects to migrating adult fish are likely to be insignificant as the adult fish should simply avoid any sediment plumes and any increase in suspended sediment and turbidity is within the natural range of conditions commonly encountered by both upstream migrating adults and downstream migrating smolts.

The greatest increases in suspended sediment and turbidity within the FNC are likely at the three beach nourishment sites. These erosive sites are generally not favored habitat for juvenile salmonids and any fish that may be moving within the vicinity are likely to avoid any sediment plume.

Dredging caused turbidity levels that are potentially harmful to fish are a greater concern in the side channels due to the fine-grained substrate that may stay suspended in the water column

(ODEQ 2008b). NMFS currently has no information to estimate the concentration of suspended sediment dredging the side channels may generate, or the length of time different concentrations may be likely to persist. The amount of suspended sediment will also depend on the type of dredge used. Both mechanical and hydraulic dredges may be used in the side channels depending upon availability and the amount of work required. The amount of suspended sediment may be closer to the high end created by the different methods as reported in Wilbur and Clarke (2001) due to the fine material. The duration suspended sediment caused by dredging the side channels is likely to be longer than in the FNC due to the combination of fine material and lower flow rates. The potentially higher dosages in the side channels may approach the potential for lethal effects, especially if they persist for a day or more. It is also not known if a “fluff” zone will develop although tidal action will dissipate the material.

The nature of the potential effects to individuals and habitat are somewhat diminished in that Corps’ proposed in-water work period for side channel dredging occurs during the period of lowest yearly juvenile salmonid densities and prior to the usual peak eulachon outmigration. The quality of juvenile salmon rearing habitat and eulachon migratory habitat may be reduced due to side channel dredging as juvenile salmon may be subjected to sublethal to lethal concentrations of suspended sediment when the side channels are dredged. The area affected and suspended sediment dosage within any side channel will depend on the type of dredge used plus the flow and tidal conditions. The effects to eulachon, especially upstream migrating adults, are unknown; however eulachon are found in naturally turbid rivers and the effects are likely to be minor.

Disposal of dredge material from the side channels occurs in the flowlane or upland sites so are similar to those effects described for the FNC above.

Dissolved Oxygen. Dredging sediment with a high organic content can cause a decrease in dissolved oxygen due to higher BOD. As the organic material, especially fine material increases in the water column the more dissolved oxygen is used to decompose the material. The potential for dredging to reduce DO to levels harmful to ESA listed fish are greatest in the side channels during the summer when water temperatures are high, the solubility of DO in water is decreased, and the metabolic needs of fish increase.

Eulachon are not present in the Columbia River during the summer and green sturgeon are usually found in deeper water so the concern regarding the potential for decreased dissolved oxygen is greatest for the ESA-listed salmonids. While salmonids should not be adversely affected at DO concentrations down to 8 mg/l, juvenile salmon sustained swimming speeds are sharply decreased at DO concentrations of 6.5-7.0 mg/l. Salmonids may be able to survive DO concentrations as low as 5 mg/l but growth, food conversion efficiency and swimming performance are all adversely affected.

The State of Oregon LCR dissolved oxygen water quality standard for cold-water aquatic life is not less than 8.0 mg/l as an absolute minimum. Where natural conditions of barometric pressure, altitude and temperature preclude attainment of 8.0 mg/l dissolved oxygen may not be less than 90% saturation. At the discretion of the Oregon Department of Environmental Quality, the dissolved oxygen may not fall below 8.0 mg/l as a 30-day mean minimum, 6.5 mg/l as a seven-day minimum mean and, may not fall below 6.0 mg/l as an absolute mean (ODEQ 2008a).

Dissolved oxygen concentrations in the LCR naturally range between 9.0 and 15.8 mg/l (ODEQ 2008b). The lowest dissolved oxygen concentrations coincide with high summer water temperatures (Johnson *et al*. 2011).

Decreases in DO as a result of dredging and disposal are not a concern in the FNC or at the River Mouth (ODEQ 2008a and ODEQ 2008b). The FNC and River Mouth substrate is primarily sand with little fine organic material. The volume of water flow through the FNC and River Mouth will quickly dissipate the little organic material that may be present so a significant increase in BOD will not occur. For the same reasons, ocean disposal will also not cause adverse declines in DO.

Dredging the side channels during the summer and early fall presents the greatest threat to ESA-listed salmonids, particularly subyearling Chinook salmon. The potential for high water temperatures, naturally low DO concentrations, approaching 8.0 mg/l, and the fine substrates create the conditions where a localized increase in BOD could cause adverse reduction in DO.

Most side channels are not dredged each year and the timing depends on dredge availability so NMFS cannot predict how often the dredging may cause DO concentrations to fall below 8.0 mg/l. Based upon temperature and DO graphs in Johnson *et al* (2011), adverse reductions in DO may be a realistic possibility when the water temperatures in the side channels are above 15ºC. The frequency that dredging side channels may cause adverse reductions is likely to be low as the side channels are dredged on an intermittent basis. The severity of adverse reductions in DO is also relatively low because DO concentrations should recover as either water temperatures drop, or the suspended material settles or is dissipated by river flow and tidal action.

The type of dredge used, river flow and tidal conditions will influence the potential for reduced DO if a side channel is dredged during warm water periods. Clamshell dredges generally produce higher suspended sediment concentrations and larger turbidity plumes. Hopper dredge may produce a turbidity plume similar to a clamshell dredge. Pipeline dredges generally mobilize less sediment and create a smaller turbidity plume than either clamshell or hopper dredges. River flow and tidal action determine the rate the suspended sediment is dissipated and water re-oxygenated.

The fish caught directly in the turbidity plume are most likely to be affected by a decrease in the DO concentration. The Corps proposed in-water work period should avoid exposing eulachon to decreased dissolved oxygen. Eulachon are not likely to be present in the action area during the summer and operations during November and December when water temperatures are cold and DO levels naturally high are less likely to result in harmful reductions in DO. The relatively large green sturgeon should be able to avoid any areas of low DO concentration. Salmonids exposed to DO concentrations below 8.0 mg/l may suffer an increase in metabolic stress and decreased swimming performance making the affected fish more susceptible to predation until the DO concentrations return to normal. If dredging results in extreme reductions in DO exposed juvenile salmonids may be killed. Fish outside the area affected by the low DO concentrations are likely to be able to avoid waters with a low DO concentration. There is also the possibility that some adult fish could encounter the low DO concentrations while migrating to streams tributary to the side channels in fall. The adult fish are likely to swim around areas of low DO or possibly delay the migration. The dredges are not operating at all times so any possible delays are likely to be very minor.

Adverse decreases in DO are not likely due disposal of the side channel material. Material dredged in the side channels is disposed in the flowlane where the material should be quickly dispersed and diluted; or at upland sites.

Dredging the side channels during the summer and fall may injure or result in the death of some subyearling salmonids. Similar to the effects of suspended sediment, NMFS cannot quantify the amount of habitat or number of fish that may be affected by reduced DO. Factors such as water temperature during dredging, the organic content of the sediment, and river and tidal flows during dredging all influence the DO concentration during dredging. However due to the small amount of shallow water habitat potentially affected in any year we believe there will not be any population level effects due to dredging caused reductions in DO.

Contaminants. The Columbia River is currently classified as water quality limited under the Federal Clean Water Act, section 303(d), for DDE (DDT metabolite); PCB; and arsenic. Other contaminants of concern that have been detected in the Columbia River include dioxin, a number of metals and PAHs. Dredging has the potential to resuspend contaminants which may be present in sediment, making them bioavailable and thereby degrading the ecological integrity of the direct area as well as areas downstream (Fresh *et al*. 2005, ODEQ 2008a, ODEQ 2008b). PCBs and DDT have been found in juvenile fish that exceed levels that may cause health effects and could be toxic to juvenile salmonids.

Stream-type, yearling salmonids may be most susceptible to contaminants in the water column such as organophosphate pesticides and dissolved metals while ocean-type subyearlings may also be susceptible to sediment derived contaminants such as PCBs and DDTs. Contaminants are a concern for eulachon as the species have been found to carry high levels of chemical pollutants. The potential resuspension of harmful contaminants during dredging has been identified as a threat to eulachon in the Columbia River. Re-suspension of contaminants is also a potential threat to green sturgeon.

It is unlikely that dredging the coarse-grained materials in the FNC, including the River Mouth, will release contaminants at levels harmful aquatic organisms (ODEQ 2008a and ODEQ 2008b). The results of the most recent sediment sampling in the FNC confirmed that most of the material to be dredged in the FNC is sand. Twenty-three samples were tested for metals and none exceeded the SEF (2009) screening levels. Pesticides and PCBs were found in four of 23 samples but no sample exceeded the screening levels. PAHs were detected in all of the 23 samples submitted for chemical analysis but the concentrations were below the SEF screening level (Corps 2009b). Similar results were reported for sediment sampling between Vancouver, Washington and The Dalles, Oregon (Corps 2009c). As reported by the Corps (2011c), the analysis showed no significant changes from previous sampling efforts and FNC sediment meets the SEF (2009) very-low category; suitable for dredging and unconfined in-water placement with no further testing required for ten years.

Unlike the mainstem FNC, fine sediment and organic material that may contain contaminants are more likely to be present in the side channels and Portland-Vancouver Anchorage. The results of the most recent sediment sampling for contaminants in the side channels were summarized in the environmental baseline. Sediment contaminant levels in the side-channels, except one sample from Skipanon Channel, met the unconfined in-water placement screening criteria in place at the time of sampling. Only Baker Bay sediments have been analyzed under the current SEF (2009) screening criteria (Corps 2011c). The Corps (2011c) states sediment sampling utilizing the current screening criteria will occur prior to dredging in the side channels and Portland - Vancouver Anchorage. If concentrations of contaminants in the sediment exceed SEF (2009) screening criteria and are determined to be unsuitable for open water disposal, according to the requirements of the Clean Water Act and the Marine Protection, Research, and Sanctuaries Act, then disposal is limited to confined disposal; subject to the applicable environmental regulations for confined disposal.

While the contaminant levels in side channel sediment has been within screening levels, most of the side channels have not been tested using the current screening criteria and the potential for synergistic or cumulative effects remains a question. The Columbia River Basin is heavily developed and contaminants will continue to enter the system from industrial, urban and agricultural sources. The side channels with their low water velocities and fine-grained, organic sediment are potential areas for contaminants to accumulate then be resuspended during dredging.

A number of factors determine whether toxic substances are present in amounts that are detrimental to aquatic life including: bioavailability of the form; dilution; the uptake mechanism; duration of exposure, any synergistic effects between the different contaminants, local environmental conditions and cumulative concentrations of the chemicals (ODEQ 2008a and 2008b). This complex array of factors makes predicting the potential effects from toxics liberated due to sediment disturbance during dredging difficult to effectively isolate (ODEQ 2008b).

Water pollution is a limiting factor for eulachon (Table 31) and contaminants are considered a limiting factor for many ESA-listed salmonids (Table 32). NMFS cannot predict the potential effects to salmonids and eulachon of contaminants being released by dredging operations and either directly exposing ESA-listed fish to the contaminants or indirectly exposing the fish to contaminants through their food web. We believe, based upon current information, that following the processes outlined SEF (2009) and any future revisions, combined with the results of past testing and the small amount of side channel habitat that may be dredged; the potential re-suspension of contaminated sediment due to dredging operations is not expected to affect more than a few fish. The potential exposure of fish to resuspended sediments is low as; the contaminant levels in the side channel substrates have been within screening criteria, a very small amount of potentially contaminated sediment is disturbed in any year and the protective measures outlined in SEF (2009).

Accidental spills are another potential pathway for ESA-listed fish to be exposed to contaminants. Dredging equipment will be operating in and over water. The use of mechanized equipment on and in proximity to water creates the potential for toxins to be introduced into the water column (ODEQ 2008a). The equipment requires the use of fuel, lubricants, and other petroleum products, which, if spilled into the water during project activities could injure or kill aquatic organisms. The Corps proposed action includes requirements for a spill control plan including immediate cleanup. All contractors are also required to submit a spill control plan to the Corps before beginning operations (Smith 2012a).

A spill control plan requiring a rapid response and cleanup in case of an accidental spill of fuel, lubricants and other petroleum products should help limit the adverse effects to fish and habitat if a spill occurs. There is always potential for a spill when dredges or other machinery are operating in or near water so the risk to ESA-listed fish and aquatic habitat is always present during the dredging. NMFS believes that the probability of a spill is low but cannot be discounted over the life of the proposed action. We cannot predict the frequency or severity of a potential spill. However, adherence to BMPS reduces the probability of a large spill such that we expect only minor effects from small releases of contaminants.

Upland Disposal – Avian Predation. The construction, operations and maintenance of the FNC has in part been responsible for increased predation on juvenile salmonids by Caspian terns and double-crested cormorants. The disposal of dredge material created islands and suitable nesting habitat for the terns and cormorants. Pile dikes constructed to help maintain the FNC provide resting, loafing and feeding platforms, especially for the cormorants. Before 1984, there was no known Caspian tern nesting in the LCR and by 2001, the majority of Caspian terns on the west coast were nesting on East Sand Island. East Sand Island also supports the largest double-crested cormorant nesting colony on the west coast of North America.

Predation on juvenile salmonids by Caspian terns and double-crested cormorants has been identified as a limiting factor for the recovery of ESA listed salmon and steelhead. Management actions identified by NMFS (2011b) to reduce predation on juvenile salmonids include:

- Implement projects to redistribute part of the Caspian tern colony currently nesting on East Sand Island.
- Implement projects to reduce double-breasted cormorant habitat and encourage dispersal to other habitats.

The Corps does not describe any avian predation management activities in the proposed action. The Corps, the Bonneville Power Administration and the U.S. Bureau of Reclamation are however implementing avian predation management actions as required in the opinion for operation of the FCRPS. The opinion includes two reasonable and prudent alternatives specifically addressing Caspian tern and double-crested cormorant predation:

- RPA 45 – Reduce Caspian terns on East Sand Island in the Columbia River Estuary.
- RPA 46 – Develop a cormorant management plan.

Implementation of RPA 45 includes reducing the amount of nesting habitat on East Sand Island and construction of new nesting habitat in historically occupied areas outside the Columbia Estuary. The Corps is developing a cormorant management plan in compliance with RPA 46. A draft environmental impact statement for the plan was released in February 2012.

Disposing the dredge material at upland sites does have the potential to create new nesting habitat for Caspian terns and possibly double-crested cormorants if the sites are not monitored and measures immediately implemented to discourage nesting. The Corps has been monitoring the upland sites. Based upon the monitoring, Caspian terns and double-crested cormorants are not known to be nesting where dredged material is currently disposed. Therefore we do not expect significant predation due to the potential creation of nesting habitat at the upland disposal sites. Management actions are being implemented or planned consistent with the FCRPS and the recovery plan but the success of those actions is not yet known.

Beach Nourishment – Stranding Beach nourishment involves disposing dredge material on selected river banks to restore eroding shorelines and to prevent juvenile salmon from becoming stranded due to ship wakes. Beach nourishment can affect ESA listed species, particularly subyearling salmon, by increasing turbidity, pump entrainment, or altering the habitat and prey base if the disposed material is different than the natural substrate(discussed above); and by creating conditions that may enhance or prevent juvenile stranding due to ship wakes.

The proposed action will continue beach nourishment at three locations; Miller Sands, Skamokawa Vista Park, and Sand Island at St Helens. The new Bensen Beach ocean disposal site is also a beach nourishment site. BMPs for beach nourishment include grading the disposal site to a slope of 10 to 15 percent with no swales to reduce the possibility of stranding. Beach nourishment as described with the BMPs should not result in stranding, will help restore shoreline and nearshore habitat and is consistent with recovery actions to address the beach stranding threat to the recovery of ESA listed salmon.

2.4.3 Effects on Critical Habitat within the Action Area

The action area includes designated critical habitat for ESA-listed salmon and steelhead, eulachon and southern green sturgeon. The primary constituent elements of salmon and steelhead critical habitat considered in this opinion include: freshwater spawning, rearing and migration; estuarine areas, nearshore marine areas and offshore marine areas. Designated critical habitat for eulachon includes freshwater spawning and rearing and freshwater migration. Southern green sturgeon designated critical habitat within the action area includes estuarine areas and coastal marine areas. The southern green sturgeon freshwater riverine system component of critical habitat is not found within the action. The life history events tied to the freshwater riverine system are: spawning; embryo incubation, growth and development; larval emergence growth and development; and juvenile metamorphosis, growth and development. For the southern green sturgeon, these life history events occur in the Sacramento River system.

The information provided below provides a synopsis of the discussion in Section 2.4.2

Pacific salmon and steelhead

1. Freshwater spawning sites
   a. Substrate. No effect, freshwater spawning sites are avoided.
   b. Water Quality. No effect, in-water work windows avoid spawning periods.
   c. Water quantity. No effect

2. Freshwater rearing
    a. Floodplain connectivity. No effect
    b. Forage. *Direct* – A very small proportion of the forage base may be entrained and killed when the side channels are dredged. The amount of forage potentially killed is small as the area of shallow water habitat inhabited by forage organisms is very small compared to the total shallow water habitat and the affected species typically are able to recolonize quickly. Forage does not appear to be limiting growth and survival of juvenile salmonids. *Indirect* – A limited amount of rearing habitat will be disturbed when the side channels are dredged. The affected habitat is very small compared to the total available habitat and the effects are short –term as the habitat recovers quickly and most of the side channels are not dredged annually. The vast majority of the dredged material is disposed in the flowlane thus maintained in the system. Beach nourishment may help restore forage habitat over time. The main FNC is not a productive forage habitat. Resuspension of contaminants in the water column may exposure juvenile salmonids harmful, sublethal dosages of toxins however the potential impacts are reduced by adhering to the SEF (2009) process and framework.
    c. Natural Cover. No effect
    d. Water quality. *Direct* – Dredging will increase turbidity, and dredging the side channels may reduce dissolved oxygen. Increased suspended sediment and any reduction in dissolved oxygen should be short-term and limited in extent. *Indirect* – Resuspension of contaminants in the substrate may expose salmonid prey to toxins that may harm the prey or bioaccumulate in juvenile salmonids that feed on the contaminated organisms. The potential impacts are reduced by adhering to the SEF (2009) process and framework.
    e. Water quantity. No effect.

3. Freshwater migration**.**
    a. Free of artificial obstruction. *Direct* – Adult salmon and steelhead may be exposed to dredging and disposal. The adult fish should be able to avoid the dredging and escape or avoid any turbidity plumes. Turbidity created when the side channels are dredged may delay migration into tributary streams for a very short duration.
    b. Natural cover. No effect
    c. Water quality. See freshwater rearing above
    d. Water quantity. No effect.

4. Estuarine areas
    a. Forage. See fresh water rearing, above.
    b. Free of artificial obstruction. See freshwater migration above
    c. Natural cover. No effect
    d. Salinity. No effect
    e. Water quality. See freshwater rearing above.
    f. Water quantity. No effect.

5. Nearshore marine areas
    a. Forage. *Direct* - The prey species that may potentially be buried during disposal operations in the nearshore environment are adapted to a dynamic environment and

are able to rapidly recolonize. The ability of most prey species to rapidly recolonize and the amount of habitat and thus the forage base is very small compared to the area of nearshore habitat. *Indirect*- Ocean disposal in the nearshore environment is considered a beneficial use of the dredged material. Disposal in the littoral cell may help restore degraded nearshore habitat.

   b. Free of artificial obstruction. No effect
   c. Natural cover. No effect
   d. Water quantity. No effect
   e. Water quality. *Direct* – Increased turbidity due to dredge material disposal in the nearshore environment will be short –term. The material disposed in the nearshore environment is primarily sand that will settle rapidly or be dispersed in the dynamic environment. The sandy material is very unlikely to result in decreased DO, especially in the ocean environment and the material is largely free of contaminants.

6. <u>Offshore marine areas</u>.
   a. Forage. *Direct* – Some forage species may be entrained in the disposal plume but the Deep water ocean disposal site is very small so the amount of prey potentially affected is very small compared to the available prey base.
   b. Water quality. *Direct* – See nearshore marine areas, above.

<u>Eulachon</u>

1. <u>Freshwater spawning and incubation</u>
   a. Flow. No effect
   b. Water quality. See salmon and steelhead fresh water rearing, above.
   c. Water temperature. No effect.
   d. Substrate. *Direct* - Dredging and disposal will disturb spawning and incubation habitat. The amount of habitat impacted is very small compared to the available habitat. In-water work windows reduce the amount of spawning and incubation habitat that may be impacted and the duration of the impact is very short and the habitat will recover quickly. *Indirect* – Most of the dredged material is disposed in the flowlane where it is available to create habitat.

2. <u>Freshwater migration</u>
   a. Flow. No effect
   b. Water quality. See salmon and steelhead freshwater rearing, above.
   c. Water temperature. No effect
   d. Food. The construction of dams on the mainstem Columbia River, and the loss of historic freshwater marshes due to development in the lower Columbia River may have altered the forage base for eulachon. The extent of the effect whether beneficial or detrimental is not understood. The proposed action will have no effect.

<u>Southern Green Sturgeon</u>

1. <u>Estuarine areas</u>
   a. Food Resources. *Direct* – Dredging may entrain bottom dwelling organisms
   b. Migratory corridor. No effect
   c. Sediment quality. No effect

d. Water flow. No effect.
e. Water depth. *Direct* – Dredging by nature increases the depth of a channel. Increasing the depth in the dynamic shoaling areas is not expected to fundamentally alter the habitat at the scale of a river segment and increasing depth does not necessarily diminish to conservation value of the habitat. Disposal may decrease depth but flowlane disposal affects a very small amount of the deep water habitat.
f. Water quality. See salmon and steelhead rearing, above.

2. <u>Coastal marine areas.</u>
   a. Food resources. *Direct* - Ocean disposal may bury some sturgeon prey but a population level effect is not expected as the numbers of individual prey species that may be affected is very small compared to the total prey populations. The affected populations are expected to rapidly recover. *Indirect* – Benthic habitat should not be affected as the material being disposed is similar to the substrate material that would be naturally present.
   b. Migratory corridor. No effect
   c. Water quality. See salmon and steelhead nearshore areas, above.

2.5 Cumulative Effects

"Cumulative effects" are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Future state and private actions are likely to continue to affect ESA-listed species in the Columbia River, although it is not possible to predict which specific actions will be significant given the broad geographic landscape covered by the action area, the geographic and political variation in the action area, uncertainties associated with Tribal, state, and local governments, and private actions.

Actions to restore the LCR estuary habitat are a high priority for all parties working for the recovery of salmon and steelhead in the Columbia River estuary. The states of Oregon and Washington, in partnership with Columbia River Basin Indian Tribes are likely to continue restoration of shallow-water habitats and reduction of avian predation. Commercial activities related to shipping and port development are important to the regional economy, but cannot proceed independently from unforeseeable trends in international trade.

Human population in the LCR, especially the Portland-Vancouver area, is likely to continue to grow and increase demand for commercial and residential development or redevelopment beside the river. However, the level of environmental protection provided by development codes and standards continues to improve.

The adverse effects of agriculture, forestry, and development were discussed in the environmental baseline, and are likely to continue. However, the net impact of such those activities combined with restorative redevelopment and active restoration efforts is likely to be a gradual reduction in the legacy problems of problems created by earlier patterns of state and private use of land and water in the LCR, and a gradual improvement in aquatic habitat conditions.

2.6 Integration and Synthesis

The Integration and Synthesis section is the final step of NMFS' assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 2.4) to the environmental baseline (Section 2.3) and the cumulative effects (Section 2.5) to formulate the agency's opinion as to whether the proposed action is likely to: (1) Result in appreciable reductions in the likelihood of both survival and recovery of the species in the wild by reducing its numbers, reproduction, or distribution; or (2) reduce the value of designated or proposed critical habitat for the conservation of the species. These assessments are made in full consideration of the status of the species and critical habitat (Section 2.2).

The status of the species affected by the proposed action varies from very high risk (SR sockeye salmon) to moderate risk (MCR steelhead). The status of critical habitat at the designation-wide scale varies. Critical habitat within the action area has been degraded by human activities including; the construction and operation of dams in the Columbia basin, construction of the FNC, flood protection, and urban development Many salmonid species complete the entire freshwater part of their life history there, and others encounter the action area a primary migration corridor connecting their natal tributaries to the Pacific Ocean.

As described in Section 2.2, all Columbia River salmon and steelhead species, and eulachon migrate through the action area twice, once as out-migrating juveniles and then again as adult fish on their upstream spawning migration. The LCR is an important summer habitat for the southern green sturgeon. The viability of the various populations that comprise the 13 salmon and steelhead species considered in this opinion ranges from extirpated or nearly so to populations that are a low risk for extinction. The eulachon population abundance has declined significantly since the early 1990s and at this time, there is no evidence of their returning to former population levels. The viability status of the green sturgeon is not completely understood but this species currently has very low abundance levels.

Adult upstream migrating ESA-listed salmonids are present in the Lower Columbia River primarily from early spring through autumn but upstream migrating fish may be found year-around. The adult fish are generally migrating in the upper 25 feet of the water column but may be found to depths of 50 feet. There is a limited amount of LCR Chinook salmon and CR chum salmon spawning in the mainstem Columbia between RM 113 to RM 142.

The Lower Columbia River is an important rearing habitat for juvenile salmonids. The shallow water habitats are especially important for species expressing an ocean-type life history that spend an extended amount of time in the estuary. The highest densities of juvenile salmon and steelhead in the estuary occurs in the spring when individuals of all the species may be present, with the lowest densities occurring in the summer and fall. The juvenile fish tend to inhabit shallow waters near the shoreline but have been observed at depths of 20 feet.

Outmigrating stream-type salmonids spend little time in the estuary, migrating downstream through the main channel. The stream-type individuals are generally present from March through June with peak abundances in April and June. The stream-type individuals are usually actively migrating spending little time in the shallow-water habitats although the shallow waters although food produced in the shallow waters may be important to the migrating fish.

The action area also includes the Columbia River plume, the freshwater interface where freshwater exiting the Columbia River meets and rises above the denser ocean saltwater. The plume habitat is especially important for the stream-type out-migrants. The turbid plume waters may benefit early ocean survival by; distributing the juvenile salmon and steelhead away from predation pressure closer to shore, concentrating food resources, and providing cover from predators in the more turbid, low salinity waters.

Eulachon typically enter the Columbia River from mid-December to May with peak entry and spawning during February and March. The eulachon spawn in the mainstem Columbia River, Cowlitz River, Grays River, Skamokawa Creek, Elochoman River, Kalama River Lewis River and Sandy River. Eulachon eggs are believed to hatch in 30 to 40 days. The young eulachon are feeble swimmers, usually near the bottom as they are transported downstream but may be found throughout the water column. Eulachon are frequently found in the Columbia River plume.

Southern green sturgeon enter the Columbia River in May with their peak abundance occurring in August and then the fish move out of the LCR by the end of October. The habitat preferences of the green sturgeon within the Columbia River are not completely understood and current information suggests they may be found in both the deep and shallow water habitats. The ocean environment within the action area provides both foraging and migratory habitat.

The Lower Columbia River is designated as critical habitat for eulachon the Columbia River salmon and steelhead species and green sturgeon. The physical and biological features of eulachon critical habitat that are provided by the Lower Columbia River that may be impacted by the proposed action are freshwater spawning and incubation habitat and freshwater migration. Freshwater spawning, freshwater rearing, adult and juvenile migration corridors estuarine habitat and nearshore marine areas are PCEs of salmon and steelhead critical habitat within the action area. Critical habitat for green sturgeon in the action area includes the PCEs for estuarine areas and coastal marine areas. Climate change and human development have and continue to adversely impact critical habitat creating limiting factors and threats to the recovery of the ESA listed species.

Information in Section 2.3 described the environmental baseline in the action area as a product of development of the Columbia River. Flow regulation and irrigation withdrawals above Bonneville dam have reduced the magnitude of the spring freshet. The Columbia River has been diked for flood control, wetlands filled for development, and pile dikes constructed to help maintain the FNC. The combined effect of flow and habitat changes on estuarine habitat has been to reduce the amount of shallow-water habitat (especially vegetated habitat such as swamps and marshes). These shallow water habitats are especially important for ocean-type salmon species.

The reduce spring freshet and subsequent reduction in sediment routing into the ocean have impacted the nearshore ocean environment and have unknown effects on the extent of plume habitat. The construction of jetties has narrowed the River Mouth modifying nearshore circulation patterns, shoreline sediment accretion and erosion rates affecting the nearshore habitat. The jetties have also restricted the flow of marine nutrients into the estuary.

The habitat changes and development of the Columbia River for hydropower have altered the food-web in the estuary by reducing nutrient outflow from shallow-water habitat and changing the food web from a macrodetritus to a microdetritus base. The potential impacts to ESA listed species are not fully understood, however the available prey base does not appear to be limiting the growth and survival of juvenile salmon and steelhead.

Upland disposal of dredge material has increased nesting habitat for Caspian terns and cormorants. The enhanced habitat has resulted in higher populations of the avian predators and thus increased mortality to juvenile salmonids due to predation. Another indirect effect of the FNC is juvenile salmon being stranded on beaches by the wakes of large vessels.

Agriculture, mining, industrial discharges and storm water runoff from urban areas has resulted in high levels of contaminants in the Columbia River. The Columbia River is classified as water quality limited under the Clean Water Act section 303(d) for DDE, PCB and arsenic. The concentrations of currently used pesticides and trace metals are also a concern. The true magnitude of the contaminant effects to ESA-listed fish are not fully understood but studies in areas similar to the LCR have shown contaminants to cause immunosuppression, reduced disease resistance and reduced growth rates.

The changes to the estuary habitat have been most pronounced on salmon expressing ocean-type life histories that rely on shallow-water habitats. Flow changes affecting the plume and avian predation are probably more significant for stream-type salmonids. The potential impacts to eulachon due to changed habitat conditions in the Columbia River estuary are poorly understood although the flow alterations, reduced nutrient outflow from marshes, and swamps, and exposure to contaminants has likely diminished the habitat quality for eulachon.

Habitat improvement projects are being actively implemented through salmon recovery efforts and the FCRPS. At the same time, development pressures on the Columbia River may be increasing. The ports of Portland, Vancouver, Longview St Helens and Astoria may be looking to develop additional capacity for grain, coal and liquefied natural gas exports. A growing human population base may increase pressure for development adjacent to the river for both commercial and recreational interests such as boating. The extent to which such activities may further degrade the Lower Columbia River habitat, by increasing dredging needs, especially non-routine dredging, increasing the development of berths and other shipping infrastructure, or preclude some restoration actions is unknown.

As described in Section 2.4, the most important effects of FNC maintenance to ESA-listed fish and critical habitat include entrainment, when fish are trapped during the uptake of sediment and water by dredging machinery, and burial, when fish are trapped by deposition of dredge material in the flowlane or ocean. The risk of entrainment depends upon the likelihood of fish occurring during the dredging and disposal period, dredge depth, dredge operation, and location of the dredging operation. Juvenile salmonids, green sturgeon, and all life stages of eulachon are at risk of entrainment during dredging. Juvenile salmonids and the egg and larval stages of eulachon are likely at greatest risk of burial. Adult salmonids are likely to be able to avoid being entrained or buried and juvenile green sturgeon and adult eulachon are likely to avoid being buried.

Dredging as described in the proposed action, including BMPs to have dragheads and cutterheads buried in the substrate and only raised three feet above the substrate while operating under limited situations, pose a small risk of entraining juvenile salmonids. Entrainment of adult eulachon has been documented at the mouth of the Columbia River and eulachon eggs and larvae on the substrate may also be entrained. Entrainment of green sturgeon has not been documented but based upon a study in the Columbia, documented entrainment of other sturgeon species in other parts of the country, and documented entrainment of other bottom-dwelling fish species, it appears that the smaller subadult green sturgeon in the Columbia River may be at risk. The risk of juvenile salmon being buried during disposal is felt to be small; however the potential risk to eulachon eggs and larvae may be high. Green sturgeon are not expected to be significantly affected by burial at this time.

NMFS was not able to estimate the number of ESA-listed fish potentially killed or injured by entrainment or burial. Therefore, NMFS, using information provided by the Corps, conducted a relative impact analysis to assess the potential duration, frequency, intensity and severity of effects to juvenile salmon, eulachon and green sturgeon. The analysis was conducted based on the time period that the fish may be expected to be in the proximity of dredging and disposal operations. Salmon and steelhead smolts and subadult sturgeon are most likely to be affected by dredge and disposal operations in the main channel, subyearling salmonids in the side channels, and eulachon by dredging either in the FNC or the side channels.

The analysis showed that the amount of time and area dredging operations could potentially kill or injure ESA-listed fish is extremely small compared to the amount of time the fish may actually be present and area of potentially occupied habitat. Therefore, NMFS concluded individuals of ESA-listed fish potentially may be killed or injured, but the number of individual fish actually killed or injured is likely to be extremely small and would not significantly affect the abundance or productivity of any ESA-listed fish population. The risk of impacts resulting in population level effects is also very small because:

- Dredging operations will avoid most of the smolt outmigration period and will occur when juvenile densities in the shallow side channels are lowest.
- Most the side channels are not dredged annually, thus allowing recovery time between impacts.
- Very few smolts are likely to be near the bottom of the FNC so only a very small number of individuals of any population will be exposed to dredging.

- The timing of most dredge and disposal activities avoids the peak migration time of eulachon and when eulachon eggs and larvae are likely to be present
- Flowlane disposal below the mouth of the Cowlitz is prohibited outside the normal dredging season thus minimizing, but not totally avoiding burial of eulachon eggs or larvae.
- The habitat affected by dredging and disposal operations and the short duration of potential effects is extremely small compared to the total available habitat for green sturgeon and the other the ESA-listed species.

The FNC and River Mouth are dynamic environments, used primarily as a migration corridor for adult and juvenile ESA-listed fish. The effects of dredging are not expected to adversely affect the migratory habitat. The very nature of dredging, deepening a channel, changes the physical habitat for some time period. The FNC substrate is primarily sand. The transport and deposition of coarse material such as sand and gravel is important for creating aquatic habitat in the Lower Columbia River. Flow regulation and climate change have decreased the magnitude of the spring freshet and thus reduced the transport of coarse material within the river and out into the Columbia River littoral cell.

Reducing the export of sand and gravel by disposing dredged material within the system, either through flowlane disposal, beach nourishment or ocean disposal is an identified management to reduce limiting factor s and threats to ESA-listed fish.

The most severe effects of the dredging program will occur in the shallow-water side channels. Shallow water habitats are very important rearing habitat for subyearling salmonids and eulachon eggs and larvae may be present, but will only affect approximately 153 acres of over 88,000 acres of available shallow water habitat. Moreover, side channels are not dredged annually so the habitat has time to recover after the disturbance. Dredging and disposal also causes a proportionate disruption in the food web in the estuary and marine environment while dredging the highly dynamic River Mouth and nearshore disposal will not significantly affect the prey base for ESA-listed fish.

Further, less than 10% of the dredged material is likely to be placed in upland sites and will result in some loss of sand within the river system. The extent to which the lost material will affect habitat forming processes is unknown but available information leads us to conclude that the effects will be minor. The majority of the dredge material will be disposed in the flowlane where it will continue to be resorted by hydrological processes that create or maintain habitat conditions in the Lower Columbia River.

Minor adverse effects of the action are increased suspended sediments, reduced DO, and contaminant resuspension, conditions that are largely limited to side channels and the Portland-Vancouver Anchorage. These effects will be minimized by limiting operations to period of lowest yearly juvenile salmonid densities and before the usual eulachon migration. Sturgeon are less sensitive to these effects and, in any event, are likely to avoid any areas with short-term adverse increases in suspended sediment or reductions in DO.

Beach nourishment is another minor effect pathway that can create conditions that increase the likelihood of juvenile stranding due to ship wakes. Subyearling salmon are most susceptible to stranding.

The proposed action will continue beach nourishment at three locations; Miller Sands, Skamokawa Vista Park, and Sand Island at St Helens. The new Bensen Beach ocean disposal site is also a beach nourishment site. The Corps' BMPs for beach nourishment include grading the disposal site to a slope of 10 to 15 percent with no swales to reduce the possibility of stranding. Beach nourishment as proposed by the Corps will help restore shoreline and nearshore habitat and is consistent with recovery actions to address the beach stranding threat to the recovery of ESA listed salmon.

As noted in Sections 2.2 and 2.3, climate change is likely to affect all species considered in this opinion and their habitat in the Lower Columbia River. These effects are expected to be positive and negative, but are likely to result in a generally negative trend for stream flow and temperature.

As described in Section 2.5, the cumulative effects of state and private actions within the action area are also variable over such a large action area, but are likely to reflect continued population growth in urban areas and continued use of current agricultural and forestry practices in rural areas. Federal efforts to improve aquatic habitat conditions throughout the Columbia River basin, especially in the Lower Columbia River, are likely to moderate any adverse cumulative effects, as well as leverage beneficial ones, so that the action area will trend toward improved habitat conditions overall. However, the extent to which development and human uses combined with restoration activities will affect ESA listed species' habitat in the Lower Columbia River is not known. Regardless of whether the ameliorative Federal actions occur, NMFS believes the effects of the proposed action will not cumulatively jeopardize any of the ESA-listed species or adversely modify designated critical habitat.

In summary, the proposed action will result in relatively intense, annual disturbances to a very small and variable area within the Lower Columbia River, but these disturbances will not appreciably reduce or prevent the increase of abundance or productivity of the populations addressed by this consultation. The same disturbances will cause minor, transitory effects to aquatic habitats in the Lower Columbia River, but those impacts to habitat will not appreciably reduce or prevent the increase of abundance or productivity of the populations addressed by this consultation. Similarly, the proposed action will have no effect on the population spatial structure or diversity of any species affected, and will not affect their habitat's contribution to recovery. By avoiding or minimizing contact with species over time, the proposed action is consistent with the recovery strategy of increasing juvenile fish survival within the Lower Columbia River, a critical step toward recovery of these species as whole.

The conservation value of critical habitat within the action area for salmon and steelhead varies by life history strategy, and is higher for species with ocean-type histories than for the stream-type. That is because the former group is more reliant on shallow-water habitats that are easily affected by a wide range of natural and human disturbances. The conservation value of critical habitat for sturgeon is greatest in the lower portions of the action area within the deeper portions of the river channel. The conservation value of critical habitat for eulachon in the Lower Columbia River is very high because the Columbia River produces most of the world's eulachon. The proposed action will have minor effects on the quality and function of critical habitat PCEs. The full set of management measures proposed by the Corps will ensure that effects to PCEs remain minimal. As channel conditions in the newly improved FNC stabilize over time and less annual maintenance is required, habitat conditions may further improve over time and critical habitat will be able to better serve its intended conservation role, supporting viable populations of ESA-listed salmon, steelhead, southern green sturgeon, and eulachon. The proposed action will not impair the ability of critical habitat in the action area to play its intended conservation role of providing migration and rearing habitat to the affected species.

2.7 Conclusion

After reviewing the current status of the listed species, the environmental baseline within the action area, the effects of the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of SRB steelhead, UCR steelhead, LCR steelhead, MCR steelhead, UWR steelhead, SR spring/summer Chinook salmon, SR fall-run Chinook salmon, UCR spring-run Chinook salmon, UWR spring-run Chinook salmon, LCR Chinook salmon, Columbia River chum salmon, SR sockeye salmon, LCR coho salmon, the southern eulachon, the southern green sturgeon species; or to destroy or adversely modify critical habitat designated for those species.

2.8. Incidental Take Statement

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by regulation to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. For purposes of this consultation, we interpret "harass" to mean an intentional or negligent action that has the potential to injure an animal or disrupt its normal behaviors to a point where such behaviors are abandoned or significantly altered.

NMFS has not adopted a regulatory definition of harassment under the ESA. The World English Dictionary defines harass as "to trouble, torment, or confuse by continual persistent attacks, questions, etc." The U.S. Fish and Wildlife Service defines "harass" in its regulations as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering," 50 CFR 17.3. The interpretation we adopt in this consultation is consistent with our understanding of the dictionary definition of harass and is consistent with the U.S. Fish and Wildlife interpretation of the term.

Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA, if that action is performed in compliance with the terms and conditions of this incidental take statement.

NMFS has not yet promulgated an ESA section 4(d) rule prohibiting take of threatened Pacific eulachon. Anticipating that such a rule may be issued in the future, we have included a prospective incidental take exemption for eulachon. The elements of this ITS that relate to eulachon would take effect on the effective date of any future 4(d) rule prohibiting take of eulachon.

2.8.1 Amount or Extent of Take

Dredging and dredge material disposal necessary to complete the proposed maintenance of the Columbia River navigation channel, including dredging or dredge disposal at sites identified in the RSMP, the nine side channels, and in the Portland-Vancouver Anchorage, will occur when ESA-listed salmon and steelhead, southern green sturgeon and eulachon will be present. Those actions are reasonably certain to cause incidental take when juvenile salmon, steelhead, or green sturgeon, or juvenile or adult eulachon, are entrained and injured or killed by dredge suction, captured and injured or killed in a mechanical dredge, or when injured or killed by contact with dredged material as it falls through the water column during in-water disposal. Additional incidental take is reasonably likely to occur due to harm caused by adverse alteration of channel substrate and prey resources, and reduced DO, increased turbidity, and other impaired water quality conditions caused by maintenance of the side channels and anchorage.

This incidental take will occur in the Columbia River, between RM -3.0 and 145.0, at disposal sites identified in the RSMP, in the nine side channels, and in the Portland-Vancouver Anchorage. Incidental take within those areas that meets the terms and conditions of this incidental take statement will be exempt from the taking prohibition.

Take caused by the habitat-related effects of this action cannot be accurately quantified as a number of fish because the distribution and abundance of fish that occur within the action area are affected by habitat quality, competition, predation, and the interaction of processes that influence genetic, population, and environmental characteristics. These biotic and environmental processes interact in ways that may be random or directional, and may operate across far broader temporal and spatial scales than are affected by the proposed action. Thus, the distribution and abundance of fish within the action area cannot be attributed entirely to habitat conditions, nor can NMFS precisely predict the number of fish that are reasonably certain to be injured or killed if their habitat is modified or degraded by the proposed action. In such circumstances, NMFS uses the causal link established between the activity and the likely changes in habitat conditions affecting the listed species to describe the extent of take as a numerical level of habitat disturbance.

Here, the best available indicators for the extent of take are: (1) The area likely to be disturbed each year by active dredging and disposal operations relative to the routine (preferred) dredging period, measured as acres; (2) the time that will be required to complete dredging and disposal operations, measured as day of actual active dredging or disposal operations relative to the routine dredging period; and (3) the total number of side channels dredged in a year. Because the amount of take increases with the time spent dredging and the area disturbed by dredging and disposal, these indicators are proportional to extent of incidental take attributable to this project. The extent of take indicators in the following tables were derived using the salmon, eulachon and green sturgeon impact analyses and additional information received from the Corps regarding their operations (Smith 2012p). Although the Corps' proposed action would have authorized dredging to occur the entire length of the river, year-around, with some timing and area restrictions; the following extent of take indicators limit the potential effects to ESA-listed species and designated critical habitat to those effects assessed in this opinion.

Table 47. Amount and Extent of Take - Days Dredging and Disposal

River Segment	Annual Operation Duration -Dredging (Days of actual dredging)		Annual Operation Duration - Disposal (Days of actual disposal)	
	Completed During Routine Dates	Completed During Non-Routine Dates	Completed During Routine Dates	Completed During Non-Routine Dates
River Mouth RM-3 to RM +3	52	0	NA*	NA
RM +3 to RM 145	160	30	105	16

*NMFS determined the potential effects to ESA listed fish due to ocean disposal are insignificant.

Table 48. Amount and Extent of Take - Acres

River Segment	Annual Dredging Area (acres)		Annual Disposal Area (acres)	
	Impacted During Routine Dates	Impacted During Non-Routine Dates	Impacted During Routine Dates	Impacted During Non-Preferred Dates
River Mouth RM-3 to RM +3	6,100	0	NA	NA
RM +3 to RM 145	7,000	1,400	12,000	1,800

Historically, not all the side channels and Portland-Vancouver Anchorage are dredged each year, allowing the habitat to recover. Here the best indicator for the extent of take is the amount of side channel habitat disturbed in a given year. This disturbance is best expressed as, an average of three side channels (including Portland-Vancouver Anchorage) dredged per year in a five year period, other than Baker Bay which may be dredged every year.

Exceeding any of these limits will trigger the reinitiation provisions of this opinion.

2.8.2 Effect of the Take

In the accompanying opinion, NMFS determined that this level of anticipated take is not likely to result in jeopardy to the species.

2.8.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" are nondiscretionary measures to minimize the amount or extent of incidental take (50 CFR 402.02). "Terms and conditions" implement the reasonable and prudent measures (50 CFR 402.14). These must be carried out for the exemption in section 7(o)(2) to apply.

The following reasonable and prudent measures are necessary and appropriate to minimize take of listed species resulting from implementation of the proposed action. These reasonable and prudent measures will also minimize adverse effects to critical habitat. The Corps shall:

1. Minimize incidental take caused by maintenance of the Columbia River navigation channel by limiting the time and manner of dredging, and dredged material disposal.

2. Ensure completion of a comprehensive monitoring and reporting program to confirm this opinion is meeting its objective of minimizing take from the proposed action.

2.8.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the Corps or any applicant must comply with them in order to implement the reasonable and prudent measures (50 CFR 402.14). The Corps or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this incidental take statement (50 CFR 402.14). If the following terms and conditions are not complied with, the protective coverage of section 7(o)(2) will likely lapse.

1. To implement Reasonable and Prudent Measure #1 (dredging and dredge material disposal), the Corps shall:
    a. Apply these terms and conditions to its own actions when carrying out FNC O&M work, to the actions of any contractor hired by the Corps for that purpose, and to the actions of any party licensed by the Corps to dredge sand from the FNC for commercial purposes.
    b. Complete all dredging and in-water placement during the following times (the "routine" or "preferred" O&M season):
        i. The mouth of the Columbia River at RM -3.0 to the Interstate 5 Bridge at RM 106.5 from June 1 through December 15.
        ii. I-5 Bridge at 106.5 to the Bonneville Dam at RM 145 from August 1 through September 30.
        iii. All side channels except the Old Mouth Cowlitz River from August 1 through December 15 (i.e., Baker Bay/West Channel, Chinook Channel, Hammond Boat Basin, Skipanon Channel, Skamokawa Creek,

Wahkiakum Ferry Channel, Westport Slough, and Upstream Entrance to Oregon Slough and Portland-Vancouver Anchorage.

iv. Old Mouth Cowlitz River from September 1 through December 1

c. Dredging and in-water placement may be completed outside the preferred O&M season as necessary to resolve shoaling conditions that cause, or are likely to cause, significant draft restrictions for commercial vessels if left unmanaged until the next preferred O&M season.

   i. Whenever possible, limit dredging outside the preferred O&M season to April 1 through May 31.
   ii. No in-water disposal is allowed between December 1 and May 31Cowlitz River at RM 63 to 70,
   iii. When alternative sites are available, there will be no in-water placement near the mouths of the Kalama River at RM 71 to 75, or the Lewis River at RM 85-89 December 1 and May 31.
   iv. Testing and calibration of dredge equipment outside the preferred O&M season must occur upstream the Lewis River at RM 89.

d. Prior to any dredging taking place, the Corps must develop and implement a Water Quality Sampling and Monitoring Plan for dredging and disposal that has been reviewed and approved by NMFS. The plan must include the following minimum requirements for turbidity monitoring during periods of active dredging, disposal, and dewatering of upland facilities.

   i. A properly and regularly calibrated turbidimeter is recommended, however visual gauging is acceptable
   ii. Locations of turbidity samples or observations must be identified and described in the plan. At a minimum, monitoring must take place at the following distance, and within any visible plumes:
      1. Dredging and in-water disposal activities (flowlane and beach placement) – Upcurrent (background) and 900 feet down current from the point of discharge (bucket, cutterhead, draghead, or pipeline) and no more than 150 feet laterally from the vessel or shoreline.
      2. Other disposal activities (upland) – Upcurrent (background) and 300 feet downcurrent from the discharge point.
      3. If a meter is used the Corps must identify a depth between 10 and 20 feet, or at mid-depth if in shallow areas (less than 20 feet in depth), to collect all samples.
   iii. Monitoring must occur when dredging and disposal is being conducted and must meet the following requirements;
      1. Active Dredging – once a day during a flood tide and once a day during an ebb tide.
      2. In-Water Disposal (Flowlane and Beach Placement) – once a day during a flood tide and once a day during an ebb tide during a disposal activity.
      3. Background turbidity NTU or observation, location, tidal stage, and time must be recorded prior to monitoring downcurrent

iv. Compliance:

1. Turbidity must be measured or observed and recorded as described above during periods of active dredging, disposal, and dewatering of upland facilities. Results must be compared to the background sample or observation taken during that monitoring event.
2. If an exceedance over the background level (as defined below Table 49) occurs at the second monitoring interval the activity must stop until the turbidity levels return to background. At that time, activity may resume with the minimum frequency of monitoring while maintaining compliance

Table 49. Turbidity Exceedance and Actions Required

<table>
<tr><th rowspan="3">TURBIDITY CAUSING ACTION</th><th colspan="3">ALLOWABLE EXCEEDANCE TURBIDITY LEVEL</th><th rowspan="3">ACTION REQUIRED AT 1ST MONITORING INTERVAL</th><th rowspan="3">ACTION REQUIRED AT 2ND MONITORING INTERVAL</th></tr>
<tr><th colspan="2">TURBIDIMETER</th><th rowspan="2">VISUAL</th></tr>
<tr><th>Background < 50 NTU</th><th>Background ≥ 50 NTU</th></tr>
<tr><td>DREDGING & IN-WATER DISPOSAL</td><td rowspan="2">0 to 5 NTU above background</td><td rowspan="2">10% over background</td><td rowspan="2">Visible plume</td><td>Modify activity and continue to monitor at ebb or flood tide</td><td>Stop activity until levels return to background and continue to monitor at ebb or flood tide</td></tr>
<tr><td>UPLAND DISPOSAL</td><td>Modify activity and continue to monitor every 4 hours</td><td>Stop activity until levels return to background and continue to monitor every 4 hours</td></tr>
</table>

e. Water quality limits on side channel and Portland-Vancouver Anchorage dredging:

i. DO will be sampled at the mid-point of the water column 300 feet down current from the dredge and in the turbidity plume if visible.

ii. Samples will be collected during daylight hours during active dredging at the following frequency; once a day during a flood tide and once a day during an ebb tide.

iii. DO concentrations must be sampled with a dissolved oxygen meter properly and regularly calibrated according to the owner's manual.

iv. Dredging may not begin if DO concentrations at the dredge site are less than 6.5 mg/l

v. If the level of DO measured is below 8 mg/l, the monitoring frequency must increase to every four hours until the level returns above 8 mg/l.

vi. If the level of DO is measured below 6.5 mg/l, or if distressed or dead fish are observed in or beside the dredge, the activity must be stopped until the level returns to above 6.5 mg/l.

vii. Restricted visibility: During periods of restricted visibility that could cause an unsafe condition, the Corps may postpone required compliance monitoring until conditions improve if confirmation is made by a third party, such as the Coast Guard Watch Stander or the National Weather Service, that the visibility in the area to be monitored is considered to be restricted and is unsafe to conduct the required monitoring. If monitoring is postponed due to restricted visibility and unsafe conditions, the weather condition, time of determination, and verification route must be recorded. Regular monitoring must resume once the visibility returns to safe levels.

f. Keep dragheads and cutterheads at or buried in the substrate when suction dredges are working, and no more than 3.0 feet above the substrate for the minimum time necessary to clean or purge the dragheads.

g. Discharge material from a pipeline dredge at depths of 20.0 feet or more below the water surface.

h. Require use of an enclosed-bucket whenever a clamshell dredge or back-hoe will be used to dredge materials that are not approved for in-water disposal due to contaminant concerns.

i. Use the SEF (2009; or the most recent version) to determine the suitability of sediment for in-water disposal or beneficial use.

j. Grade all shoreline disposal or beach nourishment sites to between 10 to 15% with no swales to reduce the potential to strand juvenile salmonids.

k. Monitor upland disposal sites during the nesting season. Discourage any avian predators that are found nesting at an upland disposal site, consistent with the Migratory Bird Act.

l. Construct any new upland disposal site at least 300 feet from the shoreline, and include a berm designed to minimize sediment in return flow.

m. Provide this notice to all Corps project managers or contractors engaged in FNC maintenance, and to all private vendors licensed to remove sand from the FNC for commercial purposes:

> <u>NOTICE</u>. If a sick, injured or dead specimen of a threatened or endangered species is found, the finder must notify the Vancouver Field Office of NMFS Law Enforcement at 360.418.4246. The finder must take care in handling of sick or injured specimens to ensure effective treatment, and in handling dead specimens to preserve biological material in the best possible condition for later analysis of cause of death. The finder also has the responsibility to carry out instructions provided by law enforcement to ensure that evidence intrinsic to the specimen is not disturbed unnecessarily.

2. To Implement Reasonable and Prudent Measure #2 (monitoring), the Corps shall:

a. Prepare a monitoring report for NMFS by February 15 each year that describes the Corps' efforts in carrying out these terms and conditions. The report must include

i. An assessment of overall channel maintenance activity.

ii. An assessment of dredging and disposal activities by river segment, including the dredged area in acres, dredging time in minutes, date, dredge type, disposal site.

iii. DO and turbidity observations before and during side channel dredging.
iv. A summary of all observations of upland disposal sites that may be used for nesting use by avian predators, especially Caspian terns and double-crested cormorants.
v. The finished beach gradient at any beach nourishment site used during the year.
vi. The location, time and amount of any reported spills, the cleanup response time and actions as well as effectiveness.
vii. A copy of any warning, notice of noncompliance, penalty notice, violation, or other enforcement action taken by a Federal, state or local agency.

b. Submit the annual monitoring report to:

State Director
Oregon State Habitat Office
Attn: 2011/02095
1202 NE Lloyd Boulevard, Suite 1100
Portland, Oregon 97232-2778

c. The Corps must attend an annual coordination meeting with NMFS by March 1 each year to discuss the annual report and any actions that can improve conservation under this opinion, or make the maintenance program more efficient or accountable. The Corps is also encouraged to invite representatives from the Oregon Department of Environmental Quality, the Washington Department of Ecology, the Oregon Department of Fish and Wildlife, the Washington Department of Fish and Wildlife and the U.S. Environmental Protection Agency to attend.

2.9. Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02). The following conservation recommendation is a discretionary measure that NMFS believes is consistent with this obligation and therefore should be carried out by the Federal action agency:

- Decrease the proportion of dredged material disposed of at upland sites.
- Implement projects to reduce double-breasted cormorant habitats and encourage dispersal to other locations.
- Remove or modify pilings and pile dikes with low economic value when removal or modification would benefit juvenile salmonids and improve ecosystem health.
- Reduce the effects of vessel wake stranding in the estuary.

- As the Corps explores options for future disposal sites, beach nourishment or other locations that maintain the dredged material in the Columbia River system should be emphasized over upland disposal.
- Prior to non-routine dredging the Corps should, in coordination with the Oregon Department of Fish and Wildlife and the Washington Department of Fish Wildlife, and the National Marine Fisheries Service sample the area to be dredged for the presence eulachon adult eggs and larvae presence so more information can be collected regarding potential dredging effects on the species.
- The Corps should in cooperation with the Oregon Department of Fish and Wildlife the Washington Department of Fish and Wildlife and the National Marine Fisheries Service develop and implement a study to estimate the entrainment rate of green sturgeon during FNC dredging operations.

Please notify NMFS if the Federal action agency carries out any of these recommendations so that we will be kept informed of actions that are intended to improve the conservation of listed species or their designated critical habitats.

2.10 Reinitiation of Consultation

As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal action agency involvement or control over the action has been retained, or is authorized by law, and if: (1) The amount or extent of incidental take is exceeded, (2) new information reveals effects of the agency action on listed species or designated critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

2.11 "Not Likely to Adversely Affect" Determinations

An action is not likely to adversely affect (NLAA) a species or critical habitat if the effects are all likely to be discountable, insignificant, or completely beneficial (USFWS and NMFS 1998). Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur. Based on best judgment, a person would not (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur. Beneficial effects are wholly positive, without any adverse effects to the species or designated critical habitat.

The proposed action is NLAA the leatherback sea turtle, the eastern Steller sea lion (*Eumetopias jubatus)*, the Southern Resident Killer Whale (*Orcinus orca*), the humpback whale (*Megaptera novaeangliae*), blue whale (*Balaenoptera musculus*) sei whale (*Balaenoptera borealis*), fin whale (*Balaenoptera physalus*) and sperm whale (*Physeter macrocephalus*) for the following reasons. The proposed action is also NLAA designated critical habitats for the leatherback sea turtle, but the action area does not include designated critical habitat for the eastern Steller sea lion, or the Southern Resident Killer Whale. Critical habitat has not been designated for the humpback whale, the blue whale, the sei whale or the fin whale.

2.11.1 Steller Sea Lion

Listed as an ESA threatened species (63 FR 24345), the eastern Steller sea lion is commonly observed in the LCR. The eastern Steller sea lion species includes sea lions born on rookeries from California north through Southeast Alaska. The eastern Steller sea lion population has increased at about 3% per year numbering 45,000 to 51,000 animals in 2002 (NMFS 2008).

Steller sea lions are generalist predators that eat a variety of fishes and cephalopods, occasionally other marine mammals and birds. Steller sea lions will prey upon eulachon when abundant during spawning migrations (NMFS 2008). The mouth of the Columbia River, especially the South Jetty, is a haulout site for Steller sea lions but there are no rookeries near the action area and the action area is not designated as critical habitat (58 FR 45269). Haulout means terrestrial areas used by adult sea lions during times other than the breeding season and by non-breeding adults and subadults throughout the year.

Steller sea lions are present at the South jetty haulout site year around with up to 1,146 individuals being observed (NMFS 2011a). Steller sea lions are now commonly observed up to the tailrace of Bonneville Dam preying on salmon and white sturgeon (Stansell *et al*. 2009). Steller sea lions probably also prey on green sturgeon in the lower reaches of the Columbia estuary.

The proposed action could potentially impact Steller sea lions by disturbance during dredge and disposal activities, diminishing prey and exposing sea lions to resuspended contaminants associated with suspend sediments. Disturbance to Steller sea lions will be an insignificant effect. The sea lions can easily move away from dredge and disposal activities. Dredging at the River mouth will not significantly increase ship traffic near the South Jetty haulout site and the, consistent use of the haulout site indicates current vessel traffic is not adversely disturbing the sea lions. The dredging activities are not likely to cause significant reductions in available sea lion prey. The proposed action is not likely to adversely affect green sturgeon or jeopardize salmon, steelhead and eulachon populations. The sea lions should not be exposed to harmful concentrations of contaminants as management practices associated with the proposed action and the opinion to avoid exposure of ESA-listed fish to contaminants will be make any Steller sea lion exposure to contaminants insignificant. NMFS has determined that the proposed action is NLAA the eastern Steller sea lion population.

2.11.2 Leatherback Sea Turtle

The leatherback sea turtle is listed as an endangered species (6/02/70: 39 FR 19320) and the ocean portion of the action area is within designated critical habitat (1/05/2010: 77 FR 417). The following species and habitat information was obtained from 77 FR 417.

The leatherback sea turtle is the largest marine turtle and has the most extensive range of any living reptile, having been reported circumglobally throughout all the world’s oceans. The leatherback sea turtle nests in tropical to subtropical latitudes but can forage in cold temperate regions of the oceans having been found in latitudes as high as 71° N and 47°S. In the Pacific

Ocean, significant nesting aggregations occur primarily in Mexico, Costa Rica, Indonesia, the Solomon Islands, and Papua New Guinea.

Leatherbacks are largely a pelagic species foraging primarily on cnidarians (jellyfish and siphonophores) and to a lesser extent on tunicates (pyrosomas and salps). Leatherbacks forage widely in temperate waters especially in areas upwelling and convergence zones in the open ocean and in archipelagic waters.

Research has documented leatherback sea turtle migrations from the western tropical Pacific to the California current off the western coast of the United States. The sea turtles are most frequently observed off the coasts of California, Oregon and Washington during summer and late fall foraging on dense aggregations of the brown sea nettle (*Chrysaora fuscescens*) and other scyphomedusae, particularly moon jellies (*Aurelia labiata*). Leatherbacks are capable of deep diving but are usually found foraging at or near the surface.

Jellyfish blooms are seasonally and regionally predictable but at finer scales the local distribution is patchy and dependent upon oceanographic conditions. The seasonal and annual population variation in jellyfish is largely dependent upon the benthic polyp stages, about which little are known of their coastal populations. In the open ocean jellyfish tend to collect along boundaries such as oceanic fronts, local circulation patterns and upwelling as created along the western coast of the United States by the California Current. The Columbia River plume is known to aggregate jellyfish in the northern California Current.
The proposed critical habitat within which the action area includes the nearshore area from Cape Flattery, Washington to Winchester Bay, Oregon and extends offshore to a line approximating the 2000 meter isobath. One PCE essential for the conservation of leatherback sea turtles have been identified in marine waters off the western United States:

1. Occurrence of prey species, primarily scyphomedusae of the order Semaeostomeae (*Chrysaora, Aurelia*, *Phacellophora*, and *Cyanea*) of sufficient condition, distribution, diversity, and abundance to support individual as well as population growth, reproduction, and development of leatherbacks.

Specific, range-wide threats to leatherback sea turtles the harvest of eggs and nesting females, and incidental capture in fishing gear. The critical habitat review team did not consider vessel traffic as a potential threat to passage.

Leatherback turtles are not found in the Columbia River or in the dynamic environment associated with the nearshore dredge disposal sites. Leatherback turtles may be found in the ocean near the Deep Water site as their prey is fairly common off the River Mouth and associated with the plume. As discussed above, the Columbia River plume is known to aggregate jellyfish. Sea nettles were commonly collected by Emmett *et al.* (2004) in their study of the vertical distribution of juvenile salmon in the Columbia River plume. Moon jellies were also collected as were other jellyfish.

A review of the studies summarized in Corps (2007) found that polychaetes (marine worms) mollusks and crustaceans are the most common invertebrates found on the bottom of the Deep Water Site with no mention of the jellyfish polyps.

Jellyfish are found in the ocean off the mouth of the Columbia River and are aggregated in the plume therefore if jellyfish are under the ship when dredge material is deposited they will likely be entrained and buried by the discharge plume. However given the patchy nature of jelly fish distribution and the small area impacted by the dredge disposal NMFS believes the activities will not significantly affect the condition, distribution, diversity, and abundance of leatherback prey necessary to support individual as well as population growth, reproduction, and development.

Individual leatherback turtles may be in the vicinity of the Deepwater Site. NMFS believes the patchy distribution of prey within the broad distribution of the leatherback sea turtle makes the potential for a dredge to strike a turtle discountable.

One threat common to all sea turtles is contaminates in the water. The predominately sandy dredged material that will be deposited in the ocean under the proposed action has been found to be free of contaminants and therefore the proposed action will not contribute further to the contaminated water threat.

NMFS has determined that the proposed action is NLAA the leatherback sea turtle.

2.11.3 Blue Whales, Fin Whales, Sperm Whale, Sei Whale, Humpback Whales and Southern Resident Killer Whales.

NMFS reviewed the proposed action and recently concluded consultations (NMFS 2010b, 2010c) involving ocean disposal of dredge material or activities associated with maintaining the FNC at the River Mouth (NMFS 2011a) to assess the potential effects to the above ESA-listed whale species.

NMFS concurs with the Corps “may affect, not likely to adversely affect’ determination for the whale species. The whales all occur as migrants in waters off the Oregon and Washington coasts. The whales are not present in the Columbia River but could potentially occur in the vicinity of the dredge disposal routes particularly the Deep Water Site. However, blue whales, fin whales, sperm whales, and sei whales are generally not found in the nearshore environments and are unlikely to be present in the action area. Humpback whales and killer whales may occur closer to shore but killer whales are the only ones observed of the mouth of the Columbia River on a somewhat regular basis. As reviewed in NMFS (2011a), Southern Resident Killer Whales have been observed feeding off the Columbia River plume in the vicinity of the jetties during the peak spring Chinook migration in March and April which is outside the primary dredging season.

The two potential impacts of the proposed action on ESA listed whales are the potential for ship strikes as dredges move to the ocean disposal sites, a reduction in prey: salmon and eulachon for killer whales; eulachon and northern anchovy for humpback whales, and release of contaminated sediment into the ocean environment. The potential for vessel strikes is extremely unlikely (LCSG 2011). The dredge vessels are extremely slow moving, follow a predictable course and should be easily avoided by whales making the potential for a ship strike due to a dredge vessel discountable (NMFS 2010c).

As described in the effects analysis for salmon, the magnitude of anticipated adverse effects to juvenile salmon individuals is not quantifiable but is not likely to result in an appreciable reduction in the abundance of adult salmon that are prey for the killer whales.

The material dredged at the River Mouth that will be deposited in the ocean is predominately sand with little fine material and organic content and free of contaminants therefore the disposal will not increase the potential for the whales to be exposed to contaminants as the material is disposed into the water column.

3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

The consultation requirement of section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. The MSA (section 3) defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. Adverse effects include the direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside EFH, and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH.

The Corps did not specifically request MSA consultation or assess the effects of the action on EFH. The Corps (2011c) did however provide enough information to allow NMFS to conduct its own EFH effects assessment. This analysis is based, in part, on the proposed action and other information in the Corps (2011c) provided by the Corps; the assessment of the current environmental baseline and habitat effects of the action as described in this B.O.; and descriptions of EFH contained in the fishery management plans developed by the Pacific Fishery Management Council (PFMC) and approved by the Secretary of Commerce for coho salmon and Chinook salmon (1999), Pacific coast groundfish (PFMC 2006) and coastal pelagic species (PFMC 1998).

3.1 Essential Fish Habitat Affected by the Project

The proposed action will affect EFH designated for the various life-history stages of Pacific salmon, groundfish species, and coastal pelagic species, including the LCR estuary, an area that is also designated as HAPC.

Table 50. Species of fish and life stages with designated EFH that may occur within the action area, activities and prey.

Groundfish Species	Life stage	Activity	Prey
Arrowtooth flounder	Adults	All	Gadids, *Theragra chalcogramma*, krill, clupeids, shrimp
	Eggs	Unknown	
	Larvae		
Big skate	Adults	All	Crustaceans, fish
Black rockfish	Juveniles	Feeding, growth to maturity	
	Adults	All	
Blue rockfish	Juveniles	All	
	Adults	All	
	Larvae	Feeding	
Bocaccio	Juveniles	Feeding	Euphausiids, copepods
Butter sole	Adults	All	Polychaetes, molluscs, fish, decapod crustaceans, amphipods, shrimp, sea stars
Cabezon	Adults	All	Fish eggs, lobsters, molluscs, small fishes, crabs
California skate	Eggs	Unknown	
Canary rockfish	Juveniles	Feeding, growth to maturity	
Chilipepper	Adults	All	Clupeids, euphausiids, *Merluccius productus*, squids, copepods, euphausiids
	Juveniles	Feeding, growth to maturity	
Copper rockfish	Adults	All	Crustaceans, fish, shrimp, molluscs
Curlfin sole	Adults	All	Crustacean eggs, *Echiurid proboscises*, nudibranchs, polychaetes
Dusky rockfish	Adults	All	
English sole	Juveniles	Feeding, growth to maturity	Polychaetes, molluscs, cumaceans, copepods, amphipods, mysids
	Adults	All	Polychaetes, ophiuroids, molluscs, cumaceans, amphipods, crustaceans
Flathead sole	Adults	All	Polychaetes, mysids, shrimp, molluscs, clupeids, fish
Kelp greenling	Adults	All	Worms, crabs, octopi, shrimp, small fishes, brittle stars, snails
	Larvae		

Groundfish Species	Life stage	Activity	Prey
Lingcod	Adults	All	Juvenile crab, demersal fish, squid, octopi
	Larvae	Feeding	Decapod larvae, copepods, euphausiids, copepod nauplii, copepod eggs, amphipods
Longnose skate	Adults	All	
Pacific cod	Juveniles		Amphipods, shrimp, copepods, crabs
	Larvae		Copepods
Pacific hake	Juveniles		Euphausiids
	Adults	All	
Pacific sanddab	Adults	All	Squids, octopi, crab larvae, clupeids
Petrale sole	Adults	All	Shrimp, *Eopsetta jordani*, euphausiids, ophiuroids, pelagic fishes
Quillback rockfish	Adults	All	Amphipods, molluscs, euphausiids, polychaetes, fish juveniles, shrimp, clupeids, crabs
Redstripe rockfish	Adults	All	Fish juveniles, squid, clupeids
Rex sole	Adults	All	Cumaceans, euphausiids, larvacea, polychaetes
Rock sole	Adults	All	Tunicates, echinoderms, fish, molluscs, polychaetes, echiurans
Rosy rockfish	Adults	All	Crabs, shrimp
Sablefish	Adults		Octopi, clupeids, euphausiids, shrimp, rockfish
	Juveniles	Growth to Maturity	Krill, small fishes, squids, euphausiids, demersal fish, tunicates, cephalopods, amphipods, copepods
	Larvae	Feeding	
Sand sole	Adults	All	Polychaetes, clupeids, crabs, fish, mysids, shrimp, molluscs
	Juveniles	Growth to Maturity, feeding	Euphausiids, molluscs, mysids, polychaetes, shrimp
Silvergray rockfish	Adults	All	
Soupfin shark	Adults	All	Fish, invertebrates
	Juveniles	Growth to Maturity	Invertebrates, fish
Spiny dogfish	Adults	All	Pelagic fishes, invertebrates

Groundfish Species	Life stage	Activity	Prey
Splitnose rockfish	Juveniles	Feeding	Copepods, cladocerans, amphipods
	Larvae		
Spotted ratfish	Adults	All	Amphipods, annelids, brittle stars, fish, algae, molluscs, squids, small crustacea, ostracods, opisthobranchs, nudibranchs
	Juveniles	Growth to Maturity	Small crustacea, squids, ostracods, ophisthobranchs, nudibranchs, molluscs, fish, brittle stars, amphipods, algae, annelids
Starry flounder	Adults	Growth to Maturity	Molluscs, fish juveniles, polychaetes, crabs
	Juveniles	Feeding	Polychaetes, copepods, amphipods
Stripetail rockfish	Adults	All	Euphausiids, copepods
	Juveniles	Growth to Maturity	Copepods
Tiger rockfish	Adults	All	Juvenile rockfish, amphipods, fish juveniles, shrimp, clupeids, crabs
Vermilion rockfish	Adults		Clupeids, juvenile rockfish, krill, octopi, squids
Widow rockfish	Juveniles	Growth to Maturity, feeding	Copepods, copepod eggs, euphausiid eggs
Yellowtail rockfish	Adults	All	Clupeids, euphausiids, tunicates, mysids, salps, squid, krill, *Merluccius productus*

Coastal Pelagic Species	Life stage	Activity*	Prey
Northern anchovy	Eggs		
	Larvae		
	Juvenile		
	Adult	All	Zooplankton
Pacific sardine	Eggs		
	Larvae		
	Juvenile		
	Adult	All	Zooplankton
Pacific mackerel	Eggs		
	Larvae		
	Juvenile		
	Adult	All	Zooplankton, micronekton
Jack mackerel	Adult		Krill, small crustacea
Market squid	Eggs		
	Larvae		
	Juvenile		
	Adult	All	Plankton, small crustacea, euphausiids, copepods

Pacific Salmon			
Coho salmon**	Juvenile		
	Adults	Feeding	
Chinook salmon	Juvenile		Plankton, insects, small fish
	Adults	Feeding	

3.2 Adverse Effects on Essential Fish Habitat

As described more fully in the effects analysis above, the primary adverse effects of dredging and dredge material disposal necessary to complete the proposed maintenance of the Columbia River navigation channel, when the dredges create suction that will entrain, or other mechanical conditions that will grab, and injure or kill juvenile, salmon, groundfish, coastal pelagic species or their prey. Additional adverse effects are reasonably likely to occur due to modification of channel substrate and impairment of prey resources, and reduced water quality conditions caused by maintenance of the side channels and anchorage.

3.3 Essential Fish Habitat Conservation Recommendations

NMFS expects that full implementation of these EFH conservation recommendations would protect approximately 154,000 acres of designated EFH for Pacific Coast salmon, groundfish and coastal pelagic species by avoiding or minimizing the adverse effects described in Section 3.2 above.

1. Protect EFH from the effects of maintaining the FNC by limiting the time and manner of dredging, and dredged material disposal as described in Term and Condition 1, above.

2. Ensure that the effects of maintaining the FNC do not exceed those predicted by completing a comprehensive monitoring and reporting program as described in Term and Condition 2, above.

These conservation recommendations are a subset of the ESA terms and conditions above, plus the ESA section 7(a)(2) conservation recommendation given above.

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the Federal action agency must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation from NMFS. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS' EFH Conservation Recommendations, unless NMFS and the Federal action agency have agreed to use alternative time frames for the Federal action agency response. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NMFS Conservation Recommendations, the Federal action agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects, 50 CFR 600.920(k)(1).

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

3.5 Supplemental Consultation

The Corps must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations, 50 CFR 600.920(l).

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

Section 515 of the Treasury and General Government Appropriations Act of 2001 (Public Law 106-554) (Data Quality Act) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these Data Quality Act (DQA) components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

4.1 Utility: Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users are the Corps and their dredging contractors or licensees.

An individual copy was provided to the Corps. The format and naming adheres to conventional standards for style.

4.2 Integrity: This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in

Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

4.3 Objectivity:

Information Product Category: Natural Resource Plan.

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA Regulations, 50 CFR 402.01, *et seq*., and the MSA implementing regulations regarding EFH, 50 CFR 600.920(j).

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the Literature Cited section. The analyses in this opinion/EFH consultation contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation, and reviewed in accordance with Northwest Region ESA quality control and assurance processes.

5. LITERATURE CITED

Adams, P.B., C. B. Grimes, S.T. Lindley, and M.L. Moser. 2002. Status review for North American Green Sturgeon, *Acipenser medirostris*. National Marine Fisheries Service Southwest Fisheries Science Center. Santa Cruz, CA 95060. June 2002. 50p

Adams, P.B., C. Grimes, J.E. Hightower, S.T. Lindley, M.L. Moser and M.J. Parsley. 2007. Population status of North American green sturgeon, *Acipenser medirostris*. Environmental Biology of Fishes 79:339-356.

Beamesderfer, R., L. Berg, M. Chilcote, J. Firman, E. Gilbert, K. Goodson, D. Jepsen, T. Jones, S. Knapp, C. Knutsen, K. Kostow, B. McIntosh, J. Nicholas, J. Rodgers, T. Stahl, and B. Taylor. 2010. Lower Columbia River conservation and recovery plan for Oregon populations of salmon and steelhead. Oregon Department of Fish and Wildlife, Salem, Oregon.

Bindoff, N.L., J. Willebrand, V. Artale, A, Cazenave, J. Gregory, S. Gulev, K. Hanawa, C. Le Quéré, S. Levitus, Y. Nojiri, C.K. Shum, L.D. Talley, and A. Unnikrishnan. 2007. Observations: oceanic climate change and sea level. In: *Climate change 2007: The physical science basis. Contribution of Working Group I to the fourth assessment report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor, and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY.

Bird Research Northwest. 2012. Oregon State University and U.S. Geological Survey – Oregon Cooperative Fish and Wildlife Research Unit. May 16, 2012, http://www.birdresearchnw.org/

Bjornn, T.C. and D.W. Reiser 1991. Habitat requirements of salmonids in streams. American Fisheries Society Special Publication 19.

Bottom, D.L., C.A. Simenstad, J. Burke, A.M. Baptista, D.A. Jay, K.K. Jones, E. Casillas, and M.H. Schiewe. 2005. Salmon at river's end: The role of the estuary in the decline and recovery of Columbia River salmon. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-68, 246 p.

Buell, J.W. 1992. Fish entrainment monitoring of the Western Pacific Dredge *R. W. Lofgren* during operations outside the preferred work period. Report of Buell and Associates to Western Pacific Dredging. Portland, Oregon

Busch, S., P. McElhany, and M. Ruckelshaus. 2008. A comparison of the viability criteria developed for management of ESA listed Pacific salmon and steelhead. Northwest Fisheries Science Center, National Marine Fisheries Service, Seattle, Washington.

Casey, J. 2012. Letter from Joyce Casey, Corps to Kim Kratz, NMFS. (February 8, 2012) (Results of the Columbia River Channel Operations and Maintenance Project monitoring program).

Chapman, D.W. 1988. Critical review of variables used to define effects of fines in redds of large salmonids. Transactions of the American Fisheries Society 117: 1-21

Collins, M.A. 1995. Dredging-induced near-field resuspended sediment concentrations and source strengths. Miscellaneous Paper D-95-2. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS

Corps (Army Corps of Engineers). 2001. Biological assessment. Columbia River channel improvements project. U.S. Army Corps of Engineers, Portland District, Portland, Oregon. December 28, 2001.

Corps (Army Corps of Engineers). Parameters Describing the Convective Descent of Dredged material Placed in Open Water by a Hopper Dredge. Compiled by the Corps of Engineers, Portland District Portland, Oregon. February 26, 2005.

Corps (Army Corps of Engineers). 2007. Summary of physical and biological studies at the mouth of the Columbia River sponsored by the U.S. Army Corps of Engineers. U.S Army Corps of Engineers Portland District, Portland, Oregon June 2007.

Corps (Army Corps of Engineers). 2009a. Draft biological assessment Columbia River operations and maintenance mouth of the Columbia River to Bonneville Dam. U.S Army Corps of Engineers Portland District, Portland, Oregon. October 2009

Corps (Army Corps of Engineers). 2009b. Columbia River Mainstem Federal Navigation Channel sediment quality evaluation report. U.S. Army Corps of Engineers, Portland District Portland, Oregon. September 2009

Corps (Army Corps of Engineers). 2009c. Vancouver to The Dalles Federal Navigation Channel Sediment Quality Evaluation Report. U.S. Army Corps of Engineers, Portland District, Portland, Oregon. October 2009.

Corps (Army Corps of Engineers).2011a. Endangered Species Act biological assessment for anadromous salmonids, green sturgeon, Pacific eulachon, marine mammals & marine turtles for Columbia River channel operations and maintenance, mouth of the Columbia River to Bonneville Dam, Oregon and Washington. U.S. Army Corps of Engineers, Portland District, Portland, Oregon. January 2011.

Corps (Army Corps of Engineers).2011b. Endangered Species Act biological assessment for anadromous salmonids, green sturgeon, Pacific eulachon, marine mammals & marine turtles for Columbia River channel operations and maintenance, mouth of the Columbia River to Bonneville Dam, Oregon and Washington. U.S. Army Corps of Engineers, Portland District, Portland, Oregon. April 2011.

Corps (Army Corps of Engineers). 2011c. Endangered Species Act biological assessment for anadromous salmonids, green sturgeon, Pacific eulachon, marine mammals & marine turtles for Columbia River channel operations and maintenance, mouth of the Columbia River to Bonneville Dam, Oregon and Washington. U.S. Army Corps of Engineers, Portland District, Portland, Oregon. April 2011 Amended August 2011.

De Robertis, A., C.A. Morgan, R.A. Schabetsberger, R.W. Zabel, R.D. Brodeur, R.L. Emmett, C.M. Knight, G.K. Krutzikowsky, E. Casillas. 2005. Columbia River plume fronts. II. Distribution, abundance, and feeding ecology of juvenile salmon. *Marine Ecology Progress Series* 299:33-44.

Domingue, R. 2012. Email from Richard Domingue, NMFS to Marc Liverman, NMFS (May 17, 2012) (Confirming 2011 was a high flow year, approximately 10% exceedence)

Drake, J., R. Emmett, K. Fresh, R. Gustafson, M. Rowse, D. Teel, M. Wilson, P. Adams, E.A.K. Spangler, and R. Spangler. 2008. Summary of scientific conclusions of the review of the status of eulachon (*Thaleichthys pacificus*) in Washington, Oregon and California. Northwest Fisheries Science Center, National Marine Fisheries Service, Seattle, Washington.

EPA (U.S. Environmental Protection Agency). 2002. Columbia River basin fish contaminant survey 1996–1998. EPA 910-R-02-006. EPA, Region 10, Seattle, Washington.

Emmett, R.L., R.D. Brodeur and P.M. Orton. 2004. The vertical distribution of juvenile salmon (*Oncorhynchus* spp.) and associated fishes in the Columbia River plume. Fisheries and Oceanography 13: 392-402.

Erickson, D.L., J.A. North, J.E. Hightower, J. Weber and L. Lauck. 2002. Journal of Applied Icthyology. 18:565-569.

Fernald, A.G., P.J. Wigington, and D.H. Landers. 2001. Transient storage and hyporheic flow along the Willamette River, Oregon: Field measurements and model estimates. Water Resources Research 37(6):1681-1694.

Ford, M.J. (ed.). 2011. Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-113, 281 p

Fredrick G. 2012. Personal communication between Ken MacDonald, NMFS and Gary Fredrick, NMFS, (May 2, 2012) (conservation discussing migration depth of yearling salmonid outmigrants in the lower Columbia River).

Fresh, K.L., E. Casillas, L.L. Johnson, and D.L. Bottom. 2005. Role of the estuary in the recovery of Columbia River Basin salmon and steelhead: An evaluation of the effects of selected factors on salmonid population viability. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-69, 105 p.

Good, T.P., R.S. Waples, and P. Adams (editors). 2005. Updated status of federally listed ESUs of west coast salmon and steelhead. West Coast Salmon Biological Review Team. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-66, 598 p.

Gregory, S., R. Wildman, L. Ashkenas, K. Wildman, and P. Haggerty. 2002a. Fish assemblages. Pages 44-45 *in* D. Hulse, S. Gregory, and J. Baker (editors). Willamette River basin planning atlas: Trajectories of environmental and ecological change. Oregon State University Press, Corvallis, Oregon.

Gregory, S., L. Ashkenas, D. Oetter, P. Minear, R. Wildman, P. Minear, S. Jett, and K. Wildman. 2002b. Revetments. Pages 32-33 *in* D. Hulse, S. Gregory, and J. Baker (editors). Willamette River Basin planning atlas: Trajectories of environmental and ecological change. Oregon State University Press, Corvallis, Oregon.

Gregory, S., L. Ashkenas, D. Oetter, P. Minear, and K. Wildman. 2002c. Historical Willamette River channel change. Pages 18-26 *in* D. Hulse, S. Gregory, and J. Baker (editors). Willamette River basin planning atlas: Trajectories of environmental and ecological change. Oregon State University Press, Corvallis, Oregon.

Gregory, S., L. Ashkenas, P. Haggerty, D. Oetter, K. Wildman, D. Hulse, A. Branscomb, and J. VanSickle. 2002d. Riparian vegetation. Pages 40-43 *in* D. Hulse, S. Gregory, and J. Baker (editors). Willamette River basin planning atlas: Trajectories of environmental and ecological change. Oregon State University Press, Corvallis, Oregon.

Gustafson, R.G., M.J. Ford, D. Teel, and J.S. Drake. 2010. Status review of eulachon (*Thaleichthys pacificus*) in Washington, Oregon, and California. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-105, 360 p.

Gustafson, R.G., M.J. Ford, P.B. Adams, J.S. Drake, R.L. Emmett, K.L. Fresh, M. Rowse, E.A.K. Spangler, R.E. Spangler, D.J. Teel, and M.T. Wilson. 2011. Conservation status of eulachon in the California Current. Fish and Fisheries. DOI: 10.1111/j.1467-2979.2011.00418.x

Hayes, D.F., T.R. Crockett, T.J. Ward, and D. Averett 2000. Sediment resuspension during cutterhead dredging operations. Journal of Waterway Port, Coastal, and Ocean Engineering. 126:153-161

Hebdon, J.L., P. Kline, D. Taki, and T.A. Flagg. 2004. Evaluating reintroduction strategies for Redfish Lake Sockeye Salmon captive brood progeny. *American* Fisheries *Society Symposium* 44:401-413.

Hogarth, W. 2005. Memorandum from William T. Hogarth to Regional Administrators, Office of Protected Resources, NMFS (Application of the “Destruction or Adverse Modification” Standard Under Section 7(a)(2) of the Endangered Species Act) (November 7, 2005).

Hongsheng, B., R.E. Ruppel and W.T. Peterson 2007. Modeling the pelagic habitat of salmon off the Pacific Northwest (USA) coast using logistic regression. Marine Ecology Progress Series 336: 249-265.

Idaho Department of Environmental Quality. 2011. Idaho Department of Environmental Quality final 2010 integrated report. Boise, Idaho.

IC-TRT (Interior Columbia Technical Recovery Team). 2003. Working draft. Independent populations of Chinook, steelhead, and sockeye for listed evolutionarily significant units within the Interior Columbia River domain. NOAA Fisheries. July.

IC-TRT. 2006. Draft Snake River salmon and steelhead recovery plan. National Marine Fisheries Service, Northwest Region, Protected Resources Division, Portland, Oregon.

IC-TRT. 2007. Viability criteria for application to Interior Columbia Basin salmonid ESUs. Review draft. March. Northwest Fisheries Science Center, National Marine Fisheries Service, Seattle, Washington.

IC-TRT, 2011. Draft recovery plan for Idaho Snake River spring/summer Chinook and steelhead populations in the Snake River spring/summer Chinook salmon evolutionarily significant unit and Snake River steelhead distinct population segment (chapters 1-3). National Marine Fisheries Service, Northwest Region, Protected Resources Division. Boise, Idaho. http://www.idahosalmonrecovery .net.

ISAB (Independent Scientific Advisory Board) 2000. The Columbia River Estuary and the Columbia Basin Fish and Wildlife Program. A Review of the Impacts of the Columbia River's Hydroelectric System on Estuarine Conditions. Northwest Power Planning Council. Portland Oregon. ISAB 2000-5.

ISAB (Independent Scientific Advisory Board). 2007. Climate change impacts on Columbia River Basin fish and wildlife. ISAB Climate Change Report, ISAB 2007-2, Northwest Power and Conservation Council, Portland, Oregon.

JCRMS (Joint Columbia River Management Staff). 2010 joint staff report concerning stock status and fisheries for sturgeon and smelt. Oregon Department of Fish and Wildlife and Washington Department of Fish and Wildlife.

Johnson, G.E. and fourteen others. 2011. Ecology of juvenile salmon in shallow tidal freshwater habitats of the lower Columbia River. Prepared for the Bonneville Power Administration. Contract number DE-AC05-76RL01830. Pacific Northwest National Laboratory. Richland, Washington.

Keefer, M.L., C.A. Peery, and M.J. Henrich. 2008. Temperature mediated *en route* migration mortality and travel rates of endangered Snake River sockeye salmon. Ecology of Freshwater Fish 17:136-145.

Kelly, J.T., A.P. Klimley and C.E. Crocker (2006). Movements of green sturgeon, *Acipenser medirostris*, in the San Francisco Bay estuary, California. Environmental Biology of Fishes. Springer 2006

Larson, K. 2010. Email from Kim Larson, Corps to Robert Anderson, NMFS (November 10, 2010).

LCFRB (Lower Columbia Fish Recovery Board). 2010. Washington lower Columbia salmon recovery & fish and wildlife subbasin plan. May 28. Final. Lower Columbia Fish Recovery Board, Olympia, Washington.

LCREP (Lower Columbia River Estuary Partnership). 2007. Lower Columbia River and estuary ecosystem monitoring: Water quality and salmon sampling report. Lower Columbia River Estuary Partnership, Portland, Oregon.

LCSG (Lower Columbia Solutions Group).2011. Mouth of the Columbia River regional sediment management plan. August 2011.40 pp

Lindley, S.T., D.L. Erickson, M.L. Moser, G. Williams, O.P. Langness, B.W. McCovey, M. Belchik, D. Vogel, W. Phinnix, J.T. Kelly, J.C.Heublein and A.P. Klimley. 2011. Electronic tagging of green sturgeon reveals population structure and movement among estuaries. Transactions of the American Fisheries Society 140: 108-122.

Lyons, D.E., D.D. Roby, A.F. Evans, N.J. Hostetter, K. Collis and S.H. Sebring. 2011. Benefits to Columbia River anadromous salmonids from potential reductions in predation by double-crested cormorants nesting at the East Sand Island colony. Draft report. Prepared for the U.S. Army Corps of Engineers-Portland District. December, 2011.

Marin Jarrin, J.R., A.L. Shanks and M.A. Banks. 2009. Confirmation of the presence and use of sandy beach surf-zones by juvenile Chinook salmon. Environmental Biology of Fishes. 85:119-125

McElhany, P., M. H. Ruckelshaus, M. J. Ford, T. C. Wainwright, and E.P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionarily significant units. U.S. Department of Commerce, NOAA Technical Memorandum, NMFS-NWFSC-42 Seattle, Washington, 156p.

McElhany, P., C. Busack, M. Chilcote, S. Kolmes, B. McIntosh, J.M. Myers, D. Rawding, A. Steel, C. Steward, D. Ward, T. Whitesel, and C. Willis. 2006. Revised viability criteria for salmon and steelhead in the Willamette and Lower Columbia basins. Review draft. Willamette/Lower Columbia Technical Recovery Team and Oregon Department of Fish and Wildlife.

McElhany, P., M. Chilcote, J. Myers, and R. Beamesderfer. 2007. Viability status of Oregon salmon and steelhead populations in the Willamette and Lower Columbia Basins. Prepared for Oregon Department of Fish and Wildlife and National Marine Fisheries Service, Portland, Oregon.

Meyer, B. 2012. Conversation between Ken MacDonald, NMFS, and Ben Meyer, NMFS (April12, 2012) (confirming the dynamic nature of the channel substrate within the FNC).

Moser, M.L. and S.T. Lindley. 2007. Use of Washington estuaries by subadult and adult green sturgeon. Environmental Biology of Fishes. 79:243-253.

Myers, J.M., C. Busack, D. Rawding, A.R. Marshall, D.J. Teel, D.M. Van Doornik, and M.T. Maher. 2006. Historical population structure of Pacific salmonids in the Willamette River and lower Columbia River basins. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-73, 311 p.

NMFS (National Marine Fisheries Service). 2005a. Endangered Species Act – Section 7 consultation biological opinion and conference opinion & Magnuson-Stevens Act Essential Fish Habitat Consultation, reinitiation of Columbia River Federal Navigation Channel improvements project. NMFS No. 2004/01612. Northwest Region. Seattle, Washington. February 16, 2005.

NMFS (National Marine Fisheries Service). 2005b. Endangered Species Act – Section 7 consultation biological opinion and conference opinion & Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation Columbia River operations and maintenance program Columbia River Basin Mouth of the Columbia River to Bonneville Dam. NMFS No2004/01041. Northwest Region. Seattle, Washington. March 11, 2005.

NMFS (National Marine Fisheries Service). 2006. Columbia River estuary recovery plan module. National Marine Fisheries Service, Northwest Region, Seattle, Washington.

NMFS (National Marine Fisheries Service). 2007. 2007 Report to Congress: Pacific Coastal Salmon Recovery Fund, FY 2000-2006. National Marine Fisheries Service, Silver Spring, Maryland.

NMFS (National Marine Fisheries Service). 2008. Recovery Plan for the Steller Sea Lion (*Eumetopiasjubatus*). Revision. National Marine Fisheries Service, Silver Spring, MD. 325 pages.

NMFS (National Marine Fisheries Service). 2009a. Middle Columbia River steelhead distinct population segment ESA recovery plan. November 30. Northwest Region, Seattle, Washington

NMFS (National Marine Fisheries Service). 2009b.Endangered Species Act Section 7 Informal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat consultation for the Sundial Marine maintenance dredging and habitat enhancement project, Columbia River, Multnomah County, Oregon. NMFS No. 2008/09088. Northwest Region. Seattle, Washington, October 22, 2009.

NMFS (National Marine Fisheries Service) 2010a. Lower Columbia River conservation and recovery plan for Oregon populations of salmon and steelhead. Final August 6, 2010.

NMFS (National Marine Fisheries Service). 2010b. Endangered Species Act Section 7 Biological Opinion and Magnuson- Stevens Fishery Conservation and Management Act Essential Fish Habitat Conservation Recommendations for the Siuslaw River ocean dredged material disposal site designation. NMFS No: 2009/04136. Northwest Region, Seattle, Washington. April 21, 2010.

NMFS (National Marine Fisheries Service). 2010c. Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Corps maintenance dredging program for the Oregon coastal projects. NMFS No: 2009/01756. Northwest Region, Seattle, Washington. May 28, 2010.

NMFS (National Marine Fisheries Service) 2011a. Endangered Species Act biological opinion and conference report and Magnuson-Stevens Fishery Conservation Act Essential Fish Habitat Consultation for the major rehabilitation of the jetty system at the mouth of the Columbia River. NMFS No. 2010/06104. Northwest Region. Seattle, Washington. March 18, 2011.

NMFS(National Marine Fisheries Service). 2011b. *Columbia River Estuary ESA Recovery Plan Module for Salmon and Steelhead*. NMFS Northwest Region. Portland, Oregon. January. Prepared for NMFS by the Lower Columbia River Estuary Partnership (contractor) and PC Trask &Associates, Inc., subcontractor

Newcombe, C.P., and J.O. Jensen. 1996. Channel suspended sediment and fisheries: a synthesis for quantitative assessment of risk and impact. North American Journal of Fisheries Management 16:693-727.

Newcombe, C.P. and D.D. MacDonald. 1991. Effects of suspended sediments on aquatic ecosystems. North American Journal of Fisheries Management 11:72-82

NOAA (National Oceanic and Atmospheric Administration) Fisheries. 2005. Assessment of NOAA Fisheries' critical habitat analytical review teams for 12 evolutionarily significant units of West Coast salmon and steelhead. National Marine Fisheries Service, Protected Resources Division, Portland, Oregon.

NOAA (National Oceanic and Atmospheric Administration) Fisheries. 2011. Biennial report to Congress on the recovery program for threatened and endangered species October 1, 2008 – September 30, 2010. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Washington, D.C.

NRC (National Research Council). 1995. Science and the Endangered Species Act. Committee on scientific issues in the Endangered Species Act. Commission on Life Sciences. National Research Council. National Academy Press, Washington, D.C.

ODEQ (Oregon Department of Environmental Quality). 2008a. Evaluation report and findings on the application for certification pursuant to Section 401 of the Federal Clean Water Act. Mouth of the Columbia River Channel Maintenance Dredging. Submitted by Department of the Army, U.S. Army Corps of Engineers. Oregon Department of Environmental Quality. Northwest Region. Portland, Oregon. January 3, 2008.

ODEQ (Oregon Department of Environmental Quality) 2008b Evaluation report and findings on the application for certification pursuant to Section 401 of the Federal Clean Water Act. The Columbia River Channel Improvement Project and the Columbia River Operations and Maintenance Dredging. Submitted by Department of the Army, U.S. Army Corps of Engineers. Oregon Department of Environmental Quality. Northwest Region. Portland, Oregon. May 30, 2008.

ODFW and NMFS (Oregon Department of Fish and Wildlife and National Marine Fisheries Service, Northwest Region). 2011. Upper Willamette River conservation and recovery plan for Chinook salmon and steelhead.

Parsley, M.J., N.D. Popoff, and J.G. Romine. 2011. Short-term response of subadult white sturgeon to hopper dredge disposal operations. North American Journal of Fisheries Management. 31: 1-11

Pearson, W.H. and J.R. Skalski (2010). Factors affecting stranding of juvenile salmonids by wakes from ship passage in the lower Columbia River. River Research and Applications. Published online – Wiley InterScience, DOI:1002/rra.1397

R2 Resource Consultants. 1999. Entrainment of outmigrating fish by hopper dredge in the Columbia River and Oregon coastal sites. Final unpublished report to the Army Corps of Engineers, Portland District. July 1999. 23 pp.

Reed, D.H., J.J. O'Grady, J.D. Ballou, and R. Frankham. 2003. The frequency and severity of catastrophic die-offs in vertebrates. Animal Conservation 6:109-114.

Reynold, N. 2012. Personal communication from Nate Reynolds (Cowlitz Indian Tribe) during a January 27 meeting between representatives of NMFS, the Corps, and biologists from the Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, Cowlitz Tribe to discuss what is currently known about eulachon in the Columbia River.

Rien, T. 2012. Personal communication between Ken MacDonald, NMFS and Tom Rien, ODFW. (May 18, 2012) (telephone conversation to clarify literature regarding green sturgeon feeding habits in the lower Columbia River)

Romano, M. 2011 Personal communication between Ken MacDonald, NMFS and Marc Romano, NMFS (December 22, 2011) (conservation to clarify interpretation of the literature regarding habitat use by larval eulachon).

Romano, M. 2012. Personal communication between Ken MacDonald, NMFS and Marc Romano, NMFS (February 10, 2012) (conversation regarding the potential viability of eulachon eggs along the bottom of the FNC).

Scheuerell, M.D. and J.G. Williams. 2005. Forecasting climate-induced changes in the survival of Snake River spring/summer Chinook salmon (*Oncorhynchus tshawytscha*). Fisheries Oceanography 14:448-457.

Sedell, J.R. and J.L. Froggatt. 1984. Importance of streamside forests to large rivers: The isolation of the Willamette River, Oregon, USA from its floodplain by snagging and streamside forest removal. Internationale Vereinigung für Theoretische und angewandte Limnologie Verhandlungen 22:1828-1834.

SEF (Sediment Evaluation Framework) 2009. Sediment evaluation framework for the Pacific Northwest. U.S. Corps of Engineers – Portland District, Seattle District, Walla Walla District and Northwest Division; U.S. Environmental Protection Agency, Region 10; Washington Department of Ecology, Washington Department of Natural Resources, Oregon Department of Environmental Quality, Idaho Department of Environmental Quality, National Marine Fisheries Service, U.S. Fish and Wildlife Service. U.S. Army Corps of Engineers, Portland District. May 16, 2012. http://www.nwp.usace.army.mil/environment/sediment.asp

Servizi, J.A. and D.W. Martens. 1992. Sublethal responses of coho salmon (*Oncorhynchus kisutch*) to suspended sediments. Canadian Journal of Fisheries and Aquatic Sciences 49:1389-1395.

Shaffer, M. 1987. Minimum viable populations: coping with uncertainty. Pages 69-86 *in* M. Soulé (editor). Viable populations for conservation. Cambridge University Press, Cambridge.

Sherwood, C.R., D.A. Jay, R.B. Harvey, P. Hamilton, and C.A. Simenstad. 1990. Historical changes in the Columbia River estuary. Progress in Oceanography 25:299–357.

Smedley, R.A., R.A. Curry, and M.A. Gray. 2011. Testing the severity of ill effects model for predicting fish abundance and condition. North American Journal of Fisheries Management 31:419-426.

Smith, G. 2011. Email from Gretchen Smith, Corps to Ken MacDonald, NMFS (November 15, 2011) (confirming that the Corps was withdrawing consultation on dredging Portland Harbor).

Smith, G. 2012a. Email from Gretchen Smith, Corps to Ken MacDonald, NMFS (March 5, 2012) (transmitting the revised proposed action).

Smith, G. 2012b. Email from Gretchen Smith, Corps to Ken MacDonald, NMFS (March 14, 2012) (transmitting the Corps impact analysis and best management practices for eulachon).

Smith, G. 2012c. Email from Gretchen Smith, Corps to Ken MacDonald, NMFS (March14, 2012) (BA Information Requested by NMFS)

Smith, G. 2012c. Email from Gretchen Smith, Corps, to Ken MacDonald, NMFS (March 14, 2012) (NMFS Info Request submitted 03-14-2012 re: CR FNC Impact dredging analysis),

Smith, G. 2012e. Email from Gretchen Smith,Corps to Ken MacDonald, NMFS (March 20, 2012) clarifying Portland Anchorage should be included in the proposed action as described in the March 11 2010 BA).

Smith, G. 2012f. Email from Gretchen Smith, Corps to Ken MacDonald, NMFS (March 29, 2012) (BA Information Requested By NMFS - Side Channels).

Smith, G. 2012g. Email from Gretchen Smith, Corps to Ken MacDonald, NMFS (March 30, 2012) (Realignment of the Desdemona Channel).

Smith, G. 2012h. Telephone conversation between Gretchen Smith, Corps and Ken MacDonald, NMFS (March 30, 2012) (Discussion regarding the March 29, 2012 email BA Information Requested by NMFS – Side Channels)

Smith, G. 2012i. Email from Gretchen Smith, Corps to Ken MacDonald, NMFS (April 2, 2012) (Re Numbers. The navigation channel is included within the area of flowlane used and not used for placement, therefore the total bank to bank area equals area of flowlane used for placement + area of the flowlane not used for placement + the outer channel area).

Smith, G. 2012j. Email from Gretchen Smith, Corps to Ken MacDonald, NMFS (April 10, 2012) (Dredging BMPS, revised this BMP from that included in the proposed action).

Smith, G. 2012k, Email from Gretchen Smith, Corps to Ken MacDonald, NMFS (April 13, 2012) (re spill control plan).

Smith, G. 2012m. Time period was clarified in email from Gretchen Smith, Corps to Ken MacDonald, NMFS (April 23, 2012) (re Kalama and Lewis Rivers).

Smith, G. 2012n. Email from Gretchen Smith, Corps to Ken MacDonald, NMFS (May 17, 2012) (re MCR *Essayons* dredging)

Smith, G. 2012o. Email from Gretchen Smith, Corps to Ken MacDonald, NMFS (May 17,and May 18, 2012) (re_MCR Dredging).

Smith, G. 2012p. Email from Gretchen Smith, Corps to Ken MacDonald, NMFS (June 12, 2012) (re Take Adjustment)

Smith, G. and K. Marcoe. 2012. Project spreadsheets provided by Gretchen Smith, Corps (January 19, 2012) and Keith Marcoe, Lower Columbia Estuary Partnership (February 14, 2012) to Ken Macdonald, NMFS

Spence, B.C., G.A. Lomnicky, R.M. Hughes, and R.P. Novitzki. 1996. An ecosystem approach to salmonid conservation. Report by ManTech Environmental Research Services, Inc., Corvallis, Oregon, to National Marine Fisheries Service, Portland, Oregon.

Suttle, K.B., M.E. Power, J.M. Levine, and C. McNeely. 2004. How fine sediment in riverbeds impairs growth and survival of juvenile salmonids. Ecological Applications 14: 969-974.

UCSRB (Upper Columbia Salmon Recovery Board). 2007. Upper Columbia spring Chinook salmon and steelhead recovery plan.

USDC (U.S. Department of Commerce). 2009. Endangered and threatened wildlife and plants: Final rulemaking to designate critical habitat for the threatened southern distinct population segment of North American green sturgeon. National Marine Fisheries Service. Federal Register 74(195):52300-52351

USDC (U.S. Department of Commerce). 2010. Endangered and threatened wildlife and plants, final rulemaking to establish take prohibitions for the threatened southern distinct population segment of North American green sturgeon. National Marine Fisheries Service. Federal Register 75(105):30714-30728

USDC (U.S. Department of Commerce). 2011. Endangered and threatened species, designation of critical habitat for southern distinct population segment of eulachon. Proposed rule; request for comment. National Marine Fisheries Service. Federal Register 76(3):515-536.

USFWS (U.S. Fish and Wildlife Service) and NMFS (National Marine Fisheries Service) 1998.Consultation handbook. Procedures for conducting consultation and conference activities under section 7 of the Endangered Species Act. Final March 1998.

USGCRP (U.S. Global Change Research Program). 2009. Global Climate Change Impacts in the U.S. USGCRP, Suite 250, 1717 Pennsylvania Ave., NW, Washington, DC 20006.

Wagner, H.H., F.P. Conte, and J.L. Fessler. 1969. Development of osmotic and ionic regulation in two races of Chinook salmon (*Oncorhynchus tshawytscha*). Comparative Biochemistry and Physiology 29: 325-341.

Wainwright, T.C., M.W. Chilcote, P.W. Lawson, T.E. Nickelson, C.W. Huntington, J.S. Mills, K.M.S. Moore, G.H. Reeves, H.A. Stout, and L.A. Weitkamp. 2008. Biological recovery criteria for the Oregon Coast coho salmon evolutionarily significant unit. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-91, 199 p.

WDFW and ODFW (Washington Department of Fish and Wildlife and Oregon Department of Fish and Wildlife). 2001. Joint state eulachon management plan.

Wentz, D.A., B.A. Bonn, K.D. Carpenter, S.R. Hinkle, M.L. Janet, F.A. Rinella, M.A. Uhrich, I.R. Waite, A. Laenen, and K.E. Bencala. 1998. Water quality in the Willamette Basin, Oregon, 1991-95: U.S. Geological Survey Circular 1161. June 25.

West, S. 2012a. Email from Steve West, Washington Department of Fish and Wildlife to ken MacDonald, NMFS (May 7, 2012) (Chinook outmigration in the Cowlitz River)

West, S. 2012b. Email from Steve West, Washington Department of Fish and Wildlife to ken MacDonald, NMFS (May 7, 2012) (Confirmation August Chinook outmigration from the Cowlitz River are subyearling fish)

Wilber, D.H. and D.G. Clark. 2001. Biological effects of suspended sediments: a review of suspended sediment impacts of fish and shellfish with relation to dredging activities in estuaries. North American Journal of Fisheries Management. 21:855-875

Wissmar, R.C., J.E. Smith, B.A. McIntosh, H.W. Li, G.H. Reeves, and J.R. Sedell. 1994. Ecological health of river basins in forested regions of eastern Washington and Oregon. General Technical Report PNW-GTR-326. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Portland, Oregon.

Woodbury, D. 2012a. Email from David Woodbury, NMFS to Ken MacDonald, NMFS. (May 16, 2012) (Green sturgeon lengths from Columbia River).

Woodbury, D. 2012b. Email from David Woodbury, NMFS to Ken MacDonald, NMFS. (May 16, 2012) (Sturgeon entrainment photographs).

Woodbury, D. 2012c. Email from David Woodbury, NMFS to Ken MacDonald, NMFS. (May 16, 2012) (Shark entrainment and attached spreadsheet, 2011_BaySmeltMon_All ThruNoon1Aug.xls).

Woodbury, D. 2012d. Telephone conversation between David Woodbury, NMFS Ken MacDonald, NMFS and Eric Murry, NMFS. (May 16, 2012). (Discussion of potential dredging effects on green sturgeon).

Woodbury, D. 2012e. Email from David Woodbury, NMFS to Ken MacDonald, NMFS. (May 16, 2012) (Vessel Props).

Zabel, R.W., M.D. Scheuerell, M.M. McClure, and J.G. Williams. 2006. The interplay between climate variability and density dependence in the population viability of Chinook salmon. Conservation Biology 20:190-200.

6. APPENDICES

Appendix 1

FNC History

(Amendment to the Biological Assessment 11-7-2011)

In the River and Harbor Act of 18 June 1878, Congress authorized the Columbia River Navigation Channel Project and directed the Corps to establish and maintain a 20-foot minimum channel depth. Maintaining this depth required dredging in only a few shallow reaches of the river where the natural controlling depths were in the 12 to 15 foot range (Corps 1999). In the River and Harbor Act of 13 July 1892, Congress increased the authorized navigation channel depth to 25 feet. The maintenance dredging associated with this increase was still limited to a few particularly shallow reaches where sporadic dredging was conducted as needed (Corps 1999). In the River and Harbor Act of 13 June 1902, Congress adopted a 25-foot channel to the sea.

In the River and Harbor Act of 25 July 1912, Congress increased the navigation channel depth to 30 feet. At that time, the navigation channel width was established at 300 feet. Increasing the channel depth to 30 feet resulted in the need for increased maintenance dredging to ensure that authorized navigation depths were safe for shipping and to address shoaling associated with the new depth (Corps 1999).

In the River and Harbor Act of 3 July 1930, House Document 195, Congress increased the authorized depth from Portland to the sea to 35 feet. The navigation channel width also was increased to 500 feet and was realigned in certain reaches. The channel modifications were completed in 1935. From 1936 to 1957, Congress authorized additional channel alignment adjustments that added to the dredging requirements. During this period, dredging averaged 6.7 million cubic yards (mcy) per year.

By 1958, the channel alignment had stabilized, but maintenance dredging was augmented to increase the advanced maintenance dredging (AMD) depth from 2 to 5 feet in areas of active shoaling. This AMD approach enhances navigational safety by maintaining the authorized channel depth (which is necessary to ensure adequate under-keel clearance) during periods of channel shoaling that occur between maintenance dredging events. AMD in the navigation channel is done at the same time as routine maintenance dredging.

The 40-foot navigation channel was authorized by the River and Harbor Act of 23 October 1962, and construction took place in stages from 1964 to 1976.

The current 43-foot deep channel in the Columbia and Lower Willamette (C&LW) was authorized by the Water Resources Development Act of 17 August 1999 (Public Law 106-53). The channel is 43 feet deep and 600 feet wide from RM 3.0 to 101.4; 43 feet deep and 400 feet wide from RM 101.4 to 105.5; 43 feet deep and 400 feet wide in the downstream 1.5 miles of Oregon Slough; and 35 feet deep from RM 105.5 to 106.5 (from the Burlington Northern and Santa Fe Railway Bridge to the Interstate 5 Bridge). The navigation channel generally follows the deepest part of the natural river channel. Most of the channel is naturally deeper than 43 feet;

however, shoals tend to form in channel reaches where natural depth is less than 43 feet. This reach also includes the Portland/Vancouver Anchorage (River and Harbor Act of 1960, Section 107 project), which consists of one deep-draft anchorage and one anchorage used primarily for empty vessels. From 1976 to the onset of the most recent channel improvement, maintenance dredging has averaged approximately 5.5 to 6.5 mcy per year excluding emergency dredging related to the 1980 eruption of Mount St. Helens (Corps 1999). Since channel improvement activities began in June 2005, average annual volume dredged has been greater than prior to improvement activities. It is difficult to predict volumes dredged over the next 5 years as the new channel comes into equilibrium.

The MCR Project was authorized separately from the LCR navigation channel under the River and Harbor Act of 5 July 1884; however, the originally authorized project depth of 40 feet was not completed until 1918. The South Jetty was completed in 1914 and the North Jetty completed in 1917. A spur jetty (Jetty A) was completed in 1939 for the purpose of channel stabilization. The River and Harbor Act of 3 September 1954 authorized a 48-foot channel depth. Public Law 98-63 (30 July 1983) authorized deepening of the northernmost 2,000 feet of the channel to 55 feet. Four to 5 mcy of sand are dredged at the MCR Project annually and placed at U.S. Environmental Protection Agency (EPA) approved disposal sites and one Clean Water Act site. In 2008, sand was placed on the north side of the MCR North Jetty for the purpose of protecting the jetty from scouring resulting from storm surges. The South Jetty and North Jetty at the MCR were constructed to secure the FNC though the ocean entrance to the Columbia River. The South Jetty is about 6.6 miles long. The first 4.5 miles of the South Jetty were constructed from 1885 to 1895. It was extended to its present footprint length from 1913 to 1914; however, about 6,200 feet (head loss) have eroded. The North Jetty is about 2.5 miles long and was constructed from 1915 to 1917. About 1,900 feet of head loss has occurred. These existing project features were authorized by the River and Harbor Acts of July 5, 1884; March 3, 1905; and September 3, 1954. Portions of the South Jetty were repaired in 1982.

The jetties were constructed at the entrance to the Columbia River to confine tidal currents, to obtain scouring velocities in the bar and entrance channels to help maintain the authorized channel dimensions, and to help protect vessels entering and exiting the river. The North and South Jetties at the MCR have experienced damage to both jetty heads and along the jetties at several locations. Damage along both jetties has been repaired in 2005-2007.

The portion of the Columbia River navigation channel from Vancouver, Washington to The Dalles, Oregon (RM 106.5-192), was authorized by the River and Harbor Acts of 26 August 1937 and 24 July 1946. The portion of the navigation channel from Vancouver to Bonneville Dam is authorized for maintenance to a depth of 27 feet. Currently, this portion of the navigation channel is maintained for barge traffic only. Based on draft requirements of current users, the channel is maintained to a depth of 17 feet, with 2 feet of AMD (depth 19 feet).

The side-channel projects included in this BA were first authorized at various times, as shown below. More detailed descriptions for the side channel projects, as well as their recent dredging history, can be found in the biological assessment submitted for this consultation

1933 –Columbia River at Baker Bay, first authorized by the River and Harbor Act of 11 December 1933. The Baker Bay West Channel is authorized by the River and Harbor Act of 2 March 1945.

1938 –Chinook Channel, authorized by the River and Harbor Act of 20 June 1938.

1975 –Hammond Boat Basin, authorized under Section 107 of the River and Harbor Act of 1960.

1930 –Skipanon Channel authorized by the River and Harbor Act of 3 July 1930.

1919 –Skamokawa Creek, authorized by the River and Harbor Act of 2 March 1919.

1993 –Wahkiakum Ferry, authorized under Section 107 of the River and Harbor Act of 1960.

1937 –Westport Slough, authorized by the River and Harbor Act of 26 August 1937.

1945 –Old Mouth Cowlitz River, as part of the C&LW project, authorized by the River and Harbor Act of 2 March 1945.

1946–Upstream Entrance to Oregon Slough, as part of the Columbia River from Vancouver to The Dalles project, authorized by the Rivers and Harbors Act of 24 July 1946.

Appendix 2

Impact Analysis

The NMFS ESA listed species jeopardy analysis and analysis of potential take due to dredging required information that was not available in the BA. On February 2, 2012, Mark Liverman and Ken MacDonald (NMFS) met with Jessica Stokke and Gretchen Smith (Corps) to discuss potential approaches to better quantify the potential effects of the proposed action on eulachon, salmon and steelhead, and designated critical habitat. To determine the potential intensity or magnitude of effects, NMFS requested the Corps to determine the amount of habitat potentially affected by dredging and disposal activities compared to the amount of habitat available in the Columbia River. NMFS also asked the Corps if it would be possible to quantify the potential timing and duration of effects.

The Corps responded with an impact analysis via email on March 14, 2012 (Smith 2012c). This appendix documents the NMFS' effects analysis based upon the information provided by the Corps. The complete information provided by the Corps is included in the record of the biological opinion. The information provided by the Corps used in this analysis will be presented first followed by the NMFS' analysis of effects using the information.

Corps Impact Analysis

The Corps typically dredges the Columbia River Federal Navigation Channel with two hopper dredges owned by the Corps, the *Essayons* and *Yaquina*, contract hopper dredges and the *Oregon*, a pipeline dredge owned by the Port of Portland. The dimensions and production rates of the hopper dredges are displayed in Table A2-1.

Table A2-1. Hopper Dredges.

	Essayons	Yaquina	Contract Hopper
Dump bay size (ft^2)*	3,348	888	in between , may be split hull
Width (ft)	31	24	-
Length (ft)	108	37	-
Average length of placement event (ft)	2,500	1,500	2,500
Load size/volume (CY)	5,500	998	3,500-5,000
Total cycle time (min)	164	77	115
Pumping time (min)	95	48	45
Placement time (min)	8	4	10
Turning/Transit (min)	61	25	60
Average production (CY/day)	48,000	19,000	50,000
*dump bay size = max area as the load is released from the vessel			

The pipeline dredge *Oregon* may be dispose of dredged material in the flowlane, at upland sites or at beach nourishment sites. The Oregon dredges an approximately 400 foot wide area advancing about 450 feet downstream per day. During flowlane disposal a slurry is discharged at approximately 9 feet/second into the channel flowing about 3 feet/second. The sand settles quickly creating an immediate prism of less than 40 feet in diameter (1300 square feet). The slurry is discharged through a 30 inch discharge pipe at least 20 feet below the water surface. The discharge pipe has a diffuser on the end to evenly displace the material. The discharge area for a dredging site is usually 2500 feet by 400 feet as the pipe is moved several times per day to prevent mounding. The *Oregon* can dredge approximately 2500 cubic yards (cy) per day.
The Corps next calculated the area potentially affected per minute by dredging (Table A2-2) and the area potentially affected per minute through disposal (Table A2-3).

Table A2-2. Area affected by dredging/minute.

Vessel	Acres/minute
Essayons	0.07
Yaquina	0.03
Contract Hopper	0.11
Oregon	0.003

Table A2-3. Area affected by flowlane disposal/minute.

Vessel	Acres/minute
Essayons	0.67
Yaquina	0.62
Contract Hopper	0.77
Oregon	0.03

A Clamshell was used to dredge river segment 6. The Corps provided the NMFS the following information regarding clamshell dredges (Smith 2012f) (Clamshell rate was based on use of a large scow capable of 1.4 loads/day at 3,150 cy/load):

- Clamshell dredging time is based on 3.8 cy material removed per 60 second cycle when dredging.
    - Clamshell dredges typically spend 50%-75% of the shift time actively dredging and not all contractors work 24 hour shifts.
- In-water placement when clamshell dredging depending upon the scow used (equipment varies depending upon availability) (Smith 2012h).
    - Large scow = 3,150 cy/load; small scow = 1,050 cy/load
    - Large scow = 11 min (sand), 30 min (silt) to empty one load; small scow = 8 min (sand) 20 min (silt) to empty one load.
    - Large scow approximately 1.4 loads/day; small scow approximately 3.5 loads/day (placement occupies approximately 3% of the time each day)
    - Approximately 6 acres affected/load

The Corps records the annual amount of material dredged and disposed, including disposal method (flowlane, ocean disposal, upland disposal and beach nourishment) by river segment and vessel used. Tables A3-4 and A3-5 display an example of the dredging and disposal information the Corps provided for the impact analysis. Dredging information for 2011 is used in this analysis as it is the only year the FNC has been dredged since completion of the 43 foot channel. The Corps expects it will take several years before the new 43 foot channel stabilizes and a new "baseline" of annual dredging needs is established. However, NMFS believes the one year of data available for 2011 provides for a reasonable analysis of effects to ESA listed species and designated habitat. The Columbia River runoff flows were high so creation of shoals and dredging needs experienced in 2011 may be towards the high end of potential effects into the future.

Table A2-4. 2011 Columbia River – detailed dredging by reach.

Month - Year	Dredge Name	Dredge Type	Dredging Location	Dredging (CY)
RIVER SEGMENT 1				
September-2011	Essayons	Hopper	Flavel Bar	94,408
October-2011	Yaquina	Hopper	Flavel Bar	22,265
March-2011	Essayons	Hopper	Tongue Point Crossing	62,101
September - 2011	Terrapin	Hopper	Tongue Point Crossing	250,000
October-2011	Essayons	Hopper	Tongue Point Crossing	233,363
August - 2011	Terrapin	Hopper	Miller Sands	75,330
October-2011	Essayons	Hopper	Miller Sands	167,899
October-2011	Yaquina	Hopper	Miller Sands	80,641
October-2011	Oregon	Pipeline	Miller Sands	227,586
RIVER SEGMENT 2				
May - 2011	Yaquina	Hopper	Pillar Rock	52,019
August/September-2011	Oregon	Pipeline	Pillar Rock	551,064
September-2011	Essayons	Hopper	Pillar Rock	111,660
October - 2011	Essayons	Hopper	Pillar Rock	112,834
October/November - 2011	Essayons	Hopper	Pillar Rock	47,028
August-2011	Oregon	Pipeline	Brookfield Welch	231,958
September/October-2011	Oregon	Pipeline	Brookfield Welch	844,773
May-2011	Essayons	Hopper	Skamokawa Bar	98,460
September/October - 2011	Terrapin	Hopper	Skamokawa Bar	248,726
November-2011	Essayons	Hopper	Skamokawa Bar	24,413
March-2011	Essayons	Hopper	Puget Island Bar	101,859
May-2011	Essayons	Hopper	Puget Island Bar	129,339
October/November-2011	Essayons	Hopper	Puget Island Bar	358,556
May-2011	Essayons	Hopper	Wauna/Driscoll	77,564
August-2011	Essayons	Hopper	Wauna/Driscoll	45,457
October - 2011	Terrapin	Hopper	Wauna/Driscoll	125,827
November-2011	Essayons	Hopper	Wauna/Driscoll	12,630
May/June-2011	Essayons	Hopper	Westport Bar	374,604
June-2011	Essayons	Hopper	Westport Bar	47,911
July/August-2011	Oregon	Pipeline	Westport Bar	204,922
August-2011	Essayons	Hopper	Westport Bar	89,226
October - 2011	Terrapin	Hopper	Westport Bar	364,927
October/November-2011	Oregon	Pipeline	Westport Bar	181,140
November-2011	Essayons	Hopper	Westport Bar	61,283
November-2011	Essayons	Hopper	Westport Bar	50,250
RIVER SEGMENT 3				
July-2011	Oregon	Pipeline	Eureka Bar	41,238
November-2011	Essayons	Hopper	Eureka Bar	78,644
May - 2011	Yaquina	Hopper	Stella-Fisher Bar	24,200
August-2011	Essayons	Hopper	Stella-Fisher Bar	166,685
November-2011	Essayons	Hopper	Stella-Fisher Bar	165,505
November-2011	Oregon	Pipeline	Stella-Fisher Bar	182,996
September-2011	Essayons	Hopper	Slaughters Bar	80,350
November-2011	Essayons	Hopper	Slaughters Bar	65,216

Tables A2-5 A3-7 display the river segment, dredge and disposal information for the different river segments by the actual minutes of the dredging operations in 2011.

Table A2- 5. River Segments and Main Tributaries (D/S RM means downstream river mile; U/S RM means upstream river mile).

River Segment	Channel	Length		Tributaries
		D/S RM	U/S RM	
1	43-foot	3	25.2	Grays River (RM 22)
2	43-foot	25.2	48.2	-
3	43-foot	48.2	67.1	-
4	43-foot	67.1	83.8	Cowlitz (RM 68) & Kalama (RM 73)
5	43-foot	83.8	97.8	Lewis (RM 87)
6	43-foot	97.8	105.3	-
7	17-foot	105.3	125.3	Sandy (RM 120)
8	17-foot	125.3	136.4	-
9	17-foot	136.4	145.3	-

Table A2-6. Total Dredging (Minutes) by River Segment – 2011.

River segment	Channel	Length		Tributaries	Essayons	Yaquina	Contract Hopper	Oregon	Total
		D/S RM	U/S RM						
1	43-foot	3	25.2	Grays River	8,491	5,956	3,870	10,055	28,372
2	43-foot	25.2	48.2	-	28,622	2,113	215,460	96,447	342,642
3	43-foot	48.2	67.1	-	12,791	1,829		14,945	29,565
4	43-foot	67.1	83.8	Cowlitz	4,599	4,080		31,660	40,339
5	43-foot	83.8	97.8	Lewis (RM 87)	3,410	1,048			4,458
6	43-foot	97.8	105.3	-					0
7	17-foot	105.3	125.3	Sandy (RM 120)		4,152			4,152
8	17-foot	125.3	136.4	-		1,655			1,655
9	17-foot	136.4	145.3	-					0

Table A2-7. Total Flowlane Disposal (Minutes) by River Segment – 2011.

River Segment	Channel	Length		Tributaries	Essayons	Yaquina	Contract Hopper	Oregon	Total
		D/S RM	U/S RM						
1	43-foot	3	25.2	Grays River	1,041	464	860		2,365
2	43-foot	25.2	48.2	-	2,702	203	1,210	67,317	71,432
3	43-foot	48.2	67.1	-	652	82	1,070	33,835	35,639
4	43-foot	67.1	83.8	Cowlitz	209	297		4,535	5,041
5	43-foot	83.8	97.8	Lewis	198	76			274
6	43-foot	97.8	105.3	-					0
7	17-foot	105.3	125.3	Sandy		231			231
8	17-foot	125.3	136.4	-		73			73
9	17-foot	136.4	145.3	-					0

Table A2-8 displays the Corps calculations of the dimensions of the Columbia River, the area FNC that is expected need dredging, and the area that may potentially be affected by flowlane disposal.

Table A2-8. Columbia River channel dimensions (Smith 2012i).

River Segment	Channel	Length		Bank to bank river surface area at average water level (acres)	Area of navigation channel that needs dredging to maintain depth (acres)	Area of flow lane deeper than -20-ft contour used for placement (acres)
		D/S RM	U/S RM			
1	43-foot	3	25.2	76,100	1,208	138
2	43-foot	25.2	48.2	23,220	885	358
3	43-foot	48.2	67.1	9,690	438	330
4	43-foot	67.1	83.8	6,840	412	248
5	43-foot	83.8	97.8	5,060	315	193
6	43-foot	97.8	106.5	2,720	42	28
7	17-foot	106.5	125.3	10,350	81	110
8	17-foot	125.3	136.4	6,200	12	28
9	17-foot	136.4	145.3	2,780	1	0

Table A2-8. Columbia River channel dimensions (cont'd).

River Segment	Channel	Length		Area of navigation channel that does NOT need dredging to maintain depth (acres)	Area of flow lane deeper than -20-ft contour NOT used for placement (acres)	Outer Channel Area shallower than 20-ft contour NOT dredged or used for placement (acres)
		D/S RM	U/S RM			
1	43-foot	3	25.2	1,790	23,383	52,580
2	43-foot	25.2	48.2	1,110	8,631	14,232
3	43-foot	48.2	67.1	1,270	4,870	4,490
4	43-foot	67.1	83.8	1,222	4,393	2,200
5	43-foot	83.8	97.8	955	3,158	1,710
6	43-foot	97.8	106.5	656	2,113	580
7	17-foot	106.5	125.3	910	3,200	7,040
8	17-foot	125.3	136.4	438	2,123	4,050
9	17-foot	136.4	145.3	339	1,220	1,560

With the above information the Corps analyzed the habitat area affected by dredging and disposal compared to the total aquatic habitat area of the Columbia River (Table A2-9)

Table A2-9. Total effects analysis for 1 year: (Maintenance area + Placement area)/Total area = impact over 1 year.

River Segment	Channel	Length		Tributaries	Area of navigation channel that needs dredging to maintain depth (acres)	Area of flow lane below 20-ft contour used for placement (acres)	Total Area (acres)	% Affected/Total
		D/S RM	U/S RM					
1	43-foot	3	25.2	Grays River	1,208	138	76,100	2%
2	43-foot	25.2	48.2	-	885	358	23,220	5%
3	43-foot	48.2	67.1	-	438	330	9,690	8%
4	43-foot	67.1	83.8	Cowlitz	412	248	6,840	10%
5	43-foot	83.8	97.8	Lewis (RM	315	193	5,060	10%
6	43-foot	97.8	105.3	-	42	28	2,720	3%
7	17-foot	105.3	125.3	Sandy (RM	81	110	10,350	2%
8	17-foot	125.3	136.4	-	12	28	6,200	1%
9	17-foot	136.4	145.3	-	1	0	2,780	0%

Table A2-9 shows that the area affected by the 2011dredging and disposal activities ranged from 0% to 10% of the total wetted area depending upon the reach. The potential effects however are not constant so the Corps next analyzed the relative impact of dredging and disposal over the course of a year (Table A2-10 and Table A2-11).

Table A2-10. Dredging Impact (minutes) over One Year (Affected area per pumping minute x Total dredging minutes)/(Total Area available per minute x Total minutes). Affected Area per pumping is from Table A2-2 weighted by the amount dredging each vessel completed in a river segment. Total pumping minutes is the sum of the total minutes by vessel. Total area available is the surface area of the segment (Table A2-8). Total minutes equals the minutes in a year.

River Segment	Channel	Length		Tributaries	Affected Area per Pumping Minute (acres)	Total Pumping Time 2011 (min)	Total Area (acres)	Total Time available 2011 (min)	% Affected/Total
		D/S RM	U/S RM						
1	43-foot	3	25.2	Grays	0.04	28,372	76,10	525,600	0.000003%
2	43-foot	25.2	48.2	-	0.08	342,642	23,22	525,600	0.000212%
3	43-foot	48.2	67.1	-	0.03	29,565	9,690	525,600	0.000019%
4	43-foot	67.1	83.8	Cowlitz	0.01	40,339	6,840	525,600	0.000013%
5	43-foot	83.8	97.8	Lewis	0.06	4,458	5,060	525,600	0.000010%
6	43-foot	97.8	105.3	-		0	2,720	525,600	0.000000%
7	17-foot	105.3	125.3	Sandy	0.03	4,152	10,35	525,600	0.000002%
8	17-foot	125.3	136.4	-	0.03	1,655	6,200	525,600	0.000002%
9	17-foot	136.4	145.3	-		0	2,780	525,600	0.000000%

Table A2-11. Disposal Impact (minutes) over One Year (Affected area per placement minute X Total placement minutes)/ (Total area available per minute X Total minutes) = impact over 1 year.

River Segment	Channel	Length		Tributaries	Affected Area per Placement Minute (acres)	Total Placement Time 2011 (min)	Total Area (acres)	Total Time available 2011 (min)	% Affected/Total
		D/S RM	U/S RM						
1	43-foot	3	25.2	Grays	0.70	2,365	76,10	525,600	0.000003%
2	43-foot	25.2	48.2	-	0.07	71,432	23,22	525,600	0.000212%
3	43-foot	48.2	67.1	-	0.07	35,639	9,690	525,600	0.000019%
4	43-foot	67.1	83.8	Cowlitz &	0.09	5,041	6,840	525,600	0.000013%
5	43-foot	83.8	97.8	Lewis	0.66	274	5,060	525,600	0.000010%
6	43-foot	97.8	105.3	-		0	2,720	525,600	0.000000%
7	17-foot	105.3	125.3	Sandy	0.62	231	10,35	525,600	0.000002%
8	17-foot	125.3	136.4	-	0.62	73	6,200	525,600	0.000002%
9	17-foot	136.4	145.3	-		0	2,780	525,600	0.000000%

NMFS Impact Analysis

The Corps analysis provides a reasonable assessment of the potential magnitude, timing, duration and severity of effects to habitat due to the dredging operations. However the Corps calculated the potential impacts over the course of a year which does not account for impacts when vulnerable species or life stages may be present. Dredging the FNC is most likely to impact salmon and steelhead smolts and eulachon. Subyearling steelhead are most likely to be rearing in the tributary streams although some may be present in the more shallow water habitats of the Columbia estuary. Subyearling salmon may occur in the FNC but are most likely to be present in the shallow water habitats so dredging impacts to the subyearling life are most likely to occur due to dredging and disposal in the side channels. Salmon and steelhead smolts primarily migrate through the main Columbia River channel and eulachon, especially the eggs and larvae may be found throughout the channel and therefore may be impacted by FNC dredging. In order to better estimate the potential magnitude, timing, duration and severity of effects, NMFS conducted the following impact analysis based upon the time the fish are most likely to be in the proximity of the dredging and disposal operations.

Salmon and Steelhead Impact Analysis

Salmon and steelhead smolts begin migrating through the LCR in February with the peak abundances in April and June (Fresh *et al* 2005). The potential impacts to salmon and steelhead smolts were assessed following a similar process as the Corps but limiting the assessment to the March through time period (while the smolt out migration may begin in February there was no dredging during the month in 2011) . NMFS developed Table A2-13 beginning with the detailed dredging and disposal by reach information for 2011 (Tables A2-4 and A2-5 display examples of the information) but only including the data for February-June. NMFS also divided the volume dredged by the average production rate of the dredge (Table A2-1) to estimate the number of days the dredging occurred.

Table A2-12. 2011 Columbia River – Detailed dredging operations by reach: Smolt Out-Migration March – June.

Month - Year	Dredge Name	Dredge Type	Dredging Location	Dredging (CY)	Days
RIVER SEGMENT 1					
March-2011	*Essayons*	Hopper	Tongue Point Crossing	62,101	1.3
Total				**62,101**	**1.3**
RIVER SEGMENT 2					
May – 2011	*Yaquina*	Hopper	Pillar Rock	52,019	2.7
May-2011	*Essayons*	Hopper	Skamokawa Bar	98,460	2.1
March-2011	*Essayons*	Hopper	Puget Island Bar	101,859	2.1
May-2011	*Essayons*	Hopper	Puget Island Bar	129,339	2.7
May-2011	*Essayons*	Hopper	Wauna/Driscoll	77,564	1.6
May/June-2011	*Essayons*	Hopper	Westport Bar	374,604	7.8
June-2011	*Essayons*	Hopper	Westport Bar	47,911	1.0
Total				**881,756**	**20.0**
RIVER SEGMENT 3					
May – 2011	*Yaquina*	Hopper	Stella-Fisher Bar	24,200	1.3
Total				**24,200**	**1.3**
RIVER SEGMENT 4					
				0	**0**
RIVER SEGMENT 5					
March – 2011	*Yaquina*	Hopper	St. Helens Bar	11,750	0.6
March – 2011	*Yaquina*	Hopper	Willow Bar	2,154	0.1
March-2011	*Essayons*	Hopper	Willow Bar	11,923	0.3
Total				**25,827**	**1.0**
RIVER SEGMENT 6					
March/September – 2011*	*Hickey*	Clamshell	Lower Vancouver Bar	89,000	16.3
Total				**89,000**	**16.3**
RIVER SEGMENT 7					
				0	**0**
RIVER SEGMENT 8					
				0	**0**

*The Corps did not provide information separating the amount dredged in March versus December therefore the total dredging was assumed to occur in March to describe maximum potential impacts for this analysis.

Out-migrating smolts are typically moving through the main Columbia channel with the flowlane. To estimate the habitat most smolts are expected to occupy NMFS used the dimensions of the navigation channel and flowlane (Table A2-13) to estimate the smolt migratory corridor (Table A2-14).

Table A2-13. Estimated Lower Columbia Smolt Migratory Corridor (estimated smolt habitat equals the sum of the flowlane used for placement + the flowlane not used for placement).

River Segment	Area of navigation channel that needs dredging to maintain depth (acres)	Area of flow lane deeper than -20-ft contour used for placement (acres)	Area of navigation channel that does NOT need dredging to maintain depth (acres)	Area of flow lane deeper than -20-ft contour NOT used for placement (acres)	Total Estimated Smolt Migratory Habitat (acres)	Estimated Percent Habitat Potentially Affected
1	1,208	138	1,790	23,383	23,521	6%
2	885	358	1,110	8,631	8,989	14%
3	438	330	1,270	4,870	5,200	15%
4	412	248	1,222	4,393	4,641	14%
5	315	193	955	3,158	3,351	15%
6	42	28	656	2,113	2,141	3%
7	81	110	910	3,200	3,310	6%
8	12	28	438	2,123	466	9%
9	1	0	339	1,220	1,220	0.08%

The information in Table A2-13 and the cycle time for the dredges presented in Table A2-1was used to calculate the amount of time each vessel was dredging and disposing during the out-migration period (Table A2-14 and Table A2-17).

Table A2-14. *Essayons* Dredging Impacts March-June 2011.

River Segment	Dredging Operations (days)	Dredging Operations (minutes)	Cycle Time (minutes)	Cycles	Minutes Dredging	Minutes Disposal
1	1.3	1,872	164	11	1,045	88
2	17.3	24,912	164	152	14,440	1,216
5	0.3	432	164	3	285	24

Table A2-15. *Yaquina* Dredging Impacts March-June 2011.

River Segment	Dredging Operations (days)	Dredging Operations (minutes)	Cycle Time (minutes	Cycles	Minutes Dredging	Minutes Disposal
2	2.7	3,888	77	50	2,400	200
3	1.3	1,872	77	24	1,152	96
5	0.7	1008	77	13	624	52

Table A2-16. Clamshell Dredging Impacts - March 2011.

River Segment	Volume Dredged (cy)	Dredging Minutes (89,000cy/3.8cy/min)	Navigation Channel Needing Dredging (acres)	Acres Affected/minute
6	89,000	23,421	42	0.002

Table A2-17. Clamshell Disposal Impacts March 2011 (for this analysis the load capacity and number of loads per day for the large scow was were used and the 11 minutes per disposal was used assuming the navigation channel is predominately sand).

River Segment	Loads Disposed (89,000 cy/3,150 cy/load)	Disposal Minutes (11 min/load as assuming predominately sand)	Acres Affected/minute (6 acres/load)
6	28	308	0.019

Finally NMFS conducted analysis of the potential relative impacts to smolt habitat during the outmigration period (March-June 2011). The analysis is similar to the annual impact analysis conducted by the Corps displayed in Table A3-11 and Table A2-12. When two dredges were used in a reach the acres affected/minute from Table A2-2 and A2-3 was weighted by the amount of time each dredge was dredging or disposing (Table A2-16 and Table A2-17).

Table A2-18. Dredging Impacts to Smolt Outmigration Habitat March-June 2011 (% Affected= affected area per dredging minute x total dredging minutes)/total habitat area available per minute x total minutes).

River Segment	Affected Area per Dredging Minute (acres)	Total Dredging Time 2011 (min)	Total Area (acres)	Total Time available 2011 (min)	% Affected/Total
1	0.07	1,045	23,521	175,680	.002%
2	0.06	16,840	8,989	175,680	.064%
3	0.03	1,152	5,200	175,680	.004%
5	0.04	909	3,351	175,680	.006%
6	0.002	23,421	2,720	175,680	.01%

Table A2-19. Disposal Impacts to Smolt Outmigration Habitat March-June 2011(% Affected= affected area per disposal minute x total disposal minutes)/total habitat area available per minute x total minutes).

River Segment	Affected Area per Disposal Minute (acres)	Total Disposal Time 2011 (min)	Total Area (acres)	Total Time available 2011 (min)	% Affected/Total
1	0.67	88	23,521	175,680	.001%
2	0.66	1,416	8,989	175,680	.059%
3	0.62	96	5,200	175,680	.007%
5	0.64	76	3,351	175,680	.008%
6	0.019	308	2,720	175,680	.001%

Eulachon Impact Analysis

Eulachon typically enter the Columbia River in mid-December with peak spawning during February and March. Eulachon have been documented in the Columbia River as early as November and the average date of commercial landings in the Sandy River is March 21. Eulachon eggs are estimated to hatch in 30-40 days. Assuming March 21 as an "average" peak spawning time in the upper Columbia River then eggs and larvae may be present into May. The eulachon impact analysis followed the same steps as outlined in the smolt impact analysis.

Table A2-20. 2011 Columbia River – Detailed dredging operations by reach: Eulachon December – May.

Month - Year	Dredge Name	Dredge Type	Dredging Location	Dredging (CY)	Days
RIVER SEGMENT 1					
March-2011	*Essayons*	Hopper	Tongue Point Crossing	62,101	1.3
Total				62,101	1.3
RIVER SEGMENT 2					
May - 2011	*Yaquina*	Hopper	Pillar Rock	52,019	2.7
May-2011	*Essayons*	Hopper	Skamokawa Bar	98,460	2.1
March-2011	*Essayons*	Hopper	Puget Island Bar	101,859	2.1
May-2011	*Essayons*	Hopper	Puget Island Bar	129,339	2.7
May-2011	*Essayons*	Hopper	Wauna/Driscoll	77,564	1.6
May/June-2011	*Essayons*	Hopper	Westport Bar	374,604	7.8*
Total				833,845	19
RIVER SEGMENT 3					
May - 2011	*Yaquina*	Hopper	Stella-Fisher Bar	24,200	1.3
				24,200	1.3
RIVER SEGMENT 4					
December-2011	*Oregon*	Pipeline	Kalama Bar	297,555	11.9
December-2011	*Oregon*	Pipeline	Lower Martin Is. Bar	80,351	3.2
				377,906	15.1
RIVER SEGMENT 5					
March - 2011	*Yaquina*	Hopper	St. Helens Bar	11,750	0.6
March - 2011	*Yaquina*	Hopper	Willow Bar	2,154	0.1
March-2011	*Essayons*	Hopper	Willow Bar	11,923	0.3
November/December-2011	*Essayons*	Hopper	Willow Bar	35,286	0.7**
November/December-2011	*Essayons*	Hopper	Willow Bar	72,830	1.5
				98,657	3.2
RIVER SEGMENT 6					
March/September-2011	*Hickey*	Clam	Lower Vancouver Bar	89,000	20.2
December-2011	*Ross Is.*	Clam	Lower Vancouver Bar	7,530	1.7
				96,530	21.9
RIVER SEGMENT 7					
				0	0
RIVER SEGMENT 8					
				0	0

*Although the row includes dredging into June, how much was completed in June is not known so the full dredging time is assumed to potentially impact eulachon for this analysis

**Although the row includes dredging in November how much was completed in November vs. December is not known and since eulachon may be present in the latter part of November the full dredging time is assumed to potentially impact eulachon for this analysis

Unlike smolts which are primarily outmigrating through the main Columbia River channel and thus the FNC, eulachon, especially the eggs and larvae may be found throughout the whole river channel, therefore the area potentially impacted is the navigation channel but the whole Columbia wetted channel is considered potential habitat (Table A2-19) .

Table A2-21. Federal Navigation Channel and Potential Eulachon Habitat.

River Segment	Area of navigation channel that needs dredging to maintain depth (acres)	Area of flow lane deeper than -20-ft contour used for placement (acres)	Total Estimated Eulachon Habitat (acres)(From Table A2-9	% Potentially Affected Area
1	1,208	138	76,100	2%
2	885	358	23,220	5%
3	438	330	9,690	8%
4	412	248	6,840	10%
5	315	193	5,060	10%
6	42	28	2,720	3%
7	81	110	10,350	2%
8	12	28	6,200	1%
9	1	0	2,780	.04%

As described for Tables A2-14 and A2-15 NMFS used the number of days the vessel were operating in a river segment and the cycle times presented in Table A2-1 to calculate the amount of time each vessel was dredging and disposing material during the time the December – May time period (Tables A2-22 and Table A2-26).

Table A2-22. *Essayons* Dredging Impacts December-May 2011.

River Segment	Dredging Operations (days)	Dredging Operations (minutes)	Cycle Time (minutes)	Cycles	Minutes Dredging	Minutes Disposal
1	1.3	1,872	164	11	1,045	88
2	16.3	23,472	164	143	13,585	1,144
5	2.2	3,168	164	19	1,805	152

Table A2-23. *Yaquina* Dredging Impacts December – May 2011.

River Segment	Dredging Operations (days)	Dredging Operations (minutes)	Cycle Time (minutes	Cycles	Minutes Dredging	Minutes Disposal
2	2.7	3,888	77	50	2,400	200
3	1.3	1872	77	24	1,152	96
5	0.7	1,008	77	13	624	52

In addition to the *Essayons* and *Yaquina*, the pipeline dredge *Oregon* and two clamshell dredges, *Hickey* and *Ross Island* were in operation during the eulachon out analysis time period. The information regarding the potential impacts due to the *Oregon's* operations was provided in the Corps' March 14, 2012 impact analysis. The information for clamshell dredges was provided in a second email from Gretchen Smith, Corps on March 29, 2012 (Smith 2012i).

Table A2-24. *Oregon* Dredging Impacts December – May 2011.

River Segment	Dredging and Disposal Operations (days)	Dredging and Disposal Operations assuming dredge operates 84% of the time(minutes)
4	15.1	18,265

Table A2-25. Clamshell Dredging Impacts December – May 2011.

River Segment	Volume Dredged (cy)	Dredging Minutes (96,530cy/3.8cy/min)	Navigation Channel Needing Dredging (acres)	Acres Affected/minute
6	96,530	25,403	42	0.002

Table A2-26. Clamshell Disposal Impacts December – May 2011 (for this analysis the load capacity and number of loads per day for the large scow was were used and the 11 minutes per disposal was used assuming the navigation channel is predominately sand).

River Segment	Loads Disposed (96,530 cy/3,150 cy/load)	Disposal Minutes (11 min/load as assuming predominate	Acres Affected/minute (6 acres/load)
6	31	341	.055

NMFS then calculated a eulachon relative impact analysis similar to the smolt impact analysis. When two dredges were used in a reach the impacted acres and the dredging and disposal times were weighted by the amount of time each dredge was dredging or disposing.

Table A2-27. Dredging Impacts to Eulachon Habitat December-May2011 (% Affected= affected area per dredging minute x total dredging minutes)/total habitat area available per minute x total minutes).

River Segment	Affected Area per Dredging Minute (acres)	Total Dredging Time 2011 (min)	Total Area (acres)	Total Time available 2011 (min)	% Affected/Total
1	0.07	1,045	76,100	262,080	.0004
2	0.06	15,985	23,220	262,080	.0158
3	0.03	1,152	9,690	262,080	.0014
4	0.003	18,265	6,840	262,080	.0003
5	0.06	624	5,060	262,080	.0028
6	0.002	25,403	2,720	262,080	.0071

Table A2-28. Disposal Impacts to Eulachon Habitat December-May 2011(% Affected= affected area per dredging minute x total dredging minutes)/total habitat area available per minute x total minutes).

River Segment	Affected Area per Disposal Minute (acres)	Total Disposal Time 2011 (min)	Total Area (acres)	Total Time available 2011 (min)	% Affected/Total
1	0.67	88	76,100	262,080	.0003
2	0.66	1,344	23,220	262,080	.0146
3	0.62	96	9,690	262,080	.0023
4	0.03	18,265	6,840	262,080	.0334
5	0.66	204	5,060	262,080	.0102
6	0.55	341	2,720	262,080	.0263

Green Sturgeon Impact Analysis

Green sturgeon enter the Columbia River in May and can be present in the River through October therefore the potential to impact green sturgeon is during the May through October time period. The 2011 dredging record from May through October was used to calculate the relative impact to green sturgeon and their habitat. The green sturgeon impact analysis followed the same steps as outlined in the smolt impact analysis.

Table A2-29 2011 Columbia River – Detailed dredging operations by reach: Green Sturgeon May – October.

Month - Year	Dredge Name	Dredge Type	Dredging Location	Dredging (CY)	Days
RIVER SEGMENT 1					
October-2011	Yaquina	Hopper	Flavel Bar	22,265	1.2
September - 2011	Terrapin	Hopper	Tongue Point Crossing	250,000	5.0
October-2011	Essayons	Hopper	Tongue Point Crossing	233,363	4.9
August - 2011	Terrapin	Hopper	Miller Sands	75,330	1.5
October-2011	Essayons	Hopper	Miller Sands	167,899	3.5
October-2011	Yaquina	Hopper	Miller Sands	80,641	4.2
October-2011	Oregon	Pipeline	Miller Sands	227,586	9.1
Total				**1,057,084**	**29.4**
RIVER SEGMENT 2					
May - 2011	Yaquina	Hopper	Pillar Rock	52,019	2.7
August/September-2011	Oregon	Pipeline	Pillar Rock	551,064	22.0
September-2011	Essayons	Hopper	Pillar Rock	111,660	2.3
October - 2011	Essayons	Hopper	Pillar Rock	112,834	2.4
October/November – 2011*	Essayons	Hopper	Pillar Rock	47,028	1.0
August-2011	Oregon	Pipeline	Brookfield Welch	231,958	9.3
September/October-2011	Oregon	Pipeline	Brookfield Welch	844,773	33.4
May-2011	Essayons	Hopper	Skamokawa Bar	98,460	2.1
September/October - 2011	Terrapin	Hopper	Skamokawa Bar	248,726	5.0
May-2011	Essayons	Hopper	Puget Island Bar	129,339	2.7
October/November-2011*	Essayons	Hopper	Puget Island Bar	358,556	7.5
May-2011	Essayons	Hopper	Wauna/Driscoll	77,564	1.6
August-2011	Essayons	Hopper	Wauna/Driscoll	45,457	0.9
October - 2011	Terrapin	Hopper	Wauna/Driscoll	125,827	2.5
May/June-2011	Essayons	Hopper	Westport Bar	374,604	7.5
June-2011	Essayons	Hopper	Westport Bar	47,911	1.0
July/August-2011	Oregon	Pipeline	Westport Bar	204,922	8.2
August-2011	Essayons	Hopper	Westport Bar	89,226	1.9
October - 2011	Terrapin	Hopper	Westport Bar	364,927	7.3
October/November-2011*	Oregon	Pipeline	Westport Bar	181,140	7.2
Total				**4,297,995**	**128.5**
RIVER SEGMENT 3					
July-2011	Oregon	Pipeline	Eureka Bar	41,238	1.6
May - 2011	Yaquina	Hopper	Stella-Fisher Bar	24,200	1.3
August-2011	Essayons	Hopper	Stella-Fisher Bar	166,685	3.5
September-2011	Essayons	Hopper	Slaughters Bar	80,350	1.7
Total				**312,473**	**8.1**
RIVER SEGMENT 4					
July-2011	Oregon	Pipeline	Lower Dobelbower Bar	99,780	4.0
September - 2011	Yaquina	Hopper	Kalama Bar	28,239	1.5
October-2011	Yaquina	Hopper	Kalama Bar	28,460	1.5
September - 2011	Yaquina	Hopper	Upper Martin Island Bar	30,287	1.6
Total				**186,766**	**8.6**

Month - Year	Dredge Name	Dredge Type	Dredging Location	Dredging (CY)	Days
RIVER SEGMENT 5					
August-2011	Essayons	Hopper	St. Helens Bar	42,488	0.9
September - 2011	Yaquina	Hopper	Willow Bar	1,024	0.1
September - 2011	Yaquina	Hopper	Willow Bar	1,045	0.1
Total				**44,557**	**1.1**
RIVER SEGMENT 6					
March/September-2011*	Hickey	Clam	Lower Vancouver Bar	89,000	
Total					
RIVER SEGMENT 7					
September - 2011	Yaquina	Hopper	Upper Vancouver Bar	7,050	0.4
September - 2011	Yaquina	Hopper	Airport Bar	25,518	1.3
September - 2011	Yaquina	Hopper	Washougal Ranges	26,401	1.4
Total				**58,969**	**3.1**
RIVER SEGMENT 8					
September - 2011	Yaquina	Hopper	Fashion Reef	**21,475**	**1.1**

*Although the dredging in portions of River Segment 2 extended into November and River Segment 6 included dredging in March how much occurred outside the May through October time period was not provided so the for the purpose of the analysis it is assumed all the dredging occurred during the green sturgeon analysis period.

The green sturgeon habitat use in the lower Columbia River is not fully understood. While the may prefer water depths below 5 meters they also may be present in the deeper portions of the FNC and may move with the tide into shallow water habitats. Therefore as with the eulachon impact analysis, for the green sturgeon impact analysis the whole wetted channel is considered to be potential habitat.

Table A2-30. Federal Navigation Channel and Potential Green Sturgeon Habitat.

River Segment	Area of navigation channel that needs dredging to maintain depth (acres)	Area of flow lane deeper than -20-ft contour used for placement (acres)	Total Estimated Eulachon Habitat (acres)(From Table A2-9	% Potentially Affected Area
1	1,208	138	76,100	2%
2	885	358	23,220	5%
3	438	330	9,690	8%
4	412	248	6,840	10%
5	315	193	5,060	10%
6	42	28	2,720	3%
7	81	110	10,350	2%
8	12	28	6,200	1%
9	1	0	2,780	.04%

As was done for the smolt and eulachon analysis, NMFS used the number of days the vessel were operating in a river segment and the cycle times presented in Table A2-1 to calculate the amount of time each vessel was dredging and disposing material during the May – September time period (Tables A2-31 Table A2-35).

Table A2-31. *Essayons* Dredging Impacts May – October 2011.

River Segment	Dredging Operations (days)	Dredging Operations (minutes)	Cycle Time (minutes)	Cycles	Minutes Dredging	Minutes Disposal
1	8.4	12,096	164	74	7,030	592
2	28.8	41,472	164	253	24,035	2,024
3	5.2	7,488	164	46	4,370	368
5	0.9	1,296	164	8	760	64

Table A2-32. *Yaquina* Dredging Impacts May - October2011.

River Segment	Dredging Operations (days)	Dredging Operations (minutes)	Cycle Time (minutes	Cycles	Minutes Dredging	Minutes Disposal
1	5.4	7,776	77	101	4,848	404
2	2.7	3,888	77	50	2,400	200
3	1.3	1,872	77	24	1,152	96
4	4.6	6,624	77	86	4,128	344
5	0.2	288	77	4	192	768
7	3.1	4,464	77	58	2,784	232
8	1.1	1,584	77	21	1,008	84

Table A2-33. *Terrapin* Dredging Impacts May – October 2011

River Segment	Dredging Operations (days)	Dredging Operations (minutes)	Cycle Time (minutes)	Cycles	Minutes Dredging	Minutes Disposal
1	6.5	9,360	115	81	3,645	810
2	14.8	23,312	115	203	9,135	2,030

Table A2-34. *Oregon* Dredging Impacts December – May 2011.

River Segment	Dredging and Disposal Operations (days)	Dredging and Disposal Operations assuming dredge operates 84% of the time(minutes)
1	9.1	11,007
2	80.1	96,889
3	1.6	1,935
4	4.0	4,834

Table A2-35. Clamshell Dredging Impacts May – October 2011.

River Segment	Volume Dredged (cy)	Dredging Minutes (89,000 cy/3.8cy/min)	Navigation Channel Needing Dredging (acres)	Acres Affected/minute
6	89,000	23,421	42	0.002

Table A2-36. Clamshell Disposal Impacts May – October 2011 (for this analysis the load capacity and number of loads per day for the large scow was were used and the 11 minutes per disposal was used assuming the navigation channel is predominately sand).

River Segment	Loads Disposed (89,000 cy/3,150 cy/load)	Disposal Minutes (11 min/load as assuming predominate sand	Acres Affected/minute (6 acres/load)
6	28	308	.02

NMFS then calculated a relative green sturgeon relative impact analysis similar to the smolt and eulachon impact analysis. When two dredges were used in a reach the impacted acres and the dredging and disposal times were weighted by the amount of time each dredge was dredging or disposing.

Table A2-37. Dredging Impacts to Green Sturgeon Habitat May - October 2011 (% Affected= affected area per dredging minute x total dredging minutes)/total habitat area available per minute x total minutes).

River Segment	Affected Area per Dredging Minute (acres)	Total Dredging Time 2011 (min)	Total Area (acres)	Total Time available 2011 (min)	% Affected/Total
1	.04	26,530	76,100	264,960	.005
2	.023	132,459	23,220	264,960	.05
3	.033	10,433	9,690	264,960	.013
4	.015	8,962	6,840	264,960	.007
5	.062	9,52	5,060	264,960	.004
6	.002	23,421	2,720	264,960	.006
7	.03	2,784	10,350	264,960	.003
8	.03	1,008	6,200	264,960	.002

Table A2-38. Disposal Impacts to Green Sturgeon Habitat May - October 2011 (% Affected = affected area per dredging minute x total dredging minutes)/total habitat area available per minute x total minutes).

River Segment	Affected Area per Disposal Minute (acres)	Total Disposal Time 2011 (min)	Total Area (acres)	Total Time available 2011 (min)	% Affected/Total
1	.12	12,813	76,100	264,960	.008
2	.06	101,143	23,220	264,960	.099
3	.15	2,399	9,690	264,960	.014
4	.07	5,178	6,840	264,960	.02
5	.19	104	5,060	264,960	.001
6	.02	308	2,720	264,960	.001
7	.62	232	10,350	264,960	.005
8	.62	84	6,200	264,960	.003

EPA-Region 10 5 July 2017
Office of Environmental Review & Assessment (Sediment Management Unit)

Memorandum for: U.S. Army Corps of Engineers — Portland District, Operations Division, Channels and Harbors, Waterways Maintenance Section (CENWP-OD-NW, Stokke)

Subject: Portland Sediment Evaluation Team (PSET) Level 2 dredged material suitability determination for the U.S. Army Corps of Engineers - Portland District's (Corps) operations and maintenance (O&M) dredging of the Lower Columbia River (LCR) deep-draft Federal Navigation Channel (FNC) in the Columbia River from River Mile (RM) 3 to 106.5 in Oregon and Washington.

Introduction: Per the *Sediment Evaluation framework for the Pacific Northwest* (SEF)', this suitability memorandum (SDM) documents the consensus of the PSET agencies regarding the suitability of the dredged material for unconfined, aquatic placement. The PSET reviewed the Corps' 21 April 2017 "Sediment Quality Evaluation Report: Lower Columbia River Federal Navigation Channel (River Miles 3 to 106.5)" (SQER), prepared by Corps' Sediment Quality Team (SQT)[2]. Sediment physical testing results are summarized in the SQER; the analytical results were compared to the physical screening levels published in the 2016 SEF.

Suitability Summary:

Surface Sediments:	Îf Suitable	O Unsuitable
Post-Dredge Surface (PDS):	Îf Suitable	O Unsuitable

Reviewers: The PSET agencies include the Corps, U.S. Environmental Protection Agency — Region 10 (EPA), National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife (USFWS), Washington Department of Ecology (Ecology), and Oregon Department of Environmental Quality (ODEQ). Table 1 lists the PSET's review timeline for this project. Reviewers included:

i2J James Holm (Corps, Lead)	i2J Bridgette Lohrman (EPA, Co-Lead)	
i2J James McMillan (Corps)	i2J Pete Anderson (ODEQ)	UJ Laura Inouye (Ecology)
in Tom Hausmann (NMFS)	O Jeremy Buck (USFWS)	

Table 1. PSET Review Timeline

Sampling and analysis plan (SAP) received	9 March 2016
SAP consistency determination	9 March 2016'
Sampling date(s)	22-31 March 2016
SQER received by PSET	24 April 2017
Suitability determination memorandum issued	5 July 2017
Management area ranking	Very Low (deep-draft federal navigation channel)
Recency of data*	10 years from sampling date (expires March 2026)

*If site conditions or the proposed project change, or if new information related contaminants of concerns are discovered, additional project coordination with PSET may be required to determine the validity of this SDM.

[1] U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, Washington Department of Ecology, Washington Department of Natural Resources, Oregon Department of Environmental Quality, Idaho Department of Environmental Quality, National Marine Fisheries Service, and U.S. Fish and Wildlife Service. 2016. *Sediment Evaluation Franie»ork for the Pacific Northwest.* Published July 2016, by the U.S. Army Corps of Engineers, Northwestern Division, 172 pp + Appendices.

[2] U.S. Army Corps of Engineers —Portland District. 2017. *Sediment Quality Evaluation Report —Lower Columbia River Federal Navigation Channel (Kbs 3 to 106.5).* Prepared by the Portland District Sediment Quality Team, 21 April 2017. 89 pp.

[3] Portland Sediment Evaluation Team (PSET). 2016. *PSET - SAP Approval for the LCR FNC and RSV Dredging.* Email issued 9 March 2016, by PSET. 2 pp.

Federal Regulatory Authorities:
UJ Section 10, Rivers and Harbors Act
UJ Section 404, Clean Water Act (CWA)
iZi Section 401, CWA
iZi Section 7, Endangered Species Act
UJ Section 305 of the Magnuson-Stevens Act
in Fish and Wildlife Coordination Act
iZi Section 103, Marine Protection, Research and Sanctuaries Act
O Comprehensive Environmental Response, Compensation, and Liability Act

Project Description: Table 2 summarizes the O&M dredging program details for the LCR FNC project. Dredging is needed to provide reliable commercial and recreational navigation.

Table 2. Project Details

Waterbody / river miles (RMs)	Columbia River / +3.0 to +l06.5
Dredged volume	=6.7 million cubic yards annually
Deep-draft channel dimensions	600 ft. wide + 100 ft. over-dredge width, 103 miles long
Max. proposed dredging depth	-48 ft. (43 ft. + 5 ft. advanced maintenance depth, MLLW/CRD)
Dredging method	Pipeline, Hopper Dredge
Dredged material transport	Pipeline, Hopper Dredge
Placement locations	Ocean, in-river, shoreline, upland
Dredging dates	Typically April through October

Sampling and Analysis Description: The Corps' sampling and analytical program for the LCR FNC is summarized in Table 3. Dredge prism surface grab (power grab sampler) samples were collected from 22 through 31 March 2016. Sample station locations are shown in Figures 2 through 6 of the SQER.

Table 3. LCR FNC Sampling and Analysis Description

Sampling Description		
Sample collection methods		Power grab sampler
Dredged material management unit (DMMU)		N/A
Averaged DMMU volume (cy)		On average, each sample represents =l 14,000 cy
Subsamples (SS)/DMMU		
DP	Depth range (ft. MLLW/CRD)	-22.6 to -74.5
	Composite (Y/N)	N
	SS archive (Y/N)	N
	Composite archive (Y/N)	N
PDS	Not Proposed	
Sediment Physical and Chemical Analysis (no. analyses/decision unit)		
Decision unit (DMMU ID)		59 discrete stations
Station ID(s)		CR-2 to CR-299
ASTM Dredge Analyses		
Grain size		1
Bulk Density		1
Total volatile solids		
Total organic carbon		1
Sulfides		
Ammonia		
Metals		

Semi volatile organic compounds (polynuclear aromatic hydrocarbons, chlorinated hydrocarbons, phthalates, phenols, misc. extractables)	
Pesticides	
Polychlorinated biphenyls (Aroclors)	
Butyltins	
Total petroleum hydrocarbons	
Dioxins/furans	
Biological Testing Description	
Bioassays planned (Y/N)	N

Deviations from the SAP: Five (5) deviations from the PSET-approved SAP occurred.

1. The Corps simplified the sample ID by removing the date of collection from the sample ID and relied on the station ID because each station was discretely analyzed.
2. No fine-grained sediments were visually observed in the FNC grab samples. Therefore, no chemical analyses were necessary.
3. The Corps sampled 59 stations within the LCR FNC, 4 more than proposed in the PSET-approved SAP.
4. To achieve cost efficiencies, the Corps proposed the LCR FNC survey in conjunction with a larger regional sediment management survey. This combined survey effort and unpredictable shoaling resulted in only 44% (26) of samples representing dredge prism material and 56% (33) of the stations were below the advanced maintenance depth of— 48 feet. For 6.7 MCY of dredging, a minimum of 22 stations are needed in very low ranked project (300,000 CY per DMMU) per the 2016 SEF. The 26 samples the Corps collected within the dredge prism meets the sampling density for a very low ranked project.
5. Even though approximately half of the stations were below maintenance depth (-48', AMD included), the majority of dredged material in the FNC consists of coarse-grained bedload material instead of fine-grained suspended sediment load. Bedload material typically form the sand waves that shoal (each typically less than 50,000 CY) within the FNC and trigger localized dredging. Sand waves move downstream as bedload sediment erodes from the upstream face, deposits in the downstream trough and is then buried by additional material eroded from the upstream face. This movement occurs in a layer only a few sand grains thick. Through this mechanism, all the individual grains in a sand wave are exposed to flow, eroded, transported, deposited, buried, and then eventually exposed again as the sand wave migrates downstream. The height of sand waves is dependent on higher river flows (spring freshets) that shapes the bedload material into taller sand waves. The suspended sediment load stays suspended by high flows and does not interact with the bedload materials that form sand waves. Therefore, even the bedload sediments sampled below -48' have the potential to form sandwave shoals that require dredging and are represented of dredged materials in LCR FNC.

Results and Discussion: Analytical results for the Corps' sampling event are summarized in Table 4. The analytical results from the SQER were compared to the 2016 SEF SLs.

Table 4. LCR FNC Sediment Analytical Summary

Sediment Physical Results	
DMMU ID and Sample ID(s):	59 discrete sampling stations
Sample type (dredge prism, adv. main. depth)	dredge prism + advanced maintenance depth*
Grain size, minimum % gravel and sand / maximum % silt and clay	>97 / 2.6
Bulk density, range (g/cm')	1.27 to 2.15
Total organic carbon, range (%)	0.1 to 0.29

* 33 of the 59 stations (56%) were sampled below the maximum depth of -48' due the location of the regional sediment management transects every =two river miles. This broader survey effort dictated where LCR FNC stations were placed.

There have been no substantive changes in the complex hydrologic (riverine, tidal) regimes of the lower Columbia River, hydropower operations within the Columbia River Basin, or the LCR federal navigation channel since the completion of the Columbia River Channel Improvement Project that deepened the LCR FNC to -43+5 feet in 2010. The grain size, bulk density, and total organic carbon results from the March 2016 sampling event are representative of the bedload sediments within the LCR FNC regardless of the sampling surface elevation relative to the project depth. The 2016 physical results confirm the LCR FNC sediments are very similar to previous testing results (2008).

Dredge Prism: The LCR deep-draft FNC is assigned a "very low" rank because the project is dominated by coarse sands, low total organic carbon content (<0.5%), and strong river and tidal currents. Per the Section 3.5.3 of the 2016 SEF, chemical testing is not required. Therefore, the LCR deep-draft FNC dredge prism material is suitable for unconfined, aquatic placement per the SEF guidance through March 2026.

Post-Dredge Surface: The dredge prism materials were determined to be suitable and the LCR deep-draft FNC is assigned a "very low" rank. As such, the PSET assumes that the LCR deep-draft FNC post-dredge surface is suitable for unconfined, aquatic exposure per the SEF guidance through March 2026.

Contact: This memorandum was prepared by Bridgette Lohrman (PSET Co-Lead) and reviewed by the participating PSET agencies, identified above. Questions regarding this memorandum should be directed to Bridgette Lohrman at (503) 326-4006 or e-mail to: lohrman.bridgette@epa.gov.

Stokke, Jessica B CIV USARMY CENWP (USA)

From: Lohrman, Bridgette <lohrman.bridgette@epa.gov>
Sent: Friday, July 8, 2022 2:28 PM
To: Stokke, Jessica B CIV USARMY CENWP (USA)
Cc: Holm, James A CIV USARMY CENWP (USA); Yballe, Dominic P CIV USARMY CENWP (USA); Pete Anderson; Inouye, Laura (ECY); Jeremy_Buck@fws.gov; Tom Hausmann - NOAA Federal (tom.hausmann@noaa.gov)
Subject: [Non-DoD Source] PSET - LCR FNC Transfer Sites - suitability
Attachments: 20220707 LCR DM Transfer Sites Lvl 1_Plates.pdf

Hello Jessica,

This email correspondence constitutes the Portland Sediment Evaluation Team's (PSET's) determination regarding the June 2022 No Test request for the U.S. Army Corps of Engineers – Portland District (Corps) transfer sites for the Lower Columbia River (LCR) deep draft federal navigation channel (FNC). The LCR FNC is located in the Columbia River from river mile (RM 3 to 106.5) along the boundary between the states of Oregon and Washington. This determination was made in accordance with the May 2018 Sediment Evaluation Framework for the Pacific Northwest (SEF) and after reviewing the Corps 28 June 2022 "MEMORANDUM FOR THE RECORD– Re: SEF Level 1 No Test Request for the Lower Columbia River Federal Navigation Project – In- Water Dredged Material Transfer Sites" (Level 1 memo), prepared by the Corps' Sediment Quality Team. The scope of the PSET's sediment evaluation includes placement of previously determined suitable LCR FNC dredged material in the aquatic transfer sites and the subsequent dredging for shoreline or upland placement, including minimal over-dredging of the transfer sites when removing LCR FNC sediments. This email documents the PSET's decision to not require sediment testing per Subpart G of the Clean Water Act section 404(b)(1) guidelines (see 40 CFR 230.60- 230.61).

PROJECT DESCRIPTION: The Corps dredges 6 to 8 million cubic yards of sand from the LCR FNC each year. The eight LCR FNC transfer sites are in-water holding areas for temporary storage of suitable dredged materials. The Corps proposes to modify one existing site and add seven new sites. Transfer sites are necessary when shoaling forms beyond the reach of the pipeline DREDGE Oregon that is used to place sediments along shorelines or in upland sites. Dredged materials would typically be placed by a hopper dredge. Transfer sites are located in water deeper than 20 feet and in locations which have been previously used by the Corps for placement of dredged material. The Corps anticipates placing and removing the material into/from these eight sites annually.

SOURCES OF CONTAMINATION: In 2017, the PSET evaluated potential sources of contamination for the LCR FNC sediments and issued a suitability determination memo (SDM) stating the dredged materials are suitable for unconfined aquatic placement without chemical testing. The PSET confirmed a "very low" management area ranking for these sediments.

Once the material is within the transfer sites, the potential for contamination is very low given the 8 sites are subject to high river flows which transport large bed loads of material. Based on the Corps' LCR FNC sediment sampling in 2017, an analysis of stations in close proximity to the transfer sites indicates that any material that may be transported into the transfer sites by the riverine processes is predominately sand and gravel (>95%) with less than 5% fines. Thus, the potential for the sediments to be carriers of contamination is very low. Also, the 8 transfer sites are not in close proximity to known land-based sources of contamination that could cause contamination while the sediments are "stored" at the transfer sites.

MANAGEMENT AREA RANK: The PSET assigns a "very low" management area ranking to these 8 transfer sites due to the previous review of the LCR FNC, and no reason to believe that the project sediments have chemicals of concerns at concentrations above SEF SLs.

REGULATORY REQUIREMENTS FOR SEDIMENT EVALUATION: In accordance with the CWA section 404(b)(1) guidelines (40 CFR 230.60), when provided information indicates the material is sufficiently removed from sources of contamination, with reasonable assurances that the dredged material is not a carrier of contaminants, then testing is unnecessary. Project sediments are most likely not a carrier of contaminants because they are composed primarily of sand, gravel, or other naturally occurring inert material and if dredged materials are found in areas of high current or wave energy. Less than 5% of the material is fine-grained sediment.

NO TEST DETERMINATION: Based on the information provided, the PSET has determined that the transfer sites project areas do not require additional sediment physical or chemical evaluation per the CWA section 404(b)(1) guidelines. If the project changes or if additional information is available, then this "no test" determination must be re-evaluated, and sediment testing may be required. The PSET has assigned a "very low" site management area ranking to this project with this analysis being valid until March 2026, which aligns with the recency of the data collected by the Corps for the LCR FNC in 2016. If there are project changes or new information regarding sources of contamination are available, PSET would re evaluate the suitability determination.

REVIEWING PSET AGENCIES: U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, Oregon Department of Environmental Quality, Washington Department of Ecology, U.S. Fish and Wildlife Service, National Marine Fisheries Service.

CONTACT: If you have questions regarding this PSET determination, please email or call me.

Take care,
-Bridgette
~~~~~~

Bridgette Lohrman | Ecologist | U.S. Environmental Protection Agency
Ocean Dumping Program | Oregon Operations Office | 805 SW Broadway, Suite 500 | Portland, OR 97205 | 503.326.4006 | lohrman.bridgette@epa.gov
~~~~~~

EPA-Region 10 Water Division, Wetlands and Oceans Section 08 May 2023

Memorandum for: U.S. Army Corps of Engineers — Portland District, Operations Division, Channels and Harbors, Waterways Maintenance Section (CENWP-ODN-W, Stokke), Oregon Slough Downstream Deep Draft Federal Navigation Channel (entrance to mile 1.5) in Portland, Multnomah County, Oregon.

Subject: Portland Sediment Evaluation Team (PSET) Level 2A dredged material suitability determination for the U.S. Army Corps of Engineers - Portland District's (USACE) operations and maintenance (O&M) dredging for the Oregon Slough Downstream (OSD) Deep Draft Federal Navigation Channel (FNC) in the Columbia River at river mile (RM) 102 to 104 (project mile entrance to 1.5).

Introduction: Per the May 2018 *Sediment Evaluation Framework for the Pacific Northwest* (SEF) , this suitability memorandum (SDM) documents the consensus of the PSET agencies regarding the suitability of the OSD deep draft FNC dredged material for unconfined, aquatic disposal and suitability of the post-dredge surface for unconfined, aquatic exposure. The PSET reviewed the April 2023 *"Sediment Characterization. Oregon Slough Downstream Deep-Draft Draft Channel, Columbia River Mile 102.5, Multnomah County, Oregon"* (SQER)' prepared by ANAMAR for the USACE's Sediment Quality Team (SQT). Sediment chemical testing results are summarized in the SQER; chemical analytical results were compared to the freshwater benthic toxicity screening levels (SEF SLs) published in the 2018 SEF. The PSET also used Oregon DEQ's sediment screening level value (SLV) for freshwater fish to evaluate PCBs[3]

Suitability Summary:

Dredge Prism (DP) Sediments:	& Suitable	OUnsuitable
Post-Dredge Surface (PDS):	Suitable	OUnsuitable

' U.s. Army Corps of Engineers, U.s. Environmental Protection Agency, Washington Department of Ecology, Washington Department of Natural Resources, Oregon Department of Environmental Quality, Idaho Department of Environmental Quality, National Marine Fisheries Service, and U.S. Fish and Wildlife Service. 2018. *Sediment Evaluation Framework for the Pacific North»est.* Published May 2018, by the U.S. Army Corps of Engineers, Northwestern Division, 183 pp with Appendices.

2 U.S. Army Corps of Engineers (USACE) — Portland District. 2023. *Sediment Characteri--ation.' Oregon Slough Do›1'nstream Deep-Draft Channel, Columbia River Mile 102.5, Multnomah County, Oregon.* Prepared by ANAMAR, April 2023. 25 pp with Maps, Tables, and Appendices.

Oregon Department of Environmental Quality. 2007. *Guidance for Assessing Bioaccunuilative Chemicals of Concern in Sediment.* Updated April 3, 2007 by ODEQ Environmental Cleanup Program, 18 pp with Appendices.

Reviewers: The PSET agencies include the USACE, U.S. Environmental Protection Agency — Region 10 (EPA), National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife (USFWS), Washington Department of Ecology (Ecology), and Oregon Department of Environmental Quality (ODEQ). Table 1 lists the PSET's review timeline for this project. Reviewers included:

I8i James Holm (USACE, Lead)
S Bridgette Lohrman (EPA, Co-Lead)
Hi Pete Anderson (ODEQ)
S Laura Inouye (Ecology)
I8i Dominic Yballe (USACE)
S Tom Hausmann (NMFS)
UJ Jeremy Buck (USFWS)
I8i Samantha Lynch (USACE)

PSET/SEF Conditions:

Data Recency Expiration — Based on a "Low" rank, the data recency for sediments in the Oregon Slough Downstream Deep Draft Federal Navigation Channel expires in November 2029

Table 1. Review Timeline

Draft Sampling and analysis plan (SAP) submitted to PSET	30 August 2022
SAP revisions requested by PSET	31 August 2022
Revised SAP submitted to PSET	31 August 2022
Revised SAP revisions requested by PSET	7 September 2022
Final SAP[4] submitted to PSET	13 September 2022
Final SAP approved by PSET'	19 September 2022
Sampling date(s)	14 November 2022
Draft SQER submitted to PSET	4 April 2023
Draft SQER edits requested by PSET	18 April 2023
Final SQER submitted to PSET	25 April 2023
Suitability Determination Memorandum (SDM) issued by PSET	08 May 2023
Management area ranking	Low
Recency of data	November 2029 (7 years)

Federal Regulatory Authorities:

Section 10, Rivers and Harbors Act
& Section 404, Clean Water Act (CWA)
& Section 401, CWA
Section 7, Endangered Species Act
Section 305 of the Magnuson-Stevens Act
Fish and Wildlife Coordination Act
O Section 103, Marine Protection, Research and Sanctuaries Act
☐ Comprehensive Environmental Response, Compensation, and Liability Act

[4] USACE — Portland District. 2022. *Oregon Slough Do»nstreani Deep-Draft Channel, Columbia River Mile 102.5, Multnomah County, Oregon, Sediment Sampling and Analyses Plan.* Prepared by SQT, 13 September 2022. 16 pp with Attachments.

Portland Sediment Evaluation Team (PSET). 2022. *PSET - Oregon Slough SAP Approval.* Email issued by B. Lohrman (EPA) for PSET, 19

September 2022. 2 pp with Attachment.

Project Description: Table 2 provides a summary of the dredging project details for the OSD deep draft FNC. Maintenance dredging is needed to provide navigation access.

Table 2. Project Details

Waterbody/river mile (RM)	Columbia River, 102 to 104
Total proposed dredging volume (cy)	=l00,000 to 250,000
Max. proposed dredging depth (includes overdepth allowance)	-48 feet CRD (43+5 ft overdredge)
Dredging area (acres, approx.)	=l25
Dredge dimensions	Triangular turning basin: =l,000 ft. wide by 3,000 ft long; Deep draft channel: 400 ft wide by 1.5 miles
Dredging method	Pipeline, clamshell or hopper dredge
Dredged material transport	Barge, hopper
Proposed disposal location(s)	Columbia River flowlane
Proposed dredging date(s)	August 1 through December 15
Dredged material mgmt. units (DMMUs)	3

Sampling and Analysis Description: The USACE sampling and analytical program for the OSD deep draft FNC is summarized in Table 3. Actual grab sample station locations are shown in SQER Table 1 and Map 1 (SDM Figure 1).

Deviations from the SAP: One lab deviation from the PSET-approved SAP was identified in SQER Section 4.3.5, regarding the SVOCs.

In all three composite samples, bis(2-ethylhexyl) phthalate was L-qualified (QC recovery was off scale high and the concentration exceeded the linear range) and V-qualified (detected in the sample and blank). Benzoic acid was HP-qualified (the time between prep and analysis was outside the method specified hold time) and V-qualified. Di-n-buty1 phthalate and phenol were V-qualified. Therefore, the USACE had frozen archive samples analyzed at ARI for bis(2-ethylhexyl) phthalate and benzoic acid. The ARI results were below SEF SLs for both analytes.

Table 3. Sampling and Analysis Description

Sample collection method	Standard Ponar		
DMMU IDs (location)	OSDS-1 (triangular turning basin)	OSDS-2 (mile 0+05 to 0+48)	OSDS-3 (mile 0+48 to 1+26)
DMMU Rank	Low		
Station/Sample ID	OSDS-1A, OSDS-IB, OSDS-2A, OSDS-2B, OSDS-3A, OSDS-3B, OSDS-1C, OSDS- lD OSDS-2C, OSDS-2D OSDS-3C, OSDS-3D ll22-OSDS-1-		
Composite Sample ID	COMP 1122-OSDS-2-COMP 1122-OSDS-3-COMP		
DMMU volume (cy)	=l00,000 to 250,000		
Dredge Prism: Mudline range (ft CRD)	-40.8 to -45.7	-36.2 to -45.5	-31.8 to -41.6
Dredge Prism: Composite(Y/N)	Y	Y	Y
Dredge Prism: Subsample /DMMU	4	4	4
Dredge Prism: Subsample Archive	Y	Y	Y
PDS Layer: Depth range (ft CRD) Composite (Y/N) Subsample /PDS Subsample Archive	N/A	N/A	N/A
Sediment Physical and Chemical Analysis (No. DP samples / No. PDS samples analyzed)			
Grainsize	1/-	1/-	1/-
Totalorganiccarbon	1/-	1/-	1/-
Totalsolids	1/-	1/-	1/-
Ammonia	1/-	1/-	1/-
Totalsulfides	1/-	1/-	1/-
Metals,freshwater	1/-	1/-	1/-
PAHs	1/-	1/-	1/-
SVOCs (phthalates, phenols, misc. extractables)	1/-	1/-	1/-
Pesticides	1/-	1/-	1/-
PCBs (Total Aroclors)	1/-	1/-	1/-
Butyltins	1/-	1/-	1/-
TPH (diesel [dx], residual [rx] range)	1/-	1/-	1/-
Dioxin/Furans	-/-	-/-	-/-
Biological Analysis (No. DP samples / No. PDS samples analyzed)			
Freshwater Bioassays	-/-	-/-	-/-

Results and Discussion: Analytical results for the USACE sampling event are summarized in Table 4. The chemical analytical results were compared to the 2018 SEF freshwater SLs and to ODEQ's fish based freshwater SLV (22 ug/kg) to evaluate PCBs (total Aroclors). There were no exceedances of ODEQ's fish-based, freshwater bioaccumulative SLV (22 ug/kg) for total PCB Aroclors because all samples were between 5.75 and 8.81 ug/kg.

All analytes were detected below SEF freshwater SLs or were non-detections (U) with method reporting limits (MRLs) below SLs. The composite samples consisted of 73 to 82% sand and 18 to 27% fines with trace gravel (+0.4%). The total organic carbon (TOC) ranged from 0.62 to 1.27%. Total solids ranged from 60.7 to 63.8%.

Site Ranking: Based on the results, the PSET confirms a "low" rank to the Oregon Slough Downstream deep draft sediments.

PSET Suitability Determination:
Dredge Prism —Chemical concentrations in OSD dredge prisms are below the SEF freshwater SLs and ODEQ SLV as discussed above. As such, the OSD deep draft FNC dredged prism material is suitable for unconfined, aquatic disposal per the 2018 SEF guidance without additional testing.

Post-Dredge Surface — Based on a "Low" rank and multiple rounds of suitable sediments, the post-dredge surfaces are expected to be of similar quality to the dredge prisms. As such, the OSD deep draft FNC post-dredge surfaces are suitable for unconfined, aquatic exposure per the 2018 SEF guidance without additional testing.

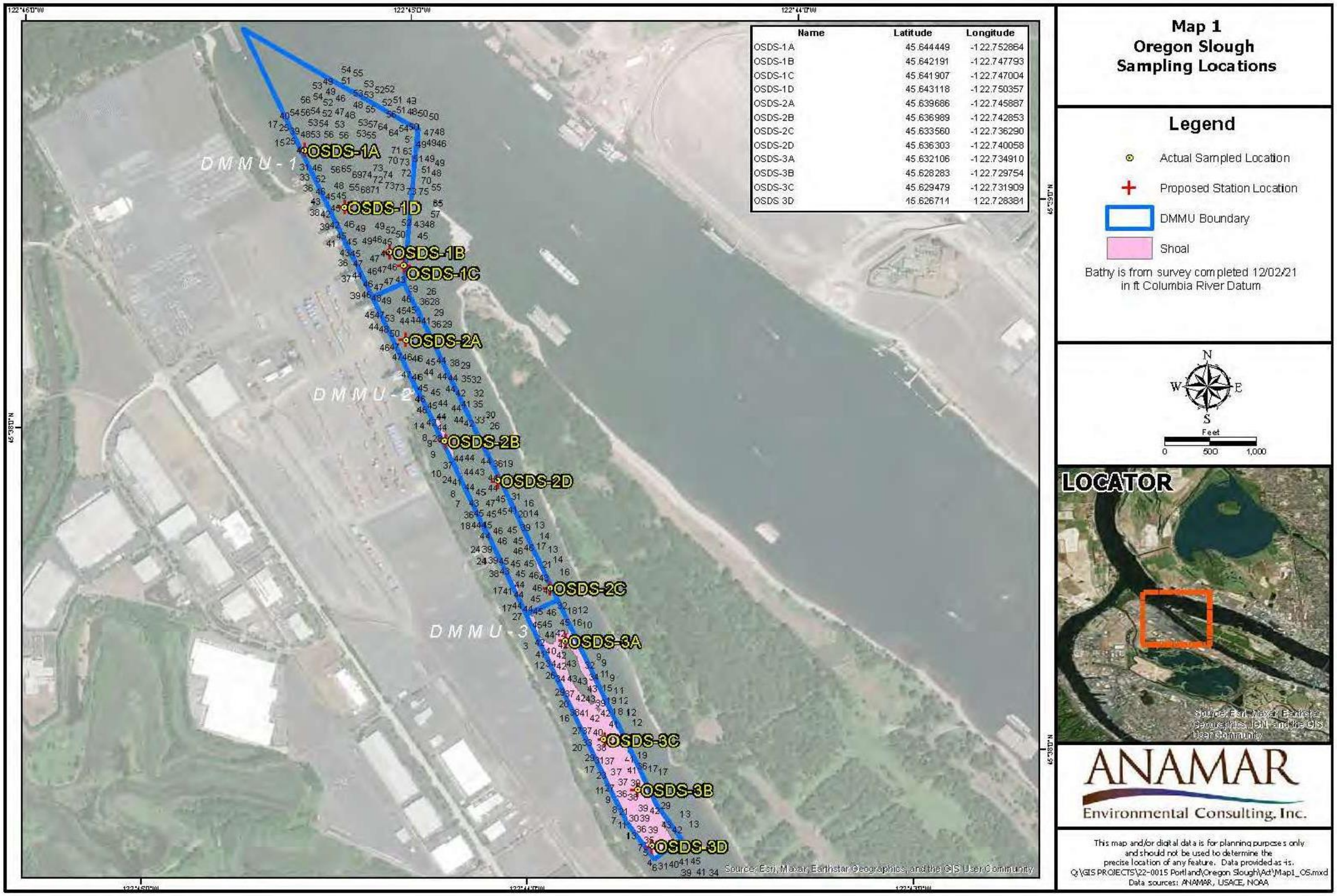
Contact: This memorandum was prepared by Bridgette Lohrman (PSET co-lead) and James Holm (PSET Lead, USACE) and reviewed by the participating PSET agencies, identified above. Questions regarding this memorandum should be directed to Bridgette Lohrman at (503) 326-4006 or e-mail to: lohrman.bridgette@epa.gov.

Table 4. Project Sediment Analytical Summary – Dredge Prism (sampled November 2022)

Sediment Physical and Chemical Results				
Parameter / Composite Sample ID:	1122-OSDS-1-COMP	1122-OSDS-2-COMP	1122-OSDS-3-COMP	SEF SU, freshwater (SLV)
Grain size: gravel, sand, silt + clay (%)	0.4, 81.4, 18.2	0.2, 72.8, 26.9	0.1, 81.8, 18.0	
Total Solids (%)	60.7	61.9	63.8	
Total Organic Carbon(%)	1.27	0.98	0.62	
Ammonia(mg/kg)	72.8	78.8	51.5	230
TotalSulfides(mg/kg)	0.54U	0.68U	0.37U	39
Metals (mg/kg)	Non-detect, Detect <SLs U, J, V	Non-detect, Detect <SLs U, J, V	Non-detect, Detect <SLs U, J, V	Varies
Total PAHs (ug/kg)	31.7 J	27.8 J	17.6 J	17,000
SVOCs (ug/kg) (phenols, phthalates, misc. extractables)	Non-detect, Detect <SLs U, J, V, C+	Non-detect, Detect <SLs U, J, V, C+	Non-detect, Detect <SLs U, J, V, C+	Varies
Pesticides (ug/kg)	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	Varies
2,4'+4,4'-DDD	1.65 HP, U	1.62 HP, U	1.57 HP, U	310
2,4'+4,4'-DDE	1.05 J	0.60 J, P	1.57 HP, U	21
2,4'+4,4'-DDT	1.65 HP, U	1.62 HP, U	1.57 HP, U	100
PCBs, Total Aroclors (ug/kg)	5.75 C	8.81 C	7.23 C	110 (22a)
Butyltins (ug/kg)	Non-detect +SLs U	Non-detect +SLs U	Non-detect +SLs U	Varies
TPH (dx/rx) (ug/kg)	25 U / 15.8 J	25 U / 21.7 J	25 U / 25 U	340 / 3,600

U = Non-detection (ND) at the method reporting limit (MRL) or method detection limit (MDL), MRL reported (MDL in parenthesis); J = Estimated value between MDL and MRL; V = analyte detected is sample and blank; HP = time between prep and analysis was outside the method holding time; P = difference between GC column results greater than method requirement - higher result reported; C = associated calibration QC is outside the established QC criteria for accuracy; C+ = associated calibration QC is outside the established QC criteria for accuracy - no hit in sample - data not affected and acceptable to report; = ODEQ (2007) freshwater fish-based bioaccumulation screening level value.

Figure 1.Oregon Slough Downstream deep draft FNC DMMUs and actual grab sample locations (sampled 14 November 2022).



Name	Latitude	Longitude
OSDS-1A	45.644449	-122.752864
OSDS-1B	45.642191	-122.747793
OSDS-1C	45.641907	-122.747004
OSDS-1D	45.643118	-122.750357
OSDS-2A	45.639686	-122.745887
OSDS-2B	45.636989	-122.742853
OSDS-2C	45.633560	-122.736290
OSDS-2D	45.636303	-122.740058
OSDS-3A	45.632106	-122.734910
OSDS-3B	45.628283	-122.729754
OSDS-3C	45.629479	-122.731909
OSDS 3D	45.626714	-122.728384

EPA-Region 10 Water Division, Wetlands and Oceans Section 17 April 2019

Memorandum for: U.S. Army Corps of Engineers – Portland District, Operations Division, Channels and Harbors, Waterways Maintenance Section (CENWP-ODN-W, Stokke), Vancouver to The Dalles Federal Navigation Channel

Subject: Portland Sediment Evaluation Team (PSET) Level 2A dredged material suitability determination for the U.S. Army Corps of Engineers - Portland District's (Corps) operations and maintenance (O&M) dredging for the Vancouver to The Dalles Federal Navigation Channel (VTD FNC) in the Columbia River from river mile (RM) 106 to 192.5.

Introduction: Per the Sediment Evaluation Framework for the Pacific Northwest (SEF)[1], this suitability memorandum (SDM) documents the consensus of the PSET agencies regarding the suitability of the dredged material for unconfined, aquatic disposal. The PSET reviewed the Corps' 20 March 2019 "Sediment Quality Evaluation Report: Vancouver to The Dalles Federal Navigation Channel" (SQER)[2], prepared by Corps' Sediment Quality Team (SQT). Sediment testing consisted of physical analysis of sediments to confirm very low rank. If the sediment testing did not confirm a "very low rank", additional testing would be pursued.

Suitability Summary:

Surface Sediments:	☒Suitable	☐ Unsuitable
Post-Dredge Surface (PDS):	☒Suitable	☐ Unsuitable

Reviewers: The PSET agencies include the Corps, U.S. Environmental Protection Agency – Region 10 (EPA), National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife (USFWS), Washington Department of Ecology (Ecology), and Oregon Department of Environmental Quality (ODEQ). Table 1 lists the PSET's review timeline for this project. Reviewers included:

☒James Holm (Corps, Lead) ☒ Bridgette Lohrman (EPA, Co-Lead)
☒Pete Anderson (ODEQ) ☒Laura Inouye (Ecology) ☒ Dominic Yballe (Corps)
☒Tom Hausmann (NMFS) ☒ Jeremy Buck (USFWS)

PSET/SEF Condition:

☒ Data Recency Expiration – The data recency of this SDM expires for the VTD FNC in January 2029.

[1] U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, Washington Department of Ecology, Washington Department of Natural Resources, Oregon Department of Environmental Quality, Idaho Department of Environmental Quality, National Marine Fisheries Service, and U.S. Fish and Wildlife Service. 2018. *Sediment Evaluation Framework for the Pacific Northwest*. Published May 2018, by the U.S. Army Corps of Engineers, Northwestern Division, 278 pp with Appendices.

[2] U.S. Army Corps of Engineers – Portland District. 2019. Sediment Quality Evaluation Report – Vancouver to the Dalles Federal Navigation Channel. Prepared by the Portland District Sediment Quality Team, 20 March 2019. 22 pp

Table 1. PSET Review Timeline

Sampling and analysis plan (SAP) received	18 December 2018
SAP Approval	27 December 2018[3]
Sampling date(s)	10 January 2019
SQER received by PSET	25 March 2019
Suitability Determination Memo issued	17 April 2019
Management area ranking	Very Low
Recency of data*	January 2029 (10 years)

* If site conditions or the proposed project change, or if new information related contaminants of concerns are discovered, additional project coordination with PSET may be required to determine the validity of this SDM.

Federal Regulatory Authorities:

☒ Section 10, Rivers and Harbors Act
☒ Section 404, Clean Water Act (CWA)
☒ Section 401, CWA
☒ Section 7, Endangered Species Act
☒ Section 305 of the Magnuson-Stevens Act
☒ Fish and Wildlife Coordination Act
☐ Section 103, Marine Protection, Research and Sanctuaries Act
☐ Comprehensive Environmental Response, Compensation, and Liability Act

Project Description: Table 2 summarizes the O&M dredging program details for the VTD FNC project. Dredging is needed to provide reliable commercial and recreational navigation.

Table 2. Project Details

Waterbody / river miles (RMs)	Columbia River (106-192.5)
Dredged volume (cy)	~406,960 (2019 volume for RM 106-136; dredged annually)
Channel dimensions	300 ft wide by 84.5 miles long
Dredge area	~1,090 acres
Max. proposed dredging depth + advanced maintenance depth	-27 ft Columbia River Datum (CRD) (authorized); Maintained to -19 ft CRD (-17+2)
Dredging method	Hopper dredge
Dredged material transport	Hopper dredge
Disposal locations	In-water placement in off-channel areas
Dredging dates	Typically June through December
Dredged material management units (DMMUs): No. of stations	DMMU 1: 4 grabs, 1 composite sample DMMU 2: 5 grabs, 1 composite sample DMMU 3: 2 grabs, 1 composite sample

Sampling and Analysis Description: The Corps' sampling and analytical program for the VTD FNC is summarized in Table 3. Actual sample station locations are shown in SQER Table 3 and Figures 2, 3, and 4.

[3] Portland Sediment Evaluation Team (PSET). 2018. [E-mail correspondence] PSET – SAP Approval for LCR FNC and RSM Dredging. *Bridgette Lohrman*. 27 December 2018. 2 pages.

Table 3. Project Sampling and Analysis Description

<table>
<tr><td colspan="5">Sampling Description</td></tr>
<tr><td colspan="2">Sample collection methods</td><td colspan="3">Double van Veen grab sampler</td></tr>
<tr><td colspan="2">DMMU ID</td><td>VTD-01</td><td>VTD-02</td><td>VTD-03</td></tr>
<tr><td colspan="2">Proposed DMMU volume (cy)</td><td>~122,467</td><td>~258,049</td><td>~26,444</td></tr>
<tr><td colspan="2">Subsamples per DMMU</td><td>4</td><td>5</td><td>2</td></tr>
<tr><td rowspan="4">Dredge Prism</td><td>Depth range (ft. CRD)</td><td>-5.8 to -21.7</td><td>-13.4 to -20.5</td><td>-13.8 to -18.7</td></tr>
<tr><td>Composite (Y/N)</td><td>Y</td><td>Y</td><td>Y</td></tr>
<tr><td>SS archive (Y/N)</td><td>N</td><td>N</td><td>N</td></tr>
<tr><td>Composite archive (Y/N)</td><td>N</td><td>N</td><td>N</td></tr>
<tr><td>PDS</td><td></td><td colspan="3">Not proposed</td></tr>
<tr><td colspan="5">Sediment Analytical Parameters (No. Analyses by DMMU)</td></tr>
<tr><td colspan="2">Grain Size</td><td>1 (triplicate analysis)</td><td>1</td><td>1</td></tr>
<tr><td colspan="2">Total Solids</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td colspan="2">Total Organic Carbon</td><td>1</td><td>1</td><td>1</td></tr>
</table>

Deviations from the SAP: There were two minor deviations from the sampling and analysis plan. These minor deviations do not affect the sediment suitability.

- Samples were collected using a double van Veen grab sampler provided by the contractor instead of the Grey-O'hara box corer.
- Five of the 11 stations were deeper than the proposed dredge prism (-19 ft. CRD) as listed in SQER Table 3; however, at least two samples in each DMMU are representative of the dredge prism. Surficial sediments within the VTD FNC are consistently dominated by coarse-grain particles.

Results and Discussion: Analytical results for the Corps' sampling event are summarized in Table 4. Sediment testing consisted of physical analysis of sediments to confirm a very low rank (minimum 80% sand, less than 0.5% total organic carbon (TOC)). As expected, the sampling results confirmed a "very low rank", therefore, analytical chemistry testing was not triggered.

Table 4. Sediment Analytical Summary

Sediment Physical and Conventional Results – Dredge Prism			
Sample ID:	011019VTD-COMP01	011019VTD-COMP02	011019VTD-COMP03
DMMU ID: Parameter	DMMU 1 (triplicate analysis)	DMMU 2	DMMU 3
Total Organic Carbon (%)	0.04	0.16	0.03
Total Solids (%)	85.3 85.4 76.7	73.2	74.2
Gravel (%)	17.7 17.4 20.8	0.1	0.2
Sand (%)	81.2 81.2 76.7	98.0	99.6
Fines (%), silt + clays	1.1 1.4 2.5	1.9	0.1

PSET Suitability Determination:

Dredge Prism

The VTD FNC maintains a "very low" management area rank because the project sediments are still dominated by coarse sands and gravels (>98%) with low total organic carbon content (<0.2%) in strong river and tidal currents. The VTD FNC dredge prism material is suitable for unconfined, aquatic disposal without further testing per the 2018 SEF guidance.

Post-Dredge Surface

Based on a "very low" management area rank and confirmed coarse grain size with low total organic carbon for the dredge prism, chemical testing of the post-dredge surface sediments is not required. The VTD FNC post-dredge surface is suitable for unconfined, aquatic exposure without further testing per the 2018 SEF guidance.

Contact: This memorandum was prepared by Bridgette Lohrman (EPA, PSET Co-Lead), James Holm (USACE, PSET Lead) and reviewed by the participating PSET agencies, identified above. Questions regarding this memorandum should be directed to Bridgette Lohrman at (503) 326-4006 or e-mail to: lohrman.bridgette@epa.gov.

EPA-Region 10 Water Division, Wetlands and Oceans Section 17 March 2021

Memorandum for: U.S. Army Corps of Engineers — Portland District, Operations Division, Channels and Harbors, Waterways Maintenance Section (CENWP-ODN-W, Groth), Skipanon River Federal Navigation Channel (Mile 0.0 to 2.0), near Warrenton, Clatsop County, Oregon.

Subject: Portland Sediment Evaluation Team (PSET) Level 2A dredged material suitability determination for the U.S. Army Corps of Engineers - Portland District's (Corps) operations and maintenance (O&M) dredging for the Skipanon River (SKIP) Federal Navigation Channel (FNC) at river mile (RM) 10.7 of the Columbia River.

Introduction: Per the May 2018 *Sediment Evaluation Framework for the Pacific Northwest* (SEF) , this suitability memorandum (SDM) documents the consensus of the PSET agencies regarding the suitability of the SKIP FNC dredged material for unconfined, aquatic disposal and suitability of the post-dredge surface for unconfined, aquatic exposure. The PSET reviewed the February 2021 *"Sediment Characterization. ' Skipanon Channel Federal Navigation Project, Skipanon River Miles 0.0 to 2.0, Clatsop County, Oregon"* (SQER)[2], prepared by ANAMAR for the Corps' Sediment Quality Team (SQT). Sediment chemical testing results are summarized in the SQER; chemical analytical results were compared to the marine benthic toxicity screening levels (SEF SLs) published in the 2018 SEF. The PSET also used Oregon DEQ's sediment screening level value (SLV) for marine fish to evaluate PCBs'.

Suitability Summary:
Dredge Prism (DP) Sediments:
Ö Suitable OUnsuitable
Post-Dredge Surface (PDS):
& Suitable &Unsuitab1e (DMMU SKIP-04-Z, -17 to -19 ft MLLW)

Reviewers: The PSET agencies include the Corps, U.S. Environmental Protection Agency — Region 10 (EPA), National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife (USFWS), Washington Department of Ecology (Ecology), and Oregon Department of Environmental Quality (ODEQ). Table 1 lists the PSET's review timeline for this project. Reviewers included:

I8i James Holm (Corps, Lead)	*S* Bridgette Lohrman (EPA, Co-Lead)	
Hi Pete Anderson (ODEQ)	*S* Laura Inouye (Ecology)	Hi Dominic Yballe (Corps)
I8i Tom Hausmann (NMFS)	*S* Jeremy Buck (USFWS)	

' U.s. Army Corps of Engineers, U.s. Environmental Protection Agency, Washington Department of Ecology, Washington Department of Natural Resources, Oregon Department of Environmental Quality, Idaho Department of Environmental Quality, National Marine Fisheries Service, and U.S. Fish and Wildlife Service. 2018. *Sediment Evaluation Framework for the Pacific Northwest.* Published May 2018, by the U.S. Army Corps of Engineers, Northwestern Division, 183 pp with Appendices.

[2] U.S. Army Corps of Engineers — Portland District. 2021. *Sediment Characteri-ation. Skipanon Channel Federal Navigation Project, Skipanon River Miles 0.0 to 2.0, Clatsop County, Oregon.* Prepared by ANAMAR, February 2021. 23 pp with Maps, Tables, and Appendices.

[3] Oregon Department of Environmental Quality. 2007. *Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment.* Updated April 3, 2007 by ODEQ Environmental Cleanup Program, 18 pp with Appendices.

PSET/SEF Conditions:

& Data Recency Expiration:

- Based on a “Moderate” rank, the data recency for DMMUs 2, 3, 4, and 5 in the Skipanon FNC expires in September 2025
- Based on a “Low” rank, the data recency for DMMUs 1 and 6789 in the Skipanon FNC expires in September 2027

☒ Biological testing per the 2018 SEF is required for the post-dredge surface in DMMU 4 to assess the suitability of these sediments for unconfined, aquatic exposure. If biological testing is not performed or if biological tests fail, then the following is required:

- Upland disposal of post-dredge surface sediments (-17 to -19 feet MLLW) from DMMU 4 with full characterization of underlying sediments and/or placement of 12 inches of sand; or
- Post-dredge surface management in DMMU 4 in coordination with PSET. Post-dredge surface management may include one or more of the following:
  - o Under dredging to -15 feet MLLW or shallower;
  - o Post-dredge sampling for pesticides;
  - o Placement of 12 inches of sand; and/or
  - o Monitored natural recovery.

Table 1. Review Timeline

Draft Sampling and analysis plan (SAP)[4] submitted to PSET	24 August 2020
SAP approved by PSET[5]	4 September 2020
Sampling date(s)	8 and 9 September 2020
Draft SQER submitted to PSET	11 December 2020
SQER revisions requested by PSET	14, 16 December 2020
Core correction discussion	23 December 2020
SQER revisions requested by PSET	6 January 2021
Corps submits re-analysis results	9 February 2021
Final SQER submitted to PSET	25 February 2021
Suitability Determination Memorandum (SDM) issued by PSET	17 March 2021
Management area ranking	Moderate — DMMUs 2-5 Low — DMMUs 1 & 6789*
Recency of data	DMMUs 2-5 — September 2025 DMMUs 1 & 6789* — September 2027

* - Naming convention for DMMU “6789” represents DMMUs 6 through 9 sampled in 2014.

Federal Regulatory Authorities:

Section 10, Rivers and Harbors Act

Section 404, Clean Water Act (CWA)

Section 401, CWA

---

[4] U.S. Army Corps of Engineers. 2020. *Skipanon Channel Federal Navigation Project, Skipanon River, whiles 0.0 to 2.0, Clatsop County, Oregon, Sediment Sampling and Analysis Plan.* Prepared by Corps SQT, 24 August 2020. 21 pp with Attachments.

[5] Portland Sediment Evaluation Team (PsET). 2020. [E-mail correspondence] *PSET — Skipanon FNC SAP Approval.* Bridgette Lohrman, EPA, sent 4 September 2021. 3 pp.

& Section 7, Endangered Species Act
X Section 305 of the Magnuson-Stevens Act
X Fish and Wildlife Coordination Act
☐ Section 103, Marine Protection, Research and Sanctuaries Act
☐ Comprehensive Environmental Response, Compensation, and Liability Act

Project Description: Table 2 provides a summary of the dredging project details for the SKIP FNC. Maintenance dredging is needed to provide reliable navigation access.

Table 2. Project Details

Waterbody/river mile (RM)	Skipanon River / 0.0 to 2.0 (Enters the Columbia River at RM 10.7)
Total proposed dredging volume (cy)	=l60,000 (range: 65,000 to 355,000)
Max. proposed dredging depth (includes overdepth allowance)	-17 feet MLLW (-16 + 1 ft)
Dredge dimensions	Channel: 2.0 miles long by 200 feet wide with a turning basin from RM 1.5 to 1.8 that is 220 to 480 feet wide
Dredging method	Pipeline, clamshell, or hopper
Dredged material transport	Barge, hopper, or pipeline
Proposed disposal location(s)	Columbia River flowlane
Proposed dredging date(s)	Typically August through December
Dredged material mgmt. units (DMMUs) / stations	6 / 2 per DMMU

Sampling and Analysis Description: The Corps' sampling and analytical program for the SKIP FNC is summarized in Table 3. Actual sample station locations are shown in the SQER Table 1 and Map 1 (SDM Figure 1) with full delineation of all DMMUs in Figures 3 and 4 of SAP.

Deviations from the SAP: Deviations from the PSET-approved SAP are listed in SQER section 3.1 and noted in SQER Tables 1 (core summary). Deviations included the following:

1. Core station VC-04 for DMMU SKIP-02 was relocated to avoid rocks (potentially rip rap) that caused shallow refusal. The Corps was only able to penetrate to -18 feet MLLW, one foot short of the full Z-layer interval (-17 to -19 ft MLLW).
2. Seven cores (VC-06 to VC-12) were over-penetrated by 1 to 4 feet to improve retention of the soft silty surface layer and minimize sample loss from the bottom of the core sampler. Consolidated sediments at depth prevented sample loss. The over-penetrated section of the core was discarded after completing the linear core compaction correction. See SQER section 2.2.2 (Vibracore Sampling Methods) and SQER Exhibit 2-3.
3. Low percent core recovery (<75%) occurred on multiple core attempts at core stations VC-02, VC-04, VC-05, VC-06, VC-07, VC-08, VC-09, VC-11, and VC-12 as shown in SQER Table 1. The field team processed the core with highest recovery.

G-20

Table 3. Sampling and Analysis Description

Sample collection method		Vibracore					
DMMU ID		SKIP-01	SKIP-02	SKIP-03	SKIP-04	SKIP-05	SKIP-6789
Project mile		1+50 to 2+00	1+40 to 1+50	1+37 to 1+40	1+32 to 1+37	1+30 to 1+32	0+00 to 1+30
DMMMU volume (CY)		=50,000	=20,000	=l7,000	=22,000	=l4,000	=37,000
DMMU rank		Low	Moderate	Moderate	Moderate	Moderate	Low
DP composite sample ID (mudline to -17 ft MLLW)		SKIP-01-COMP	SKIP-02-COMP	SKIP-03-COMP	SKIP-04-COMP	SKIP-05-COMP	SKIP-6789-COMP
PDS composite sample ID (-17 to -19 ft MLLW)		SKIP-01-COMP-Z	SKIP-02-COMP-Z	SKIP-03-COMP-Z	SKIP-04-COMP-Z	SKIP-05-COMP-Z	SKIP-6789-COMP-Z
Dredge Prism	Depth range (ft MLLW)	-6.4, -7.2 to -17	-7.4, -8.5 to -17	-12.3, -13.0 to -17	-12.0, -12.6 to -17	-12.1, -15.3 to -17	-14.6, -15.0 to -17
	Composite(Y/N)	Y	Y	Y	Y	Y	Y
	Subsamples/DMMU	2	2	2	2	2	2
	SubsampleArchive	y	y		y		y
PDS Layer	Depth range (ft MLLW)	-17 to -19	-17 to -19, -17 to -18°	-17 to -19	-17 to -19	-17 to -19	-17 to -19
	Composite (Y/N)	Y	Y	Y	Y	Y	Y
	Subsample /PDS-layer	2	2	2	2	2	2
	Subsample Archive						
Sediment Physical and Chemical Analysis per DMMU (No. DP/ No. PDS)							
Grain size		l/1	1/l	l/1	1/l	l/1	1/l
Total organic carbon		l/1	1/l	l/1	1/l	l/1	1/l
Total solids		l/1	1/l	l/1	1/l	l/1	1/l
Ammonia		l/1	1/l	l/1	1/l	l/1	1/l
Total sulfides		l/1	1/l	l/1	1/l	l/1	1/l
Metals, marine		l/1	1/l	l/1	1/l	l/1	1/l
PAHs		l/1	1/l	l/1	1/l	l/1	1/l
SVOCs (chlorinated hydrocarbons, phthalates, phenols, misc. extractables)		l/1	1/l	1/1	1/1	1/1	1/1
Pesticides		1/1	1/l	l/1	1/l	l/1	1/l
PCBs(Total Aroclors)		1/1	1/l	l/1	1/l	l/1	1/l
Tributyltin		1/1	1/l	l/1	1/l	l/1	1/l
Dioxin/Furans		-/-	-/-	-/-	-/-	-/-	-/-

= refusal meet, 1-ft Z-layer sample collected

Results and Discussion: Dredge prism analytical results for the Corps' sampling event are summarized in Table 4. Post-dredge surface analytical results for the Corps' sampling event are summarized in Table S. The chemical analytical results from the SQER were compared to the 2018 SEF marine SLs and to ODEQ's SLV for marine fish (47 ug/kg) to evaluate PCBs.

The dredge prism sediments are predominantly silt (77-86%) with some clay (12-20%) and minor amounts of sand and gravels (<3%). Total organic carbon (TOC) in the dredge prism sediments ranged from 2.14 to 2.79%. Total solids in the dredge prism sediments ranged from 35 to 42%.

In all dredge prism composite samples, no parameters had detections, estimated concentrations (I) or non-detections (U) with elevated detections or reporting limits above SEF marine SLs or the ODEQ SLV for PCB Aroclors.

The post-dredge surface sediments are predominantly silt (56-79%) with clay (15-42%) and lesser amounts of sand and gravels (2 to 29%). Total organic carbon (TOC) in the post-dredge surface sediments ranged from 1.66 to 3.13%. Total solids in the dredge prism sediments ranged from 44 to 52%.

In the post-dredge surface composite sample for DMMU 4 (SKIP-04-COMP-Z), 4,4'-DDD was detected at a concentration of 48.2 ug/kg which exceeds the SEF marine SL of 16 ug/kg. In the 2014 dredged material evaluation, 4,4'-DDD was also detected at a concentration of 19 ug/kg in the post-dredge surface layer of DMMU 4. Based on the continued presence of elevated DDD concentrations, the post-dredge surface is not suitable for unconfined aquatic exposure without further testing. If testing is not conducted or fails, management of the post-dredge surface in DMMU 4 is required. The Corps may choose upland disposal of the post-dredge surface sediments and conduct post-dredge sampling for pesticides to inform placement of a 12-inch sand layer. The Corps shall prepare a dredging and disposal quality control plan for the project and coordinate with PSET for implementation prior to dredging DMMU 4.

N-nitrosodiphenylamine was detected in 3 PDS samples (IZ, 3Z, and 4Z). However, the concentration only minimally exceeded the SEF marine SL (28 ug/kg) in the lZ (29 ug/kg) and 4Z (30 ug/kg) samples. The sample 3Z concentration of 17 ug/kg is below the SEF SL. To confirm the concentration in the post-dredge surface of DMMU 1, the Corps re-analyzed the initial composite sample twice and an archived jar of the composite sample. All three re-analyses were non-detections for n-nitrosodiphenylamine with a sufficiently low MRL (5.0 ug/kg) below the SEF SL. There is "no reason to believe" that n-nitrosodiphenylamine is present in the post-dredge surface sediments in DMMU 1 at concentrations exceeding the SEF SL.

No other parameters had detections, estimated concentrations (I) or non-detections (U) with elevated detections limits above SEF marine SLs or ODEQ SLV for PCB Aroclors.

PSET Suitability Determination:
Dredge Prism — Chemical concentrations in all dredge prism samples were below the SEF marine SLs and ODEQ SLV as discussed above. As such, the Skipanon FNC dredged prism

material is suitable for unconfined, aquatic disposal per the 2018 SEF guidance without additional testing.

Post-Dredge Surface —Chemical concentrations in five of the six post-dredge surface samples were below the SEF marine SLs and ODEQ SLV as discussed above. As such, the Skipanon FNC post-dredge surfaces excluding DMMU 4, are suitable for unconfined, aquatic exposure per the 2018 SEF guidance without additional testing.

The post-dredge surface (-17 to -19 ft MLLW) in DMMU 4 has elevated n-nitrosodiphenylamine and 4,4'-DDD above SEF marine SLs. Therefore, the DMMU 4 post-dredge surface is not suitable for unconfined, aquatic exposure without biological testing per the 2018 SEF. If additional testing is not completed or fails, management of the post-dredge surface is required in coordination with the PSET.

Contact: This memorandum was prepared by Bridgette Lohrman (PSET co-lead) and James Holm (PSET Lead, Corps) and reviewed by the participating PSET agencies, identified above. Questions regarding this memorandum should be directed to Bridgette Lohrman at (503) 326-4006 or e-mail to: lohrman.bridgette@epa.gov.

Table 4. Project Sediment Analytical Summary – Dredge Prism

Parameter / Decision unit/Sample ID:	Mile 1+50 to 2+00 / SKIP-01-COMP	Mile 1+40 to 1+50 / SKIP-02-COMP	Mile 1+3 7 to 1+40 / SKIP-03-COMP	Mile 1+32 to 1+37 / SKIP-04-COMP	Mile 1+30 to 1+32 / SKIP-05-COMP	Mile 0+00 to 1+30 / SKIP-6789-COMP	SEF SL1 marine (SLV)
Dredge Prism Sediment Physical and Chemical Results							
Grain size: gravel, sand, silt, clay (%)	0.3, 1.5, 86.0, 12.5	0.3, 2.3, 84.8, 12.9	0.5, 2.0, 82.4, 15.5	0.3, 1.6, 79.8, 18.6	0.3, 2.2, 79.2, 18.7	0.5, 3. 1, 76.9, 19.8	
Total Solids (%)	59.41	42.42	55.09	39.59	38.8	40.01	
Total Orgaiiic Carbon (%)	2 76	2. 14	2 79	2 5	2 53	2 22	
.1mmouia (uig/kg)	344	281	278	300	255	205	
Total Sulfides (uig/kg)	2,940	2,710	2,720	2,610	2,030	2,080	
Metals (ug/kg)	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, I	varies
PAHs (ug/kg)	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, I	varies
LPAHs (ug/kg)	13 1	32 1	7.7 1	22 I	8.6 1	20 U	5,200
HPAHs (ug/kg)	248 1	329 1	129 1	200 1	152 1	89 I	12,000
SVOCs (ug/kg) (phenols, chlorinated hydrocarbons, misc. extractables)	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, I	varies
N-nitrosodiphenylainine	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	28
Pesticides (ug/kg)	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	varies
4,4"-DDD	4.20)	2.86	2.69	4.00	3.91	2.12 1	16
4,4"-DDE	2.99)	2.22	3.31	1.75	1.81	1.43	9
4,4'-DDT	0.99 U	1.0 U	1.0 U	1.0 U	1.02 U	1.0 U	12
PCBs, Total Aroclors (ug/kg)	27.8 I	16.7	17.9	20.5	12.9 J	11.2 1	130 (47a)
Tribu9 ltin (ug/kg)	1.5 I	1.8 J	1.6 I	1.8 J	0.83 J	0.85 1	73

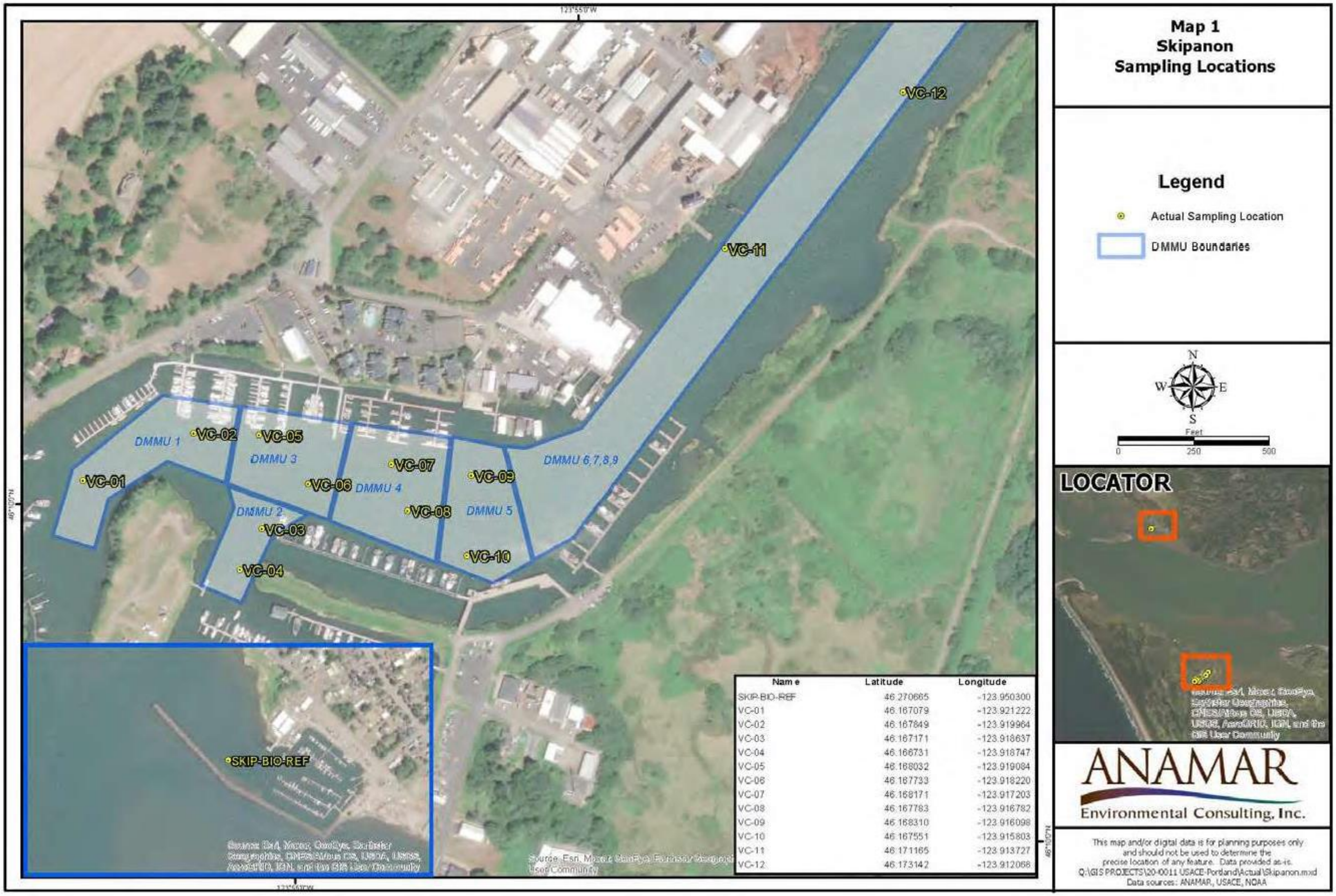
BOLD= Detection exceeds SEF marine screening level (SL); U = Non-detection (ND) at the method reporting limit (MRL) or method detection limit (MDL), MRL reported; I = Estimated value between MDL and MRL; = ODEQ (2007) Marine fish-based bioaccumulation screening level value.

Table 5. Project Sediment Analytical Summary – Post-Dredge Surface

Post-Dredge Surface Sediment Physical and Chemical Results							
Decision unit/Sample ID: Parameter	Mile 1+50 to 2+00 / SKIP-01-COMP-Z	Mile 1+40 to 1+50 / SKIP-02-COMP-Z	Mile 1+37 to 1+40 / SKIP-03-COMP-Z	Mile 1+32 to 1+37 / SKIP-04-COMP-Z	Mile 1+30 to 1+32 / SKIP-05-COMP-Z	Mile 0+00 to 1+30 / SKIP-6789-COMP-Z	SEF SL1 marine (SLV)
Grain size: gravel, sand, silt, clay (%)	0.3, 1.5, 57.0, 41.8	0.7, 28.0, 56.3, 15.0	0.9, 1.5, 79. 1, 19.2	0.3, 1.4, 74.8, 24.0	0.3, 3.5, 78.0, 18.7	0.3, 2.9, 77.0, 20.0	
Total Solids (%)	48.05	52.35	45. 12	44.96	44. 35	44. 17	
Total Orgaiiic Carbon (%)	3. 13	1 66	2 62	2 73	2 36	2 22	
.1mmouia (uig/kg)	707	257	463	630	457	409	
Total Sulfides (uig/kg)	1, 150	1,660	2,830	2,080	2,060	1,930	
Metals (nig/kg)	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, I	varies
PAHs (ug/kg)	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, I	varies
LPAHs (ug/kg)	151 1	159 1	102 1	107 1	16 I	9.5 I	5,200
HPAHs (ug/kg)	1,271 1	485 1	532 1	700 1	258 1	147 I	12,000
SVOCs (ug/kg) (phenols, chlorinated hydrocarbons, misc. extractables)	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, I	varies
N-nitrosodiphenylamine Re-analysis in triplicate	29 5.0 U	5.0 U	17	30	5.0 U	5.0 U	28
Pesticides (ug/kg)	Non-detect *-SLs U	Non-detect <SLs U	Non-detect *-SLs U	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	varies
4,4′-DDD	15.8	3.32	15.3	48.2	11.6	2.3 2 1	16
4,4′-DDE	2. 11	1.64	3.58	3.37	2.71	1.75	9
4,4′-DDT	1.0 U	1.0 U	1.0 U	0.99 U	1.0 U	0.99 U	12
PCBs, Total Aroclors (ug/kg)	23 .8	24.8	33.3 I	28.9 1	37. 1 I	11.3 1	130 (47a)
Tribute ltin (ug/kg)	3.8 U	1.2 I	1.2 I	0.49 1	0.78 I	0.76 1	73

BOLD= Detection exceeds SEF marine screening level (SL); U = Non-detection (ND) at the method reporting limit (MRL) or method detection limit (MDL), MRL reported; I = Estimated value between MDL and MRL; t = ODEQ (2007) Marine fish-based bioaccumulation screening level value.

Figure 1.Skipanon River Federal Navigation Channel, actual sample locations and DMMUs (sampled 8-9 September 2020).



Name	Latitude	Longitude
SKIP-BIO-REF	46.270665	-123.950300
VC-01	46.167079	-123.921222
VC-02	46.167849	-123.919964
VC-03	46.167171	-123.918637
VC-04	46.166731	-123.918747
VC-05	46.168032	-123.919084
VC-06	46.167733	-123.918220
VC-07	46.168171	-123.917203
VC-08	46.167783	-123.916782
VC-09	46.168310	-123.916098
VC-10	46.167551	-123.915803
VC-11	46.171165	-123.913727
VC-12	46.173142	-123.912068

EPA-Region 10 Water Division, Wetlands and Oceans Section 11 January 2021

Memorandum for: U.S. Army Corps of Engineers — Portland District, Operations Division, Channels and Harbors, Waterways Maintenance Section (CENWP-ODN-W, Stokke), Cathlamet Bay (Tongue Point) Federal Navigation Channel (Station 0+00 to 1+24), near Astoria, Clatsop County, Oregon.

Subject: Portland Sediment Evaluation Team (PSET) Level 2B dredged material suitability determination for the U.S. Army Corps of Engineers - Portland District's (Corps) operations and maintenance (O&M) dredging for the Cathlamet Bay (CBY) Federal Navigation Channel (FNC) in the Columbia River at river mile (RM) 18.5.

Introduction: Per the May 2018 *Sediment Evaluation Framework for the Pacific Northwest* (SEF) , this Level 2B suitability determination memorandum (SDM) documents the consensus of the PSET agencies regarding the suitability of the CBY FNC dredged material from DMMUs CBY-54-B and CBY-67-A for unconfined, aquatic disposal. The PSET reviewed the December 2020 *"Sediment Characterization and Bioassays of Cathlamet Bay Federal Side Channel (Tongue Point), Lower Columbia River, Clatsop County, Oregon"* (2B SQER)', prepared by ANAMAR for the Corps' Sediment Quality Team (SQT). Sediment chemical and bioassay testing results are summarized in the 2B SQER; chemical analytical results were compared to the marine benthic toxicity screening levels (SLs) published in the 2018 SEF; bioassay results were compared to the SEF interpretive criteria for dispersive sites (SEF Table 7-1). The PSET also used Oregon DEQ's sediment screening level value (SLV) for marine fish to evaluate PCBs'.

Suitability Summary:

Dredge Prism (DP) Sediments:

fi Suitable (DMMUs CBY 54-B and 67-A)

OUnsuitable

Post-Dredge Surface (PDS):

Previously determined suitable.

Reviewers: The PSET agencies include the Corps, U.S. Environmental Protection Agency — Region 10 (EPA), National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife (USFWS), Washington Department of Ecology (Ecology), and Oregon Department of Environmental Quality (ODEQ). Table 1 lists the PSET's review timeline for this project. Reviewers included:

UJ James Holm (Corps, Lead) *S* Bridgette Lohrman (EPA, Co-Lead)

' U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, Washington Department of Ecology, Washington Department of Natural Resources, Oregon Department of Environmental Quality, Idaho Department of Environmental Quality, National Marine Fisheries Service, and U.S. Fish and Wildlife Service. 2018. *Sediment Evaluation Framework for the Pacific Northwest.* Published May 2018, by the U.S. Army Corps of Engineers, Northwestern Division, 183 pp with Appendices.

[2] U.S. Army Corps of Engineers—Portland District (Corps). 2020. *Sediment Characteri--ation and Bioassays of the Cathlamet Bay Federal Side Channel (Tongue Point), Longer Columbia River, Clatsop County, Oregon.* Prepared by ANAMAR, December 2020. 24 pp with Maps, Tables, and Appendices.

[3] Oregon Department of Environmental Quality. 2007. *Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment.* Updated April 3, 2007 by ODEQ Environmental Cleanup Program, 18 pp with Appendices.

Hi Pete Anderson (ODEQ) S Laura Inouye (Ecology) Hi Dominic Yballe (Corps)
I8i Tom Hausmann (NMFS) S Jeremy Buck (USFWS)

PSET/SEF Condition:

Data Recency Expiration: Based on a "Moderate" rank, the data recency for DMMUs 54-B and 67-A in Shoal B of the Cathlamet Bay Federal Navigation Channel expires concurrent with the rest of Shoal B in November 2024

Table 1. Review Timeline – CBY FNC

LEVEL 2A	
Draft Sampling and analysis plan (SAP) submitted to PSET	1 October 2019
SAP revisions requested by PSET	2 October 2019
Revised Draft SAP submitted	8 October 2019
Revised SAP revisions requested by PSET	11 October 2019
Final SAP submitted	15 October 2019
Final SAP approved by PSET	31 October 2019
Sampling date(s)	11 to 19 November 2019
Draft SQER submitted to PSET	10 March 2020
SQER revisions requested by PSET	11 March 2020
Final SQER submitted to PSET	22 April 2020
Level 2A SDM issued by PSET	31 July 2020
LEVEL 2B	
Draft Supplement SAP (SSAP) submitted to PSET	20 August 2020
SSAP comments given during PSET call	26 August 2020
Revised SSAP[4] submitted to PSET	1 September 2020
SSAP approved by PSET'	2 September 2020
Sampling date(s)	10 September 2020
Level 2B SQER submitted to PSET	8 December 2020
Level 2B SDM issued by PSET	11 January 2021
Management area ranking	Shoal A — Very Low Shoal B — Moderate
Recency of data	Shoal A — November 2029 (10 years) Shoal B — November 2024 (5 years)

Federal Regulatory Authorities:

Section 10, Rivers and Harbors Act
Section 404, Clean Water Act (CWA)
& Section 401, CWA
& Section 7, Endangered Species Act
& Section 305 of the Magnuson-Stevens Act
& Fish and Wildlife Coordination Act
Section 103, Marine Protection, Research and Sanctuaries Act

Corps. 2020. *Supplemental Sediment Sampling and Analysis Plan (SSAP) for the Cathlamet Bay Federal Navigation Side Channel.* Prepared by Corps SQT, 1 September 2020. 6 pp.

Portland sediment Evaluation Team (PsrT). 2020. [E-mail correspondence] *PSET — Cathlamet Bay — Bioassay SAP Approval.* Bridgette Lohrman, EPA, sent 2 September 2020. 3 pp with attachment.

O Comprehensive Environmental Response, Compensation, and Liability Act

Project Description: Table 2 provides a summary of the Corps' dredging project details for the CBY FNC. Maintenance dredging is needed to provide navigation access. The CBY turning basin (Station 1+24 to 1+40) will not be dredged, was not characterized in the Level 2A or 2B SQER and is not evaluated in this 2B SDM.

Table 2. Project Details – CBY FNC

Waterbody/river mile (RM)	Columbia River, 18.5
Total proposed dredging volume (cy)	=585,000 (Shoal A = =80,000, Shoal B = =465,000, Shoal B side slopes = =40,000)
Max. proposed dredging depth (includes overdepth allowance)	-36 feet MLLW (34 + 2 ft overdredge)
Dredging area (acres, approx.)	=l20
Dredge dimensions	=2,200 ft. wide narrowing to 350 ft. wide for =3,000 ft., then 350 ft. wide for 1 mi. (turning basin excluded)
Dredging method	Pipeline, clamshell or hopper dredge
Dredged material transport	Barge, hopper, or pipeline
Proposed disposal location(s)	Columbia River flowlane
Proposed dredging date(s)	Typically August through December
Dredged material mgmt. units (DMMUs)	Level 2A: 94 + 16 side slope stations Level 2B: 2(CBY-54-B, CBY-67-A)

Sampling and Analysis Description: The Corps' Level 2B sampling and analytical program for DMMUs CBY-54-B and CBY-67-A and the reference site sediments are summarized in Table 3. Actual sample station locations are shown in the 2B SQER Table 1 and Map 1 (Level 2B SDM Figure 1).

Deviations from the SSAP: One deviation from the PSET-approved SSAP was necessary. The reference site was relocated from outside the Chinook Channel breakwater to within the breakwater to collect reference sediments with grain size similar to the Cathlamet Bay FNC test sediments.

Table 3. Sampling and Analysis Description – Level 2B, CBY FNC

Sampling Description				
Sample collection method		Vibracore		PONAR
Shoal ID		B	B	Reference Site
DMMU ID		CBY-54-B	CBY-67-A	N/A
DMMU Rank		Moderate	Moderate	N/A
Proposed DMMU volume (cy)		=5,000	=5,000	N/A
Sample ID (planned interval, ft MLLW)		200910-CBY-54-B-BIO-COMP (-32 to -36)	200910-CBY-67-A-BIO-COMP (mudline to -32)	200910-CBY-REF-COMP (mudline)
Dredge Prism	Depth range (ft MLLW)	-32 to -36	Mudline (-27.1) to -32	Mudline at -6
	Composite (Y/N)	Y	Y	N
	Subsamples /DMMU	2	2	1
	Subsample Archive (Y/N)	Y	Y	N
PDS Layer	Depth range (ft MLLW)	N/A	N/A	N/A
	Composite (Y/N)			
	Subsample /PDS-layer			
	Subsample Archive (Y/N)			
Sediment Physical, Chemical and Biological Analyses per DMMU (No. DP/ No. PDS)				
Grain size		1/--	1/--	1/--
Total organic carbon		1/--	1/--	1/--
Total solids		1/--	1/--	1/--
Ammonia		1/--	1/--	1/--
Total sulfides		1/--	1/--	1/--
Metals, marine		1/--	1/--	1/--
PAHs		1/--	1/--	1/--
SVOCs (chlorinated hydrocarbons, phthalates, phenols, misc. extractables)		1/--	1/--	1/--
Pesticides		1/--	1/--	1/--
PCBs (Total Aroclors)		1/--	1/--	1/--
Tributyltin		1/--	1/--	1/--
Bioassays, marine		3/--	3/--	3/--

Results and Discussion: Analytical results for the Corps' Level 2B sampling event are summarized in Table 4. The chemical analytical results were compared to the 2018 SEF marine SLs and to ODEQ's SLV for marine fish to evaluate PCBs (47 ug/kg). The marine bioassay results were compared to the 2018 SEF performance standards and interpretive criteria for dispersive disposal sites as shown in Tables 5, 6, 7, and 8.

The initial November 2019 concentrations of diethyl phthalate detected in DMMUs CBY-54-B (254 ug/kg) and CBY-67-A (223 ug/kg) were not replicated in the Level 2B test sediments (19 ug/kg I, 15 ug/kg I). No other parameters had detections, estimated concentrations (I) or non-detections (U) with elevated detections limits above SEF marine SLs or ODEQ SLV for PCBs.

Table 4. DMMUs CBY-54-B and CBY-67-A and Reference Site Analytical Summary

Sediment Physical and Chemical Results				
Decision unit/sample ID: Parameter	200910-CBY-54-B-BIO-COMP	200910-CBY-67-A-BIO-COMP	200910-CBY-REF-COMP	SEF SL1 marine (SLV)
Grain size: gravel, sand, silt, clay (%)	0.7, 8.9, 80.8, 9.8	0.3, 31.5, 59.7, 8.7	0.3, 19, 61.7, 19	
TotalSolids(%)	47.5	58.7	61.3	
TotalOrganicCarbon(%)	2.12	1.54	1.18	
Ammonia(mg/kg)	5.27	187	46.1	
TotalSulfides(mg/kg)	599	646	514	
Metals (mg/kg)	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Detect <SLs J	varies
PAHs (ug/kg)	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	varies
LPAHs (ug/kg)	103 J	65 J	307 J	5,200
HPAHs (ug/kg)	331 J	314 J	1,149 J	12,000
SVOCs (ug/kg) (phenols, phthalates, chlorinated hydrocarbons, misc. extractables)	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	varies
Pesticides (ug/kg)	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	varies
4,4'-DDD	1.4	0.52 J	0.87 J	16
4,4'-DDE	0.84 J	0.42 J	0.85 J	9
4,4'-DDT	1.0 U	1.0 U	0.50 U	12
PCBs, Total Aroclors (ug/kg)	10.2 J	1.2 J	6.6 J	130 (47)
Tributyltin (ug/kg)	7.0	0.83 J	3.8 U	73

U = Non-detection at the method reporting limit (MRL) or method detection limit (MDL), MRL reported; J = Estimated value between MDL and MRL;   = ODEQ (2007) Marine fish-based bioaccumulation screening level value for PCBs.

Table 5. DMMUs CBY-54-B and CBY-67-A Bioassay Summary

Treatment	1-Hit Rule			2-Hit Rule		
	Amphipod	Polychaete	Larval	Amphipod	Polychaete	Larval
200910-CBY-54-B-BIO-Comp	Pass	Pass	Pass	Pass	Pass	Pass
200910-CBY-67-A-BIO-Comp	Pass	Pass	Pass	Pass	Pass	Pass

Table 6. 10-day Amphipod Mortality Comparison for Eohaustorius estuarius

Treatment	Mean Mortality (%)	Statistically Different than Reference? (P=0.05)	Mortality Comparison to Control MT-Mc (%)	Mortality Comparison to Reference MT-MR (%)	Fails 2-Hit?'	Fails l-Hit?'
Control	2					
200910-CBY-REF-Comp	18					
200910-CBY-54-B-BIO-Comp	5	No	3	-13	No	No
200910-CBY-67-A-BIO-Comp	10	No	8	-8	No	No

'2-Hit Rule: Statistical Significance and MT-Mc >20% 21-Hit Rule: Statistical Significance and MT-Mq >20% and MT-MR >10% (dispersive); MT - Treatment Mortality;' MR - Reference Mortality; Mq = Control Mortality

Table 7. 20-day Polychaete Mortality and Growth Comparison for Neanthes arenaceodentata

Treatment	MIG (mg/ind/day) AFDW	Statistically Less than Reference? (p=0.05)	MIG Relative to Control MIGT/MIGc	MIG Relative to Reference MIGT/MIGR	Fails 2-Hit?'	Fails 1-Hit?'
Control	0.552					
200910-CBY-REF-Comp	0.445					
200910-CBY-54-B-BIO-Comp	0.543	No	0.98	1.22	No	No
200910-CBY-67-A-BIO-Comp	0.623	No	1.13	1.40	No	No

'2-Hit Rule: Statistical Significance and MIGT/MIGc <0.80; [2]l-Hit Rule: Statistical Significance and MIGT/MIGc <0.80 and MIGT/MIGR <0.70; MIGT = Treatment Mean Individual Growth; MIGR = Reference Mean Individual Growth; MIGc = Control Mean Individual Growth

Table 8. Larval Development Comparison for Mytilus galloprovincialis

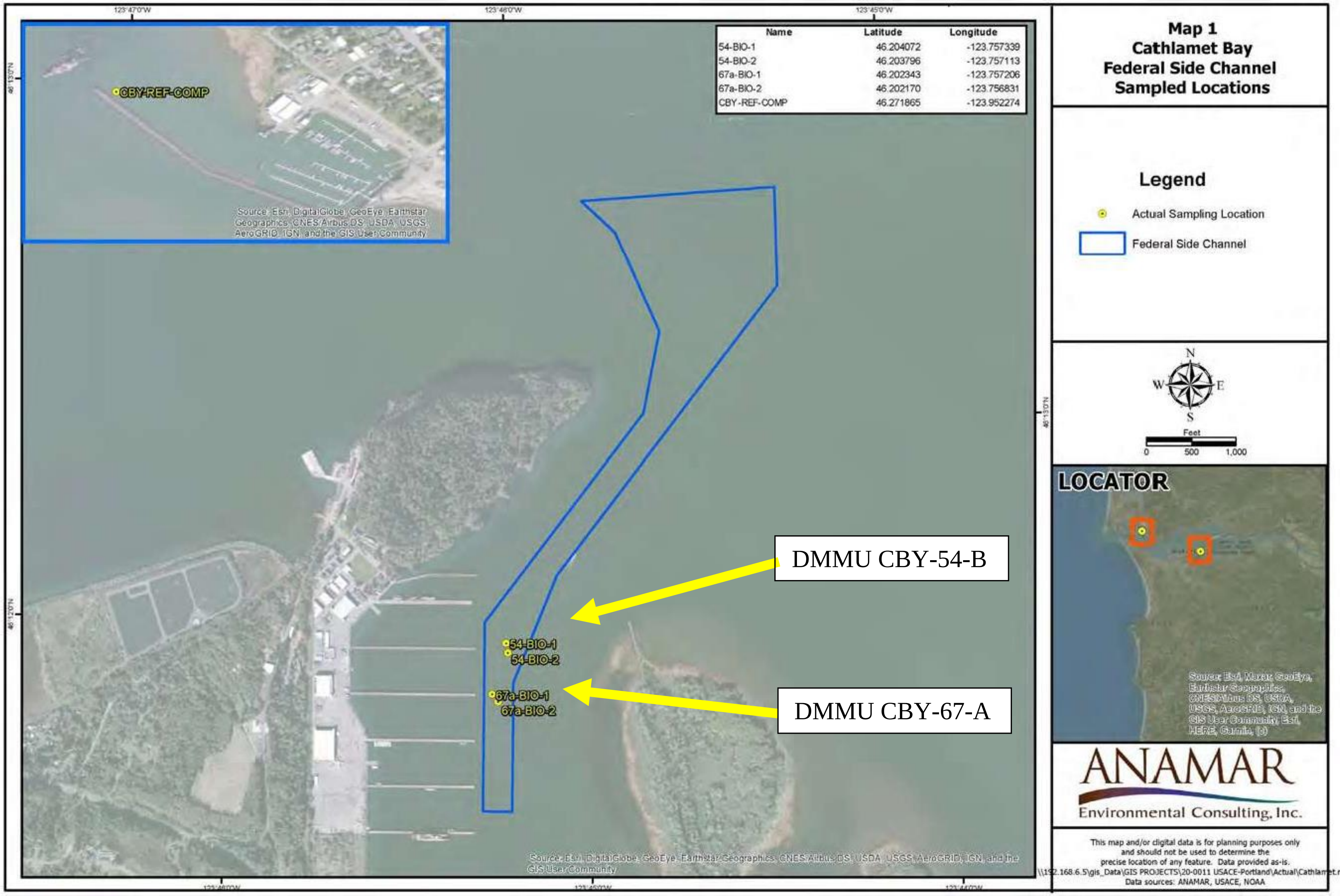
Treatment	Mean Number Normal	Statistically Less than Reference? (p=0.10)	Normal Survival to Seawater Control NT C	NR/Nc - NTSC	Fails 2-Hit?'	Fails 1-Hit?'
Seawater Control	244.6					
Sediment Control	252.0					
200910-CBY-REF-Comp	252.6					
200910-CBY-54-B-BIO-Comp	235.0	Yes	0.96	0.07	No	No
200910-CBY-67-A-BIO-Comp	226.0	Yes	0.92	0.11	No	No

'2-Hit Rule: Statistical Significance and (NTSC) <0.80; ' 1-Hit Rule: Statistical Significance and (NTSC) +0.80 and NR C - NT C 0.15; NT =Treatment Mean Number Normal; NR =Reference Mean Number Normal; Nc =Control Mean Number Normal

PSET Suitability Determination:
Based on both l-hit and 2-hit rules for dispersive disposal site criteria, both DMMU CBY-54-B and DMMU CBY-67-A pass all marine bioassay tests. Therefore, dredged materials from DMMUs CBY-54-B and CBY-67-A are suitable for unconfined, aquatic disposal per the 2018 SEF.

Contact: This memorandum was prepared by Bridgette Lohrman (PSET co-lead) and James Holm (PSET Lead, Corps) and reviewed by the participating PSET agencies, identified above. Questions regarding this memorandum should be directed to Bridgette Lohrman at (503) 326-4006 or e-mail to: lohrman.bridgette@epa.gov.

Figure 1. Cathlamet Bay Federal Navigation Channel, actual core sampling stations for DMMUs CBY-54-B and CBY-67-A (near Astoria, OR) and grab sampling stations for the reference site (near Chinook, WA).



CENWP-EC-HR March 5, 2014

Memorandum for: Portland District, Waterways Maintenance, (CENWP-OD-NW, Stokke)

Subject: Portland Sediment Evaluation Team (PSET) Level 2 dredged material suitability determination for maintenance dredging at the Wahkiakum Ferry and Westport Slough side channel projects.

Reviewers: The PSET includes the U.S. Army Corps of Engineers (Corps), Environmental Protection Agency (EPA), National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife (USFWS), Washington Department of Ecology (Ecology), and Oregon Department of Environmental Quality (ODEQ). The reviewers for this project included James McMillan and James Holm (Corps), Laura Inouye (Ecology), Jeff Lockwood (NMFS), Jeremy Buck (USFWS), Pete Anderson (ODEQ), and Jonathan Freedman and Bridgette Lohrman (EPA).

The PSET reviewed the Portland District (District) Sediment Quality Team's February 3, 2014 "Wahkiakum Ferry Channel Realignment — Westport Slough Dredging Project, Sediment Quality Evaluation Report" (SQER). This technical memorandum documents the consensus of the reviewing agencies regarding the suitability of sediments at the Wahkiakum Ferry and Westport Slough side channels for unconfined, aquatic placement. Sediment quality data collected from these side channel projects was evaluated using guidance found in the 2009 *Sediment Evaluation Framework for the Pacific Northwest* (SEF).

Applicable Authorities Governing the Project: Congressional authorization under the Rivers and Harbors Act of 1937; sections 401 and 404 of the Clean Water Act; section 7 of the Endangered Species Act; section 305 of the Magnuson-Stevens Act; et al.

Project Description: The Lower Columbia River (LCR) deep draft navigation channel bisects the Wahkiakum Ferry channel into two side channel projects: the Westport Slough side channel (Oregon) and Wahkiakum Ferry side channel (Washington). These side channel projects are located at Columbia River mile (RM) 43.5. Side channel project figures appear in the SQER.

<u>Wahkiakum Ferry Side Channel.</u> The existing Wahkiakum Ferry side channel project is currently maintained for ferry traffic only, and provides for a channel 9 ft. deep, 200 ft. wide, and 1,900 ft. long, with a 100-ft. over-width on each side of the channel. The Corps performs advanced maintenance dredging on the project to -11 ft. Columbia River Datum (CRD); the project was last dredged in 2010 and the sediment was placed in the Columbia River flow lane. The Corps proposes to widen and realign the Puget Island segment of the ferry channel; the channel centerline would be shifted upstream and the channel will be widened from 200 to 300 ft. and shifted upstream. The downstream channel boundary would shift upstream approximately 70 ft. while the upstream channel boundary would shift upstream approximately 170 ft. The 100-ft. over-width will shift upstream as well. The Wahkiakum Ferry side channel depth would remain the same (-11 ft. CRD). The new area to be dredged is approximately 300 ft. by 400 ft., and the

total volume of sediment to be dredged is estimated between 22,000 and 33,000 cubic yards

Westport Slough Side Channel. The Westport Slough side channel project was authorized by Congress for a channel 28 ft. deep, 200 ft. wide, and 1,600 ft. long, with a 100-ft. over-width on each side of the channel. A single user may ultimately need the channel maintained to -22 ft. CRD, but funding has not been available for the Corps to maintain the channel to that depth. However, the Corps currently maintains the Westport Slough side channel to -11 ft. CRD for the ferry. The project was last maintained to -11 ft. CRD in 2010 and the sediment was placed in the Columbia River flow lane. The area to be dredged (to -11 ft. CRD) is approximately 200 ft. by 500 ft., and the total volume to be dredged is estimated between 30,000 and 40,000 CY. The estimated volume of sediment to be dredged for the -22 ft. CRD project would be 75,000 to 100,000 CY.

Dredging Methods: Both side channel projects will be dredged with a clamshell dredge.

Dredged Material Transport and Placement: A tug and bottom dumping scow are typically used to transport the dredged material. Dredged material will be placed near the Wahkiakum Ferry channel in the Columbia River flow lane.

Site History and Management Area Ranking: Based on prior sediment characterization, sediment grades from coarse-grained material in the LCR federal navigation channel to fine-grained material in the Westport Slough side channel. The Wahkiakum Ferry side channel is composed of coarse-grained material. There are no known sources of contamination in the project area or immediately upstream of the ferry. Georgia Pacific (formerly James River paper mill) is located at Wauna, Clatsop County, Oregon, approximately 2 miles downstream. Sediments in both side channel projects have been characterized multiple times. Sediment concentrations of metals, semi-volatile organic compounds (SVOCs), pesticides, and polychlorinated biphenyls (PCBs) have never exceeded the SEF freshwater benthic toxicity screening levels (SLs). Based on the previous testing, SVOC analysis was not included in the CoC list for this round of testing.

Management Area Ranking: The PSET has assigned a “very low” management area ranking to the Wahkiakum Ferry side channel. The Wahkiakum Ferry side channel sediments must be re-characterized 10 years from the sampling date, by September 2023. A “low” management area ranking is assigned to the Westport Slough side channel project. The Westport Slough side channel sediments must be re-characterized 7 years from the sampling date, by September 2020.

Sampling and Analysis Description: The Wahkiakum Ferry federal project was sampled on September 26, 2013; samples were collected with a petite ponar grab sampler. Sample stations appear in Figures 3 and 4 of the SQER; the grab sample log form appears in Attachment A of the SQER. The laboratory chain of custody form appears in Attachment B of the SQER.

Wahkiakum Ferry Side Channel. Three dredge prism subsamples were collected at the Wahkiakum Ferry dredged material management unit (DMMU) to form one composite sample (092613CRWF-COMP-1). Although metals were not originally proposed for analysis, the District instructed the contract laboratory to analyze the Wahkiakum Ferry composite sample for total solids, total organic carbon, grain size, and metals.

Westport Slough Side Channel. The Westport Slough side channel was split into two DMMUs that were defined by depth. Sample 092613CRWS-COMP-1 was composited from four grabs to characterize material above -11 ft. CRD (the typical maintenance depth). Sample 092613CRWS-COMP-2 was composited from four grabs to characterize material from -11 ft. to -22 ft. CRD (the depth that would be required for ocean-going barges that could potentially use the channel in the future). The District instructed the contract laboratory to analyze the Westport Slough composite samples for total solids, total organic carbon (TOC), grain size, metals, pesticides, PCBs, and total petroleum hydrocarbons.

Results: Sediment chemical results appear in Table 2 of the SQER. The District compared bulk sediment concentrations to the 2006 SEF freshwater SLs.

Wahkiakum Ferry Side Channel. The Wahkiakum Ferry shoal is composed of 96.2% sand and 3.5% fines (silt + clay); the TOC content of the shoal material is 0.768%. Antimony, mercury, and silver were not detected in sample 092613CRWF-COMP-1. Concentrations of detected metals were below the respective SLs.

Westport Slough Side Channel. The Westport Slough material is composed of an average of 83.1% sand and 15.2% fines; the TOC content is 0.698%. Antimony, mercury, and silver were not detected in either of the composite samples (092613CRWS-COMP-1, 092613CRWS-COMP-2). Concentrations of detected metals were below the respective SLs in both samples. Pesticides and PCBs were not detected in either sample. Diesel-range organics ranged from 7.8 to 35 mg/kg. Lube oil was only detected in the deep composite sample (092613CRWS-COMP-2; -11 to -22 ft. CRD) at 130 mg/kg; it was not detected in 092613CRWS-COMP-1.

Suitability Determination: The PSET's suitability determination is based on comparison of the District's sediment quality data to the 2006 SEF freshwater SLs.

Wahkiakum Ferry Side Channel. Material in the current and realigned Wahkiakum Ferry side channel configurations is suitable for unconfined, aquatic placement. The PSET assumes that the quality of sediments exposed after dredging will be similar to the dredge prism material.

Westport Slough Side Channel. Material in the Westport Slough side channel project is suitable for unconfined, aquatic placement. Materials from the mudline to -11 ft. CRD and from -11 ft. to -22 ft. CRD may be placed in the Columbia River flow lane. The PSET assumes that the quality of sediments exposed after dredging will be similar to the dredge prism material.

Contact: This memorandum was prepared by James McMillan, and reviewed by the participating PSET agencies, identified above. Questions regarding this memorandum should be directed to James McMillan (Lead—Portland Sediment Evaluation Team) at (503) 808-4376 or e-mail to: james.m.mcmillan@usace.army.mil.

References:

U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, Washington Department of Ecology, Washington Department of Natural Resources, Oregon Department of Environmental Quality, Idaho Department of Environmental Quality, National Marine Fisheries Service, and U.S. Fish and Wildlife Service. 2009. *Sediment Evaluation Framework for the Pacific Northwest.* Published May 2009, by the U.S. Army Corps of Engineers, Northwestern Division, 128 p. plus Appendices.

U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, Washington Department of Ecology, Washington Department of Natural Resources, Oregon Department of Environmental Quality, Idaho Department of Environmental Quality, National Marine Fisheries Service, and U.S. Fish and Wildlife Service. 2006. Interim Final *Sediment Evaluation Framework for the Pacific Northwest.* Published May 2009, by the U.S. Army Corps of Engineers, Northwestern Division, 194 p. plus Appendices.

U. S. Army Corps of Engineers. 2014. Wahkiakum Ferry Channel Realignment—Westport Slough Dredging Project, Sediment Quality Evaluation Report. February 3, 2014; *prepared by* Portland District—Sediment Quality Team; 12 p. plus figures and attachments.

EPA-Region 10 Water Division, Wetlands and Oceans Section 08 September 2021

Memorandum for: U.S. Army Corps of Engineers —Portland District, Operations Division, Channels and Harbors, Waterways Maintenance Section (CENWP-ODN-W, Stokke), Oregon Slough Downstream Shallow Draft Federal Navigation Channel (miles 1.5 to 3.8) in Portland, Multnomah County, Oregon.

Subject: Portland Sediment Evaluation Team (PSET) Level 2A dredged material suitability determination for the U.S. Army Corps of Engineers - Portland District's (USACE) operations and maintenance (O&M) dredging for the Oregon Slough Downstream (OSD) Shallow Draft Federal Navigation Channel (FNC) in the Columbia River at river mile (RM) 101.4 to 104.6 (project mile 1.5 to 3.8).

Introduction: Per the May 2018 *Sediment Evaluation Framework for the Pacific Northwest* (SEF) , this suitability memorandum (SDM) documents the consensus of the PSET agencies regarding the suitability of the OSD shallow draft FNC dredged material for unconfined, aquatic disposal and suitability of the post-dredge surface for unconfined, aquatic exposure. The PSET reviewed the December 2020 *"Sediment Characterization. Oregon Slough Downstream Shallow Draft Channel (Miles 1.5 to 3.8), Multnomah County, Oregon"* (2020 SQER)[2] and the August 2021 *"Supplemental Sediment Characterization. Oregon Slough Downstream Shallow Draft Channel (Miles 1.5 to 3.8), Multnomah County, Oregon"* (2021 SQER)', prepared by ANAMAR for the USACE's Sediment Quality Team (SQT). Sediment chemical testing results are summarized in the SQER; chemical analytical results were compared to the freshwater benthic toxicity screening levels (SEF SLs) published in the 2018 SEF. The PSET also used Oregon DEQ's sediment screening level value (SLV) for freshwater fish to evaluate PCBs and dioxins and furans[4].

Suitability Summary:

Dredge Prism (DP) Sediments:	& Suitable	OUnsuitable
Post-Dredge Surface (PDS):	& Suitable	OUnsuitable

Reviewers: The PSET agencies include the USACE, U.S. Environmental Protection Agency — Region 10 (EPA), National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife (USFWS), Washington Department of Ecology (Ecology), and Oregon Department of Environmental Quality (ODEQ). Table 1 lists the PSET's review timeline for this project. Reviewers included:

' U.s. Army Corps of Engineers, U.s. Environmental Protection Agency, Washington Department of Ecology, Washington Department of Natural Resources, Oregon Department of Environmental Quality, Idaho Department of Environmental Quality, National Marine Fisheries Service, and U.S. Fish and Wildlife Service. 2018. *Sediment Evaluation Framework for the Pacific Northwest.* Published May 2018, by the U.S. Army Corps of Engineers, Northwestern Division, 183 pp with Appendices.

[2] U.S. Army Corps of Engineers (USACE) —Portland District. 2020. *Sediment Characteri--ation Oregon Slough Downstream Shallow Draft Channel (Miles 1.5 to 3.8), Mulmomah County, Oregon.* Prepared by ANAMAR, December 2020. 25 pp with Maps, Tables, and Appendices.

[3] USACE —Portland District. 2021. *Supplemental Sediment Characteri-ation Oregon Slough Downstream Shallow Draft Channel (Miles I.5 to 3.8), Multnomah County, Oregon.* Prepared by ANAMAR, August 2021. 27 pp u'ith Maps, Tables, and Appendices

[4] Oregon Department of Environmental Quality. 2007. *Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment.* Updated April 3, 2007 by ODEQ Environmental Cleanup Program, 18 pp with Appendices.

UJ James Holm (USACE, Lead)
I8i Pete Anderson (ODEQ)
Hi Dominic Yballe (USACE)
I8i Jeremy Buck (USFWS)
S Bridgette Lohrman (EPA, Co-Lead)
X Laura Inouye (Ecology)
S Tom Hausmann (NMFS)

PSET/SEF Conditions:
X Data Recency Expiration — Based on a "Low" rank, the data recency for sediments in the Oregon Slough Downstream Shallow Draft Federal Navigation Channel expires in May 2028.

Table 1. Review Timeline

Draft Sampling and analysis plan (SAP) submitted to PSET	1 September 2020
SAP revisions requested by PSET	4 September 2020
Revised SAP' submitted	5 September 2020
Revised SAP approved by PSET[6]	10 September 2020
Sampling date(s)	11-13 September 2020
Draft SQER submitted to PSET	11 December 2020
Sonic drill sampling concept submitted to PSET	19 January 2021
Supplemental SAP submitted to PSET[7]	29 January 2021
Supplemental SAP approved by PSET'	25 February 2021
Sonic drill sampling date(s)	10-12 May 2021
Supplemental SQER submitted to PSET	24 August 2021
Suitability Determination Memorandum (SDM) issued by PSET	08 September 2021
Management area ranking	Low
Recency of data	May 2028 (7 years)

Federal Regulatory Authorities:
Section 10, Rivers and Harbors Act
X Section 404, Clean Water Act (CWA)
Section 401, CWA
& Section 7, Endangered Species Act
X Section 305 of the Magnuson-Stevens Act
X Fish and Wildlife Coordination Act
__ Section 103, Marine Protection, Research and Sanctuaries Act
__ Comprehensive Environmental Response, Compensation, and Liability Act

Project Description: Table 2 provides a summary of the dredging project details for the OSD shallow draft FNC. Maintenance dredging is needed to provide navigation access.

' UsACE — Portland District. 2020. *Oregon Slough Downstream Shallow Draft Channel (mile 1.5 to 3.8) Mulmomah County, Oregon, Sediment Sampling and Analysis Plan (v2.1).* Prepared by SQT, 5 September 2020. 29 pp with Attachment.

6 Portland Sediment Evaluation Team (PSET). 2020. *Oregon Slough Downstream FNC — SAP Approval.* Email issued by B. Lohrman (EPA) for PSET, 10 September 2020. 3 pp with Attachment.

7 USACE — Portland District. 2021. *Supplemental Sampling and Analysis Plan (SSAP) for Level 2A and contingency sediment characteri--ation and sampling north a sonic drill at the Oregon Slough Do»nstream, Shallow Draft Federal Navigation Channel.* Prepared by SQT, 29 January 2021. 6 pp.

PsET. 2021. *PSET - Oregon Slough Downstream FNC (SSAP Approval).* Email issued by B. Lohrman (EPA) for PSET, 25 February 2021. 2 pp with Attachment.

Table 2. Project Details

Waterbody/river mile (RM)	Columbia River, 101.4 to 104.6
Total proposed dredging volume (cy)	=425,000
Max. proposed dredging depth (includes overdepth allowance)	-22 feet CRD (20+2 ft overdredge)
Dredging area (acres, approx.)	=55
Dredge dimensions	=200 ft. wide for 2.3 miles
Dredging method	Pipeline, clamshell or hopper dredge
Dredged material transport	Barge, hopper
Proposed disposal location(s)	Columbia River flowlane
Proposed dredging date(s)	August 1 through December 15
Dredged material mgmt. units (DMMUs)	11

Sampling and Analysis Description: The USACE sampling and analytical program for the OSD FNC is summarized in Table 3. Actual grab sample station locations are shown in the 2020 SQER Table lA and Map 1 (SDM Figure 1). Based on the inability to collect deeper-dredge prism material, a SSAP was prepared, approved by PSET, and implemented by the USACE. The USACE' significantly modified their sampling approach by using a sonic core sample to penetrate deeper through the dredge prism and into the post-dredge surface. The PSET agreed to the USACE' approach of considering the grab samples to represent the top 4-feet of dredge prism material because of the likelihood of those materials being more recently deposited coarse Columbia River sand. Actual sonic core sample station locations are shown in the 2021 SQER Table IC and Map 1 (SDM Figure 2). The conceptual DMMU layout is shown in Figure 2 of the PSET-approved SSAP (SDM Figure 3).

Deviations from the SAP: Deviations from the PSET-approved SAP are identified in the 2020 SQER sections 2.1.1, 2.2.2, and 2.2.3 and are noted in SQER Tables lA (grab sample summary) and lB (core sample summary).

1. Core sampling with a standard vibracore sample and core catcher was not possible due to the presence of unconsolidated, coarse sand and gravel in the upper 6 to 9 feet of the dredge prism. Coarse sediments resulted in core refusals above project depth (-24 ft CRD) or core recoveries of 0 to 16%. After many coring attempts across the project and coordinating with Ecology staff from the field, the USACE switched to a standard Ponar grab sampler to characterize the surface layer DMMUs (OSD-01, OSD-02, OSD-03, OSD-06, OSD-09 and OSD-11) of the project.
2. Due to the coarse character of the surface sediments, the reference site for the contingency bioassays was relocated from Elk Rock Island in the Willamette River (CRM 16) to sandy sediments along Sauvie Island in the Columbia River (CRM 100).

Deviations from the SSAP: Deviations from the PSET-approved SSAP are listed in the 2021 SQER Table lC for stations OSD-06D, OSD-06E, OSD-09D, and OSD-09E. The deviations included the inability to collect surface material from DMMUs 6 and 9 because the mudline elevation encountered in the field during sampling was deeper than what was encountered in 2020. This deviation did not result in a lack of data collection because the 2020 sampling collected sediment from the shallower depths.

Table 3. Sampling and Analysis Description

Sample collection method	Standard Ponar (}) or Sonic Drill ( )					
DP sample IDs / DMMU IDs (DP interval in ft CRD)	OSD-01 (mudline to -22 ft)	OSD-02 (mudline to -22 ft)	OSD-03J (rnudline to -14 ft); OSD-04r (-14 to -18 ft); OSD-05r (-18 to -22 ft)	OSD-06} (mudline to -14 ft); OSD-07r (-14 to -18 ft); OSD-08r (-18 to -22 ft)	OSD-09{ (mudline to -18 ft); OSD- l0r (-18 to -22 ft)	OSD-11} (mudline to -22 ft)
PDS sample IDs (-22 to -24 ft CRD)	OSD-01Z{	OSD-02Z	OSD-03Z	OSD-06Z	OSD-09Z	OSD-HZ
DMMU volume (CY)	=45,000	=45,000	=35,000 to =40,000	=35,000 to =40,000	=40,000	=25,000
Dredge Prism: Mudline range (ft CRD)	-15.5 to -17.3	-14.5 to -18.3	-11.0 to -12.5}	-7.8 to -9.8	-10.9 to -14.4}	-19.1 to -21.4
Dredge Prism: Composite (Y/N)	Y	Y	Y	Y	Y	Y
Dredge Prism: Subsample /DMMU	3	3	3 / 2r	3 / 2r	3 / 2r	3
Dredge Prism: Subsample Archive (Y/N)	Y	Y	Y	Y	Y	Y
PDS Layer: Depth range (ft CRD)	-22 to -24	-22 to -24	-22 to -24	-22 to -24	-22 to -24	-22 to -24
PDS Layer: Composite (Y/N)	Y	Y	Y	Y	Y	Y
PDS Layer: Subsample /PDS-layer	2r	2r	2r	2r	2r	2r
PDS Layer: Subsample Archive (Y/N)	Y	Y	Y	Y	Y	Y
Sediment Physical and Chemical Analysis (No. DP samples / No. PDS samples analyzed)						
Grain size	1/1	1/1	3/1	3/1	2/1	1/1
Total organic carbon	1/1	1/1	3/1	3/1	2/1	1/1
Total solids	1/1	1/1	3/1	3/1	2/1	1/1
Ammonia	1/1	1/1	3/1	3/1	2/1	1/1
Total sulfides	1/1°	1/1^	3/1°	3/1	2/1°	1/1^
Metals, freshwater	1/1	1/1	3/1	3/1	2/1	1/1
PAHs	1/1	1/1	3/1	3/1	2/1	1/1
SVOCs (phthalates, phenols, misc. extractables)			3/1	3/1	2/1	
Pesticides	1/1	1/1	3/1	3/1	2/1	1/1
PCBs (Total Aroclors)	1/1	1/1	3/1	3/1	2/1	1/1
Butyltins	1/1	1/1	3/1	3/1	2/1	1/1
TPH (diesel [dx] and residual [rx] range)	1/1	1/1	3/1	3/1	2/1	1/1
Dioxin/Furans	1/1	1/1	3/1	3/1	2/1	1/1
Contingency Biological Analysis – dredge prism only, three DMMUs maximum						
Freshwater Bioassays	1*	1*	3*	3*	2*	1*

t = Ponar grab samples; = sonic drill core samples; ° = sulfides analysis removed by USACE since no biological test are needed on the PDS; * = contingency bioassays not required based on sediment chemistry.

Total sulfides were removed from analysis by the USACE on the six Z-layer composite samples because biological tests are not necessary on the post-dredge surface and the overlying DMMUs were analyzed for sulfides. Only one of the 11 overlying DMMUs detected elevated sulfides (39.1 mg/kg, DMMU OSD-5r) above the SEF freshwater SL (39 mg/kg).

Results and Discussion: Analytical results for the USACE sampling event are summarized in Tables 5a (dredge prism) and 5b (post-dredge surface). The chemical analytical results from both SQERs were compared to the 2018 SEF freshwater SLs and to ODEQ's freshwater fish-based SLV (22 ug/kg) to evaluate PCBs (total aroclors) and SLV (5.6 ng/kg) for dioxins and furans.

Total sulfides in DMMU OSD-05r (39.1 mg/kg) was the only DMMU or post-dredge surface sample with an analyte detected above an SEF SL (39 mg/kg). All other analytes were detected below SEF freshwater SLs or were non-detections (U) with method reporting limits (MRLs) below SLs. Sulfides are generally used to inform bioassay testing for potential non-treatment effects. When total sulfides are the sole parameter detected above an SEF SL, the PSET may determine sediments are suitable for unconfined, aquatic disposal and exposure.

Except for DMMU OSD-05r, all dredge prism samples (Table 5a) consisted of at least 91% sand with a total organic carbon (TOC) of 0.1% or less. DMMU OSD-05r was 67% sand, 26% silt, and 6% clay with a TOC of 0.3%.

Except for samples OSD-03Z and OSD-09Z, all post-dredge surface samples (Table 5b) consisted of at least 80% sand with a TOC of less than 0.19%. OSD-03Z consisted of 38% sand, 51% silt, and 11% clay with a TOC of 0.89%. OSD-09Z consisted of 3% gravel, 72% sand, 22% silt, and 3% clay with a TOC of 0.9%. DMMU OSD-05r is directly on top of OSD-3Z layer.

There were no exceedances of ODEQ's bioaccumulative SLV for PCBs because all samples were non-detections (U) with an MRL (4.0 ug/kg) below the SLV (22 ug/kg). There were no exceedances of ODEQ's bioaccumulative SLV for dioxins and furans because all samples had 2,3,7,8 TCDD TEQ results below the SLV (5.6 ng/kg).

No other parameters had detections, estimated concentrations (I) or non-detections (U) with elevated MRLs above an SEF freshwater SLs or an ODEQ SLVs.

Site Ranking: The sampling design was based upon a "moderate" rank due to the lack of dredging and agency concerns about CoCs at depth. Based on the dredge prism and post-dredge surface results and similar physical characteristics to surrounding projects, the PSET has assigned a "low" rank to the OSD shallow-draft sediments.

PSET Suitability Determination:
Dredge Prism — Chemical concentrations in OSD dredge prisms are below the SEF freshwater SLs and ODEQ SLVs as discussed above. As such, the OSD shallow draft FNC dredged prism material is suitable for unconfined, aquatic disposal per the 2018 SEF guidance without additional testing.

Post-Dredge Surface — Chemical concentrations in OSD post-dredge surface samples are below the SEF freshwater SLs and ODEQ SLVs as discussed above. As such, the OSD shallow draft FNC post-dredge surfaces are suitable for unconfined, aquatic exposure per the 2018 SEF guidance without additional testing.

Contact: This memorandum was prepared by Bridgette Lohrman (PSET co-lead) and James Holm (PSET Lead, USACE) and reviewed by the participating PSET agencies, identified above. Questions regarding this memorandum should be directed to Bridgette Lohrman at (503) 326-4006 or e-mail to: lohrman.bridgette@epa.gov.

Table 5a. Project Sediment Analytical Summary – Dredge Prism(sampled September 2020 and May 2021)

Sediment Physical and Chemical Results							
Sample Location (sample year)	Surface (2020)	Subsurface (2021)					SEF SL1, freshwater
DMMU ID / Sample ID: Parameter	OSD-01, OSD-02, OSD-03, OSD-06, OSD-09, OSD-11	OSD-04r	OSD-05r	OSD-07r	OSD-08r	OSD-10r	(SLV†)
Grain size: gravel, sand, silt, clay (%)	Range: 2.8 to 8.2, 91.4 to 94.2, 0.6 to 4.3, 0.3 to 0.4	1.0, 95.7, 3.5, 0.3	0.5, 67.0, 26.3, 6.2	3.1, 95.1, 1.7, 0.1	1.5, 95.3, 3.0, 0.2	6.6, 92.7, 0.8, 0.1	
Total Solids (%)	Range: 76.1 to 88.2	79.0	74.55	80.62	84.30	79.78	
Total Organic Carbon (%)	Range: 0.04 to 0.1	0.05	0.30	0.06	0.05	0.05	
.-Ammonia (nig/kg)	Range: 0.45 U to 0.52 U	22.0	52.5	8.58	7.01	3.19	230
Total Sulfides (mg/kg)	Range: 1.15 U to 1.26 U	Range: 1.16 U to 1.26 U	Range: 1.21 U to 39.1	Range: 1.21 U to 1.24 U	Range: 1.23 U to 1.25 U	Range: 1. 17 U to 1.20 U	39
Metals (mg/kg)	Non-detect, Detect LSLs U, J	Non-detect, Detect <SLs TJ, J	Detect LSLs J	Non-detect, Detect <SLs TJ, J	Detect ?SLs J	Non-detect, Detect <SLs U, I	Varies
Total PAHs (uglg)	Range: 4.8 I to 39.8 U Non-detect, Detect SSL	39.9 U	62.7	39.9 TJ	40.0 U	40.0 U	17,000
SVOCs (ug/kg) (phenols, phthalates, iiiisc. extractables)	Non-detect, Detect CSLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Varies
Pesticides (ng/kg)	Non-detect ?SLs U	) Non-detect ?SLs U	) Non-detect *SLs U	Non-detect *SLs U	) Non-detect *SLs U	Non-detect *SLs U)	Varies
4,4"-DDD							310
4,4"-DDE	1.0 U	1.0 U	1.0 U	1.0 U	1.0U	1.0 U	21
4,4'-DDT							100
PCBs, Total Aroclors (ug/kg)	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	
Butyltins (ug/kg)	3.69 U to 5.73 U Non-detect <SLs U	3.84 U to 5.74 U Non-detect <SLs U	3.83 U to 5.74 U Non-detect *-SLs U	3.83 U to 5.73 U Non-detect *-SLs U	3.86 U to 5.78 U Non-detect <SLs U	3.86 U to 5.78 U Non-detect *-SLs U	Varies
TPH (dx/rx) (ug/kg)	Range: 5.55 U to 6.9/ 11.1 U to 37.8	6.05 U / 12.1 U	6.47 U / 17.3	6.10 U / 12.2 U	5.94 U / 11.9 U	6.08 U / 12.2 U	340 / 3,600
Dioxins/Furans, 2,3,7,8 TCDD TEQ (ng/kg) ND=0 / ND = ½ EDL	Range: 0.0056 to 0.0268 / 0.0666 to 0.1030	0.0183 / 0.1620	0.0118 / 0.1470	0.0593 / 0.1840	0.0240 / 0.1920	0.0154 / 0.1620	(5.6J)

BOLD= Detection exceeds SEF freshwater screening level; U = Non-detection (ND) at the method reporting limit (MRL) or method detection limit (MDL), MRL reported (if DL in parenthesis); I = Estimated value between MDL and MRL ; = ODEQ (2007) freshwater fish-based bioaccumi3lation screening level value.

Table 5b. Project Sediment Analytical Summary – Post-Dredge Surface(sampled May 2021)

Sediment Physical and Chemical Results							
PDS Sample ID: Parameter	**OSD-01Z**	OSD-02Z	OSD-03Z	**OSD-06Z**	**OSD-09Z**	OSD-11Z	SEF SL1, freshwater (SLV†)
Grain size: gravel, sand, silt, clay (%)	0.4, 95.6, 4.0, 0.1	0.5, 92.5, 7.0, 0.1	0.3, 38.1, 50.8, 10.6	1.0, 86.6, 11.0, 1.5	3.2, 71.9, 21.8, 3.1	2.4, 80.0, 16.1, 1.5	
Total Solids (%)	76.1	75.4	68.7	82.0	74.5	74.7	
Total Organic Carbon (%)	0.06	0.06	0.89	0.08	0.90	0.19	
Ammonia (mg/kg)	28.4	20.6	169	51.5	29.5	18.6	230
Total Sulfides (ing/kg)							39
Metals (mg/kg)	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, I	Detect <SLs I	Detect <SLs I	Detect <SLs I	Detect <SLs I	Varies
Total PAHs (ug/kg)	40.0 U	39.9 U	39.9 U	20.4	66.6 I	39.8 U	17,000
SVOCs (ug/kg) (phenols, phthalates, misc. extractables)	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, I	Non-detect, Detect <SLs U, I	Varies
Pesticides (ug/kg)	Non-detect <SLs U	Non-detect *-SLs U	Non-detect *-SLs U	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	Varies
4,4'-DDD					1.15 J		3 10
4,4'-DDE	1.0 U	1.0 U	1.0 U	1.0 U	**0.36]**	1.0 U	21
4,4'-DDT					1.0 U		**100**
PCBs, Total Aroclors	4.0 LI	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	110(22$)
Butyltins (•g/*g)	Non-detect <SLs U	Non-detect *-SLs U	Non-detect *-SLs U	Non-detect, Detect <SLs LI	Non-detect, Detect <SLs TJ	Non-detect *SLs U	Varies
TPH (dx/rx) (ug/kg)	6.71 U / 13.4 U	6.68 U / 13.4 U	11.9 / 40.5	6.09 U / 12.2 U	6.92 U / 20.8	6.82 U / 13.6 U	340 / 3,600
Dioxins/Furans, 2,3,7,8 TCDD TEQ (rig/kg) ND=0 / ND = /: EDL	0.0304 / 0. 1790	0.0124 / 0. 1240	0.0289 / 0. 1510	0.0304 / 0. 1980	2.68 / 2.78	0.0216 / 0. 1850	(5.6J)

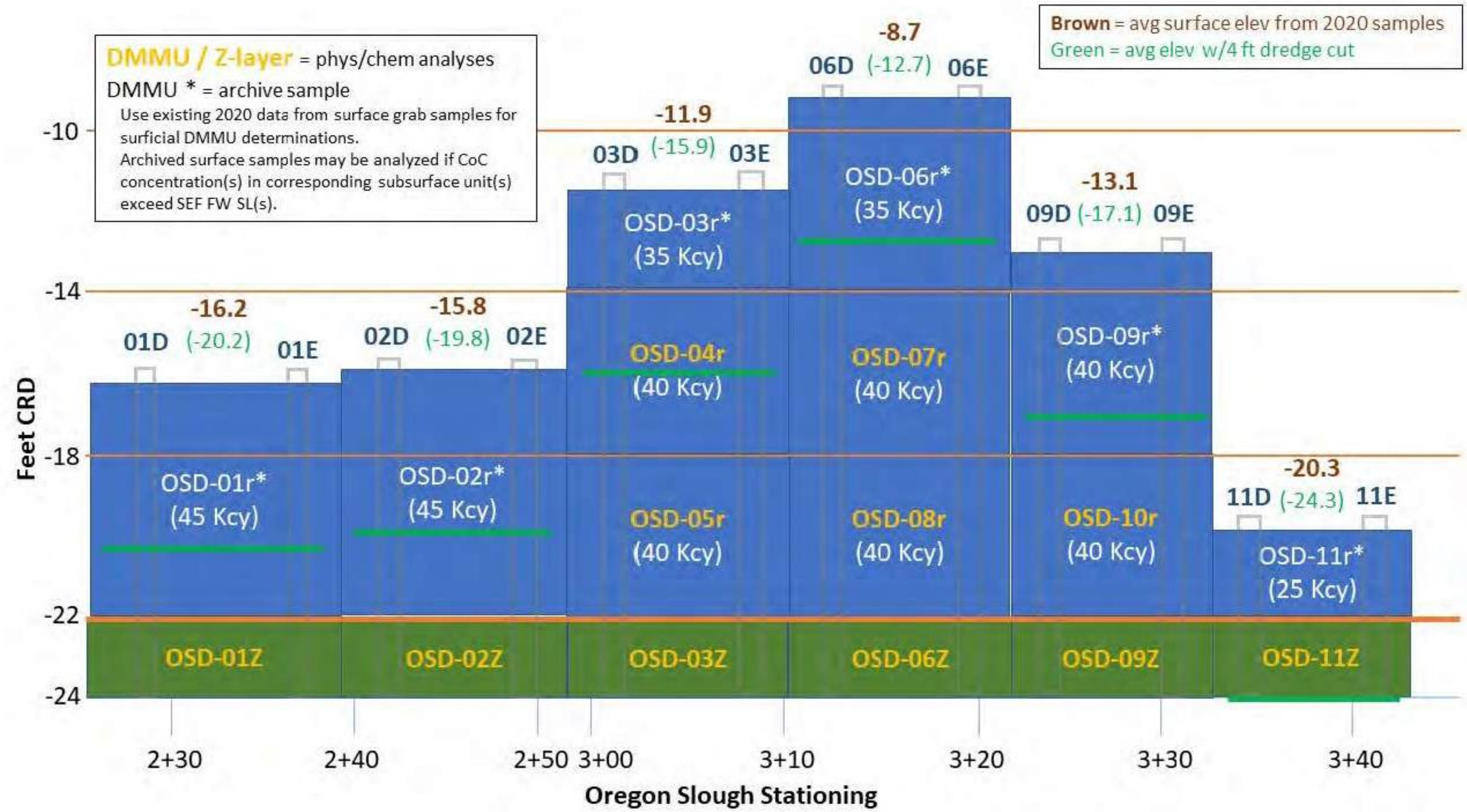
BOLD= Detection exceeds SEF freshwater screening level; U = Non-detection (ND) at the method reporting limit (MRL) or method detection limit (MDL), MRL reported (hiDL in parenthesis); I = Estimated value between MDL and MRL; = ODEQ (2007) freshwater fish-based bioaccumulation screening level value.

Figure 1.Oregon Slough Downstream shallow draft Federal Navigation Channel, actual grab sample locations (sampled 11-13 September 2020).

Name	Latitude	Longitude
CR-REF-COMP	45.674389	-122.775161
OSD-01A	45.617666	-122.709782
OSD-01B	45.617185	-122.708884
OSD-01C	45.616704	-122.707848
OSD-02A	45.616208	-122.706895
OSD-02B	45.615660	-122.705833
OSD-02C	45.615191	-122.704927
OSD-03A	45.613777	-122.702033
OSD-03B	45.613298	-122.701086
OSD-03C	45.612890	-122.700105
OSD-06A	45.612444	-122.698321
OSD-06B	45.612198	-122.696932
OSD-06C	45.611830	-122.695645
OSD-09A	45.611440	-122.694373
OSD-09B	45.611037	-122.693297
OSD-09C	45.610613	-122.692029
OSD-11A	45.610181	-122.690562
OSD-11B	45.609738	-122.689157
OSD-11C	45.609159	-122.688125

Figure 2. Oregon Slough Downstream shallow draft Federal Navigation Channel, actual sonic drill sample locations (sampled 10-12 May 2021).

Figure 3.Oregon Slough Downstream shallow draft conceptual DMMU and Z-layer diagram (USACE SSAP, 2021).



EPA-Region 10 Water Division, Wetlands and Oceans Section 1 August 2019

Memorandum for: U.S. Army Corps of Engineers —Portland District, Operations Division, Channels and Harbors, Waterways Maintenance Section (CENWP-ODN-W, Stokke), Oregon Slough Federal Navigation Side Channel, Upstream Entrance.

Subject: Portland Sediment Evaluation Team (PSET) Level 2A dredged material suitability determination for the U.S. Army Corps of Engineers - Portland District's (Corps) operations and maintenance (O&M) dredging for the Oregon Slough Federal Navigation Side Channel, Upstream Entrance (OSU FNC) in the Columbia River at river mile (RM) 108.

Introduction: Per the May 2018 *Sediment Evaluation Framework for the Pacific Northwest* (SEF) , this suitability memorandum (SDM) documents the consensus of the PSET agencies regarding the suitability of the dredged material for unconfined, aquatic disposal. The PSET reviewed the Corps' 18 July 2019 *"Oregon Slough Upstream Federal Navigation Side Channel, Sediment Quality Evaluation Report"* (SQER)[2], prepared by Corps' Sediment Quality Team (SQT). Sediment chemical testing results are summarized in the SQER; chemical analytical results were compared to the freshwater benthic toxicity screening levels (SEF SLs) published in the 2018 SEF. The PSET also used Oregon DEQ's sediment screening level value (SLV) for freshwater fish to evaluate PCBs'.

Suitability Summary:

Surface Sediments:	& Suitable	O Unsuitable
Post-Dredge Surface (PDS):	& Suitable	O Unsuitable

Reviewers: The PSET agencies include the Corps, U.S. Environmental Protection Agency — Region 10 (EPA), National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife (USFWS), Washington Department of Ecology (Ecology), and Oregon Department of Environmental Quality (ODEQ). Table 1 lists the PSET's review timeline for this project. Reviewers included:

X James Holm (Corps, Lead)
X Bridgette Lohrman (EPA, Co-Lead)
Pete Anderson (ODEQ)
X Laura Inouye (Ecology)
Dominic Yballe (Corps)
X Tom Hausmann (NMFS)
_ Jeremy Buck (USFWS)

PSET/SEF Conditions:

X Data Recency Expiration —The data recency of this SDM for the OSU FNC expires in April 2026.

' U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, Washington Department of Ecology, Washington Department of Natural Resources, Oregon Department of Environmental Quality, Idaho Department of Environmental Quality, National Marine Fisheries Service, and U.S. Fish and Wildlife Service. 2018. *Sediment Evaluation Framework for the Pacific Northwest.* Published May 2018, by the U.S. Army Corps of Engineers, Northwestern Division, 183 pp with Appendices.

2 U.S. Army Corps of Engineers —Portland District. 2019. *Oregon Slough Upstream Federal Navigation Side Channel, ' Multnomah County, Oregon, Columbia River (River Mile 108),' Sediment Quality Evaluation Report.* Prepared by the Corps SQT, 18 July 2019. 14 pp plus Attachments.

3 Oregon Department of Environmental Quality. 2007. *Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment.* Updated April 3, 2007 by ODEQ Environmental Cleanup Program, 18 pp with Appendices.

Table 1. Review Timeline

Sampling and analysis plan (SAP) submitted to PSET	12 February 2019
SAP revisions requested by PSET (verbal)	13 February 2019
Revised SAP submitted	22 February 2019
Final SAP[4] submitted	11 March 2019
Final SAP approved by PSET	26 March 2019 [5]
Sampling date(s)	5 April 2019
Draft SQER submitted to PSET	18 July 2019
Final SQER	18 July 2019
Suitability Determination Memorandum (SDM) issued by PSET	01 August 2019
Management area ranking	Low
Recency of data*	April 2026 (7 years)

Federal Regulatory Authorities:

Section 10, Rivers and Harbors Act
& Section 404, Clean Water Act (CWA)
& Section 401, CWA
& Section 7, Endangered Species Act
Section 305 of the Magnuson-Stevens Act
Fish and Wildlife Coordination Act
O Section 103, Marine Protection, Research and Sanctuaries Act
O Comprehensive Environmental Response, Compensation, and Liability Act

Project Description: Table 2 provides a summary of the dredging project details for the OSU FNC. Maintenance dredging is needed to provide navigation access.

Table 2. Project Details

Waterbody/river mile (RM)	Columbia River, 108
Total proposed dredging volume (cy)	=l33,000
Max. proposed dredging depth (includes overdepth allowance)	-12 ft. CRD
Dredging area (acres, approx.)	=40
Dredge dimensions	300 ft. wide by 5,800 ft. long
Dredging method	Pipeline, clamshell or hopper dredge
Dredged material transport	Barge, hopper, or pipeline
Proposed disposal location(s)	Columbia River flowlane
Proposed dredging date(s)	Typically August through December
Dredged material mgmt. units (DMMU)	2 (3-station composite samples)

[4] US Army Corps of Engineers. 2019. *Oregon Slough Federal Navigation Channel — Upstream Entrance (Columbia River, River Miles 108-109), Mulmomah County, Oregon,' Sediment Sampling and Analysis Plan*. Prepared by Corps SQT 11 March 2019. 14 pp with Attachments.

Portland Sediment Evaluation Team (PsET). 2019. [E-mail correspondence] *PSET — Oregon Slough Federal Project (SAP Approval).* Bridgette Lohrman, EPA, sent 26 March 2019. 2 pp.

Sampling and Analysis Description: The Corps' sampling and analytical program for the OSU FNC is summarized in Table 3. Actual sample station locations are shown in the SQER Table 3 and Figure 1, and SDM Figure 1.

Table 3. Sampling and Analysis Description

Sample collection method		Standard PONAR Grab		
DMMU ID		OSU-01	OSU-02	BOTH
DMMU Rank		Low	Low	Low
DP sample ID		040519-OSU-01-COMP	040519-OSU-02-COMP	040519-OSU-COMP-TIN
PDS sample ID		NA	NA	NA
Proposed DMMU volume (cy)		70,000	63,000	133,000
Dredge Prism	Depth range (ft CRD)	-6.42 to -6.81	-4.75 to -8.23	-4.75 to -8.23
	Composite (Y/N)	Y	Y	Y
	Subsamples (SS)/DMMU	3	3	6
	SS Archive (Y/N)	Y	Y	Y
PDS Layer	Depth range (ft CRD)	N/A		
	Composite (Y/N)			
	SS/PDS-layer			
	SS Archive (Y/N)			

Sediment Physical and Chemical Analysis (No. DP/ No. PDS)

Grainsize	1/-	1/-	-/-
Total organic carbon	1/-	1/-	-/-
Total solids	1/-	1/-	-/-
Total volatile solids	1/-	1/-	-/-
Metals, freshwater	1/-	1/-	-/-
TotalPAHs	1/-	1/-	-/-
SVOCs (phthalates, phenols, misc. extractables)	1/-	1/-	-/-
Pesticides	1/-	1/-	-/-
PCBs (Total Aroclors)	1/-	1/-	-/-
Butyltins	-/-	-/-	1/-
Total petroleum hydrocarbons (dx, rx)	1/-	1/-	-/-

Deviations from the SAP: There were no deviations from the PSET-approved SAP.

Results and Discussion: Analytical results for the Corps' sampling event are summarized in Table 4. The chemical analytical results from the SQER were compared to the 2018 SEF freshwater SLs and ODEQ's SLV for freshwater fish to evaluate PCBs. There were no detections or non-detection exceedances (U) of freshwater SEF SLs or applicable ODEQ SLV.

Table 4. Project Sediment Analytical summary

Parameters / Decision unit (Sample ID):	040519-OSU-01-COMP	040519-OSU-02-COMP	040519-OSU-COMP-TIN	SEF freshwater SL1
Grain size (%)				
Gravel	1.0	0.0		
Sand	96.8	78.6		
Silt and clay	2.0	21.3		
Total organic carbon (%)	0.03	0.47		
Total solids (%)	99.97	71.8		
Metals (mg/kg)	<SLsJ,U	<SLsJ,U		Varies
Total PAHs (ug/kg)	93.9J	39.7U		17,000
SVOCs (ug/kg) (phthalates, phenols, misc. extractables)	<SLs J, U	+SLs U		Varies
Pesticides (ug/kg)				
DDDs	0.99U	0.98U		310
DDEs	0.99U	0.98U		21
DDTs	0.99U	0.98U		100
Other pesticides	+SLsU	+SLsU		Varies
Total Aroclors — PCBs (ug/kg)	4.0U	3.9U		110 (22)
Butyltins (ug/kg)				
Monobutyltin			3.85U	540
Dibutyltin			5.45U	910
Tributyltin			3.64U	47
Tetrabutyltin			4.71U	97
Total Petroleum Hydrocarbons (mg/kg)				
Diesel range	6.1 U	27.7		340
Residual range	12.2 U	55.7		3,600

U = Non-detection at the method reporting limit (MRL) or method detection limit (MDL), MRL reported;
J = Estimated value between MDL and MRL; = ODEQ (2007) freshwater fish-based SLV

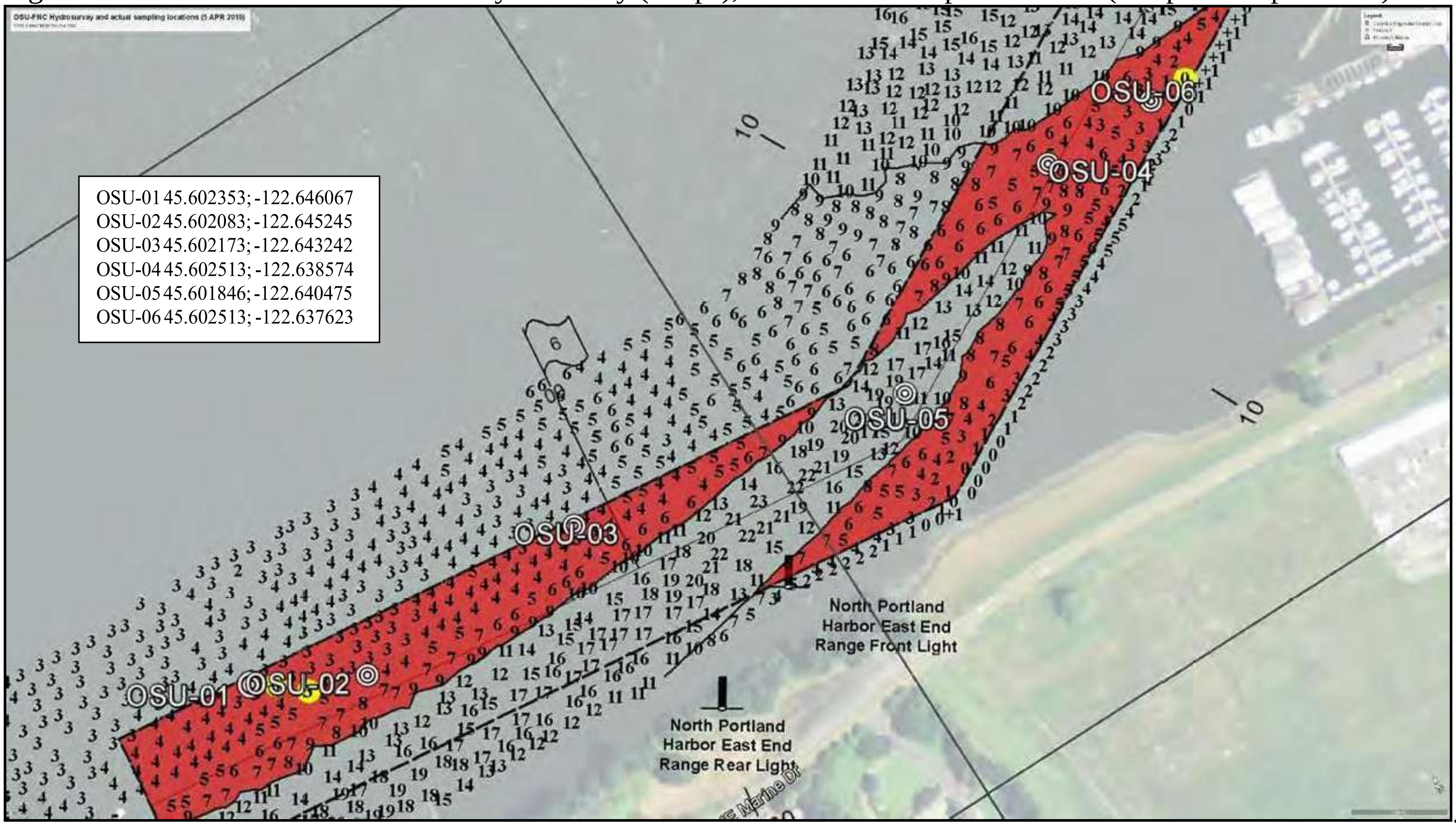
PSET Suitability Determination:

Dredge Prism—Chemical concentrations in both dredge prism composite samples were below the SEF freshwater SLs as discussed above. As such, the OSU FNC dredged prism material is suitable for unconfined, aquatic disposal per the 2018 SEF guidance.

Post-Dredge Surface — The dredge prism materials were determined to be suitable and the Oregon Slough Upstream Entrance has a “low” management area rank. As such, the PSET assumes that the OSU FNC post-dredge surface is suitable for unconfined, aquatic exposure per the 2018 SEF guidance.

Contact: This memorandum was prepared by Bridgette Lohrman (PSET co-lead) and James Holm (PSET Lead, Corps) and reviewed by the participating PSET agencies, identified above. Questions regarding this memorandum should be directed to Bridgette Lohrman at (503) 326-4006 or e-mail to: lohrman.bridgette@epa.gov.

Figure 1. OSU FNC – December 2018 hydrosurvey (Corps), 2019 actual sample locations (sampled 5 April 2019)



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
1201 NE Lloyd Boulevard, Suite 1100
PORTLAND, OR 97232-1274

Refer to NMFS No:
WCRO-2020-02918

June 16, 2021

Christopher Page
Chief, Environmental Resources Branch
United States Army Corps of Engineers
Portland District
333 SW 1st Ave.
Portland, Oregon 97204

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Operations and Maintenance Dredging of the Federal Navigation Channel at Tongue Point, Clatsop County, Oregon; Elochoman Slough, Wahkiakum County, Washington; Lake River, Clark County, Washington; and Oregon Slough, Multnomah County, Oregon.

Dear Mr. Page:

Thank you for your letter of October 16, 2020, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for the operations and maintenance dredging of the four Federal navigation channels referenced above. This consultation was conducted in accordance with the 2019 revised regulations that implement section 7 of the ESA (50 CFR 402, 84 FR 45016).

Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1855(b)) for this action.

In the attached biological opinion, NMFS concludes that the proposed action is not likely to jeopardize the continued existence of:

- *Oncorhynchus tshawytscha:* Lower Columbia River (LCR) Chinook salmon, Upper Columbia River (UCR) spring-run Chinook salmon, SR (SR) spring/summer Chinook salmon, Upper Willamette River (UWR) Chinook salmon, Snake River fall Chinook salmon;
- *O. keta:* Columbia River (CR) chum salmon;
- *O. kisutch:* LCR coho salmon;
- *O. nerka:* SR sockeye salmon;
- *O. mykiss:* UCR steelhead (*O. mykiss*), LCR steelhead, UWR steelhead, Middle Columbia River (MCR) steelhead, Snake River Basin (SRB) steelhead;

- *Acipenser medirostris:* Southern DPS green sturgeon; or
- *Thaleichthys pacificus:* Southern DPS Pacific eulachon;

or result in the destruction or adverse modification of their critical habitats.

As required by section 7 of the ESA, NMFS is providing an incidental take statement with the biological opinion. The incidental take statement describes reasonable and prudent measures NMFS considers necessary or appropriate to minimize the impact of incidental take associated with this action. The take statement sets forth nondiscretionary terms and conditions, including reporting requirements, that the U.S. Army Corps of Engineers or any applicant must comply with to carry out the reasonable and prudent measures. Incidental take from actions that meet these terms and conditions will be exempt from the ESA's prohibition against the take of listed species.

This document also includes the results of our analysis of the action's likely effects on essential fish habitat (EFH) pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and includes six conservation recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH. Section 305(b) (4) (B) of the MSA requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving these recommendations.

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we request that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

If the response is inconsistent with the EFH conservation recommendations, the Corps must explain why the recommendations will not be followed, including the scientific justification for any disagreements over the effects of the action and the recommendations.

Please contact Scott Hecht, Branch Chief, Oregon Washington Coastal Area Office in Lacey, Washington, 360-545-7490, Scott.Hecht@noaa.gov, if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Kim W. Kratz, Ph.D
Assistant Regional Administrator
Oregon Washington Coastal Office

cc: Elizabeth Santana
David Griffith

WCRO-2020-02918

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the

Federal Navigation Channel Operations and Maintenance Dredging
Tongue Point, Clatsop County, Oregon
Elochoman Slough, Wahkiakum County, Washington
Lake River, Clark County, Washington
and
Oregon Slough, Multnomah County, Oregon

NMFS Consultation Number: WCRO-2020-02918

Action Agency: U.S. Army Corps of Engineers – Portland District

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely To Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Chinook salmon *(Oncorhynchus tshawytscha)*					
Lower Columbia River Chinook salmon	Threatened	Yes	No	Yes	No
Upper Columbia River spring-run Chinook salmon	Endangered	Yes	No	Yes	No
Snake River spring/summer Chinook salmon	Threatened	Yes	No	Yes	No
Upper Willamette River Chinook salmon	Threatened	Yes	No	Yes	No
Snake River fall Chinook salmon	Threatened	Yes	No	Yes	No
Columbia River chum salmon (*O. keta*)	Threatened	Yes	No	Yes	No
Lower Columbia River coho salmon (*O. kisutch*)	Threatened	Yes	No	Yes	No
Snake River sockeye salmon (*O. nerka*)	Endangered	Yes	No	Yes	No

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely To Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Upper Columbia River steelhead *(Oncorhynchus mykiss)*	Threatened	Yes	No	Yes	No
Lower Columbia River steelhead	Threatened	Yes	No	Yes	No
Upper Willamette River steelhead	Threatened	Yes	No	Yes	No
Middle Columbia River steelhead	Threatened	Yes	No	Yes	No
Snake River Basin steelhead	Threatened	Yes	No	Yes	No
Southern DPS of green sturgeon (*Acipenser medirostris*)	Threatened	Yes	No	Yes	No
Southern DPS of Pacific eulachon (*Thaleichthys pacificus*)	Threatened	Yes	No	Yes	No

Fishery Management Plan That Identifies EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	Yes
Pacific Coast Groundfish	Yes	Yes

Consultation Conducted By: National Marine Fisheries Service, West Coast Region

Issued By:

Kim W. Kratz, Ph.D
Assistant Regional Administrator
Oregon Washington Coastal Office

Date: June 16, 2021

TABLE OF CONTENTS

1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3, below.

1.1. Background

The National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.), and implementing regulations at 50 CFR 402, as amended.

We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR 600 .

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available within two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. A complete record of this consultation is on file at the Oregon Washington Coastal Office in Lacey, Washington.

1.2. Consultation History

This biological opinion is in response to the U.S. Army Corps of Engineers – Portland District (USACE) request for formal consultation on ESA listed species detailed in Table 1 for maintenance dredging of four navigation side channels.[1] The USACE also requested consultation on Essential Fish Habitat (EFH) for Pacific salmon. Although the USACE did not request consultation on EFH for West Coast groundfish, we know that some of these are present in a portion of the action area and provide an effects analysis in Section 3. The USACE's proposed maintenance dredging and in-water placement of the dredged sediments will be conducted under Sections 102 and 103 of the Marine Protection Reserve and Sanctuaries Act (MPRSA) of 1972, Sections 401 and 404 of the Clean Water Act (CWA) of 1977, and in accordance with Regulations 33 CFR Parts 335 through 338 ("Operation and Maintenance of Army Corps of Engineers Civil Works Projects Involving Discharge of Dredged or Fill Material into Waters of the U.S. or Ocean Waters" and affiliated procedures, etc.).

[1] The USACE's original request for formal consultation did not include SDPS green sturgeon or SDPS eulachon, or their designated critical habitat, which the USACE considered not likely to be adversely affected (NLAA). NMFS considers these resources likely to be adversely affected, and includes them in the table and in the formal consultation.

On October 16, 2020, NMFS received the USACE's request for consultation and the Biological Assessment (BA) (USACE 2021):

- On November 17, 2020, NMFS sent an insufficiency letter to the USACE. NMFS' project biologist worked with the USACE's project lead to identify the missing information over the next few weeks.
- On December 17, 2020, NMFS received the revised BA and notified USACE that it was initiating consultation.
- On February 24, 2021, NMFS sent letters to the Columbia River Inter-Tribal Fish Commission, the Confederated Tribes of the Umatilla Reservation, Confederated Tribes of the Warms Springs Reservation of Oregon, Cowlitz Indian Tribe, Confederated Tribes and Bands of the Yakama Indian Reservation, the Nez Perce Indian Tribe, and the Confederated Tribes of the Siletz Indians of Oregon to gauge their interest in this project on.
- On March 11, 2021, NMFS received a letter from the Nez Perce Tribe asking for more information about the project. The Tribe was interested in NOAA's analytical method for assessing effects of the proposed action on listed fish, and the likelihood that toxic materials would be mobilized during flow lane disposal of excavated sediments. They also expressed concern about juvenile lamprey, stating that the Tribe has requested, for other dredging activity, that monitoring take place to identify the presence of lamprey in the dredging areas, along with monitoring of the dredge spoils as it is loaded on the barge. Should lamprey be present, a work-around plan should be implemented to avoid harm to the species. NMFS, USACE, and USFWS (for lamprey concerns), met with the Tribe on April 19, 2021, to discuss these concerns.
- On March 12, 2021, NMFS received an email from Amy Boyd, a Policy Analyst with the Cowlitz Indian Tribe, stating that the Tribe would like to provide feedback regarding natural and cultural resources. NMFS offered the Tribe an opportunity to provide this feedback during a web-based meeting on March 29, 2021.
- On May 17, 2021, NMFS and the USACE discussed concerns about the potential frequency of dredging in the Elochoman Slough and Lake River channels and the need to better understand effects on benthic prey organisms for salmonids. As a result, the USACE revised its proposed action to reduce the frequency of dredging in these two project areas to no more than once every three years.
- During consultation, the USACE amended its BA in response to our questions about the maximum volume of sediment to be dredged from each side channel and their turbidity monitoring and management actions. We received draft amendments on April 14, 15, 16; May 25, 2021, and the final amended BA (USACE 2021) on June 7, 2021.

Table 1. List of species included in the consultation for the maintenance dredging of four side channels that are part of the Federal Navigation Channel.

ESU or DPS Species	Listing Notice	Listing Status	Critical Habitat Listing
LCR[a] Chinook salmon	6/28/2005; 70 FR 37160	Threatened	9/2/2005; 70 FR 52630
UCR[a] Chinook salmon	6/28/2005; 70 FR 37160	Endangered	9/2/2005; 70 FR 52630
SR[a] spring/summer Chinook salmon	6/28/2005; 70 FR 37160	Threatened	10/25/1999; 64 FR 57399
UWR[a] Chinook salmon	6/28/2005; 70 FR 37160	Threatened	9/2/2005; 70 FR 52630
SR fall Chinook salmon	6/28/2005; 70 FR 37160	Threatened	10/25/1999; 64 FR 57399
CR[a] chum salmon	6/28/2005; 70 FR 37160	Threatened	9/2/2005; 70 FR 52630
LCR coho salmon	6/28/2005; 70 FR 37160	Threatened	2/24/2016; 81 FR 9252
SR sockeye salmon	4/14/2014; 79 FR 20802	Endangered	12/28/1993; 58 FR 68543
UCR steelhead	1/5/2006; 71 FR 834	Threatened	9/2/2005; 70 FR 52630
LCR steelhead	1/5/2006; 71 FR 834	Threatened	9/2/2005; 70 FR 52630
UWR steelhead	1/5/2006; 71 FR 834	Threatened	9/2/2005; 70 FR 52630
MCR[a] steelhead	1/5/2006; 71 FR 834	Threatened	9/2/2005; 70 FR 52630
SRB[a] steelhead	1/5/2006; 71 FR 834	Threatened	9/2/2005; 70 FR 52630
Southern DPS of green sturgeon	4/7/2006; 71 FR 17757	Threatened	10/9/2009; 74 FR 52300
Southern DPS of eulachon	3/18/2010; 75 FR 13012	Threatened	10/20/2011; 76FR 65324

[a] LCR: Lower Columbia River; UCR: Upper Columbia River; SR: Snake River; UWR: Upper Willamette River; CR: Columbia River; MCR: Middle Columbia River; SRB: Snake River Basin.

1.3. Proposed Federal Action

Under the ESA, “action” means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02). Under MSA, Federal action means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal Agency (50 CFR 600.910).

The USACE proposes maintenance dredging in four side channels of the lower Columbia River Federal navigation channel (FNC) over a period of 25 years (USACE 2021). The USACE proposes to dredge the Tongue Point, Oregon, channel annually, but expects to dredge the other three sites (Elochoman Slough and Lake River, Washington, and Oregon Slough, Oregon) an average once every 5 years. For example, the USACE could dredge at any of the three sites 2 years in a row depending on changes in shoaling over time, dredging priorities, and available funding, but will not dredge any of them more than five times over the term of the proposed action (USACE 2021).

The dimensions of each dredging prism are shown in Table 2 and the dredging prisms themselves are shown in Figures 1 through 4. The USACE expects to dredge areas only that have become too shallow within each prism during any dredging event, but cannot predict where this will happen over the 25-year term of the proposed action. NMFS therefore considers the entire area and depth of each dredging prism to be within the action area for this consultation. The USACE proposes to conduct dredging using either mechanical dredges (clamshell or backhoe) or hydraulic dredges (hopper or pipeline), depending on equipment availability and cost. The equipment used at each site will therefore vary from year to year. Locations for in-water disposal also will vary, depending on the depth of the river bottom each year (i.e., disposal sites will be at least 20-feet deep). The in-water work window (IWWW) at each site is 1 August to 15 December. The estimated number of days the USACE will dredge at each site is also shown in Table 2.

The USACE conducts maintenance dredging and in-water placement of dredged sediments to maintain these authorized navigation channels under Sections 102 and 103 of the Marine Protection Reserve and Sanctuaries Act (MPRSA) of 1972, Sections 401 and 404 of the Clean Water Act (CWA) of 1977, and in accordance with Regulations 33 CFR Parts 335 through 338 ("Operation and Maintenance of Army Corps of Engineers Civil Works Projects Involving Discharge of Dredged or Fill Material into Waters of the U.S. or Ocean Waters" and affiliated procedures, etc.). In the BA, the USACE describes the authorizing legislation and history of each project site as:

- Channelization to create the Tongue Point Channel was approved by the Chief of Engineers on June 14, 1989, under the authority of Section 107 of the River and Harbor Act of 1960, as amended. The most recent dredging at Tongue Point Channel was for initial construction in 1989.
- Channelization to create the Elochoman Slough was authorized by the River and Harbor Act of 26 August 26, 1937. The Elochoman Slough FNC was initially constructed in 1939 and was maintained by the Corps in 1964 and 1989. The channel was most recently dredged by Wahkiakum Port District No. 1 in 2019.
- Channelization to create the Lake River FNC was authorized by the Rivers and Harbors Act of July 3, 1930. Lake River FNC was initially constructed in 1932 and most recently maintained by the Corps in 1980.
- Channelization to create the Oregon Slough (20-foot deep channel) was authorized by the Rivers and Harbors Act of 25 July 1912. This FNC was most recently maintained by the Corps in 1963.[2]

[2] There are multiple authorized Federal Navigation Channel segments within Oregon Slough. The proposed dredge prism in the BA for this project is the 20-foot deep channel from Oregon Slough RM 1.5 to RM 3.8 (USACE 2021).

Table 2. Proposed dredging activities, frequency, and duration at each of the four side channels (USACE 2021).

Project	River Mile	Authorized Dimensions[a]	Amount of Material to be Dredged[b]	Dredge Frequency	Duration[c]
Tongue Point	18.5	34 feet deep 350 feet wide 1.6 miles long Approx. 60 acres	Initial deferred maint. max of 800,000 CY, then future annual maint. need decreasing to 119,000 CY if maintained regularly[d] Up to 75 acres per dredging event	Annually, as needed	Estimated 105 to 137 days
Elochoman Slough	38	10 feet deep 100 feet wide ~2,200 feet long Approx. 5 acres	7,000 to max of 25,000 CY each event Up to 5 acres per dredging event	Average of 1 year out of each 5, but no more than once every 3 years and not to exceed 5 times.	Estimated 3 to 14 days
Lake River	87.5	6 feet deep 100 feet wide 3 miles long Approx. 5 acres	5,000 to max of 34,000 CY each event Up to 5 acres per dredging event	Average of 1 year out of each 5, but no more than once every 3 years and not to exceed 5 times.	Estimated 4 to 15 days
Oregon Slough	104 (south side of Hayden Island)	20 feet deep 200 feet wide 2.3 miles long Approx. 35 acres	Initial deferred maint. max of 600,000 CY, then maintain as needed Up to 50 acres per dredging event	Average of 1 year out of each 5, but not to exceed 5 times.	Estimated 80 to 137 days

[a] All channels may have an additional 2 feet deep and 100 feet outside of the authorized dimensions of advanced maintenance.

[b] Amounts shown include the volumes needed for advanced maintenance and account for dredging inaccuracies. These are the USACE's best estimates based on existing conditions. Higher end of range represents initial dredging of a larger volume, resulting from deferred maintenance; lower end of range for subsequent dredging activities over the 25-year term of the proposed action.

[c] The USACE estimated the number of days required to dredge at each site assuming that a clamshell dredge would be used. This is a conservative assumption because the clamshell removes the smallest amount of material per day (typically 2,000 to 4,000 CY per day).

[d] For Tongue Point, the USACE refers to future annual volumes to be dredged "if maintained regularly" because funding to perform maintenance dredging comes from Congressional appropriations, which vary from year to year (USACE 2021).

Based on information that NMFS provided during consultation, which described uncertainty about benthic prey recolonization rates, the USACE proposes to dredge Elochoman Slough and Lake River no more frequently than once every 3 years. The channel at Tongue Point could need to be dredged annually because it is vulnerable to "side-slope adjustment" (the authorized depth is deeper than the surrounding area, so that sediment slumps into the navigation channel). Under the proposed action, the USACE could dredge the channel in Oregon Slough as frequently as 2 years in a row, but no more than five times over the term of the proposed action.

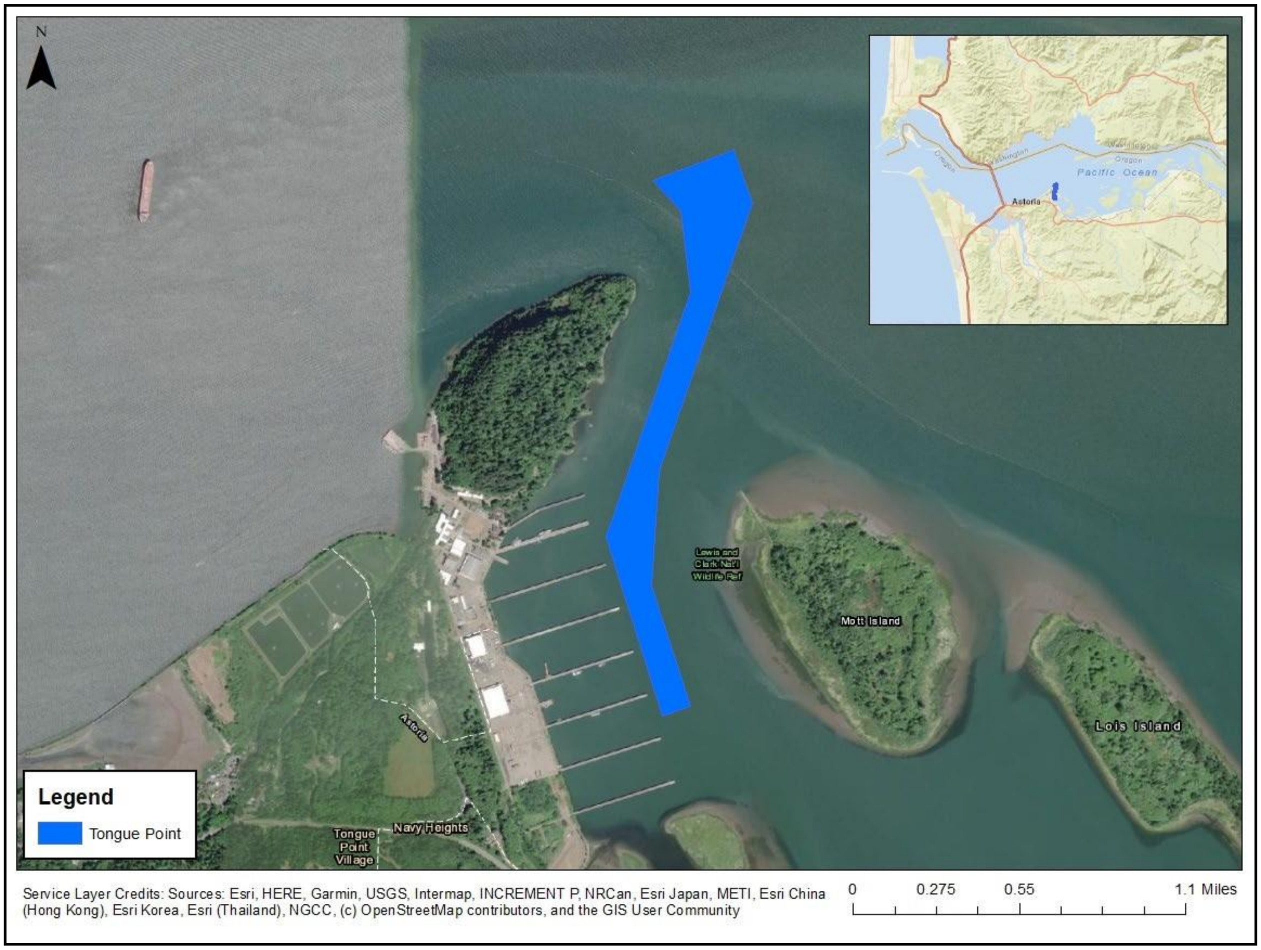


Figure 1. Location of the area to be dredged at Tongue Point, Oregon.

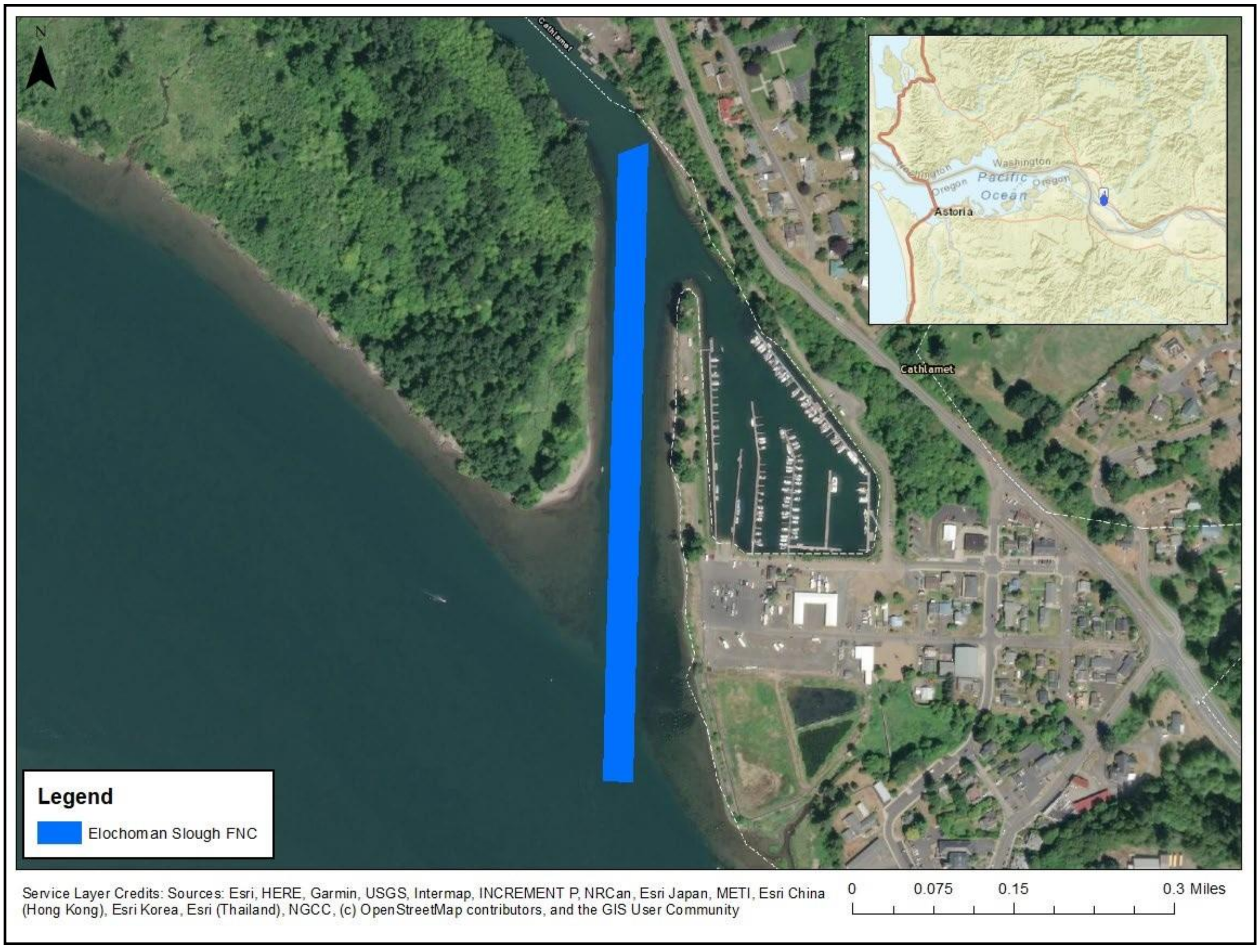


Figure 2. Location of the area to be dredged at Elochoman Slough, Washington.

Figure 3. Location of the area to be dredged at Lake River, Washington.

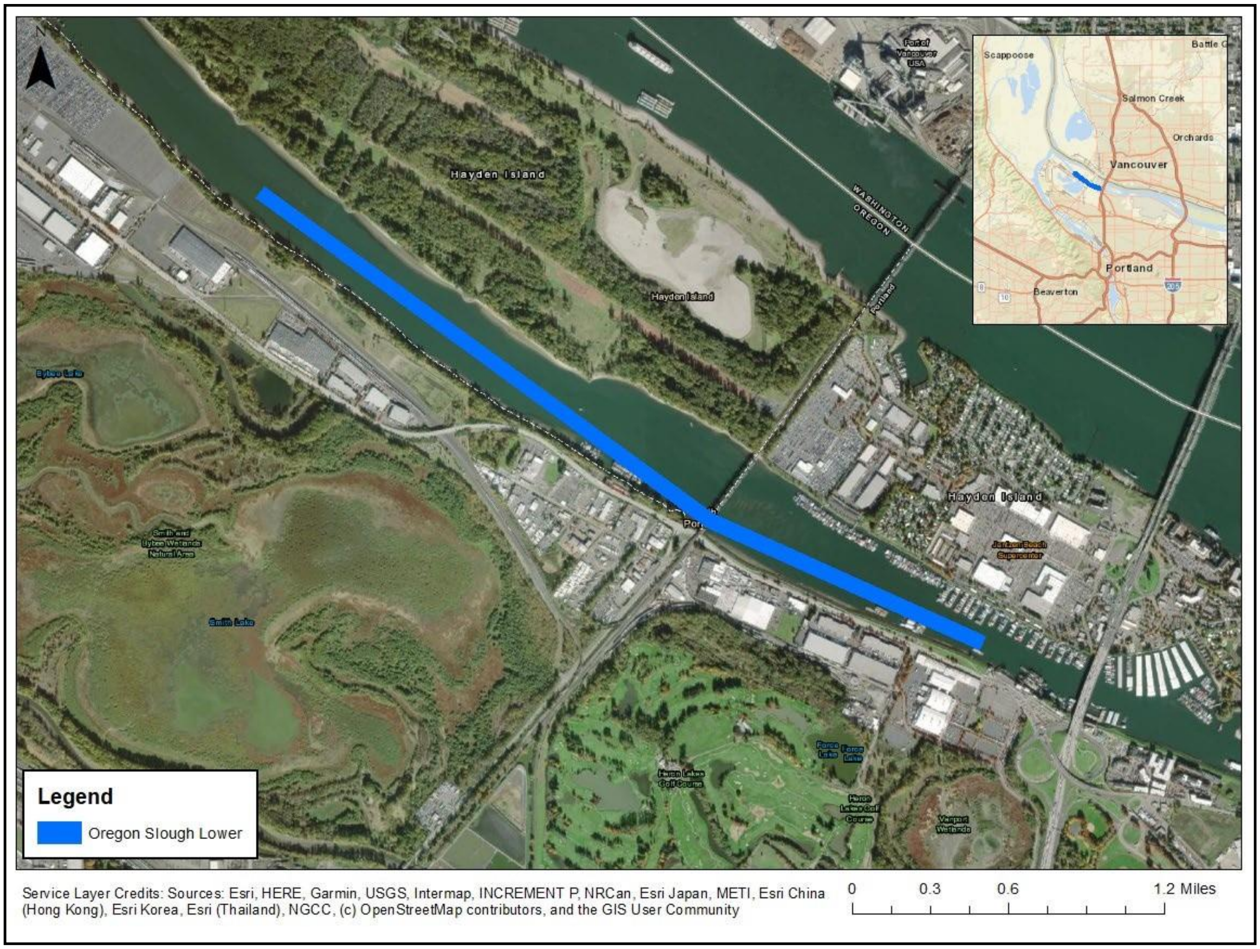


Figure 4. Location of the area to be dredged at Oregon Slough, Oregon.

Two of 93 Dredged Material Management Units (DMMUs) at Tongue Point contained concentrations of diethyl phthalate that exceeded the 200 µg/kg screening level for unconfined aquatic placement. The USACE has further evaluated these sediments using bioassays, but results were not available when the USACE prepared the BA. If the interagency Portland Sediment Evaluation Team (PSET) concludes that, based on the bioassay results, these sediments are not suitable for unconfined aquatic placement (i.e., per the Sediment Evaluation Framework), the USACE will evaluate upland disposal options. The USACE will continue to sample and evaluate material in each side channel periodically over the term of the proposed action and will place dredged material in water only if the PSET concludes that it is suitable for unconfined aquatic placement. Sediments that are determined not to be suitable for unconfined in-water disposal will be placed at upland sites.

Suitable dredged materials from these four side channels will be released in the flow lane between RM 3 and 145, in water deeper than 20 feet. Locations for in-water disposal vary, depending on the depth of the river bottom each year. As deeper areas in the river are filled with dredged material over time, new deep areas are formed elsewhere through natural river processes.

The USACE also proposes the following conservation measures and best management practices, intended to minimize adverse effects on water quality and ESA-listed species and their habitat (Table 3).

Table 3. Proposed **measures** to avoid and minimize effects on ESA-listed species and critical habitat.

Measure	Purpose	Duration and Management Determination
Hopper dredging – dragheads will be buried in the substrate and will not exceed an elevation of 3 feet off the bottom for when cleaning the hopper or reverse purging dragheads.	Minimize or eliminate entrainment of juvenile salmon during normal dredging operations.	Continuous during dredging operations. Maintain until new information becomes available that would warrant change.
Pipeline dredging – cutterheads will be buried in the substrate and will not exceed an elevation of 3 feet off the bottom when cleaning or reverse purging.	Minimize or eliminate entrainment of juvenile salmon during normal dredging operations.	Continuous during dredging operations. Maintain until new information becomes available that would warrant change.
All dredging – in shallow-water areas (less than 20 feet) outside of the Columbia River mainstem should occur only during the recommended ESA in-water work periods for the Columbia River listed in the 2012 BiOp.	The top 20 feet of the water column is considered salmon migratory habitat. Dredging or disposal in these areas could adversely impact salmonids, delay migration, or reduce or eliminate food sources.	Continuous during dredging operations. Maintain until new information becomes available that would warrant change.
All dredging – floating containment and absorbent booms kept on site.	Contain toxic substances in case of accidental spill.	Continuous during dredging operations. Maintain until new information becomes available that would warrant change.

Measure	Purpose	Duration and Management Determination
All dredging – the dredge operator shall not release any trash, garbage, oil, grease, chemicals, or other contaminants into the waterway.	Protect water resources.	Life of contract or action. If material is released, it shall be immediately removed and the area restored to a condition approximating the adjacent undisturbed area. Contaminated ground shall be excavated and removed and the area restored as directed. Any in-water releases shall be immediately reported to appropriate agencies as detailed in contract specifications.
All dredging – the dredge operator, where possible, will use, or propose for use, materials that may be considered environmentally friendly in that waste from such materials is not regulated as a hazardous waste or is not considered harmful to the environment. If hazardous wastes are generated, disposal shall be done in accordance with 40 CFR 260-272 and 49 CFR 100-177.	Accepted disposal of hazardous wastes.	Life of contract or action. If material is released, it shall be immediately removed and the area restored to a condition approximating the adjacent undisturbed area. Contaminated ground shall be excavated and removed and the area restored as directed. Any in-water releases shall be immediately reported to appropriate agencies as detailed in contract specifications.
All dredging – monitor turbidity levels during dredging in accordance with the NMFS 2012 BiOp or state water quality certification requirements (if more protective).[a]	Limits the time over which turbidity levels that could be harmful to aquatic life can persist in the water column.	Dredging must stop if exceedance over background level occurs at the second monitoring interval; dredging may continue once turbidity levels return to background level.[a]
All dredging – monitor dissolved oxygen levels during dredging in accordance with the current water quality certifications and the NMFS 2012 BiOp to ensure that dissolved oxygen levels do not drop below acceptable levels.[b]	Prevents dissolved oxygen levels from dropping to levels that are harmful to aquatic life.	At least daily. Dredging may not occur if dissolved oxygen is less than 6.5 milligrams per liter. More frequent monitoring if dissolved oxygen is below 8 milligrams per liter.

[a] This measure refers to the turbidity monitoring and responsive actions in Term and Conditions 1.d.iii. and 1.d.iv., including Table 49, in NMFS (2012).

[b] This measure refers to the dissolved oxygen monitoring and responsive actions in Term and Condition 1.e.i through 1.e.vii in NMFS (2012).

We considered whether or not the proposed action would cause any other activities and determined that associated activities are maintenance of current levels of commercial and recreational boating access.

1.4. Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02).

The USACE proposes to dredge four distinct side channels in the lower Columbia River as described in Section 1.3 (Proposed Federal Action). In three cases (Tongue Point, Elochoman Slough, and Lake River), the dredge prism includes an area within the side channel and a connection to the mainstem Federal Navigation Channel (Figures 1-4), but dredging the portions of the fourth channel, Oregon Slough, that connect to the mainstem is not part of this consultation. All dredged material that meets sediment quality criteria will eventually be released in the flow lane between RM 3.0 and RM 145. The locations for in-water disposal will vary, depending on the depth of the river bottom each year, but will be more than 20-feet deep in all cases. The action area therefore includes the four dredge prisms and the mainstem river downstream of RM 145. The mainstem will be affected by increased turbidity for up to 900 feet downstream of each side channel during dredging as well as during flow lane disposal of the excavated sediments. Assuming tidal influence, elevated suspended sediments/turbidity will also extend up to 900 feet upstream of excavated areas within each side channel, during dredging.

All four side channels include critical habitat for salmonids and eulachon. Critical habitat for green sturgeon extends from the mouth of the river through RM 46 (74 FR 52300, October 9, 2009). The action area also includes areas designated as EFH for two Pacific Coast salmon species: Chinook salmon and coho salmon (PFMC 2014) and for groundfish (PFMC 2020). For both salmon and groundfish, the habitat area of particular concern (HAPC) within the action area is "estuaries."

2. ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, each Federal agency must ensure that its actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, Federal action agencies consult with NMFS and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provide an opinion stating how the agency's actions would affect listed species and their critical habitats. If incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes non-discretionary reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

The USACE determined the proposed action is not likely to adversely affect southern DPS green sturgeon or southern DPS eulachon or their critical habitat. We find that these species and their critical habitats are likely to be adversely affected by water quality reductions, perturbations to prey, and risk of entrainment, and therefore include them in our formal analysis.

2.1. Analytical Approach

This biological opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "jeopardize the continued existence of" a listed species, which is "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

This biological opinion relies on the definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species" (50 CFR 402.02).

The designation(s) of critical habitat for (species) use(s) the term primary constituent element (PCE) or essential features. The 2016 critical habitat regulations (50 CFR 424.12) replaced this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

The 2019 regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the regulations (84 FR 44977), that definition does not change the scope of our analysis and in this opinion we use the terms "effects" and "consequences" interchangeably.

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Evaluate the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and critical habitat.
- Evaluate the effects of the proposed action on species and their habitat using an exposure-response approach.
- Evaluate cumulative effects.
- In the integration and synthesis, add the effects of the action and cumulative effects to the environmental baseline, and, in light of the status of the species and critical habitat, analyze whether the proposed action is likely to: (1) directly or indirectly reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species, or (2) directly or

indirectly result in an alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.

- If necessary, suggest a reasonable and prudent alternative to the proposed action.

2.2. Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that would be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' "reproduction, numbers, or distribution" as described in 50 CFR 402.02. The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the function of the PBFs that are essential for the conservation of the species.

One factor affecting the status of ESA-listed species considered in this opinion, and aquatic habitat at large, is climate change. Climate change is likely to play an increasingly important role in determining the abundance and distribution of ESA-listed species, and the conservation value of designated critical habitats, in the Pacific Northwest. These changes will not be spatially homogeneous across the Pacific Northwest. The largest hydrologic responses are expected to occur in basins with significant snow accumulation, where warming decreases snow pack, increases winter flows, and advances the timing of spring melt (Mote et al. 2014, Mote et al. 2016). Rain-dominated watersheds and those with significant contributions from groundwater may be less sensitive to predicted changes in climate (Tague et al. 2013, Mote et al. 2014).

During the last century, average regional air temperatures in the Pacific Northwest increased by 1-1.4°F as an annual average, and up to 2°F in some seasons (based on average linear increase per decade; Abatzoglou et al. 2014; Kunkel et al. 2013). Warming is likely to continue during the next century as average temperatures are projected to increase another 3 to 10°F, with the largest increases predicted to occur in the summer (Mote et al. 2014).

Decreases in summer precipitation of as much as 30% by the end of the century are consistently predicted across climate models (Mote et al. 2014). Precipitation is more likely to occur during October through March, less during summer months, and more winter precipitation will be rain than snow (ISAB 2007). Earlier snowmelt will cause lower stream flows in late spring, summer, and fall, and water temperatures will be warmer (ISAB 2007). Models consistently predict increases in the frequency of severe winter precipitation events (i.e., 20-year and 50-year events), in the western United States (Dominguez et al. 2012). The largest increases in winter flood frequency and magnitude are predicted in mixed rain-snow watersheds (Mote et al. 2014).

Overall, about one-third of the current cold-water salmonid habitat in the Pacific Northwest is likely to exceed key water temperature thresholds by the end of this century (Mantua et al. 2009). Higher temperatures will reduce the quality of available salmonid habitat for most freshwater life stages (ISAB 2007). Reduced flows will make it more difficult for migrating fish to pass physical and thermal obstructions, limiting their access to available habitat (Mantua et al. 2010; Isaak et al. 2012). Temperature increases shift timing of key life cycle events for salmonids and species forming the base of their aquatic foodwebs (Crozier et al. 2011; Tillmann and Siemann 2011; Winder and Schindler 2004). Higher stream temperatures will also cause decreases in dissolved oxygen and may also cause earlier onset of stratification and reduced mixing between layers in lakes and reservoirs, which can also result in reduced oxygen (Meyer et al. 1999; Winder and Schindler 2004). Higher temperatures are likely to cause several species to become more susceptible to parasites, disease, and higher predation rates (Crozier et al. 2008; Wainwright and Weitkamp 2013).

As more basins become rain-dominated and prone to more severe winter storms, higher winter stream flows may increase the risk that winter or spring floods in sensitive watersheds will damage spawning redds and wash away incubating eggs (Goode et al. 2013). Earlier peak stream flows will also alter migration timing for salmon smolts, and may flush some young salmon and steelhead from rivers to estuaries before they are physically mature, increasing stress and reducing smolt survival (McMahon and Hartman 1989; Lawson et al. 2004).

In addition to changes in freshwater conditions, predicted changes for coastal waters in the Pacific Northwest as a result of climate change include increasing surface water temperature, increasing but highly variable acidity, and increasing storm frequency and magnitude (Mote et al. 2014). Elevated ocean temperatures already documented for the Pacific Northwest are highly likely to continue during the next century, with sea surface temperature projected to increase by 1.0-3.7°C by the end of the century (IPCC 2014). Habitat loss, shifts in species' ranges and abundances, and altered marine food webs could have substantial consequences to anadromous, coastal, and marine species in the Pacific Northwest (Tillmann and Siemann 2011).

Moreover, as atmospheric carbon emissions increase, increasing levels of carbon are absorbed by the oceans, changing the pH of the water. Acidification also impacts sensitive estuary habitats, where organic matter and nutrient inputs further reduce pH and produce conditions more corrosive than those in offshore waters (Feely et al. 2012, Sunda and Cai 2012).

Global sea levels are expected to continue rising throughout this century, reaching likely predicted increases of 10-32 inches by 2081-2100 (IPCC 2014). These changes will likely result in increased erosion and more frequent and severe coastal flooding, and shifts in the composition of nearshore habitats (Tillmann and Siemann 2011). Estuarine-dependent salmonids such as chum and Chinook salmon are predicted to be impacted by significant reductions in rearing habitat in some Pacific Northwest coastal areas (Glick et al. 2007).

Historically, warm periods in the coastal Pacific Ocean have coincided with relatively low abundances of salmon and steelhead, while cooler ocean periods have coincided with relatively high abundances, and therefore these species are predicted to fare poorly in warming ocean conditions (Scheuerell and Williams 2005; Zabel et al. 2006). This is supported by the recent observation that anomalously warm sea surface temperatures off the coast of Washington from 2013 to 2016 resulted in poor coho and Chinook salmon body condition for juveniles caught in those waters (NWFSC 2015). Changes to estuarine and coastal conditions, as well as the timing of seasonal shifts in these habitats, have the potential to impact a wide range of listed aquatic species (Tillmann and Siemann 2011).

The adaptive ability of these threatened and endangered species is depressed due to reductions in population size, habitat quantity and diversity, and loss of behavioral and genetic variation. Without these natural sources of resilience, systematic changes in local and regional climatic conditions due to anthropogenic global climate change will likely reduce long-term viability and sustainability of populations in many of these ESUs (NWFSC 2015). New stressors generated by climate change, or existing stressors with effects that have been amplified by climate change, may also have synergistic impacts on species and ecosystems (Doney et al. 2012). These conditions will possibly intensify the climate change stressors inhibiting recovery of ESA-listed species in the future.

2.2.1 Status of Critical Habitat

This section describes the status of designated critical habitat affected by the proposed action by examining the condition and trends of the essential physical and biological features of that habitat throughout the designated areas. These features are essential to the conservation of the ESA-listed species because they support one or more of the species' life stages (e.g., sites with conditions that support spawning, rearing, migration and foraging). Table 4, below, summarizes the general status of critical habitat, range-wide, for each species considered in this analysis.

Physical and Biological Features of Salmon and Steelhead Critical Habitat

The NMFS designated critical habitat for three different groups of salmonids that occupy the lower Columbia River on three different dates. For each designation, NMFS used slightly different descriptions of the physical and biological features (PBFs) of critical habitat. In addition, NMFS identified the essential elements of the PBFs using slightly different terminology. This section presents each of the approaches to terminology used for each of the subsequent designations and attributes those to the specific salmonids covered by each designation. For convenience, in the remainder of the document we will refer to these attributes as PBFs, even though the original designations used different terminologies. Many of the PBFs and their essential elements actually overlap across designations.

The NMFS designated critical habitat for several Snake River salmonids on October 25, 1999 (64 FR 57399): the SR sockeye and SR spring/summer and fall Chinook salmon ESUs. The PBFs (which we originally termed "essential features") of critical habitat for Snake River salmon are (1) spawning and juvenile rearing areas; (2) juvenile migration corridors; (3) areas for growth and development to adulthood; and (4) adult migration corridors. The essential elements of the spawning and rearing PBFs are: 1) Spawning gravel; (2) water quality; (3) water quantity; (4) water temperature; (5) food; (6) riparian vegetation; and (7) access. The designation also breaks down the migration corridor for juvenile and adult salmonids as follows: Essential features of the juvenile migration corridors include adequate: (1) Substrate (2) water quality; (3) water quantity; *(4)* water temperature; (5) water velocity; (6) cover/shelter; (7) food; (8) riparian vegetation; (9) space; and (10) safe passage conditions. The adult migration corridors are the same areas included in juvenile migration corridors. Essential features would include those in the juvenile migration corridors, excluding adequate food.

Subsequently, NMFS designated critical habitat for 10 more ESUs and DPSs of Columbia River basin salmon and steelhead, including SRB steelhead, on September 2, 2005 (70 FR 52630), and for lower Columbia River coho salmon on February 24, 2016 (81 FR 9252) (Table 2). The PBFs are referred to as Primary Constituent Elements (PCE) in 70 FR 52630 and in 81 FR 9252, and those terms may be used interchangeably in this document. Specific PBFs, and essential features for salmonids designated in 2005 and in 2016 include:

- Freshwater spawning sites with water quantity and quality conditions and substrate that support spawning, incubation, and larval development;
- Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility, water quality and forage that support juvenile development, and natural cover such as shade, submerged and overhanging large wood, logjams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks;
- Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks that support juvenile and adult mobility and survival;
- Estuarine areas free of obstruction and excessive predation with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation;
- Nearshore marine areas[3] free of obstruction and excessive predation with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and
- Offshore marine areas[4] with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.

For most salmon and steelhead, NMFS's critical habitat analytical review teams (CHARTs) ranked watersheds within designated critical habitat at the scale of the fifth-field hydrologic unit code (HUC5) in terms of the conservation value they provide to each ESA-listed species that they support (NMFS 2005). The conservation rankings were high, medium, or low. To determine the conservation value of each watershed to species viability, the CHARTs evaluated the quantity and quality of habitat features, the relationship of the area compared to other areas within the species' range, and the significance to the species of the population occupying that area. Even if a location had poor habitat quality, it could be ranked with a high conservation value if it were essential due to factors such as limited availability, a unique contribution of the population it served, or is serving another important role.

[3] NMFS designated nearshore marine areas as critical habitat for Columbia basin salmon and steelhead only from the mouth of the river to an imaginary line connecting the outer extents of the north and south jetties.
[4] NMFS did not designate any offshore marine areas as critical habitat for Columbia basin salmon and steelhead.

Physical and Biological Features of Green Sturgeon Critical Habitat

Designated critical habitat for southern DPS green sturgeon includes the lower Columbia River estuary from the river mouth to RM 46 (October 9, 2009; 74 FR 52300), which supports aggregations of southern DPS green sturgeon during summer. Specific PBFs, and the essential features associated with the PBFs for Green sturgeon designated in 2009 include:

- Freshwater riverine systems which provide food resources, and water quality including depth and flow for embryo, larval and juvenile growth and development. Adult spawning requires appropriate substrate and sediment quality, in addition to migratory corridors free of obstruction.
- Estuarine areas which provide food resources, migratory corridors, and appropriate water and sediment quality, flow and depth to support growth of juvenile, sub-adult, and sexually mature green sturgeon.
- Coastal marine areas with adequate food resources are necessary for sub-adult and sexually mature green sturgeon growth. These areas also provide migratory corridors with appropriate water quality to spawning streams.

Physical and Biological Features of Eulachon Critical Habitat

The NMFS designated critical habitat for the southern DPS of eulachon on October 11, 2011 (76 FR 65324). Critical habitat includes portions of 16 rivers and streams in California, Oregon, and Washington. We designated all of these areas as migration and spawning habitat for this species. Specific PBFs, and the essential features associated with the PBFs for eulachon designated in 2011 include:

- Freshwater spawning and incubation sites with water flow, quality and temperature conditions and substrate supporting spawning and incubation, and with migratory access for adults and juveniles. These features are essential to conservation because without them the species cannot successfully spawn and produce offspring.
- Freshwater and estuarine migration corridors associated with spawning and incubation sites that are free of obstruction and with water flow, quality and temperature conditions supporting larval and adult mobility, and with abundant prey items supporting larval feeding after the yolk sac is depleted. These features are essential to conservation because they allow adult fish to swim upstream to reach spawning areas and they allow larval fish to proceed downstream and reach the ocean.
- Nearshore and offshore marine foraging habitat with water quality and available prey, supporting juveniles and adult survival. Eulachon prey on a wide variety of species including crustaceans such as copepods and euphausiids (Hay and McCarter 2000, WDFW and ODFW 2001), unidentified malacostracans (Sturdevant 1999), cumaceans (Smith and Saalfeld 1955), mysids, barnacle larvae, and worm larvae (WDFW and ODFW 2001). These features are essential to conservation because they allow juvenile fish to survive, grow, and reach maturity, and they allow adult fish to survive and return to freshwater systems to spawn.

Table 4. Critical habitat designation date, Federal Register citation, and status summary for critical habitat considered in this opinion.

Species	Designation Date and FR Citation	Critical Habitat Status Summary
Lower Columbia River Chinook salmon	9/02/05 70 FR 52630	Critical habitat encompasses 10 subbasins in Oregon and Washington containing 47 occupied watersheds, as well as the lower Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some, or high potential for improvement. We rated conservation value of HUC5 watersheds as high for 30 watersheds, medium for 13 watersheds, and low for four watersheds.
Upper Columbia River spring-run Chinook salmon	9/02/05 70 FR 52630	Critical habitat encompasses four subbasins in Washington containing 15 occupied watersheds, as well as the Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition. However, most of these watersheds have some, or high, potential for improvement. We rated conservation value of HUC5 watersheds as high for 10 watersheds, and medium for five watersheds. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.
Snake River spring/summer-run Chinook salmon	10/25/99 64 FR 57399	Critical habitat consists of river reaches of the Columbia, Snake, and Salmon rivers, and all tributaries of the Snake and Salmon rivers (except the Clearwater River) presently or historically accessible to this ESU (except reaches above impassable natural falls and Hells Canyon Dam). Habitat quality in tributary streams varies from excellent in wilderness and roadless areas, to poor in areas subject to heavy agricultural and urban development (Wissmar et al. 1994). Reduced summer stream flows, impaired water quality, and reduced habitat complexity are common problems. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.
Upper Willamette River Chinook salmon	9/02/05 70 FR 52630	Critical habitat encompasses 10 subbasins in Oregon containing 56 occupied watersheds, as well as the lower Willamette/Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition. However, most of these watersheds have some, or high, potential for improvement. Watersheds are in good to excellent condition with no potential for improvement only in the upper McKenzie River and its tributaries (NMFS 2005). We rated conservation value of HUC5 watersheds as high for 22 watersheds, medium for 16 watersheds, and low for 18 watersheds.
Snake River fall-run Chinook salmon	10/25/99 64 FR 57399	Critical habitat consists of river reaches of the Columbia, Snake, and Salmon rivers, and all tributaries of the Snake and Salmon rivers presently or historically accessible to this ESU (except reaches above impassable natural falls, and Dworshak and Hells Canyon dams). Habitat quality in tributary streams varies from excellent in wilderness and roadless areas, to poor in areas subject to heavy agricultural and urban development (Wissmar et al. 1994). Reduced summer stream flows, impaired water quality, and reduced habitat complexity are common problems. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.
Columbia River chum salmon	9/02/05 70 FR 52630	Critical habitat encompasses six subbasins in Oregon and Washington containing 19 occupied watersheds, as well as the lower Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 16 watersheds, and medium for three watersheds.

Species	Designation Date and FR Citation	Critical Habitat Status Summary
Lower Columbia River coho salmon	2/24/16 81 FR 9252	Critical habitat encompasses 10 subbasins in Oregon and Washington containing 55 occupied watersheds, as well as the lower Columbia River and estuary rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 34 watersheds, medium for 18 watersheds, and low for three watersheds.
Snake River sockeye salmon	10/25/99 64 FR 57399	Critical habitat consists of river reaches of the Columbia, Snake, and Salmon rivers; Alturas Lake Creek; Valley Creek; and Stanley, Redfish, Yellow Belly, Pettit and Alturas lakes (including their inlet and outlet creeks). Water quality in all five lakes generally is adequate for juvenile sockeye salmon, although zooplankton numbers vary considerably. Some reaches of the Salmon River and tributaries exhibit temporary elevated water temperatures and sediment loads that could restrict sockeye salmon production and survival (NMFS 2015a). Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.
Upper Columbia River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses 10 subbasins in Washington containing 31 occupied watersheds, as well as the Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 20 watersheds, medium for eight watersheds, and low for three watersheds.
Lower Columbia River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses nine subbasins in Oregon and Washington containing 41 occupied watersheds, as well as the lower Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 28 watersheds, medium for 11 watersheds, and low for two watersheds.
Upper Willamette River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses seven subbasins in Oregon containing 34 occupied watersheds, as well as the lower Willamette/Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. Watersheds are in good to excellent condition with no potential for improvement only in the upper McKenzie River and its tributaries (NMFS 2005). We rated conservation value of HUC5 watersheds as high for 25 watersheds, medium for 6 watersheds, and low for 3 watersheds.
Middle Columbia River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses 15 subbasins in Oregon and Washington containing 111 occupied watersheds, as well as the Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of occupied HUC5 watersheds as high for 80 watersheds, medium for 24 watersheds, and low for 9 watersheds.
Snake River basin steelhead	9/02/05 70 FR 52630	Critical habitat encompasses 25 subbasins in Oregon, Washington, and Idaho. Habitat quality in tributary streams varies from excellent in wilderness and roadless areas, to poor in areas subject to heavy agricultural and urban development (Wissmar et al. 1994). Reduced summer stream flows, impaired water quality, and reduced habitat complexity are common problems. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.
Southern DPS green sturgeon	10/09/09 74 FR 52300	Critical habitat has been designated in coastal U.S. marine waters within 60 fathoms depth from Monterey Bay, California (including Monterey Bay), north to Cape Flattery, Washington, including the Strait of Juan de Fuca, Washington, to its United States boundary; the Sacramento River, lower Feather River, and lower Yuba River in

Species	Designation Date and FR Citation	Critical Habitat Status Summary
		California; the Sacramento-San Joaquin Delta and Suisun, San Pablo, and San Francisco bays in California; tidally influenced areas of the Columbia River estuary from the mouth upstream to river mile 46; and certain coastal bays and estuaries in California (Humboldt Bay), Oregon (Coos Bay, Winchester Bay, Yaquina Bay, and Nehalem Bay), and Washington (Willapa Bay and Grays Harbor), including, but not limited to, areas upstream to the head of tide in various streams that drain into the bays, as listed in Table 1 in 74 FR 52300. The CHRT identified several activities that threaten the PBFs in coastal bays and estuaries and necessitate the need for special management considerations or protection. The application of pesticides is likely to adversely affect prey resources and water quality within the bays and estuaries, as well as the growth and reproductive health of Southern DPS green sturgeon through bioaccumulation. Other activities of concern include those that disturb bottom substrates, adversely affect prey resources, or degrade water quality through re-suspension of contaminated sediments. Of particular concern are activities that affect prey resources. Prey resources are affected by: commercial shipping and activities generating point source pollution and non-point source pollution that discharge contaminants and result in bioaccumulation of contaminants in green sturgeon; disposal of dredged materials that bury prey resources; and bottom trawl fisheries that disturb the bottom (but result in beneficial or adverse effects on prey resources for green sturgeon).
Southern DPS eulachon	10/20/11 76 FR 65324	Critical habitat for eulachon includes portions of 16 rivers and streams in California, Oregon, and Washington. All of these areas are designated as migration and spawning habitat for this species. In Oregon, we designated 24.2 miles of the lower Umpqua River, 12.4 miles of the lower Sandy River, and 0.2 miles of Tenmile Creek. We also designated the mainstem Columbia River from the mouth to the base of Bonneville Dam, a distance of 143.2 miles. Dams and water diversions are moderate threats to eulachon in the Columbia and Klamath rivers where hydropower generation and flood control are major activities. Degraded water quality is common in some areas occupied by southern DPS eulachon. In the Columbia and Klamath river basins, large-scale impoundment of water has increased winter water temperatures, potentially altering the water temperature during eulachon spawning periods. Numerous chemical contaminants are also present in spawning rivers, but the exact effect these compounds have on spawning and egg development is unknown. Dredging is a low to moderate threat to eulachon in the Columbia River. Dredging during eulachon spawning would be particularly detrimental.

2.2.2 Status of the Species

Table 5, below provides a summary of listing and recovery plan information, status summaries and limiting factors for the species addressed in this opinion. More information can be found in recovery plans and status reviews for these species. Acronyms appearing in the table include DPS (Distinct Population Segment), ESU (Evolutionarily Significant Unit), ICTRT (Interior Columbia Technical Recovery Team), MPG (Multiple Population Grouping), NWFSC (Northwest Fisheries Science Center), and VSP (Viable Salmonid Population).

Table 5. Listing classification and date, recovery plan reference, most recent status review, status summary, and limiting factors for each species considered in this opinion.

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Lower Columbia River Chinook salmon	Threatened 6/28/05	NMFS 2013	NWFSC 2015	This ESU comprises 32 independent populations. Twenty-seven populations are at very high risk, 2 populations are at high risk, one population is at moderate risk, and 2 populations are at very low risk Overall, there was little change since the last status review in the biological status of this ESU, although there are some positive trends. Increases in abundance were noted in about 70% of the fall-run populations and decreases in hatchery contribution were noted for several populations. Relative to baseline VSP levels identified in the recovery plan, there has been an overall improvement in the status of a number of fall-run populations, although most are still far from the recovery plan goals.	• Reduced access to spawning and rearing habitat • Hatchery-related effects • Harvest-related effects on fall Chinook salmon • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Contaminant
Upper Columbia River spring-run Chinook salmon	Endangered 6/28/05	Upper Columbia Salmon Recovery Board 2007	NWFSC 2015	This ESU comprises four independent populations. Three are at high risk and one is functionally extirpated. Current estimates of natural origin spawner abundance increased relative to the levels observed in the prior review for all three extant populations, and productivities were higher for the Wenatchee and Entiat populations and unchanged for the Methow population. However, abundance and productivity remained well below the viable thresholds called for in the Upper Columbia Recovery Plan for all three populations.	• Effects related to hydropower system in the mainstem Columbia River • Degraded freshwater habitat • Degraded estuarine and nearshore marine habitat • Hatchery-related effects • Persistence of non-native (exotic) fish species • Harvest in Columbia River fisheries

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Snake River spring/summer Chinook salmon	Threatened 6/28/05	NMFS 2017a	NWFSC 2015	This ESU comprises 28 extant and four extirpated populations. All expect one extant population (Chamberlin Creek) are at high risk. Natural origin abundance has increased over the levels reported in the prior review for most populations in this ESU, although the increases were not substantial enough to change viability ratings. Relatively high ocean survivals in recent years were a major factor in recent abundance patterns. While there have been improvements in abundance and productivity in several populations relative to prior reviews, those changes have not been sufficient to warrant a change in ESU status.	• Degraded freshwater habitat • Effects related to the hydropower system in the mainstem Columbia River, • Altered flows and degraded water quality • Harvest-related effects • Predation

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Upper Willamette River Chinook salmon	Threatened 6/28/05	ODFW and NMFS 2011	NWFSC 2015	This ESU comprises seven populations. Five populations are at very high risk, one population is at moderate risk (Clackamas River) and one population is at low risk (McKenzie River). Consideration of data collected since the last status review in 2010 indicates the fraction of hatchery origin fish in all populations remains high (even in Clackamas and McKenzie populations). The proportion of natural origin spawners improved in the North and South Santiam basins, but is still well below identified recovery goals. Abundance levels for five of the seven populations remain well below their recovery goals. Of these, the Calapooia River may be functionally extinct and the Molalla River remains critically low. Abundances in the North and South Santiam rivers have risen since the 2010 review, but still range only in the high hundreds of fish. The Clackamas and McKenzie populations have previously been viewed as natural population strongholds, but have both experienced declines in abundance despite having access to much of their historical spawning habitat. Overall, populations appear to be at either moderate or high risk, there has been likely little net change in the VSP score for the ESU since the last review, so the ESU remains at moderate risk.	• Degraded freshwater habitat • Degraded water quality • Increased disease incidence • Altered stream flows • Reduced access to spawning and rearing habitats • Altered food web due to reduced inputs of microdetritus • Predation by native and non-native species, including hatchery fish • Competition related to introduced salmon and steelhead • Altered population traits due to fisheries and bycatch

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Snake River fall Chinook salmon	Threatened 6/28/05	NMFS 2017b	NWFSC 2015	This ESU has one extant population. Historically, large populations of fall Chinook salmon spawned in the Snake River upstream of the Hells Canyon Dam complex. The extant population is at moderate risk for both diversity and spatial structure and abundance and productivity. The overall viability rating for this population is 'viable.' Overall, the status of Snake River fall Chinook salmon has clearly improved compared to the time of listing and compared to prior status reviews. The single extant population in the ESU is currently meeting the criteria for a rating of 'viable' developed by the ICTRT, but the ESU as a whole is not meeting the recovery goals described in the recovery plan for the species, which require the single population to be "highly viable with high certainty" and/or will require reintroduction of a viable population above the Hells Canyon Dam complex.	• Degraded floodplain connectivity and function • Harvest-related effects • Loss of access to historical habitat above Hells Canyon and other Snake River dams • Impacts from mainstem Columbia River and Snake River hydropower systems • Hatchery-related effects • Degraded estuarine and nearshore habitat.
Columbia River chum salmon	Threatened 6/28/05	NMFS 2013	NWFSC 2015	Overall, the status of most chum salmon populations is unchanged from the baseline VSP scores estimated in the recovery plan. A total of 3 of 17 populations are at or near their recovery viability goals, although under the recovery plan scenario these populations have very low recovery goals of 0. The remaining populations generally require a higher level of viability and most require substantial improvements to reach their viability goals. Even with the improvements observed during the last five years, the majority of populations in this ESU remain at a high or very high risk category and considerable progress remains to be made to achieve the recovery goals.	• Degraded estuarine and nearshore marine habitat • Degraded freshwater habitat • Degraded stream flow as a result of hydropower and water supply operations • Reduced water quality • Current or potential predation • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat in the lower Columbia River • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Juvenile fish wake strandings • Contaminants

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Lower Columbia River coho salmon	Threatened 6/28/05	NMFS 2013	NWFSC 2015	Of the 24 populations that make up this ESU, 21 populations are at very high risk, 1 population is at high risk, and 2 populations are at moderate risk. Recent recovery efforts may have contributed to the observed natural production, but in the absence of longer term data sets it is not possible to parse out these effects. Populations with longer term data sets exhibit stable or slightly positive abundance trends. Some trap and haul programs appear to be operating at or near replacement, although other programs still are far from that threshold and require supplementation with additional hatchery-origin spawners .Initiation of or improvement in the downstream juvenile facilities at Cowlitz Falls, Merwin, and North Fork Dam are likely to further improve the status of the associated upstream populations. While these and other recovery efforts have likely improved the status of a number of coho salmon populations, abundances are still at low levels and the majority of the populations remain at moderate or high risk. For the Lower Columbia River region land development and increasing human population pressures will likely continue to degrade habitat, especially in lowland areas. Although populations in this ESU have generally improved, especially in the 2013/14 and 2014/15 return years, recent poor ocean conditions suggest that population declines might occur in the upcoming return years	• Degraded estuarine and near-shore marine habitat • Fish passage barriers • Degraded freshwater habitat: Hatchery-related effects • Harvest-related effects • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat in the lower Columbia River • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Juvenile fish wake strandings • Contaminants

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Snake River sockeye salmon	Endangered 6/28/05	NMFS 2015a	NWFSC 2015	This single population ESU is at very high risk dues to small population size. There is high risk across all four basic risk measures. Although the captive brood program has been successful in providing substantial numbers of hatchery produced fish for use in supplementation efforts, substantial increases in survival rates across all life history stages must occur to re-establish sustainable natural production In terms of natural production, the Snake River Sockeye ESU remains at extremely high risk although there has been substantial progress on the first phase of the proposed recovery approach – developing a hatchery based program to amplify and conserve the stock to facilitate reintroductions.	• Effects related to the hydropower system in the mainstem Columbia River • Reduced water quality and elevated temperatures in the Salmon River • Water quantity • Predation
Upper Columbia River steelhead	Threatened 1/5/06	Upper Columbia Salmon Recovery Board 2007	NWFSC 2015	This DPS comprises four independent populations. Three populations are at high risk of extinction while 1 population is at moderate risk. Upper Columbia River steelhead populations have increased relative to the low levels observed in the 1990s, but natural origin abundance and productivity remain well below viability thresholds for three out of the four populations. The status of the Wenatchee River steelhead population continued to improve based on the additional year's information available for the most recent review. The abundance and productivity viability rating for the Wenatchee River exceeds the minimum threshold for 5% extinction risk. However, the overall DPS status remains unchanged from the prior review, remaining at high risk driven by low abundance and productivity relative to viability objectives and diversity concerns.	• Adverse effects related to the mainstem Columbia River hydropower system • Impaired tributary fish passage • Degraded floodplain connectivity and function, channel structure and complexity, riparian areas, large woody debris recruitment, stream flow, and water quality • Hatchery-related effects • Predation and competition • Harvest-related effects

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Lower Columbia River steelhead	Threatened 1/5/06	NMFS 2013	NWFSC 2015	This DPS comprises 23 historical populations, 17 winter-run populations and six summer-run populations. Nine populations are at very high risk, 7 populations are at high risk, 6 populations are at moderate risk, and 1 population is at low risk. The majority of winter-run steelhead populations in this DPS continue to persist at low abundances. Hatchery interactions remain a concern in select basins, but the overall situation is somewhat improved compared to prior reviews. Summer-run steelhead populations were similarly stable, but at low abundance levels. The decline in the Wind River summer-run population is a source of concern, given that this population has been considered one of the healthiest of the summer-runs; however, the most recent abundance estimates suggest that the decline was a single year aberration. Passage programs in the Cowlitz and Lewis basins have the potential to provide considerable improvements in abundance and spatial structure, but have not produced self-sustaining populations to date. Even with modest improvements in the status of several winter-run DIPs, none of the populations appear to be at fully viable status, and similarly none of the MPGs meet the criteria for viability.	• Degraded estuarine and nearshore marine habitat • Degraded freshwater habitat • Reduced access to spawning and rearing habitat • Avian and marine mammal predation • Hatchery-related effects • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat in the lower Columbia River • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Juvenile fish wake strandings • Contaminants

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Upper Willamette River steelhead	Threatened 1/5/06	ODFW and NMFS 2011	NWFSC 2015	This DPS has four demographically independent populations. Three populations are at low risk and one population is at moderate risk. Declines in abundance noted in the last status review continued through the period from 2010-2015. While rates of decline appear moderate, the DPS continues to demonstrate the overall low abundance pattern that was of concern during the last status review. The causes of these declines are not well understood, although much accessible habitat is degraded and under continued development pressure. The elimination of winter-run hatchery release in the basin reduces hatchery threats, but non-native summer steelhead hatchery releases are still a concern for species diversity and a source of competition for the DPS. While the collective risk to the persistence of the DPS has not changed significantly in recent years, continued declines and potential negative impacts from climate change may cause increased risk in the near future.	• Degraded freshwater habitat • Degraded water quality • Increased disease incidence • Altered stream flows • Reduced access to spawning and rearing habitats due to impaired passage at dams • Altered food web due to changes in inputs of microdetritus • Predation by native and non-native species, including hatchery fish and pinnipeds • Competition related to introduced salmon and steelhead • Altered population traits due to interbreeding with hatchery origin fish
Middle Columbia River steelhead	Threatened 1/5/06	NMFS 2009	NWFSC 2015	This DPS comprises 17 extant populations. The DPS does not currently include steelhead that are designated as part of an experimental population above the Pelton Round Butte Hydroelectric Project. Returns to the Yakima River basin and to the Umatilla and Walla Walla Rivers have been higher over the most recent brood cycle, while natural origin returns to the John Day River have decreased. There have been improvements in the viability ratings for some of the component populations, but the DPS is not currently meeting the viability criteria in the MCR steelhead recovery plan. In general, the majority of population level viability ratings remained unchanged from prior reviews for each major population group within the DPS.	• Degraded freshwater habitat • Mainstem Columbia River hydropower-related impacts • Degraded estuarine and nearshore marine habitat • Hatchery-related effects • Harvest-related effects • Effects of predation, competition, and disease

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Snake River Basin steelhead	Threatened 1/5/06	NMFS 2017a	NWFSC 2015	This DPS comprises 24 populations. Two populations are at high risk, 15 populations are rated as maintained, 3 populations are rated between high risk and maintained, 2 populations are at moderate risk, 1 population is viable, and 1 population is highly viable. Four out of the five MPGs are not meeting the specific objectives in the draft recovery plan based on the updated status information available for this review, and the status of many individual populations remains uncertain A great deal of uncertainty still remains regarding the relative proportion of hatchery fish in natural spawning areas near major hatchery release sites within individual populations.	• Adverse effects related to the mainstem Columbia River hydropower system • Impaired tributary fish passage • Degraded freshwater habitat • Increased water temperature • Harvest-related effects, particularly for B-run steelhead • Predation • Genetic diversity effects from out-of-population hatchery releases
Southern DPS of green sturgeon	Threatened 4/7/06	NMFS 2018a	NMFS 2015b	The Sacramento River contains the only known green sturgeon spawning population in this DPS. The current estimate of spawning adult abundance is between 824-1,872 individuals. Telemetry data and genetic analyses suggest that Southern DPS green sturgeon generally occur from Graves Harbor, Alaska to Monterey Bay, California and, within this range, most frequently occur in coastal waters of Washington, Oregon, and Vancouver Island and near San Francisco and Monterey bays. Within the nearshore marine environment, tagging and fisheries data indicate that Northern and Southern DPS green sturgeon prefer marine waters of less than a depth of 110 meters.	• Reduction of its spawning area to a single known population • Lack of water quantity • Poor water quality • Poaching

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Southern DPS of eulachon	Threatened 3/18/10	NMFS 2017c	Gustafson 2016	The Southern DPS of eulachon includes all naturally-spawned populations that occur in rivers south of the Nass River in British Columbia to the Mad River in California. Sub populations for this species include the Fraser River, Columbia River, British Columbia and the Klamath River. In the early 1990s, there was an abrupt decline in the abundance of eulachon returning to the Columbia River. Despite a brief period of improved returns in 2001-2003, the returns and associated commercial landings eventually declined to the low levels observed in the mid-1990s. Although eulachon abundance in monitored rivers has generally improved, especially in the 2013-2015 return years, recent poor ocean conditions and the likelihood that these conditions will persist into the near future suggest that population declines may be widespread in the upcoming return years.	• Changes in ocean conditions due to climate change, particularly in the southern portion of the species' range where ocean warming trends may be the most pronounced and may alter prey, spawning, and rearing success. • Climate-induced change to freshwater habitats • Bycatch of eulachon in commercial fisheries • Adverse effects related to dams and water diversions • Water quality, • Shoreline construction • Over harvest • Predation

2.2.2.1 Information on the Status of Salmon and Steelhead since the 2016 Status Review

The status information presented above is from the 2015 status review. NMFS is developing a new 5-year status review for listed salmonids, green sturgeon, and eulachon. In the biological report for the previous status review, NWFSC (2015) considered population level estimates of spawning adults through about 2013. We included revised 5-year geometric means of abundance (through 2018 or 2019) for listed salmon and steelhead in the 2020 Columbia River System biological opinion (NMFS 2020) and summarize those findings in the following paragraphs, and have included the most current information here. Similar information was not available for the southern DPS of green sturgeon or the southern DPS of eulachon.

Lower Columbia River Chinook Salmon

The best available scientific and commercial data on population-level abundance indicated a mix of recent increases, decreases, and relatively static numbers of natural-origin and total spawners in 2014 to 2018 compared to the 2009 to 2013 period (Table 2.10-2 in NMFS 2020). The direction of the percent change between 5-year geometric means was even mixed within run types. For fall-run Chinook salmon, the percent change increased for the Kalama River; Lower Cowlitz River; Washougal River; Grays and Chinook Rivers; and Lower Gorge Tributaries populations and decreased for the Coweeman River; Upper Cowlitz River; White Salmon River; Clatskanie River; and Mill, Abernathy, and Germany Creek populations.

Observations of coastal ocean conditions since 2016 indicated that recent out-migrant year classes experienced below-average ocean survival during a marine heatwave and its lingering effects (Werner et al. 2017). Some of the negative effects on juvenile salmonids had subsided by spring 2018, but other aspects of the ecosystem (e.g., temperatures below the 50-m surface layer) had not returned to normal (Harvey et al. 2019). However, the degree to which abundance has been driven by below-average ocean survival or by a variety of environmental conditions and management actions in freshwater, appeared to have varied between populations of LCR Chinook salmon.

Upper Columbia River Spring-run Chinook Salmon

The best available scientific and commercial data on the adult abundance of UCR spring-run Chinook salmon indicated a substantial downward trend in the abundance of natural-origin spawners at the ESU level from 2015 to 2019 (Figure 2.6-2 in NMFS 2020). This downturn was thought to be driven primarily by marine environmental conditions and a decline in ocean productivity. Increased abundance of sea lions in the lower Columbia River could also be a contributing factor.

Population-level abundance estimates of natural-origin and total (natural- plus hatchery-origin) spawners through 2018 also showed recent and substantial downward trends in abundance when compared to the 2009 to 2013 period (Table 2.6-3 in NMFS 2020). All populations remained considerably below the minimum abundance thresholds established by the ICTRT and included substantial numbers of hatchery-origin adults.

Snake River Spring/summer Chinook Salmon

The best available scientific and commercial data on the adult abundance of SR spring/summer Chinook salmon as of 2020 indicated a substantial downward trend in the abundance of natural-origin spawners at the ESU level from 2014 to 2019 (Figure 2.2-3 in NMFS 2020). The past 3-year period, 2017 to 2019, showed the lowest returns since 1999. This recent downturn was thought to be driven by marine environmental conditions and a decline in ocean productivity. Increased abundance of sea lions in the lower Columbia River also could have been a contributing factor.

Population-level estimates of natural-origin and total (natural- plus hatchery-origin) spawners through 2018 (Table 2.2-4 in NMFS 2020) also showed recent and substantial downward trends compared to the 2009 to 2013 period for most of the MPGs and populations (exceptions were the Lemhi River, Camas Creek, and Upper Grande Ronde Mainstem). All populations except Chamberlain Creek remained considerably below the minimum abundance thresholds established by the ICTRT. For many populations, the total spawner counts included substantial numbers of hatchery-origin adults. Exceptions were the entirety of the Middle Fork MPG and several populations in the Upper Salmon MPG, where no hatchery fish are included in the spawner counts.

Upper Willamette River Chinook Salmon

The best available scientific and commercial data for UWR Chinook salmon as of 2020 were counts from the Willamette Falls adult fishway. The 2015 run was relatively large, with 51,046 total adults (9,954 natural origin), but a more recent 5-year geometric mean (2015 to 2019) indicated a decline in both natural-origin and total numbers of adults compared to the previous 5-year period (2010 to 2014; Table 2.13-1 in NMFS 2020). This recent downturn was thought to be driven by marine environmental conditions and a decline in ocean productivity. Increased abundance of sea lions in the lower Columbia River also could have been a contributing factor.

Snake River Fall Chinook Salmon

The best available scientific and commercial data for SR fall Chinook salmon indicated a substantial downward trend in the abundance of natural-origin spawners at the ESU level from 2013 to 2019 (Figure 2.5-2 in NMFS 2020). This downturn was thought to be driven by marine environmental conditions and a decline in ocean productivity. Even with this decline, overall abundance remained higher than before 2005. This ESU appears to have been less negatively affected by ocean conditions than SR spring/summer Chinook salmon.

Columbia River Chum Salmon

The best available scientific and commercial data for CR chum salmon indicated increasing trends in the abundance of both natural-origin and total spawners when compared to the 2009 to 2013 period (Table 2.9-2 in NMFS 2020). The exception was the Upper Gorge Tributaries population, which decreased in abundance. The relationship between ocean conditions and chum salmon survival is an area of active investigation. A preliminary model suggested increased adult returns in response to the same environmental indicators that predicted higher Chinook and coho salmon returns, but it failed to predict the substantial adult returns in 2016 and significantly under-predicted returns in 2017 and 2018 (Hillson 2020, Homel 2020). The above average ocean survival of chum salmon in 2016 through 2018 may have been due to their unique consumption of the types of gelatinous organisms (jellies, salps, larvaceans) that were abundant during those warm ocean conditions (Brodeur et al. 2019, Morgan et al. 2019).

Lower Columbia River Coho Salmon

The best available scientific and commercial data for LCR coho salmon were at the population level. These indicated a mix of recent increases, decreases, and relatively static numbers of natural-origin and total spawners in 2014 to 2018 compared to the 2009 to 2013 period (see (Table 2.12-2 in NMFS 2020). These findings indicated that the degree to which abundance had been driven by below average ocean survival varied between populations, as described for LCR Chinook salmon.

Snake River Sockeye Salmon

The best available scientific and commercial data for SR sockeye salmon as of 2020 indicated a substantial downward trend in the returns of hatchery-origin and natural-origin adults to the Sawtooth Valley. The 5-year geometric mean of total spawner counts declined 6 percent in 2014 to 2018 when compared to 2009 to 2013 (Tables 2.4-2 and 2.4-3 in NMFS 2020). The recent downturn was thought to be driven by marine environmental conditions and a decline in ocean productivity. However, adult returns to the Sawtooth Valley were also significantly affected by earlier than average warm water temperatures in the mainstem in 2015. And hatchery operations faced significant water chemistry issues in 2015 to 2017, which resulted in very poor survival of outplanted juveniles as they made their way through the Columbia River hydrosystem. Those hatchery practices were modified significantly, and indications were positive that water chemistry is no longer a significant source of mortality during outmigration through the hydrosystem.

Upper Columbia River Steelhead

The best available scientific and commercial data for UCR steelhead indicated a substantial downward trend in the number of natural-origin spawners at the DPS level from 2014 to 2019 (see Figure 2.7-2 in NMFS 2020). This recent downward trend is thought to be driven primarily by marine environmental conditions and a decline in ocean productivity. Increased abundance of sea lions in the lower Columbia River also could have been a contributing factor.

Population level estimates of natural-origin and total (natural- and hatchery-origin) spawners during 2014 through 2018 also showed substantial downward trends in abundance for most of the populations (the percent change was negative, but of a smaller magnitude for the Methow population) when compared to the previous 5-yr period (Table 2.7-3 in NMFS 2020). All populations remained considerably below the minimum abundance thresholds established by the ICTRT.

Lower Columbia River Steelhead

The best available scientific and commercial data for LCR steelhead as of 2020 indicated a mix, at the population level, of recent increases, decreases, and relatively static numbers of natural-origin and total spawners in 2014 to 2018 compared to 2009 to 2013 (Table 2.11-2 in NMFS 2020). However, in all cases where available, abundance estimates for 2019 were lower than the most recent 5year geometric means indicating a common driver such as poor ocean conditions.

Upper Willamette River Steelhead

The best available scientific and commercial data for UWR steelhead were from the Willamette Falls adult fishway. Fishway counts had declined dramatically since the last status review, with 2017 and 2018 counts reaching only 15 to 30 percent of the 5-year geometric mean for the years 2010 through 2014 (Table 2.14-1 in NMFS 2020). It is likely that any recent downturn was linked to poor ocean conditions, as described for other steelhead species.

Middle Columbia River Steelhead

The best available scientific and commercial data for MCR steelhead indicated a substantial downward trend in the abundance of natural-origin spawners at the DPS level from 2014 to 2019 (Figure 2.8-2 in NMFS 2020). This recent downturn was thought to be driven by marine environmental conditions and a decline in ocean productivity. Increased abundance of sea lions in the lower Columbia River also could have been a contributing factor.

Population level estimates of natural-origin and total (natural- plus hatchery-origin) spawners through 2018 or 2019 also showed recent and substantial downward trends for most MPGs and populations (exceptions were the Klickitat and Yakima River populations) when compared to the 2009 to 2013 period (Table 2.8-4 in NMFS 2020). In many cases, the most recent 5-year geometric mean in natural-origin abundance was considerably below the minimum abundance thresholds established by the ICTRT. A relatively limited number of hatchery fish was present on the spawning grounds within this DPS.

Snake River Basin Steelhead

The best available scientific and commercial data for SRB steelhead indicated a substantial downward trend in the number of natural-origin spawners at the DPS-level from 2014 to 2019 (Figure 2.3-2 in NMFS 2020). The number of natural-origin spawners in the Upper Grande Ronde Mainstem population appeared to have been at or above the minimum abundance threshold established by the ICTRT, while the Tucannon River and Asotin Creek populations remained below their respective thresholds (Table 2.3-4 in NMFS 2020). At the MPG level, SRB steelhead generally increased in abundance after the 1990s, but experienced reductions during the more recent period when ocean conditions were poor.

2.2.2.2 Summary – Status of the Listed Species

Each species of salmon and steelhead considered in this opinion is at risk of becoming endangered in the foreseeable future, with the exception of two species (UCR spring Chinook salmon, and SR sockeye salmon), which are currently endangered. Each species is ESA-listed due to a combination of low abundance and productivity, reduced spatial structure, and decreased genetic (and life history) diversity. Many of the component populations of these ESUs and DPSs are also at low levels of abundance or productivity; in many cases, decreases in the last few years are associated with poor ocean conditions. Several species have lost some of their historical population structure due to human activities, and the populations that remain in the available habitat face multiple limiting factors. Individuals from all of the ESA-listed component populations must move through or use parts of the action area at some point during their life history. Being exposed to poor baseline conditions in the action area (see Section 2.3, below) may make individual fish more vulnerable to the effects of the action.

The abundance of the southern DPS of green sturgeon is now estimated at 2,106 spawning adults, but no data are available to establish trends in population growth or decline. The greatest extinction risk for the DPS is that it consists of a single known population that spawns in a limited portion of the Sacramento River, which has been degraded by land use activities and water diversions.

The abundance of the southern DPS of eulachon is at very low levels throughout its range, including the population segment in the lower Columbia River. There was an abrupt decline in the numbers of eulachon returning to the Columbia River in the early 1990s. These improved briefly in the early 2000s, and then returned to the low levels observed in the mid-1990s. Although eulachon abundance in monitored rivers has generally improved, especially in the 2013 to 2015 return years, recent poor ocean conditions, and the concern that these conditions will persist into the future, suggest that populations may continue to decline.

2.3. Environmental Baseline

The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultations, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

2.3.1. Habitat Conditions in the Action Area

The action area encompasses the four side channels to be dredged, and disposal locations in the flow lane. For this reason, the action area is includes the four dredge prisms and the mainstem river downstream of RM 145, which will be affected by increased turbidity downstream of each side channel during dredging as well as flow lane disposal of the excavated sediments. We consider the entire action area to be estuarine habitat because it is affected by the tides, although the upstream extent of salinity intrusion is approximately RM 34 (Bottom et al. 2005).

The Columbia River estuary provides important migratory and rearing habitat for salmon and steelhead populations, as well as two ESA-listed non-salmonids that are also anadromous, green sturgeon and Pacific eulachon. Since the late 1800s, 68 to 74 percent of the vegetated tidal wetlands of the estuary have been lost to diking, filling, and bank hardening, combined with hydrosystem flow regulation and other modifications (Kukulka and Jay 2003, Bottom et al. 2005, Marcoe and Pilson 2017, Brophy et al. 2019). Disconnection of tidal wetlands and floodplains has eliminated much of the historical rearing habitat for subyearling Chinook and chum salmon and reduced the production of wetland macrodetritus that supports salmonid food webs (Simenstad et al. 1990, Maier and Simenstad 2009), both in shallow water and for larger juveniles migrating in the mainstem (PNNL and NMFS 2020).

Restoration actions in the estuary have improved access and connectivity to some floodplain habitat. From 2007 through 2019, restoration sponsors implemented 64 projects, including dike and levee breaching or lowering, tide-gate removal, and tide-gate upgrades that reconnected over 6,100 acres of historical tidal floodplain habitat to the mainstem and another 2,000 acres of floodplain lakes (Karnezis 2019, BPA et al. 2020). This represents a more than a 2.5 percent net increase in a connectivity index for habitats that are used extensively by subyearling salmon (Johnson et al. 2018, PNNL and NMFS 2020). Although yearling migrants are less likely to enter and rear in these areas, the large amounts of prey (particularly chironomid insects) exported from restored wetlands to the mainstem are actively consumed by both yearling and subyearling smolts. The resulting growth by these fish likely contributes to survival at ocean entry (PNNL and NMFS 2020). In addition to this extensive reconnection effort, about 2,500 acres of currently functioning floodplain habitat have been acquired for conservation. However, much of the historical floodplain remains sequestered behind levees, and riparian conditions along the mainstem and in secondary and side channels are highly degraded by urban, industrial, and agricultural development.

Habitat quality and the food web in the estuary are also degraded because of past and continuing releases of toxic contaminants (Fresh et al. 2005, LCREP 2007) from both estuarine and upstream sources. Historically, levels of contaminants in the Columbia River were low, except for some metals and naturally occurring substances (Fresh et al. 2005). Today, the levels in the estuary are much higher, as it receives contaminants from more than 1,000 sources that discharge into a river and numerous sources of runoff (Fuhrer et al. 1996). With Portland and other cities on its banks, the Columbia River below Bonneville Dam is the most urbanized section of the river. Sediments in the river at Portland are contaminated with various toxic compounds, including metals, PAHs, PCBs, chlorinated pesticides, and dioxin (ODEQ 2008).

Contaminants have been detected in aquatic insects, resident fish species, salmonids, river mammals, and osprey, and they are widespread throughout the estuarine food web (Furher et al. 1996, Tetra Tech 1996, LCREP 2007). Additionally, many contaminants are specifically designed to kill insects and plants, reducing the availability of insect prey or modifying the surrounding vegetation and habitats. Changes in vegetative habitat can shift the composition of biological communities; create favorable conditions for invasive, pollution-tolerant plants and animals; and further shift the food web from macrodetrital to microdetrital sources. Overall, more work is needed on contaminant uptake and impacts on salmon of different populations and life-history types.

In addition, the environmental baseline includes the impacts from dredging to maintain the FNC for commercial vessel traffic and shallow water (shoreline, slough, side channel, and wetland) dredging to maintain marinas for government (e.g., Coast Guard), commercial, and recreational vessels. Modification of the Columbia River for commercial navigation began in 1878, when the Corps began deepening the river to 20 feet–within the range of depths preferred by juvenile rearing and migrating salmonids–then deepening it to 30 feet in 1912, and 35 feet in 1935. Since 1964, the FNC is maintained at 40+ feet in depth. Under the proposed action considered in NMFS (2012), the USACE is periodically dredging nine other secondary and side channels: West Channel in Baker Bay, Chinook Channel, Hammond Boat Basin, Skipanon Channel, Skamokawa Creek, Wahkiakum Ferry Channel, Westport Slough, Old Mouth of the Cowlitz

River, and Upstream Entrance to Oregon Slough. All are degraded by periodic sediment removal, degraded water quality, and the construction, maintenance, and use of moorage facilities. As a result of these and other human activities, the lower river does not provide many areas of rearing habitats in an undisturbed state.

The hydrology of the lower Columbia River also is significantly altered from historical conditions, shifting the natural cues that salmonids rely on for spawning and outmigration behavior. Water management in the Columbia River System and other water storage projects have reduced flows below Bonneville Dam during April through July; these reductions range from average of 7 kcfs in March to 171 kcfs in June. Flow management for hydropower has increased flows during the winter months. The seasonal mainstem temperature regime also has been altered—factors include increased temperatures in tributaries throughout the basin due to flow management, water withdrawals, loss of riparian shading, point source discharges from cities and industry, and climate change. These combine with the thermal inertia of the mainstem reservoirs so that temperatures exceed 70°F during August and early September (Figure 5), affecting the later summer-run as well as early fall-run adults. Elevated temperatures have the potential to reduce the survival and productivity of adult salmon via direct lethality, migration delays, depletion of energy stores through heightened respiration, deformation of eggs and decreased viability of gametes, and increased incidence of disease (McCullough et al. 2001).

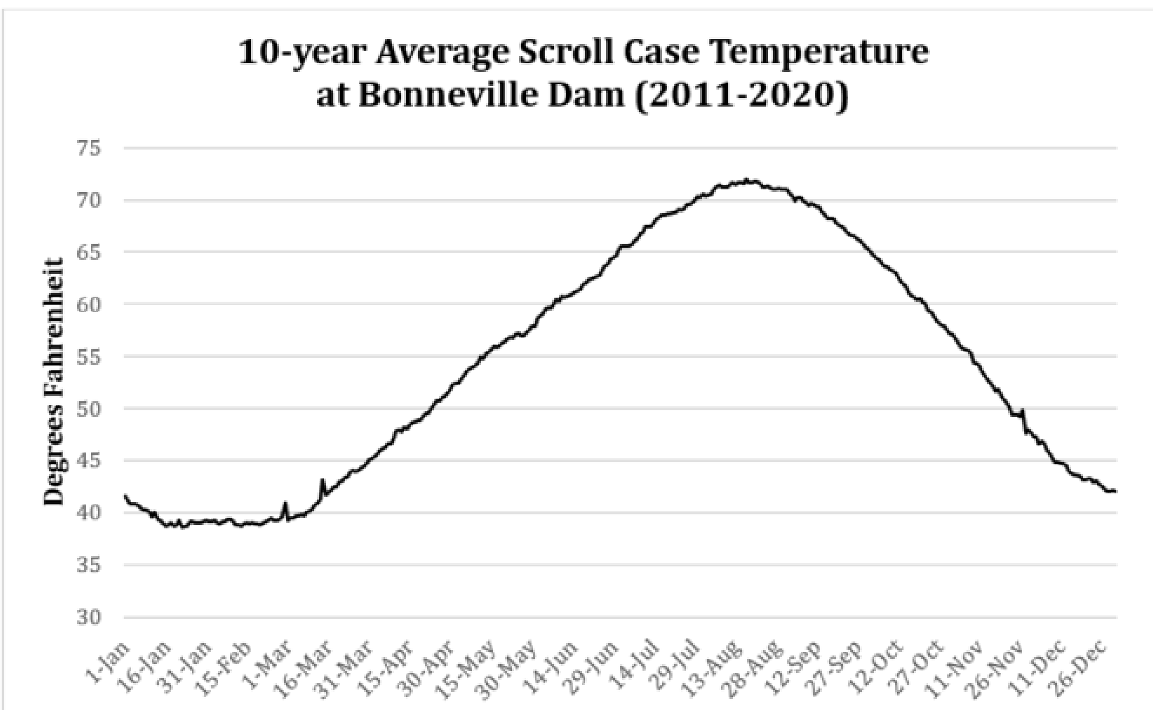


Figure 5. 10-year average temperatures in the scroll case at Bonneville Dam, 2011-2020. Source: Columbia River DART, Columbia Basin Research, University of Washington. River Environment Graphics & Text. Available from http://www.cbr.washington.edu/dart/query/river_graph_text. Accessed April 1, 2021.

The river acquires sediment as it moves downstream. Total sediment load consists of the material that travels in suspension (suspended sediment) and that which rolls and bounces along the bottom (bedload) (Simenstad et al. 1992). Suspended sediment load is mostly silt and clay, particles that can be transported by all but the lowest flows. Major freshets also can transport fine sand, which is otherwise carried downstream as bedload. Because of the exponential relationship between sediment transport and river flow, even a small reduction in peak flow during the freshet can cause a large decrease in sediment transport. Sherwood et al. (1990) calculated an average annual total suspended load for the period 1868 to 1934 (before the construction of the Federal hydrosystem) of 14.9 metric tons (MT) per year. This decreased to an estimated 7.6 MT per year in 1958 to 1981. The percent fine sand decreased from more than 50 percent before 1900 to about 33 percent for 1958 to 1981. Thus, while the model used by Sherwood et al. (1990) reduced the total input of fine sediment to the lower river by about a third between the two time periods, it reduced the input of sand (the dominant size class retained in the estuary) by a factor of three. Most of the change was attributed to flow regulation, due to the reduced intensity of the spring freshet. Although the consequences of reduced sand transport to habitat in the action area are unknown, the magnitude of the decrease indicates that there may have been a substantial effect on habitat-forming processes including those in shoreline rearing areas used by juvenile salmonids, spawning and incubation areas used by eulachon, and foraging areas used by sub-adult and adult green sturgeon.

Juvenile salmonids are vulnerable to predation by birds, fish, and marine mammals, and sea lions also prey on returning adults. A Columbia basin-wide assessment (Roby et al. 2021) of avian predation indicates that the most significant impacts on smolt survival are on steelhead and occur in the Columbia River below Bonneville Dam. Actions to reduce avian predation rates are ongoing, but this factor continues to affect juvenile survival and safe passage and refuge in rearing areas and migration corridors for salmonid ESUs and DPSs. Predation by Caspian terns (*Hydropogne caspia*) on East Sand Island is especially high for juvenile steelhead (more than 10 percent of each cohort of PIT-tagged fish passing Bonneville Dam; Chapter 1 in Roby et al. 2021). Predation on LCR Chinook salmon by double-crested cormorants (*Phalacrocorax auritis*) is also very high—up to 7 percent for the small numbers of birds that now nest on East Sand Island and even higher numbers for the colony that has moved to the Astoria-Megler Bridge (Chapter 4 in Roby et al. 2021). Rearing areas with diverse topography, including shoreline vegetation and overhanging banks, are therefore important for the functioning of rearing areas within the action area.

The native northern pikeminnow (*Ptychocheilus oregonensis*) is a significant predator of juvenile salmonids in the Columbia and Snake Rivers followed by non-native smallmouth bass and walleye (reviewed in Friesen and Ward 1999; ISAB 2011, 2015). Before the start of the sport reward fishery in the Northern Pikeminnow Management Program in 1990, this species was estimated to eat about 8 percent of the 200 million juvenile salmonids that migrated downstream in the Columbia River each year. Williams et al. (2017) compared current estimates of northern pikeminnow predation rates on juvenile salmonids to before the start of the program and estimated a median annual reduction of 30 percent. The lower Columbia River has been the highest producing zone for the pikeminnow sport reward fishery for all but one season since system-wide implementation began in 1991 (Williams et al. 2018, Winther et al. 2019). The Oregon and Washington Departments of Fish and Wildlife, which manage the non-native fish predators smallmouth bass and walleye, have removed size and bag limits for these species in their sport fishing regulations in an effort to reduce predation pressure on juvenile salmonids. Removing more of these individuals, in addition to pikeminnow, reduces predation on juvenile salmonids and the functioning of rearing and migration areas within the action area.

Predation of adult salmonids by pinnipeds has been a concern due to the general increase in sea lion populations along the West Coast and the numbers observed in the tailrace of Bonneville Dam. The Endangered Salmon Predation Prevention Act, signed into law in December, 2018, reduced restrictions on control efforts (by superseding the criteria that sea lions be individually identifiable and having a significant negative impact before lethal removal) and allowed the removal of Steller as well as California sea lions in the Columbia River and its tributaries. A permit issued by NMFS in 2020 allows three states and six tribes to kill as many as 540 California sea lions and 176 Steller sea lions between Portland and McNary Dam. According to the Oregon Department of Fish and Wildlife, the number of California sea lions feeding in the tailrace at Bonneville Dam declined from a high of 104 animals in 2003 to a low of 19 in 2019 (ODFW 2021). This indicates that control efforts are improving the survival of adult salmonids and sub-adult and adult green sturgeon and the functioning of the adult migration corridor in the action area.

The baseline also includes the future effects of Federal actions that have proceeded subsequent to section 7 consultation. During the last five years, NMFS has engaged in several Section 7 consultations on Federal projects adversely affecting ESA-listed fish and their habitats in and near the action area. These include vicinities (Multnomah County, Oregon; Clark County, Washington) adjacent to or within the action area (WCR-2019-11648, WCR-2018-10138, WCR-2017-7450, WCR-2017-6622, WCR-2016-5516), including the effects of actions addressed in programmatic consultations (the SLOPES IV programmatic consultation; NMFS number WCR-2011-05585). In general, those actions caused temporary, construction-related effects (increased noise and turbidity), and longer term effects like increasing overwater coverage. Conditions of the baseline hinder the quality of downstream migration and reduce benthic production of forage items.

All of the actions processed under the SLOPES IV programmatic consultation also include minimization measures to reduce or avoid both short- and long-term effects in the environment. These include requiring grated and translucent materials to allow light penetration, pile caps to prevent piscivorous bird perching, and limits on square footage of new overwater coverage. Actions implemented under SLOPES IV continue to have some effects that can reduce fitness[5] in a small number of individuals, and have contemporaneous minimization measures to reduce the level of habitat degradation at large. Overall effects of these SLOPES IV actions incrementally contribute to the condition of habitat in the action area under the environmental baseline and the effects of existing structures (e.g. increased shading, reduction in prey, increased predation, and possible minor migration delays).

The condition of habitat within the action area described above includes habitat features used by green sturgeon and eulachon (water quality, water quantity, depth, sediment condition, and prey quality and quantity) is described below as the condition of the PBFs of designated critical

[5] For this analysis, we define fitness as the ability to survive to reproductive age, find a mate, and produce offspring.

habitat. Information specific to green sturgeon and eulachon habitat is described below, as the condition of the PBFs of designated critical habitat.

Conditions within the Four Side Channels

In the BA, the USACE provides physical and chemical information on sediment conditions in the four side channels that it proposes to dredge (Table 6). The percent fines was relatively low in Oregon Slough (less than 9.0 percent) and relatively high in Elochoman Slough, the inner part of the Lake River dredge prism, and the inner shoal at Tongue Point.

Table 6. Physical characteristics of sediments in the four side channels considered in this opinion (USACE 2021).

	Tongue Point	**Elochoman Slough**	**Lake River**	**Oregon Slough**
Sampling date	Nov. 2019	Aug. 2015	Nov. 2018	Sept. 2020
% Silt/clay	3.6% at Outer shoal 53.% at Inner shoal	50.0	<41.0	<9.0

Contaminant testing indicated that 2 of 93 Dredged Material Management Units at Tongue Point contained diethyl phthalate at concentrations that exceeded the screening level for unconfined in-water disposal (Section 1.3). These sediments were further tested in bioassays and determined suitable for in-water disposal (USEPA 2021). No exceedances of screening levels were reported for sediments from Elochoman Slough or Lake River; results were not available for sediments from Oregon Slough at the time the BA was completed.

Beyond these physical and chemical parameters, little information is available on the current condition of fish habitat in these side channels. All four are used to access local marinas and therefore are subject to repeated human disturbance in the form of boat traffic. Boating results in discharges of pollutants and the physical disruption of wetland, riparian and benthic communities and ecosystems through the actions of a boat hull, propeller, anchor, or wake (USEPA 1993, Carrasquero 2001, Kahler et al. 2000, Mosisch and Arthington 1998). Sediment resuspension, water pollution, disturbance of fish and wildlife, destruction of aquatic plants, and shoreline erosion are the major effects pathways of concern (Asplund 2000). However, the benthic environment in these side channels has not been dredged for 30 years at Tongue Point, 40 years at Lake River, and almost 60 years in the proposed dredging prism within Oregon Slough. We expect that, in the absence of dredging, these sites have developed robust benthic communities that provide abundant prey for juvenile salmonids, and in the case of Tongue Point, green sturgeon. The channel at Elochoman Slough was dredged by Wahkiakum Port District No. 1 in 2019 (Section 1.3).

Condition of Critical Habitat for Salmonids within the Action Area.

Currently, a lack of habitat opportunity and reduced habitat quality limit the viability of salmon and steelhead in the Columbia River estuary. The amount and accessibility of in-channel and off-channel habitat have been reduced by the conversion of aquatic habitat for agricultural, urban, and industrial uses; hydroregulation and flood control; and channelization. The degraded habitat conditions in the estuary affect the abundance, productivity, spatial structure, and diversity of

ESA-listed salmon and steelhead and have led both the Oregon and Washington Management Unit recovery plans to list to estuarine habitat issues as one of six general categories of threats that limit the viability of LCR Chinook and coho salmon and steelhead and CR chum salmon. Both Management Unit plans cite water quantity and flow timing, impaired sediment and sand routing, altered channel structure, and loss or degradation of peripheral and transitional habitats in the Columbia River estuary as primary limiting factors for juveniles from all three lower river salmon ESUs and the LCR steelhead DPS (NMFS 2013).

The condition of the physical and biological features essential for conservation discussed above and summarized here in Table 7. Across the action area, widespread development and other land use activities have disrupted watershed processes (e.g., erosion and sediment transport, storage and routing of water, plant growth and successional processes, input of nutrients and thermal energy, nutrient cycling in the aquatic food web, etc.), reduced water quality, and diminished habitat quantity, quality, and complexity. Past and current land use or water management activities in subbasins that drain to the lower Columbia River have adversely affected the quality and quantity of riparian conditions, floodplain function, sediment conditions, and water quality and quantity; as a result, the important watershed processes and functions that once created healthy ecosystems for salmon and steelhead production have been weakened. Conditions in the action area have been substantially affected, and improvements may be needed before these areas function at a level that supports recovery.

Table 7. Physical and biological features (PBFs) of designated critical habitat for Columbia River basin salmon and steelhead.

Physical and Biological Feature (PBF)	Components of the PBF	Principal Factors Affecting Condition of the PBF
Freshwater spawning sites	n/a	Does not occur within the action area
Freshwater rearing sites	Water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility, water quality and forage, and natural cover.	Loss of vegetated and tidal wetland connectivity (diking, filling, bank hardening) have reduced the quantity and quality of freshwater rearing sites in the lower Columbia River estuary and the production and export of prey and organic detritus to the mainstem food web. Toxics accumulations (urban and rural development, forest and agricultural practices) have reduced water quality in freshwater rearing sites. Disruption of benthic prey communities in slough and side channel habitats (dredging, marina development and operations).

Physical and Biological Feature (PBF)	Components of the PBF	Principal Factors Affecting Condition of the PBF
Freshwater migration corridors	Free of obstruction and excessive predation, adequate water quality and quantity, and natural cover.	Alteration of the seasonal flow regime in the lower Columbia River with elevated fall and winter and reduced spring flows (hydrosystem development and operation). Reservoir releases are managed to seasonal flow objectives for juvenile fish survival given the amount of runoff expected in a given year, resulting in a small negative effect on water quantity in average- to high-flow years and a moderate negative effect in lower flow years. Alteration of the seasonal mainstem temperature regime in the lower Columbia River due to thermal inertia associated with the hydrosystem reservoirs. Temperatures are generally cooler in the spring and warmer in late summer and fall than in the predevelopment condition. This has negatively affected the functioning of water quality in the juvenile and adult migration corridors for the latest migrating subyearling smolts and the summer and earliest migrating adult fall-run Chinook salmon and summer-run steelhead populations (Appendix). Water quality in the mainstem migration corridor is not negatively modified for other adult run types (spring-run salmon and winter-run steelhead). Toxics accumulations (urban and rural development, forest and agricultural practices) have reduced water quality in freshwater rearing sites. Increased mortality on juvenile migrants due to avian predation, especially in the vicinity of East Sand Island and the Astoria-Megler Bridge. Increased mortality on adult migrants due to pinniped predation.
Estuarine areas	Free of obstruction and excessive predation with water quality, quantity, and salinity, natural cover, juvenile and adult forage.	Same as freshwater migration corridors.
Nearshore marine areas	Free of obstruction and excessive predation with water quality, quantity, and forage.	Same as freshwater migration corridors and estuarine areas.

Condition of Critical Habitat for Green Sturgeon within the Action Area
NMFS designated critical habitat for southern DPS green sturgeon from the mouth of the Columbia River to RM 46, an estuarine area. The essential features of this PBF are food resources, migratory corridors, appropriate water and sediment quality, and appropriate flow and depth to support the growth of sub-adult and adult (sexually mature) green sturgeon. We summarize the current status of these essential features is as follows:

- Prey species for green sturgeon within bays and estuaries primarily consist of benthic invertebrates and fishes, including crangonid shrimp, burrowing thalassinidean shrimp (particularly the burrowing ghost shrimp), amphipods, isopods, bivalves, annelid worms, crabs, sand lances, and anchovies (Dumbauld et al. 2008, 74 FR 52300). The types of invertebrate and fish prey favored by green sturgeon is likely to be present in the lower 46 miles of the Columbia River, but whether the abundance is adequate for the sub-adult and adult fish that are present during summer is unknown.
- Although water temperature in the lower Columbia River is affected by the existence and operation of the Federal hydrosystem's dams and storage reservoirs, temperatures in the lower 46 miles are also strongly affected by tidal exchange with the ocean. NMFS (2018a) lists the alteration of water temperatures due to climate change as a "very high" threat in coastal bays and estuaries.
- Suitable water and sediment quality requires low levels of contaminants that otherwise may disrupt the growth and survival of the sub-adult and adult life stages (74 FR 52300). Contaminants due to oil and chemical spills are a "high" threat in coastal bays and estuaries (NMFS 2018a).
- Migratory pathways must allow safe and timely passage. Ship strike, including dredge vessels and barges, is a potential source of degraded passage conditions in the Columbia River estuary.
- Sub-adult and adult green sturgeon require a diversity of depths in estuarine areas for shelter, foraging, and migration. This includes shallow depths used for feeding such as the side channel habitats in the Columbia River estuary.
- Sediment quality necessary for normal behavior, growth, and viability of all green sturgeon life stages includes sediments free of elevated levels of contaminants, such as PAHs and pesticides (74 FR 52300). The USACE's pre-dredging sediment analysis for Tongue Point detected diethyl phthalates at concentrations requiring further testing in 2 of the 93 Dredge Material Management Units (Section 1.3). The same testing of sediment samples from the dredge prism in Elochoman Slough indicated that the material was adequate for unconfined, in-water disposal. The remainder of the action area that is within designated critical habitat for green sturgeon is the flow lane of the mainstem Columbia River below RM 46. Sediment quality is likely to vary throughout this reach.

Condition of Critical Habitat for Eulachon within the Action Area
NMFS designated critical habitat for southern DPS eulachon in the lower Columbia River up to Bonneville Dam and in some tidally influenced areas including the lower reaches of the Elochoman River. The environmental baseline for the PBFs for eulachon critical habitat is reflected in the effects on the physical and biological features needed for conservation discussed above (e.g., mainstem flows, water quality, and predation) and summarized in Table 8.

Table 8. Physical and biological features (PBFs) of designated critical habitat for the southern DPS eulachon.

Physical and Biological Feature (PBF)	Components of the PBF	Principal Factors Affecting Condition of the PBF
Freshwater spawning and incubation sites	Water flow, quality, and temperature conditions and substrate supporting spawning and incubation, and with migratory access for adults and juveniles.	Less fine sediment and sand available to replenish habitat along the margins of the river, at least as far downstream as the Willamette River confluence (hydrosystem development and operations). Altered mainstem flow regime, generally increasing winter flows (November through March), when eulachon are present, and reducing peak spring flows (May and June) (water management). Altered mainstem water temperatures (generally increasing minimum winter temperatures, during spawning season, and decreasing spring temperatures) (hydrosystem development and operations; climate change). Alteration of mainstem spawning and incubation habitat by dredging (navigation). Increased levels of toxic contaminants (land use, industrial development). Increased levels of nutrients and fecal bacteria, lower dissolved oxygen in shoreline areas near leaking septic systems (rural residential and urban development). Risk of injury or mortality for adults that pass Bonneville Dam (most likely through the navigation lock) and fallback downstream [Jan-Mar] (hydrosystem development and operations). Increased exposure of eggs and larvae to total dissolved gas for greater than 35 miles downstream of Bonneville Dam for late migrants that are still in the mainstem when spring spill operations begin on April 10 (hydrosystem development and operations).
Freshwater and estuarine migration corridors	Free of obstruction and with water flow, quality, and temperature conditions that support larval and adult mobility, and with abundant prey items supporting larval feeding after the yolk sac is depleted.	Risk of injury or mortality for adults that pass Bonneville Dam (most likely through the navigation lock) and fallback downstream [Jan-Mar] (hydrosystem development and operations). Loss of a large proportion of the estuarine floodplain (agricultural, rural residential, urban, and industrial development). Recent floodplain reconnection projects are expected to support the production of eulachon prey (phytoplankton) in the lower river by improving the flux of organic material and nutrients (habitat restoration).

2.3.1.1 Summary of Habitat Conditions and Designated Critical Habitat in the Action Area

Under the environmental baseline, the fish from the component populations of each salmonid ESU and DPS that move through and use the action area will encounter habitat conditions degraded by a modified flow regime, reduced water quality from substantial chemical pollution, loss of functioning floodplains and secondary channels, and loss of vegetated riparian areas and associated shoreline cover. The significance of this degradation is reflected in the limiting factors described in recovery plans: insufficient access to floodplain and secondary channels, degraded habitat, loss of spawning and rearing space, pollution, and increased predation. We do not know of habitat conditions in the action area that limit the likelihood of survival and recovery for green sturgeon. Habitat conditions for eulachon are affected by hydrosystem operations and dredging and disposal activities that affect the quantity and quality of substrate for egg and larval development.

Likewise, the environmental baseline does not fully support the conservation role of designated critical habitat for the listed species. The PBFs within the action area that are essential for the conservation of salmon and steelhead include freshwater rearing sites, freshwater migration corridors, and estuarine rearing areas. Despite the degraded conditions, conservation value is high because migration is an obligate role for the habitat to maintain adult access to spawning areas, and juveniles to maintain access to the ocean to complete their life history demands. The Action Agencies and other Federal and non-Federal entities have taken actions in the last two decades to improve the functioning of some of these PBFs. Projects that have protected or restored riparian areas and breached or lowered dikes and levees in the estuary have improved the functioning of rearing sites and the juvenile migration corridor. However, habitat conditions as a whole remain highly modified and the factors described above continue to have negative effects on these PBFs. The estuarine PBF of critical habitat for green sturgeon within the action area is negatively affected by ship traffic and sediment contaminants, and the abundances of preferred prey are unknown. Similarly, the loss of sand due to the existence and operation of the hydrosystem and dredging of the navigation channel and potentially, some side channels, has negatively affected the PBF of substrate in freshwater spawning and incubation sites for eulachon.

2.3.2. Species in the Action Area

All 13 species of ESA-listed Columbia basin salmon and steelhead, and all of their component populations, migrate through the action area. Subyearling Chinook salmon from the Lower Columbia River and Upper Willamette River ESUs and Columbia River chum rear along the shoreline for weeks or months and are exposed to impaired habitat conditions within the action area for much of the juvenile life stage. The larger side channels like the ones that the Corps proposes to dredge for this project, are likely to be important to these fish for foraging and resting where there is no adjacent floodplain wetland, or the wetland is not inundated (e.g., during periods of low tides or low mainstem flow; Roegner et al. 2021).

Large yearling Chinook, coho, and sockeye salmon and steelhead from the interior Columbia basin move through the mainstem relatively quickly on their way to the ocean. However, yearling Chinook from lower river genetic stocks use side channels between islands and the

Oregon and Washington shorelines (Johnson et al. 2015, Sather et al. 2016). Juvenile ESA-listed species also have a wide horizontal and vertical distribution in the Columbia River related to size and life stage. Juvenile salmonids occupy the width of the river, from the surface to average depths of 35 feet (Carter et al. 2009). The likely ESUs and DPSs of Columbia basin salmonids that are likely to be present during the 1 August through 15 December IWWW are shown in the Appendix.

Upstream migrating adult salmonids, especially summer-, fall-, and winter-run fish, migrate along the shoreline or in the channel during the period when the USACE proposes to dredge side channels and release the excavated material in the flow lane (Appendix).

Sub-adult and adult southern DPS green sturgeon migrate seasonally along the West Coast, congregating in bays and estuaries, including the lower Columbia River, during the summer and fall. Individual green sturgeon exhibit diel movements, using deeper water during the day and moving to shallower water during the night to feed (Moser and Lindley 2007). Little is known about green sturgeon diet in estuaries or in the coastal ocean. A very limited sample of green sturgeon stomachs in the Columbia River found mostly crangonid shrimp and some thalassinid shrimp (Dumbauld et al. 2008). The presence of these prey species suggests the sampled green sturgeon fed in the saline and brackish water reaches in the lower Columbia River estuary. However, ODFW (2020) reports occasional incidental catches green sturgeon in commercial gillnets above RM 46 during summer and even young-of-year fish in its own gillnet sampling for sturgeon during the fall. Many of these, and four young-of-year fish captured during the state's gillnet sampling for white sturgeon, are from the unlisted northern DPS (Schreier and Stevens 2020).

Eulachon also migrate through the action area, both as adults and larvae. Adult migrations can occur as early as November or as late as June. Peak spawning typically occurs between January and March, but can occur in December. Eggs are fertilized and drift downstream, adhering to sand and small gravels, and hatch in 3 to 8 weeks depending on water temperatures. Larvae are transported downstream and after rearing in the estuary for an unknown amount of time, move to the ocean (NMFS 2017c).

Because all of the ESA-listed species considered in this opinion must migrate through the action area, all are exposed to the degraded baseline conditions. Salmonids that spend months rearing in the action area (subyearling LCR and UWR Chinook and CR chum salmon) are exposed for a significant portion of their life cycle. These conditions may negatively affect the condition of individuals that also will be exposed to the effects of the proposed action, and may influence the nature and degree of their response.

2.4. Effects of the Action

Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.17). In our analysis, which describes the effects of the proposed action, we considered 50 CFR 402.17(a) and (b).

The effects of the action include the effects on habitat that fish will experience and respond to, and effects on the fish themselves. The effects on habitat include: (1) reduced safe passage conditions in migration and rearing areas for salmonids, estuarine areas for green sturgeon, and migration and spawning and incubation areas for eulachon because of entrainment risk, (2) water quality reductions in rearing and migration areas for salmonids contemporaneous with the dredging and disposal activities, but abating within hours post-work, and (3) prey reductions in juvenile salmonid rearing areas and estuarine areas for green sturgeon that persist for uncertain periods of time (weeks to months, and potentially years) post-dredging.

2.4.1 Entrainment

In this analysis, entrainment refers both to the uptake of aquatic organisms by dredge equipment and the transport of organisms by the downward motion of sediments during in-water disposal. Both mechanical and hydraulic dredges commonly entrain slow-moving and sessile benthic epifauna along with the burrowing infauna that are removed with the sediments.

Critical Habitat

Safe passage conditions are a feature of designated critical habitat where the role of the habitat is to serve migration. Here the action area serves a migration role for all 15 ESA-listed species. Entrainment risk is a consequence both from the dredging and the placement of dredge materials. Mechanical dredges can entrain organisms by capturing them in the clamshell or backhoe bucket. Hydraulic dredges can entrain organisms by suction as sediment and water are pumped into the draghead or cutterhead. Both types of dredge reduce safe passage. The release of dredged sediments from the bottom of a barge or placement pipe can also entrain organisms by catching them in currents created as the discharge descends through the water column. A barge releases a substantial amount of sediment into the flow lane at one time, compared to a pipeline that continuously releases smaller amounts of material while the dredge is operating. Thus, the risk of entrainment in the flow lane is higher for material released from a barge than from a pipeline.

The timing of dredge and disposal activities affects the project's influence on migration values for a given species. If equipment is dredging or depositing dredged materials when fish are migrating to or from the ocean, then safe passage in that habitat will be diminished for that species. And safe passage conditions in the migration corridor may be diminished for one life stage of a species, but not another. Based on the 1 August to 15 December IWWW and the life history timing in the action area for each species (Appendix), we anticipate the safe passage element will be negatively affected each year that dredging occurs over the 25-year duration of the proposed action for the following PBFs:

- LCR Chinook salmon—juvenile and adult migration corridors, rearing areas
- UCR spring-run Chinook salmon—juvenile migration corridor, rearing areas
- UWR Chinook salmon—juvenile migration corridor
- SR spring/summer Chinook salmon—juvenile and adult migration corridors
- SR fall Chinook salmon—juvenile and adult migration corridors

- CR chum salmon—adult migration corridor, rearing areas
- LCR coho salmon—juvenile and adult migration corridors
- SR sockeye salmon—juvenile migration corridor
- MCR steelhead—juvenile migration corridor
- UCR steelhead—juvenile migration corridor
- UWR steelhead—juvenile migration corridor
- SRB steelhead—juvenile migration corridor
- SDPS green sturgeon—sub-adult and adult migration corridors (to over-summering habitat)

Safe passage in the adult migration corridor will also be negatively affected for SDPS eulachon. In addition, the functioning of migratory access to spawning and incubation sites will be disrupted if eulachon would otherwise spawn in one or more of the four side channels during the IWWW (e.g., if the USACE is dredging during early December).

Exposure and Response of Salmonids to Entrainment

In order to be entrained, highly mobile organisms such as adult and yearling salmonids must be directly in the path of a bucket or backhoe or within the suction area for a hydraulic cutter or draghead. This exposure will occur in a small area at any given time, compared with the distribution of fishes across the available habitat. Further, mechanical dredges move slowly during dredging operations, with the barge staying in one location for up to several hours, while the bucket or backhoe is repeatedly deployed within that area. Studies confirm the entrainment of fish and other organisms by hydraulic dredges (Armstrong et al. 1981; Boyd 1976; Dutta and Sookachoff 1975; R2 Resource Consultants 1999). Although there is evidence of fish surviving entrainment (Armstrong et al. 1981), entrainment is often fatal. This is not surprising, especially for larger organisms that are likely to be impacted by the cutterhead and/or pump impellers, before being dumped along with the dredged material into a hopper or onto a disposal area. Hopper dredges operate for prolonged periods, generating continuous fields of suction forces around and under the dragheads while they are pulled along the substrate at relatively high speed as compared to other dredge methods. Entrainment of fish and other mobile organisms by a hopper dredge is believed to occur most often when the dragheads are out of firm contact with the channel bottom (Reine and Clarke 1998). Typical operations require the initial run-up of the pumps before the dragheads contact the bottom, and the pumps are operated with the dragheads raised from the bottom at the end of a run to clear the dragarms. Other situations that may cause the loss of firm contact with the bottom include increases in depth that exceed the draghead's ability to remain flat against the bottom, along with wave action that may periodically pull the draghead away from the bottom. The potential for entrainment also increases with increased dredge size and flow (suction) rates.

Hydraulic pipeline dredges also entrain fish, especially smaller fish that are less able to swim against the powerful currents near the cutterhead, which is often unshrouded. Several studies confirmed entrainment of juvenile salmon by hydraulic pipeline dredging in the Fraser River (Boyd 1976; Dutta and Sookachoff 1975).

We expect that most of the large fish that are in the vicinity of a dredge at the start of operations are likely to swim away to avoid the noise and activity. Therefore, we consider it highly unlikely that any of the adults and very few of the yearling salmonids considered in this opinion would be entrained by the dredges. The risk of entrainment, and injury or death, is higher for the small subyearlings because it is influenced by the swimming stamina and size of the individual fish (Boysen and Hoover 2009). Small, subyearling Chinook and chum salmon from lower river spawning areas (i.e., populations of LCR and UWR Chinook salmon and CR chum salmon) will be present during the IWWW, with some individuals rearing in or moving through each side channel during excavation. We are unable to estimate the numbers of these fish that will be injured or killed through this pathway, but assume that the magnitude of exposure to and the likelihood of entrainment is a function of the expected days of operation and the frequency of dredging, combined with the volume of material to be dredged (Table 2). Therefore, we anticipate that entrainment will reduce the fitness (likelihood of surviving to adulthood, mating, and producing offspring) of some individuals of each of the salmonid species over the 25-year period of dredging activities.

Excavated sediments that are approved for in-water disposal would be released in the flow lane between RM 3 and 145 at a depth below 20 feet.[6] As dredged material is released from the bottom of a barge, it falls through the water column and mixes with the ambient water to create a plume (USACE 2005). When the diluted material hits the bottom, it spreads out until its energy is expended and then slowly settles out under the influences of gravity and local currents. A 6-inch fish could be dragged downward with the plume, but would most likely be displaced laterally, parallel to the bottom, as the plume reached the boundary layer. Disposal from a pipeline dredge would be less forceful, but continuous while the dredge is operating. River flow (and tidal flushing in the flow lane near the Tongue Point site) are likely to alleviate exposure to the discharged material (Wilber and Clark 2001). Consequently, the likelihood that a juvenile or adult salmon would be harmed or killed by entrainment during flow lane disposal is low.

Based on migration timing and the 1 August through 15 December IWWW, summer- and fall-run adult salmonids and subyearling juveniles could encounter downward falling sediment plumes during flow lane disposal. We estimate the magnitude of exposure and the likelihood of entrainment for these fish by the expected days of operation and the frequency of dredging, combined with the volume of material to be dredged and then released in the flow lane (Table 2). Therefore, we anticipate that flow lane disposal will reduce the fitness of exposed individuals over the 25-year period of dredging activities.

Exposure and Response of Green Sturgeon to Entrainment

Green sturgeon are likely to be in the lower reaches of the Columbia River estuary during April or May through October. Hansel et al. (2017) reported that numbers detected on acoustic arrays were highest in August and September. This indicates that some adults and sub-adults could be in the vicinity of dredging and flow lane disposal activities at Tongue Point and Elochoman Slough, which are within or close to the saline zone of the lower river.

The sub-adult and adult green sturgeon that gather in non-natal Pacific Northwest estuaries range between 2.5 and 8.5 feet in length (Moser et al. 2016). Although highly mobile and known to make vertical migrations in the water column, these fish exhibit behaviors that increase their risk

[6] The USACE would dispose of any sediments that are not approved for in-water disposal (i.e., due to contaminant concentrations that exceed screening levels) in upland areas.

of entrainment. As benthic feeders they are most often found on or near the bottom, while foraging or moving within river and estuarine systems. In Grays Harbor and Willapa Bay, adults and sub-adults were captured in the deepest available habitats, but made forays over the mud flats to feed (O. Langness, Washington Department of Fisheries, Vancouver, WA, unpublished data; cited in Moser et al. 2016).

Although the entrainment of sub-adult and adult sturgeon by suction dredging is relatively rare,[7] it has been documented in projects on the east coast. During hydraulic dredging in Delaware River Ship Channel, a 5.7-foot long Atlantic sturgeon was fatally entrained in 2014, and a 3-foot long short nose sturgeon was fatally entrained in 2017 (NMFS 2017d). A 4-foot long Atlantic sturgeon was also fatally entrained in a hopper dredge operating in the Charleston Entrance Channel in April 2016 (USACE 2016, as cited in NMFS 2018b). Five Atlantic sturgeon were entrained and killed during the first two years of dredging in Savannah Harbor, Georgia, despite pre-trawling the dredging area and capturing and releasing 17 Atlantic sturgeon. NMFS hypothesized that these sturgeon were exposed to entrainment because the project included sustained intense dredging within a relatively small area. Sturgeon also may have been attracted to the newly-dredged area if it stirred up benthic organisms and provided good foraging habitat. These conditions could pertain to dredging in the side channels, especially because maintenance has been deferred for a numbers of years and benthic organisms such as burrowing shrimp and clams may be present.

Green sturgeon are most likely to be in the lower Columbia River and exposed to dredging activities during the first months of the IWWW, August and September. Similar to salmonids, we are unable to estimate the number of green sturgeon that will be entrained and injured or killed. We estimate the magnitude of exposure and the likelihood of adverse response of green sturgeon to entrainment during dredging by the volume of material to be dredged at each site, the expected days of operation per dredging event, and the frequency of dredging (Table 2). The risk is very low for the Oregon Slough and Lake River project areas because of their distance from the mouth of the river. Therefore, we anticipate that a few green sturgeon will experience fitness level consequences during each dredging event over the 25-year action.

We expect that low numbers of sub-adult and adult green sturgeon will be affected by the disposal of sediments in the flow lane. These fish remain on or close to the bottom and over 25 years of operations, some individuals could be under a barge at the time of release. Flow lane disposal from a pipeline dredge will result in continuous exposure while the dredge is operating (Wilber and Clark 2001), but river flow (and tidal flushing near the Tongue Point site) is likely to alleviate exposure to discharged sediment. Exposure is also limited by the IWWW; based on migration timing for sub-adults and adults in Pacific Northwest estuaries, exposure to disposal activities would be very low after September.

Thus, the risk that sub-adult or adult green sturgeon would be injured or killed due to entrainment during disposal is low. We estimate the magnitude of exposure and the likelihood of adverse response of green sturgeon to entrainment during sediment disposal by the expected days of operation at each site per dredging event and the frequency of dredging, combined with the volume of material to be released in the flow lane (Table 2). Assuming that flow lane disposal

[7] See, for example, Stanford et al. (2009).

would take place near each dredged side channel, the risk of entrainment is very low for material dredged from the Oregon Slough and Lake River project areas because of their distance from the mouth of the river. Therefore, we anticipate that very few if any green sturgeon would experience reduced fitness due to flow lane disposal over the 25-year period of the proposed action.

Exposure and Response of Eulachon to Entrainment

Adult eulachon begin to enter the Columbia River during December, so that the earliest migrants (before December 15th) could encounter both the dredging equipment and the sediment plumes created during flow lane disposal. If early migrants begin spawning, incubating eggs will also be affected, with the highest risk in Elochoman Slough and Lake River, which are near major spawning areas.

We expect that low numbers of adult eulachon and their eggs would be entrained and killed by the proposed dredging and flow lane disposal activities. The magnitude of exposure and the likelihood of an adverse response to entrainment during dredging are represented by the expected days of operation at each site per dredging event and the frequency of dredging, combined with the amount of material to be dredged (Table 2). For entrainment into sediment plumes during disposal we estimate the magnitude of exposure and the likelihood of adverse response by the expected days of operation at each site per dredging event and the frequency of dredging, combined with the volume of material to be dredged and then released in the flow lane. These are conservative estimates of exposure and of the risk of injury or mortality, because only the earliest migrants and spawners would be present during the IWWW. Therefore, we anticipate reduced fitness to a few individuals that may overlap with dredging footprints over the 25-year action.

2.4.2. Degraded Water Quality

Critical Habitat

Water quality is a feature of critical habitat supporting migration for all juvenile and adult fish considered in this opinion; rearing for LCR and UWR Chinook salmon, CR chum salmon, LCR coho salmon, and LCR steelhead; and over-summering habitat for sub-adult and adult green sturgeon. Water quality is likely to be moderately degraded during dredging and disposal activities. Degradation will take the form of temporary increases in suspended sediments (measured as turbidity) and at least in the case of Tongue Point, the mobilization of small amounts of the contaminant diethyl phthalate into the water column. Where the material within the dredge prism is high in silt and clay (e.g., 53 percent for the inner shoal at Tongue Point, 50 percent at Elochoman Slough, and 41 percent at Lake River; Table 6), dredging may mobilize organic material and temporarily reduce dissolved oxygen levels in the water column. The amount of sediment that will be suspended in the water column, as well as the duration and extent of a turbidity plume will depend on the composition of the sediments, the method of dredging, and the movement of the water (including tidal forces). The finer the sediment, the longer those particles will remain suspended. The faster the current, the greater distance the turbidity plume will extend from the activity, although at lower suspended sediment concentrations.

We are unable to estimate the concentrations of suspended sediment that dredging the side channels may generate, or the length of time different concentrations are likely to persist. The amount of suspended sediment will also depend on the type of dredge used. Both mechanical and hydraulic dredges may be used in the side channels depending upon availability and cost (USACE 2021). Using a hydraulic dredge would reduce the potential for large turbidity plumes within the side channels because the mobilized sediments are sucked into the dredge. Conversely, the clamshell and backhoe buckets used during mechanical dredging would mobilize sediments across the full depth of the water column as the equipment is pulled through the water. The turbidity plumes from dredging and in-water disposal of sands (e.g., the outer shoal at Tongue Point and the Lake River dredge prism; Table 6) are expected to be both localized and short-lived (hours) compared to the finer-grained sediments mobilized at the other project sites, which would stay suspended for longer periods of time (i.e., more hours).

The USACE will periodically analyze bottom sediments in these side channels for contaminants over the 25-year term of the proposed action. If dredged sediments are contaminated, such as the diethyl phthalate detected in two of the 93 Dredged Material Management Units sampled at Tongue Point in November 2019 (USACE 2021), these compounds will be mobilized into the water column during dredging. The affected sediments from Tongue Point have undergone bioassay testing and are suitable for in-water disposal per the USACE's Sediment Evaluation Framework (USEPA 2021).

Mobilization of anaerobic sediments into the water column may cause an oxygen demand that decreases dissolved oxygen (DO) levels (Hicks et al. 1991, Morton 1977). However, the dispersal of excavated material in the flow lane is not likely to decrease dissolved oxygen concentrations in the mainstem.

Based on their presence in the action area during the IWWW, the influence of these reductions in water quality varies for the 15 species. There will be small, temporary reductions in the water quality component of the migration corridor PBF within the dredging prisms and at the flow lane disposal sites, for up to 900 feet downstream (and 900 feet upstream in areas with tidal influence) for brief periods each year over the 25-year duration of the proposed action for the following PBFs:

- LCR Chinook salmon—juvenile and adult migration corridors
- UCR spring-run Chinook salmon—juvenile migration
- UWR Chinook salmon—juvenile migration corridor
- SR spring/summer Chinook salmon—juvenile and adult migration corridors
- SR fall Chinook salmon—juvenile and adult migration corridors
- CR chum salmon—adult migration corridor
- LCR coho salmon—juvenile and adult migration corridors
- SR sockeye salmon—juvenile migration corridor
- MCR steelhead—juvenile migration corridor
- UCR steelhead—juvenile migration corridor
- UWR steelhead—juvenile migration corridor
- SR steelhead—juvenile migration corridor

- SDPS green sturgeon—sub-adult and adult migration corridors (to over-summering habitat)
- SDPS eulachon—adult migration, spawning and incubation sites

In addition, water quality in rearing areas will be temporarily diminished each year during the IWWW for LCR and UWR Chinook and CR chum salmon. Although there is significant uncertainty regarding the extent and magnitude of the negative effects, the short-term nature of the exposure indicates that the functioning of the water quality component of rearing sites will not be substantially affected.

Exposure and Response of Salmonids to Degraded Water Quality

Water quality reductions due to dredging and disposal activities will occur when summer- and fall-migrating adult salmon (LCR Chinook [fall- and late-fall run populations], SR spring/summer Chinook [summer-run populations], SR fall Chinook, CR chum, and LCR coho) and subyearling LCR and UWR Chinook and CR chum salmon are present (Appendix). Some individuals from each of these ESUs will be present during dredging and disposal activities and thus exposed to altered water quality. Water temperatures during August and early September, the early part of the IWWW, are some of the warmest in the lower Columbia River, often exceeding 70°F in recent years. Thus, some individuals are likely to experience thermal stress contemporaneous with the effects of the proposed action.

The USACE will limit exposure to increased levels of suspended sediments by implementing turbidity monitoring, and pausing dredging activities when levels exceed background by the amounts specified in the proposed action (see Table 3). As a result, we expect that exposures to elevated sediment concentrations will be brief and will elicit only low-level responses such as avoidance of the turbidity plume, and temporary minor physiological responses such as gill flaring (coughing), temporarily reduced feeding rates and success, and moderate levels of stress. Therefore, we do not anticipate fitness consequences to adult summer and fall migrants.

Juvenile salmonids are more sensitive to suspended sediment than adults, and warm water increases their sensitivity. Their metabolic demand for oxygen increases with the need to perform repeated coughing, but warm water holds less dissolved oxygen (Muck 2010). Under these circumstances (e.g., during dredging activities in August and September), even small increases in oxygen demand (e.g., for stress responses and avoidance of the turbidity plume), can result in reduced foraging capability; reduced growth and resistance to disease; physical abrasion; clogging of gills; and interference with orientation in homing and migration (Kjelland et al. 2015).

Where dredging has been deferred and the fine sediment proportion is high (e.g., the inner shoal at Tongue Point and at Lake River), organic carbon is likely to have accumulated. The resuspension of these types of sediments within a semi-enclosed side channel can decrease dissolved oxygen in the water column due to the need for oxygen to decompose the organic material (Kjelland et al. 2015). Avoidance reactions, observed when dissolved oxygen levels drop below 8.0 mg/l (WDOE 2002), could drive small juveniles rearing in these areas from preferred foraging areas, exposing them to increased risk of predation. Hostetter et al. (2012) found that the susceptibility of steelhead to Caspian tern predation increased significantly during periods of decreased water clarity (increased turbidity), along with other factors. Thus, small numbers of LCR and UWR Chinook salmon and CR chum salmon that are rearing in these channels are likely to experience reduced fitness, especially if the exposure is contemporaneous with elevated temperatures, due to degraded water quality.

Carlson et al. (2001) used hydroacoustics to document the behavioral responses of salmonids to dredging activities in the mainstem Columbia River (e.g., the flow lane). The responses of out-migrating smolts (likely fall Chinook and coho salmon) included moving inshore when they encountered dredging operations and moving offshore when they encountered the discharge plume. These fish assumed their former distributions within a short time, indicating that they could avoid areas where suspended sediment concentrations were above background. Thus, we expect that larger juvenile salmonids moving downstream in the flow lane during the IWWW will be able to avoid areas of reduced water quality and will not experience reduced fitness.

We do not expect adverse decreases in dissolved oxygen at the flow lane disposal sites where the material will be quickly dispersed and diluted.

Although we expect that most of the sediments that would be dredged will be free of contaminants, diethyl phthalates have been detected in two of 93 Dredged Material Management Units at Tongue Point. Adults and juveniles that are present in at least that part of the action area during the IWWW would be exposed to mobilized material for very brief periods before it moved downstream and became diluted in the water column. We do not expect that any of these individuals will experience decreased fitness.

We estimate the magnitude of exposure and the likelihood of adverse response of juvenile and adult salmonids to degraded water quality by the expected days of operation at each site per dredging event and the frequency of dredging, combined with the volume of material to be released in the flow lane (Table 2).

Exposure and Response of Green sturgeon to Degraded Water Quality

Green sturgeon are relatively tolerant of elevated suspended sediment concentrations. They are typically found in turbid conditions, and forage by stirring up sediments to access benthic prey such as burrowing shrimp. Wilkens et al. (2015) demonstrated that closely related Atlantic sturgeon experienced no significant effects from three days of continuous exposure to suspended sediment concentrations of up 500 mg/L. Their tolerance of relatively high levels of suspended sediment suggests that this exposure would not affect the fitness of sub-adult or adult fish during the proposed dredging and disposal activities.

Green sturgeon in the Tongue Point side channel are likely to be exposed to low concentrations of diethyl phthalate during dredging of 2 of the 93 Dredge Material Management Units at that site. We expect the exposure of green sturgeon to be so brief, before that material moves downstream and becomes diluted in the water column, that it will not affect individual fitness.

Green sturgeon could also be affected by contaminants that have been taken up by benthic prey, especially if the act of dredging makes these organisms more available. The long life span and late age at maturity of green sturgeon make them vulnerable to chronic and acute effects of bioaccumulation. A fish contaminant survey of the Columbia River basin between 1996 and 1998 found white sturgeon to have the highest contaminant concentrations of all the species tested, including various salmonids, two sucker species, walleye, pacific lamprey and eulachon (USEPA 1999). Because of their extensive marine migratory phase, green sturgeon are less exposed to concentrated anthropogenic contaminants than white sturgeon, but the potential for exposure increases when green sturgeon enter freshwater during summer (COSEWIC 2004). We expect that the proposed dredging, especially in the Tongue Point and Elochoman Slough side channels, closer to the ocean, would expose small numbers of individuals to low concentrations of contaminants, with very minor effects on fitness.

Some sub-adult and adult green sturgeon could briefly be exposed to waters within the side channels with reduced DO during dredging activities. The effects of this exposure are uncertain, but could include reduced swimming and foraging and avoidance of the area. However, the number of exposed individuals is likely to be low, and they are unlikely to experience reduced fitness given their relatively large size and mobility.

Dredging has been deferred at the proposed sites for a number of years, and especially where the fine sediment proportion is high (the inner shoal at Tongue Point and Elochoman Slough), anaerobic sediments may have accumulated. We expect exposure to low dissolved oxygen concentrations to be very brief and the effects on sub-adult and adult green sturgeon would most likely be temporary avoidance of the affected area with no detectable effects on the fitness of an exposed individual.

We estimate the magnitude of exposure and the likelihood of adverse response of sub-adult and adult green sturgeon to degraded water quality by the expected days of operation at each site per dredging event and the frequency of dredging, combined with the volume of material to be released in the flow lane (Table 2).

Exposure and Response of Eulachon to Degraded Water Quality

Many eulachon exposed to dredging-related suspended sediments would most likely be moving past the dredging sites during their upstream migration. The duration of their exposure to turbidity above background levels would be measured in minutes or a few hours. However, adults migrating to spawning areas in the Elochoman River are likely to experience longer exposures. Because eulachon are known to spawn, and larvae survive, in naturally turbid glacial rivers in Alaska (NMFS 2017c). Thus, we expect exposure to elevated suspended sediments to elicit only low-level behavioral effects in adults such as avoidance of the sediment plume, and temporary minor physiological effects such as gill flaring (coughing), temporarily reduced feeding rates and success, and moderate levels of stress. We anticipate little to no consequence to individual fitness of adults and their eggs.

If dredged sediments are contaminated (e.g., the diethyl phthalates in two of the 93 Dredge Material Management Units at Tongue Point), these compounds would be mobilized into the water column during dredging and disposal. Eulachon and any eggs present during December, at the start of the spawning run, could then be exposed to contaminants. However, exposure would be very brief before that material moved downstream and became diluted in the water column.

Effects on the condition of adults and eggs in the side channels or the flow lane disposal sites are expected to be minor, with no consequences to fitness.

Some adults and eulachon eggs could be exposed to waters within the side channels with reduced dissolved oxygen during dredging activities. The effects of this exposure are uncertain, but could include reduced swimming and foraging of adults and possible avoidance of the area. Eulachon will not be present during summer, when warm temperatures exacerbate dissolved oxygen conditions. In addition, the number of exposed individuals is likely to be low. Some early spawners could lay eggs in areas that will be exposed to reduced dissolved oxygen conditions during dredging, but those eggs are likely to be lost due to disruption of the benthos in any case. Therefore, we anticipate minimal consequences of reduced dissolved oxygen concentrations to the fitness of individuals.

The planktonic prey of adult eulachon could be affected by degraded water quality, but the degree of effect is unknown. We anticipate that eulachon will forage in other areas, away from the degraded water quality with little effect on individual fitness.

In summary, we expect that low numbers of adult eulachon and their eggs would be exposed to degraded water quality during the proposed dredging and flow lane disposal activities. We estimate the magnitude of exposure and the likelihood of an adverse response during dredging by the expected days of operation at each site per dredging event and the frequency of dredging, combined with the amount of material to be dredged (Table 2). For exposure to degraded water quality during disposal we estimate the magnitude of exposure and the likelihood of adverse response by the expected days of operation at each site per dredging event and the frequency of dredging, combined with the volume of material to be dredged and then released in the flow lane (Table 2). These are conservative estimates of exposure and of the risk of injury or mortality, because only the earliest migrants and spawners would be present during the IWWW.

2.4.3 Altered Benthic Habitat and Reduced Foraging Opportunity

Critical Habitat

Prey is a biological feature of the juvenile salmonid migration corridor and rearing habitat PBFs. We have preliminary information on the benthic community in the secondary channel behind Woodland Islands before dredged material placement and at two nearby reference sites (Sather 2020). The Woodland Islands samples were dominated by amphipods and nematodes and the reference sites by insects (mostly chironomids), annelid worms, and bivalves. The amphipods that were abundant in these channels are an important salmonid prey item, but are relatively rare in the floodplain wetlands (Kidd et al. 2019, PNNL and NMFS 2020). Thus, removal of sediment from the dredge prisms for this project is likely to affect the availability of prey for juvenile salmonids. This is especially likely in the Tongue Point, Lake River, and Oregon Slough channels, which have not been dredged in many years, so the benthic communities have been able to develop. Elochoman Slough was dredged in 2019 and the current status of the prey community in that channel is unknown.

Dredging and in-water disposal of sediments both alter benthic habitat by removing or smothering infaunal and epifaunal organisms. In doing so, these activities simplify the character of the substrate and alter benthic community structure. The effect that repeated dredging has on prey availability will depend on the frequency of disturbance and the recovery time of the benthos. McCabe et al. (1998) sampled in the mainstem ferry channel between Puget Island and the main navigation channel in the lower Columbia River, and at two nearby shoreline reference sites after a single dredging event. Unlike the areas to be dredged in the proposed action, none of these locations were semi-enclosed side channels, and the habitat in each was mostly sand. The most common benthic species were the bivalve, *Corbicula*, the amphipod, *Corophium*, and dipteran fly larvae. Sampling in the months both before and after dredging indicated no significant effects on community structure; benthic invertebrates recolonized the area very quickly. Jones and Stokes (1998) thought that recolonization of a semi-enclosed channel leading to a shipping terminal in Elliot Bay, Puget Sound, would depend on interactions between sediment parameters, timing of exposure, chance arrival of recruiting fauna, sediment/organic-matter flux to the benthos, and habitat modification caused by the colonizing species themselves (e.g., sediment stabilization, adult-larval interactions, etc.). They stated that the complexity of these factors and the small number of previous studies on recolonization made it impossible to accurately predict community development patterns in their study area. Based on a few studies from other locations, they expected that relatively stable communities would become established after a minimum of 1 to 3 years.

Given the lack of information specific to recolonization of the benthos in a side channel and the uncertainties described by Jones and Stokes (1998), the time over which a benthic community that supports foraging by juvenile salmonids would recolonize is highly uncertain. We expect that the Tongue Point channel, which the USACE proposes to dredge every year, will remain in a state of reduced function (i.e., reduced prey resources) over the entire 25-year period of the proposed action and beyond. The Oregon Slough channel, which would be dredged an average of one year out of five (potentially two years in a row, but no more than five times over the 25-year term of the proposed action), would be more likely to recover, but then become degraded again for unknown periods of time. The substrate and community in this side channel are likely to shift back toward that which was present before dredging, but there is high uncertainty regarding whether they will recover sufficiently to serve as a juvenile salmonid rearing area before the next maintenance dredging occurs. The USACE (2021) proposes to dredge Elochoman Slough and Lake River no more frequently than once every three years to allow the benthic community to recolonize and provide forage for juvenile salmonids. As a result, we conservatively assume that both the rearing and migration PBFs for salmonid critical habitat would experience moderate reductions in food availability for some months or years in the Tongue Point and Oregon Slough side channel prisms, and small reductions in availability at Elochoman Slough and Lake River. These moderate to small reductions will slightly diminish the functioning of critical habitat for all 13 ESUs and DPSs of Columbia basin salmonids.

Prey is also a feature of the green sturgeon estuarine areas PBF. We expect that the periodic removal of sediment and benthic organisms will reduce prey in the Tongue Point, and to a lesser extent, Elochoman Slough side channel dredging prism, is needed by sub-adult and adult green sturgeon for foraging, growth, and development, by a small amount.

In addition, we expect small reductions in substrate suitable for egg deposition by eulachon in spawning and rearing areas due to the periodic removal of sediment within each side channel prism.

Exposure and Response of Salmonids to Altered Benthic Habitat and Reduced Foraging Opportunity

The four side channels the USACE proposes to dredge are likely to provide rearing habitat for small subyearling LCR and UWR Chinook salmon and CR chum salmon. Roegner et al. (2021) measured physical habitat opportunity for juveniles entering floodplain wetlands, noting that the floodplain may not be accessible during low tides (at the lower end of the estuary) and low mainstem flows. This indicates that these side channels are likely to provide important habitat when floodplain wetlands are not inundated.

Annual cohorts of juvenile salmonids will rely on these locations for rearing over the 25-year term of the proposed action and beyond, but during that period will encounter prey communities that have been diminished by the proposed action. Some juveniles will be forced to move to different habitats to find prey, increasing the energetic cost of foraging and the risk of exposure to predators. Dredging also has the potential to increase inter- and intraspecific competition for prey resources and for shallow areas for refuge and resting because alternate habitats are likely to be occupied. Grant et al. (1998) found that the territory size and territorial behavior of juvenile Atlantic salmon was a function of prey availability, with territory size increasing at lower prey abundances. When juvenile salmonids are excluded from or avoid an area and move into adjacent areas, competition and territorial behavior may mean that even more juveniles experience reduced access to prey resources with implications for reduced growth and fitness.

In this case, where dredging will occur multiple times at each location over the 25-year term of the proposed action, this will affect several cohorts of each population, especially for LCR and UWR Chinook and CR chum salmon. Reductions in the fitness of individual juveniles from each cohort are expected to repeat each time a side channel is dredged. We expect this to affect subyearlings, as described above, but also yearling fish from lower Columbia and interior ESUs and DPSs that migrate downstream in the spring. These fish are known to feed primarily on chironomids that originate in floodplain wetlands and corophiid amphipods from shoreline habitats such as secondary and side channels (PNNL and NMFS 2020). Thus, we expect moderate reductions in the fitness of individual subyearling LCR and UWR Chinook and CR chum salmon, and small reductions in the fitness of individual yearling fish from interior ESUs and DPSs, with the degree of effect depending on the frequency of dredging and the time it takes the prey community to recover.

The number of individuals of each species of salmonid and the degree to which their health, condition, growth, or survival will be affected by altered benthic habitat and reduced foraging opportunity is highly uncertain. For the purpose of this analysis, we assume that these risks are proportional to the area that will be dredged, combined with the frequency of dredging, at each project site (Table 2). We anticipate that disruption of benthic communities will reduce the fitness of some individuals of each of the salmonid species over the 25-year period of dredging activities.

We do not expect the ability of juvenile salmonids to forage for prey to be affected by flow lane disposal. The flow lane is an area of strong currents, with relatively coarse-grained sediments and frequent hydraulic disturbance. This suggests that the physical environment is not suitable for the development of salmonid prey communities.

Exposure and Response of Green Sturgeon to Altered Benthic Habitat and Reduced Foraging Opportunity

Green sturgeon typically feed in shallow water on benthic invertebrates such as crustaceans (burrowing shrimp are a major component of their diet) and mollusks (Moyle et al. 1992, Moser et al. 2016). They forage by stirring up sediment to access these prey. We expect the proposed annual maintenance dredging at Tongue Point to reduce or eliminate the benthic infaunal community that has developed in the 30 years since that site was last dredged, and to maintain the benthic community in a degraded state. The loss of this prey resource could cause impacts such as reduced growth and condition in individual sub-adult and adult green sturgeon that would otherwise use this area for foraging, although the number of individuals and the degree to which condition or growth would be affected is highly uncertain. The USACE (2021) proposes to dredge the Elochoman Slough side channel no more frequently than once in every three years, up to five times over the term of the proposed action. Elochoman Slough was dredged relatively recently, in 2019, and the benthic community at this site is likely to have recovered to some degree. For each site, we estimate that the risks of reduced condition, growth, or survival are proportional to the area that will be dredged, combined with the frequency of dredging at each site (Table 2). We anticipate that disruption of the benthic community will reduce the fitness of some sub-adult and adult green sturgeon over the 25-year period of dredging activities.

There is even more uncertainty about whether green sturgeon are likely to forage in the deeper parts of the mainstem channel where flow lane disposal will take place. Although sturgeon forage in relatively deep water during their coastal migrations, they seem to feed over shallower areas in Willapa Bay, even in the intertidal (Dumbauld et al. 2008, Moser and Lindley 2007). We estimate that the level of disturbance will be proportional to the area of sediment that will be dredged, combined with the frequency of dredging at each project site. We do not expect that this will cause any individuals to experience decreased fitness.

Exposure and Response of Eulachon to Altered Benthic Habitat

We do not expect the planktonic communities preyed upon by eulachon to be affected by disturbance of the benthic environment. However, spawning success could be affected if dredging removes large amounts of the materials (especially sand) needed for egg adhesion and incubation (NMFS 2017c), or if suspended sediment that settles out after dredging contains contaminants. In the final recovery plan for this DPS, NMFS (2017c) rated dredging in the mainstem a low threat and dredging in spawning tributaries a moderate threat to recovery. Of the four side channels considered in this opinion, Elochoman Slough is connected to the Elochoman River and Lake River is just upstream of the Lewis River confluence, spawning areas that could be affected by suspended sediments that settle out during dredging. However, the material from this site that was tested in 2018 was determined suitable for unconfined aquatic exposure and disposal. The other spawning tributaries are farther from the four side channels and are unlikely to be affected by the proposed sediment removal activities. We therefore anticipate that dredging will cause reductions in the fitness of some individual adults and their eggs, estimated by the area that will be dredged, combined with the frequency of dredging, at each project site (Table 2).

2.5. Cumulative Effects

"Cumulative effects" are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02 and 402.17(a)). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline *vs.* cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the environmental baseline (Section 2.4). Over the 25-year period of the proposed action, we could expect that some of the climate effects described in the baseline, such as warming water temperatures or increasing variability of volume (low flows, high flows) will become more pronounced. These effects could increase food web disruptions, migration success, or other stresses on any or all of the listed species that rely on the action area. In modeling the response of spring- and summer-run Chinook salmon populations from the interior to warming freshwater and ocean conditions, Crozier et al. (2021) hypothesized that dramatic increases in smolt survival will be needed to overcome the negative impacts of climate change on population viability.

Also, state or private activities in the vicinity of the project locations (e.g., recreational boating, fishing, or other water-based recreation) are expected to increase and be a source of cumulative effects in the action area. Additionally, future state and private activities in upstream areas (particularly intensifying land use, and changes in tree cover) are expected to cause habitat and water quality changes that are expressed as cumulative effects. Our analysis considers how future activities in the Columbia River basin are likely to influence habitat conditions in the action area and cumulative effects caused by specific future activities in the vicinity of the project locations.

Approximately six million people live in the Columbia River basin, concentrated largely in urban centers. The effect of that population is expressed as changes to physical habitat and loadings of pollutants contributed to the Columbia River. These changes were caused by residential, commercial, industrial, agricultural, and other land uses for economic development, and are described in the Environmental Baseline (Section 2.4). The collective effects of these activities tend to be expressed most strongly in lower river systems where the impacts of numerous upstream land management actions aggregate to influence natural habitat processes and water quality. As such, these effects accrue within this action area, though many are generated from actions that occur upstream. As human population grows, the range of effects described here are likely to intensify.

Resource-based industries (e.g., agriculture, hydropower facilities, timber harvest, fishing, and metals and gravel mining) caused many long-lasting environmental changes that harmed ESA-listed species and their critical habitats, such as basin-wide loss or degradation of stream channel morphology, spawning substrates, instream roughness and cover, estuarine rearing habitats, wetlands, floodplains, riparian areas, water quality (e.g., temperature, sediment, dissolved oxygen, contaminants), fish passage, and habitat refugia. Those changes reduced the ability of populations of ESA-listed species to sustain themselves in the natural environment by altering or interfering with their behavior in ways that reduced their survival throughout their life cycle. The environmental changes also reduced the quality and function of critical habitat PBFs that are necessary for successful spawning, production of offspring, and migratory access necessary for adult fish to swim upstream to reach spawning areas and for juvenile fish to proceed downstream and reach the ocean. Without those features, the species cannot successfully spawn and produce offspring.

While widespread degradation of aquatic habitat associated with intense natural resource extraction is no longer common, ongoing and future land management actions are likely to continue to have a depressive effect on aquatic habitat quality in the Columbia River basin and within the action area. Additionally, as human population grows, other non-Federal uses of the river are likely to increase and intensify, such as recreational boating and fishing, and nonpoint stormwater inputs from upland areas. As a result, recovery of aquatic habitat is likely to be slow in most areas, and contemporaneous cumulative effects from basin-wide activities are likely to have a slightly negative impact on population abundance trends and the quality of critical habitat PBFs into the future.

2.6. Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) Reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat as a whole for the conservation of the species.

2.6.1 Salmonids and their Designated Critical Habitat

With the exception of UCR spring-run Chinook salmon and SR sockeye salmon, which are already considered endangered, each species of salmon and steelhead considered in this opinion is at risk of becoming endangered in the foreseeable future. These species are ESA-listed due to a combination of low abundance and productivity, reduced spatial structure, and decreased genetic (and in some cases, life history) diversity. Several species have lost parts of their historical population structure due to human activities, and the remaining populations face limiting factors in existing habitats. Recent adult returns have been substantially below averages for many populations/MPGs. This downturn is associated with a series of marine heatwaves and their lingering effects, which likely contributes to substantially lower ocean survival rates of juvenile salmon and steelhead. We expect that abundance could further decrease, and extinction risk increase for many ESUs and DPSs due to factors associated with climate change. These include changes in ocean survival; rates of juvenile growth and development; disease resistance; and run timing, spawn timing, etc.

Under the environmental baseline, the fish from the component populations of each ESU and DPS that move through and use the action area will encounter habitat conditions degraded by a modified flow regime; reduced water quality (chemical contamination and elevated summer and fall temperatures); loss of functioning floodplains; and loss of vegetated riparian areas and associated shoreline cover, both in the mainstem and in secondary and side channels; and high predation rates. The USACE routinely dredges sections of the mainstem navigation channel and periodically dredges shoals in nine other secondary and side channel areas. As a result, juvenile LCR and UWR Chinook and CR chum salmon encounter few undisturbed rearing areas in the lower river and less prey is produced that can be used by larger juveniles from the interior as them move through the mainstem. The significance of this degradation is reflected in the limiting factors described in NMFS' recovery plans: insufficient access to floodplain and secondary channels, degraded habitat, loss of rearing space, pollution, and increased predation. These concerns highlight the importance of minimizing entrainment and water quality degradation and protecting any currently functioning rearing and migration habitat.

The proposed action will create additional repeated physical disturbances in the water column during the IWWW, every year at Tongue Point, and in an average of 1 year out of 5 in the other three side channels, over the 25-year term of the proposed action. Entrainment is likely to kill or injure small numbers of subyearling LCR and UWR Chinook and CR chum salmon, sub-adult and adult green sturgeon attracted to the disruption of sediment and the potential suspension of benthic prey, and adult eulachon and their eggs. Water quality will be reduced within the side channels for short periods of time during dredging, but we expect only minor effects on the condition of a few salmonids, green sturgeon, and eulachon and no mortality for any of these species.

Established benthic prey communities will be disrupted, thereby reducing prey availability for subyearling Chinook and chum salmon that rear within these side channels and for larger yearling fish that consume these prey as they migrate in the mainstem. These disruptions are likely to affect the health, growth, and survival of small numbers of subyearling LCR and UWR Chinook and CR chum salmon from multiple populations each year. These affected subyearlings experience increased energetic costs from having to locate alternate prey as well as competing with juveniles that already occupy nearby areas, and experience increased exposure to predators while swimming between feeding areas. Added to the other nine secondary and side channels that the USACE already dredges (NMFS 2012), the disruption of the benthos in these four channels will further limit the availability of this type of juvenile rearing and foraging habitat. These concerns apply to fish rearing in side channel and shoreline areas or moving off the floodplain as described in Roegner et al. (2021). Reduced access to rearing habitat is identified as a limiting factor in the recovery plans for LCR and UWR Chinook salmon (Table 5).

In the context of the status of designated critical habitat and the baseline conditions of the PBF elements that occur within the action area, the functioning of critical habitat for migration and rearing is moderately reduced in the action area under the environmental baseline. The proposed action will temporarily diminish safe migration and water quality, and prey within migration corridors and rearing areas over its 25-year term and may have longer effects in the case of reduced prey availability. These additional disruptions will continue to limit opportunities for the functioning of the PBFs within the side channels to improve over time.

In summary, we find that the effects of the proposed action are not likely to diminish the conservation value of adult migration corridors for any of the 13 species of salmonid. However, the conservation value of juvenile migration corridors is likely to be diminished for LCR Chinook, UCR spring-run Chinook, UWR Chinook, SR spring/summer Chinook, SR fall Chinook, LCR coho, SR sockeye, UCR steelhead, SRB steelhead, MCR steelhead and UWR steelhead. And the conservation value of rearing areas in the side channels is likely to be diminished for LCR Chinook, UWR Chinook, and CR chum salmon. However, even when considered as an addition to the baseline conditions, and together with the cumulative effects, the proposed action is not likely to appreciably diminish the value of designated critical habitat for the conservation roles of migration or rearing. Accordingly, it is NMFS' opinion that the proposed action is not likely to result in the destruction or adverse modification of the value of the action area to provide migration and rearing sufficient for the conservation of LCR Chinook salmon, UCR spring-run Chinook salmon, SR spring/summer Chinook salmon, UWR Chinook salmon, SR fall Chinook salmon, CR chum salmon, LCR coho salmon, SR sockeye salmon, LCR steelhead, UCR steelhead, SRB steelhead, MCR steelhead, or UWR steelhead.

The habitat disruptions to safe passage, water quality, and prey will be experienced by individual fish of most of the listed salmonid species as juveniles or adults, affecting some populations each year over the 25-year term of the proposed action (annual dredging at Tongue Point), and some less frequently (an average of 1 in every 5 years at Elochoman Slough, Lake River, and Oregon Slough). We expect effects on adults to be limited to relatively small changes in behavior to avoid the dredging and disposal activities and the resulting sediment plumes. However, even during periods of elevated temperatures during late summer and early fall, we do not expect exposure to effects of the proposed action to lead to the injury or mortality of adult migrants.

Juvenile salmonids from all 13 ESUs and DPSs are more likely to have adverse responses to the reduction in availability of benthic prey such as chironomids and amphipods after excavation in the side channels, with an uncertain period before recolonization and the re-establishment of a productive benthic community. We expect that this latter effect, added to bank protection measures that support agriculture and urban development by cutting off the floodplain, plus dredging in nine other side channels in the lower Columbia River (NMFS 2012), further reduce the availability of preferred prey for rearing and migrating fish. These conditions will be maintained by repeated dredging over the 25-year term of the proposed action, causing the displacement of small numbers of juveniles in each side channel, increasing energetic costs and increasing their exposure to predators as they look for alternate sources of prey.

However, even when we consider the current status of the threatened and endangered species and the degraded environmental baseline within the action area, the proposed action's effect in terms of reducing population abundances is likely to be very small, and spread across multiple populations for any of the 13 species. This reduction itself (even annually in the case of dredging at Tongue Point and an average of once every five years in the other three side channels), for 25 years is not expected to affect the abundance, productivity, spatial structure, or diversity of any of the component populations of the ESA-listed species.

The last element in the integration of effects includes a consideration of the cumulative effects anticipated in the action area. When considering the cumulative effects of non-Federal actions, recovery of aquatic habitat from the degraded baseline conditions is likely to be slow in most of the action area, and cumulative effects (from continued or increasing use of the action area) are likely to have a negative impact on habitat conditions, which in turn may cause negative pressure on population abundance trends in the future. We expect the proposed action to have periodic negative effects on rearing conditions for salmonids in the four side channels and that small numbers of juvenile subyearling LCR Chinook salmon and CR chum salmon will be killed by entrainment. However, even when considered as an addition to the baseline conditions, and together with the cumulative effects, the proposed action is not likely to appreciably reduce the likelihood of both the survival and recovery of LCR Chinook salmon, UCR spring-run Chinook salmon, SR spring/summer Chinook salmon, UWR Chinook salmon, SR fall Chinook salmon, CR chum salmon, LCR coho salmon, SR sockeye salmon, LCR steelhead, UCR steelhead, SRB steelhead, MCR steelhead, or UWR steelhead.

2.6.2 Southern DPS of Green Sturgeon and Designated Critical Habitat

The essential PBF of southern green sturgeon critical habitat that would be affected by the proposed action is limited to estuarine areas. The attributes of these sites that would be affected by the proposed action are food resources and water quality. By periodic disruption of the benthos, the proposed action would maintain reduced prey availability in the side channels and potentially in the flow lane, and would cause episodic and temporary reductions in water quality. Based on the best available information, the scale of the proposed action's effects, when considered in combination with the degraded baseline, cumulative effects, and the impacts of climate change, would be too small to cause any detectable long-term changes in the quality or function of the affected PBF. Therefore, it is NMFS' opinion that the proposed action is not likely to alter habitat features in a manner that undermine the conservation role of habitat in the action area.

The abundance of this DPS is estimated at 2,106 spawning adults, but no data are currently available to establish any trends in population growth or decline. The extinction risk for the DPS is driven by the fact that it consists of a single population that spawns in a limited portion of the Sacramento River basin that has been degraded by land use activities and water diversions. The environmental baseline in the lower Columbia River also has been degraded, in this case by the effects of nearby streambank and shoreline development for urbanization and industry, maritime activities, agriculture, forestry, water diversions, and road building and maintenance.

Dredging-related work in the four side channels will overlap with the later portion of the seasonal presence of adult and sub-adult green sturgeon. We expect that, over the next 25 years, a low but undetermined number of these fish will be fatally entrained during hydraulic dredging and may also be killed by the disposal of dredged sediments in the flow lane. Low numbers of individuals may also be exposed to contaminants and/or water with reduced dissolved oxygen concentrations, but no injury or mortality is expected from these brief exposures. Reduced prey availability in the side channels and potentially along the bottom at the in-water disposal areas may also cause minor impacts on growth in some individuals.

The planned dredging occurs outside of the DPS's spawning habitat in the Sacramento River and will not cause or worsen any of the factors that are believed to limiting the recovery of this species. Although dredging and in-water disposal act to maintain reduced prey availability, especially in the side channels where green sturgeon may congregate and forage during daylight hours, that effect is expected to be very minor. Based on the best available information, the effects of the proposed action, when considered in combination with the degraded baseline, cumulative effects, and the impacts of climate change, would be too small to affect viability at the population level. Therefore, even when considered as an addition to the baseline conditions, and together with the cumulative effects, the proposed action is not likely to appreciably reduce the likelihood of both the survival and recovery of southern DPS green sturgeon.

2.6.3 Southern DPS of Eulachon

The essential PBFs of southern eulachon critical habitat that would be affected by the proposed action are freshwater and estuarine migration corridors. Dredging and disposal activities will temporarily obstruct or decrease safe passage within, and will temporarily reduce water quality within and downstream of each side channel dredging prism and at the flow lane disposal sites. Based on the best available information, the effects of the proposed action, when considered in combination with the degraded baseline, cumulative effects, and the impacts of climate change, would be too small to cause any detectable long-term changes in the quality or function of the affected PBFs. Therefore, it is NMFS' opinion that the proposed action is not likely to impair any physical or biological feature of habitat to the degree that the action area will not support the conservation role for which it was designated for southern DPS eulachon.

The abundance of the southern DPS of eulachon is at very low levels throughout its range, including the population segment in the lower Columbia River. There was an abrupt decline in the numbers of eulachon returning to the Columbia River in the early 1990s. These improved briefly in the early 2000s, and then returned to the low levels observed in the mid-1990s. Although eulachon abundance in monitored rivers has generally improved, especially in the 2013 to 2015 return years, recent poor ocean conditions and the concern that these conditions will persist into the future, suggest that populations may continue to decline.

Under the environmental baseline, conditions at the proposed dredging and disposal sites has been degraded by the effects of nearby streambank and shoreline development and by maritime activities. The baseline has also been degraded by nearby and upstream industry, urbanization, agriculture, forestry, water diversion, and road building and maintenance. Over the next 25 years, low numbers of early migrating adult eulachon and their eggs may be entrained and killed by dredging and may briefly be exposed to elevated levels of suspended sediment and turbidity, contaminants, and reduced dissolved oxygen that are mobilized during dredging and in-water disposal. No injury or mortality is expected in adults from the brief exposures to changes in water quality. We do not expect the planktonic communities preyed upon by eulachon to be affected by either dredging within the side channels or disposal in the flow lane, except through effects on water quality as described above.

The planned dredging and disposal would not worsen any of the factors that are believed to limit the recovery of this species. Based on the best available information, the effects of the proposed action, when considered in combination with the degraded baseline, cumulative effects, and the impacts of climate change, would be too small to affect viability at the population level. Therefore, even when considered as an addition to the baseline conditions, and together with the cumulative effects, the proposed action is not likely to reduce abundance in a manner that would appreciably reduce the productivity, spatial structure, or diversity of the southern DPS eulachon. Therefore, even when considered as an addition to the baseline conditions, and together with the cumulative effects, the proposed action is not likely to appreciably reduce the likelihood of both the survival and recovery of southern DPS Pacific eulachon.

2.7. Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of LCR Chinook salmon, UCR spring-run Chinook salmon, SR spring/summer Chinook salmon, UWR Chinook salmon, SR fall Chinook salmon, CR chum salmon, LCR coho salmon, SR sockeye salmon, LCR steelhead, UCR steelhead, SRB steelhead, MCR steelhead, UWR steelhead, southern DPS green sturgeon, or southern DPS Pacific eulachon, or destroy or adversely modify their designated critical habitats.

2.8. Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS.

2.8.1. Amount or Extent of Take

In the biological opinion, NMFS determined that incidental take is reasonably certain to occur as follows:

Incidental take in the form of injury or death due to entrainment during dredging and disposal; incidental take in the form of harm from water quality impairments; and incidental take in the form of harm from reduced prey availability.

Due to the repeating nature of the proposed action, the highly variable number of individual fish present at any given time, and difficulties in the ability to observe injury or mortality of fish, which may sink out of site, be consumed by predatory species, or have delayed death outside of the action area. we cannot determine the number of ESA-listed fish that will be killed, injured or otherwise adversely affected. In such circumstances we use a habitat-based surrogate to account for the amount of take, which is called an "extent" of take. The extent of take is causally related to the harm that occurs, and is an observable measure for monitoring, compliance, and re-initiation purposes. These surrogates function as effective reinitiation triggers because they are clear, measurable limits that can be readily monitored for any exceedances, so reinitiation could be triggered at any time during the dredging.

Injury or death from entrainment: the volume of dredged material, the number of days of operation, and frequency of dredging are the best available surrogates for the extent of take of salmonids, green sturgeon, and eulachon from entrainment. This is because entrainment is positively correlated with the volume of material removed and increases with the length and frequency of the operation.

Harm from water quality reductions: The total volume of material to be dredged, the number of days of operation, and the frequency of dredging are the best available surrogates for the extent of take of salmonids, green sturgeon, and eulachon from exposure to elevated levels of suspended sediments and contaminants or low dissolved oxygen. These reductions in water quality would increase with the volume of material removed, and the number of fish exposed would be correlated with the number of days and frequency of dredging.

Harm from reduced prey availability: The total area of material to be dredged and the frequency of dredging are the best available surrogates for the extent of take of salmonids and green sturgeon from reduced prey availability because the lost benthic prey would be positively correlated with these parameters.

Presenting these measurements of take by the areas where they will occur, the extent of take for this action is defined as:

1. Tongue Point
   a. Injury or death of salmonids, green sturgeon, or eulachon by entrainment while dredging up to 800,000 CY per dredging event each year. Each of these dredging events will take up to 137 days and will occur between 1 August and 15 December.
   b. Harm of salmonids, green sturgeon, or eulachon by exposure to degraded water quality while dredging up to 800,000 CY per dredging event each year. Each of these dredging events will take up to 137 days and will occur between 1 August and 15 December.
   c. Harm of salmonids or green sturgeon from reduced availability of benthic prey from dredging up to 75 acres per dredging event each year. Each of these dredging events will take up to 137 days and will occur annually between 1 August and 15 December.

2. Elochoman Slough

a. Injury or death of salmonids, green sturgeon, or eulachon by entrainment while dredging up to 25,000 CY per dredging event, to occur during no more than 5 years over the 25-year term of the proposed action and no more frequently than once every three years. Each of these dredging events will take up to 14 days and will occur between 1 August and 15 December.

b. Harm of salmonids, green sturgeon, or eulachon by exposure to degraded water quality while dredging up to 25,000 CY per dredging event, to occur during no more than 5 years over the 25-year term of the proposed action and no more frequently than once every three years. Each of these dredging events will take up to 14 days and will occur between 1 August and 15 December.

c. Harm of salmonids or green sturgeon from reduced availability of benthic prey from dredging up to 5 acres per dredging event, to occur during no more than 5 times over the 25-year term of the proposed action and no more frequently than once every three years. Each of these dredging events will take up to 14 days and will occur between 1 August and 15 December.

3. Lake River

a. Injury or death of salmonids, green sturgeon, or eulachon by entrainment while dredging up to 34,000 CY per dredging event, to occur during no more than 5 years over the 25-year term of the proposed action and no more frequently than once every three years. Each of these dredging events will take up to 15 days and will occur between 1 August and 15 December.

b. Harm of salmonids, green sturgeon, or eulachon by exposure to degraded water quality while dredging up to 34,000 CY per dredging event, to occur during no more than 5 years over the 25-year term of the proposed action and no more frequently than once every three years. Each of these dredging events will take up to 15 days and will occur between 1 August and 15 December.

c. Harm of salmonids or green sturgeon from reduced availability of benthic prey from dredging up to 5 acres per dredging event, to occur during no more than 5 years over the 25-year term of the proposed action and no more frequently than once every three years. Each of these dredging events will take up to 15 days and will occur between 1 August and 15 December.

4. Oregon Slough

a. Injury or death of salmonids, green sturgeon, or eulachon by entrainment while dredging up to 600,000 CY per dredging event, to occur during no more than 5 years over the 25-year term of the proposed action. Each of these dredging events will take up to 137 days and will occur between 1 August and 15 December.

b. Harm of salmonids, green sturgeon, or eulachon by exposure to degraded water quality while dredging up to 600,000 CY per dredging event, to occur during no more than 5 years over the 25-year term of the proposed action. Each of these dredging events will take up to 137 days and will occur between 1 August and 15 December.

c. Harm of salmonids or green sturgeon from reduced availability of benthic prey from dredging up to 50 acres per dredging event, to occur during no more than 5 years over the 25-year term of the proposed action. Each of these dredging events will take up to 105 days and will occur between 1 August and 15 December.

Dredging operations that are outside of the IWWW will increase the likelihood of more listed individuals being exposed to entrainment and reduced water quality. The volume and area to be dredged, the frequency of dredging, the number of days of dredging per event, and dredging outside of the IWWW are each thresholds for reinitiating consultation. Exceeding any of these indicators for extent of take will trigger the reinitiation provisions of this opinion.

2.8.2 Effect of the Take

In the biological opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

2.8.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" (RPM) are nondiscretionary measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02). The USACE shall require any permittee or contractor performing the work described in this document to:

1. Minimize entrainment during dredging and in-water disposal;
2. Minimize harm from degradation of water quality;
3. Complete an annual monitoring and reporting program to confirm that the take exemption for the proposed action is not exceeded, and that the terms and conditions in this incidental take statement are effective in minimizing incidental take.

2.8.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the USACE and its contractors must comply with them in order to implement the RPMs (50 CFR 402.14). The USACE has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. The following terms and conditions implement RPM 1, minimize entrainment during dredging and in-water disposal:
    a. Apply these terms and conditions to its own actions when carrying out FNC O&M work, and to the actions of any contractors hired by the USACE for that purpose.
    b. Complete all dredging and in-water disposal during the IWWW of 1 August through 15 December.

c. Require dredge operators to use best available technologies to ensure that dredging and disposal activities are confined to areas within the current official boundaries of the Federal channels and in-water disposal sites.

d. Require dredge operators to limit the dredge prism and the volume of removed sediment to the minimum area necessary to achieve project goals.

e. Require mechanical dredge operators to ensure that the clamshell or backhoe bucket is lowered to the bottom as slowly as feasible to allow ESA-listed fish to escape.

f. Require operators to keep dragheads or cutterheads at, or buried in the substrate when suction dredge pumps are working, and no more than 3.0 feet above the substrate for the minimum time needed to clean or purge the dragheads.

g. Require hydraulic dredge operators to minimize pump operations when dragheads or cutterheads are above the substrate.

h. Discharge material from a pipeline dredge at depths at least 20.0 feet below the surface of the water.

2. The following terms and conditions implement RPM 2, minimize effects on water quality:

a. Apply these terms and conditions to its own actions when carrying out FNC O&M work, and to the actions of any contractor hired by the USACE for that purpose.

b. Require dredge operators to comply with the current ODEQ or WDOE water quality monitoring plan(s) issued for the site.

c. Require dredge operators to monitor turbidity and comply with the following:

i. A properly and regularly calibrated turbidimeter is recommended, but visual turbidity gauging is acceptable.

ii. Locations of turbidity samples or observations must be identified and described in the USACE's water quality monitoring plans. At a minimum, monitoring must take place at the following distance, and within any visible plumes:

1. Dredging and in-water (flow lane) disposal activities - Up-current (background) and 900 feet down current from the point of discharge (bucket, backhoe, hopper, or pipeline), and no more than 150 feet laterally from the vessel.
2. If a meter is used, the USACE must identify a depth between 10 and 20 feet, or at mid-depth in water less than 20 feet in depth, to collect all sample readings.

iii. Monitoring must occur when dredging and disposal is being conducted and must meet the following requirements:

1. Active dredging–once a day during a flood tide and once a day during an ebb tide.
2. In-water disposal–once a day during a flood tide and once during an ebb tide.
3. Background turbidity NTU or observation, location tidal stage, and time must be recorded before monitoring down-current.

iv. The USACE and any dredging contractors, shall ensure turbidity in the side channels remains at background levels 900 feet downstream from the point of disturbance during dredging operations by adhering to the measure to monitor turbidity and respond to exceedances as proposed in the project description. This shall include monitoring and compliance reporting of turbidity levels observed during dredging operations as required by the States of Oregon and Washington's CWA section 401 certifications.

d. Require dredge operators to monitor dissolved oxygen concentrations and comply with the following:
   i. Sample dissolved oxygen at the mid-point of the water column, 300 feet down current from the dredge and in the turbidity plume if visible.
   ii. Collect samples during daylight hours during active dredging at the following frequency: once a day during a flood tide and once a day during an ebb tide.
   iii. Sample dissolved oxygen concentrations with a dissolved oxygen meter that is properly and regularly calibrated according to the owner's manual.
   iv. Dredging shall not begin if dissolved oxygen concentrations at the dredge site are less than 6.5 mg/l.
   v. If the level of dissolved oxygen measured is below 8 mg/l, the monitoring frequency must increase to every four hours until the level returns above 8 mg/l.
   vi. If the measured level of dissolved oxygen is below 6.5 mg/l, or if distressed or dead fish are observed in or beside the dredge, the activity must be stopped until the level returns to above 6.5 mg/l.
   vii. Restricted visibility: During periods of restricted visibility that could cause an unsafe condition, the Corps may postpone required compliance monitoring until conditions improve if confirmation is made by a third party, such as the Coast Guard Watch Stander or the National Weather Service, that the visibility in the area to be monitored is considered to be restricted and is unsafe to conduct the required monitoring. If monitoring is postponed due to restricted visibility and unsafe conditions, the weather condition, time of determination, and verification route must be recorded. Regular monitoring must resume once the visibility returns to safe levels.

3. The following terms and conditions implement RPM 3, complete an annual monitoring and reporting program to confirm that the take exemption for the proposed action is not exceeded, and that the terms and conditions in this incidental take statement are effective in minimizing incidental take.
   a. Require dredging operators to maintain and submit dredging logs to verify that all take indicators are monitored and reported. Minimally, logs should include: (1) type of dredging vessel (mechanical, hydraulic pipeline, hopper); (2) vessel position relative to the side channel while dredging, or certification that dredging was within the authorized channel, and the methods used to confirm vessel location; volumes of sediment removed/disposed; (4) extent of turbidity plumes, compliance with the Water Quality Monitoring Plan; and (5) all observed incidents of entrainment of listed species.

b. Establish procedures for the submission of observer and dredge operator logs, and other materials, to the appropriate USACE office, which will draft and submit annual monitoring reports.

c. Establish procedures for reporting take and annual monitoring reports, along with results from any DMMP sediment testing of material from the four side channels, to include any exceedances of turbidity or dissolved oxygen compliance levels and active or passive methods used to re-attain compliance, along with results from any sediment testing of material from the four side channels.

d. Submit email take reports to:
   projectsreports.wcr@noaa.gov
   Include WCRO-2020-02918 in the subject line.

e. Submit annual monitoring reports for the preceding calendar year by April 1st to NMFS at the following address:
   projectreports.wcr@noaa.gov
   Attn: WCR-2020-02918

2.9. Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

The following conservation recommendations are discretionary measures that NMFS believes are consistent with this obligation and therefore should be carried out by the USACE:

1. Regularly require use of floating silt curtains around the in-water dredge area or the use of an environmental bucket for mechanical dredging in the side channels to minimize the dispersion of suspended sediment, thereby reducing the spread of high levels of suspended sediments into adjacent areas.

2. Narrow the conditions under which maintenance dredging is allowed so that benthic habitat can more completely recover between dredge occurrences. For example, dredging would not be allowed without a showing that sediments are accumulating or have accumulated to an extent that they threaten to impair navigation or berthing.

3. Narrow the IWWW to reduce the duration of activities with risk of entrainment and reduced water quality.

4. Consult with NMFS under Section 7(a)(1) to create a mitigation bank to offset impacts associated with the regular exercise of its authority allowing impacts to the nation's waters.

5. Monitor and evaluate the ecological importance of these areas to the viability and recovery of the Columbia River subpopulation of Pacific eulachon to promote the conservation of the species and address uncertainties regarding the effects of dredging in side channels on spawning and incubation in the lower Columbia River.

6. Conduct before and after macro-benthic community structure analysis in the Elochoman Slough and Lake River dredge prisms to determine the benthic community response (taxa, diversity, richness, and abundance) at 1, 3, and 6 months following dredging. Work with NMFS to identify additional opportunities for this type of monitoring for future side channel dredging projects in the lower Columbia River.

Please notify NMFS if the USACE carries out these recommendations so that we will be kept informed of actions that are intended to improve the conservation of listed species or their designated critical habitats.

2.10. Reinitiation of Consultation

This concludes formal consultation for Federal Navigation Channel Operations and Maintenance Dredging: Tongue Point, Clatsop County, Oregon; Elochoman Slough, Wahkiakum County, Washington; Lake River, Clark County, Washington; and Oregon Slough, Multnomah County, Oregon.

As 50 CFR 402.16 states, reinitiation of consultation is required and shall be requested by the Federal agency or by the Service where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) The amount or extent of incidental taking specified in the ITS is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT RESPONSE

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species' contribution to a healthy ecosystem. For the purposes of the MSA , EFH means "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity", and includes the physical, biological, and chemical properties that are used by fish (50 CFR 600.10). Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on

EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) of the MSA also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset the adverse effects of the action on EFH [CFR 600.905(b)]

This analysis is based, in part, on the EFH assessment provided by the USACE and that conducted by NMFS, and descriptions of EFH for Pacific Coast groundfish (Pacific Fishery Management Council [PFMC] 2005) and, coastal pelagic species (CPS) (PFMC 1998), Pacific Coast salmon (PFMC 2014); and highly migratory species (PFMC 2007) contained in the fishery management plans developed by the PFMC and approved by the Secretary of Commerce. In this case, NMFS concluded the proposed action would not adversely affect EFH for coastal pelagic species and highly migratory species. Thus, consultation under the MSA is not required for these habitats.

3.1. Essential Fish Habitat Affected by the Project

The proposed action and action area for this consultation are described in the Introduction section to the biological opinion. The action area includes areas designated EFH for various life-history stages of two Pacific Coast salmon species: Chinook salmon and coho salmon (PFMC 2014). Habitat areas of particular concern (HAPC) within the action area include estuaries and channel habitat (PFMC 2005, 2014).

Freshwater EFH for Pacific Coast salmon (Chinook and coho) consists of four major components: 1) spawning and incubation, 2) juvenile rearing, 3) juvenile migration corridors, and 4) adult migration corridors and holding habitat, and overall, can include any habitat currently or historically occupied within Washington, Oregon, and Idaho. The important components of Pacific salmon marine EFH are: 1) estuarine rearing, 2) ocean rearing; and 3) juvenile and adult migration. The only marine EFH habitat for salmon found within the action area for this consultation is the estuarine habitat in the lower Columbia River. Estuarine EFH for Chinook and coho salmon found within the action area for this consultation includes juvenile rearing, juvenile migration corridors, and adult migration corridors and holding habitat (PFMC 2014). In addition, estuaries provide protected, nutrient-rich, and biologically productive habitat for groundfish (PFMC 2020).

3.2. Adverse Effects on Essential Fish Habitat

As described in detail in the preceding opinion, the proposed action is expected to affect EFH components in four side channels and in the mainstem Columbia River, including the saltwater portion of the estuary. We conclude that the proposed action will have the following adverse effects on EFH designated for Pacific Coast Salmon:

1. The proposed dredging and disposal activities will temporarily reduce water quality (suspended sediments and the mobilization of contaminants and potentially, low dissolved oxygen).

2. The proposed dredging in the side channels will reduce the quantity and quality of benthic prey communities.

The proposed action will have the following adverse effects on EFH designated for Pacific Coast Groundfish:

1. The proposed dredging and disposal activities will temporarily reduce water quality (suspended sediments and the mobilization of contaminants and potentially, low dissolved oxygen).
2. The proposed dredging activities will affect sediment characteristics in the side channels for uncertain periods of time.

3.3. Essential Fish Habitat Conservation Recommendations

NMFS determined that the following conservation recommendations are necessary to avoid, minimize, mitigate, or otherwise offset the impact of the proposed action on EFH.

To minimize the effects of the proposed dredging and disposal activities on Pacific Coast Salmon and Pacific Coast Groundfish EFH, including the estuaries HPAC, the USACE should:

(1) To minimize water quality impacts, limit the dispersion of suspended sediment from a side channel while using a clamshell or backhoe dredge, by regularly requiring use of floating silt curtains around the in-water dredge area or the use of an environmental bucket for mechanical dredging if turbidity levels are exceeded.

(2) To reduce effects on the benthic prey eaten by salmonids and juvenile groundfish such as flatfishes, conduct before and after macro-benthic community structure analysis in areas less than 20-feet deep within the Elochoman Slough and Lake River dredge prisms to determine the benthic community response (taxa, diversity, richness, and abundance) at 1, 3, and 6 months following dredging. Work with NMFS to identify opportunities for this type of monitoring for future side channel dredging projects. Based on findings, adjust the frequency of dredging to accommodate prey recolonization rates.

(3) To reduce effects on the benthic prey community and sediment characteristics, allow maintenance dredging to occur within the 25-year term of the proposed action only on a showing that sediments have accumulated or are accumulating in a manner that threatens to impair navigation or berthing.

(4) Consult with NMFS under Section 7(a)(1) to create a mitigation bank to offset impacts associated with the regular exercise of its authority allowing impacts to the nation's waters.

Fully implementing these EFH conservation recommendations would protect, by avoiding or minimizing the adverse effects described in Section 3.2, above, approximately 105 acres of designated EFH and HAPC for Pacific Coast salmon and groundfish.

3.4. Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the USACE must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS' EFH Conservation Recommendations unless NMFS and the Federal agency have agreed to use alternative time frames for the Federal agency response. The response must include a description of the measures proposed by the agency for avoiding, minimizing, mitigating, or otherwise offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the Conservation Recommendations, the Federal agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects (50 CFR 600.920(k)(1)).

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

3.5. Supplemental Consultation

The USACE must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH Conservation Recommendations (50 CFR 600.920(l)).

4. FISH AND WILDLIFE COORDINATION ACT

The purpose of the FWCA is to ensure that wildlife conservation receives equal consideration, and is coordinated with other aspects of water resources development (16 USC 661). The FWCA establishes a consultation requirement for Federal agencies that undertake any action to modify any stream or other body of water for any purpose, including navigation and drainage (16 USC 662(a)), regarding the impacts of their actions on fish and wildlife, and measures to mitigate those impacts. Consistent with this consultation requirement, NMFS provides recommendations and comments to Federal action agencies for the purpose of conserving fish and wildlife resources, and providing equal consideration for these resources. NMFS' recommendations are provided to conserve wildlife resources by preventing loss of and damage to such resources. The FWCA allows the opportunity to provide recommendations for the conservation of all species and habitats within NMFS' authority, not just those currently managed under the ESA and MSA.

The following recommendations apply to the proposed action:

1. Regularly require use of floating silt curtains around the in-water dredge area or the use of an environmental bucket for mechanical dredging in the side channels to minimize the dispersion of suspended sediment, thereby reducing the spread of high levels of suspended sediments into adjacent areas.

2. Narrow the conditions under which maintenance dredging is allowed so that benthic habitat can more completely recover between dredge occurrences. For example, dredging would not be allowed without a showing that sediments are accumulating or have accumulated to an extent that they threaten to impair navigation or berthing.

3. Narrow the IWWW to reduce the duration of activities with risk of entrainment and reduced water quality.

4. Consult with NMFS under Section 7(a)(1) to create a mitigation bank to offset impacts associated with the regular exercise of its authority allowing impacts to the nation's waters.

5. Monitor and evaluate the ecological importance of these areas to the viability and recovery of the Columbia River subpopulation of Pacific eulachon to promote the conservation of the species and address uncertainties regarding the effects of dredging in side channels on spawning and incubation in the lower Columbia River.

6. Conduct before and after macro-benthic community structure analysis in the Elochoman Slough and Lake River dredge prisms to determine the benthic community response (taxa, diversity, richness, and abundance) at 1, 3, and 6 months following dredging. Work with NMFS to identify additional opportunities for this type of monitoring for future side channel dredging projects in the lower Columbia River.

The USACE must give these recommendations equal consideration with the other aspects of the proposed action so as to meet the purpose of the FWCA.

This concludes the FWCA portion of this consultation.

5. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The Data Quality Act (DQA) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

5.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are the U.S. Army Corps of Engineers and any contractors it uses for dredging and disposal activities, the Oregon Department of Environmental Quality, and the Washington State Department of Ecology. Other interested users could include the Cowlitz Indian Tribe, the Nez Perce Tribe, Ports, recreational and commercial vessel owners, and recreational or commercial fishers. Individual copies of this opinion were provided to the USACE, the Cowlitz Indian Tribe, and the Nez Perce Tribe. The document will be available within two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adheres to conventional standards for style.

5.2 Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

5.3 Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this opinion and EFH consultation contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation, and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

6. REFERENCES

Abatzoglou, J. T., D. E. Rupp, and P. W. Mote. 2014. Seasonal climate variability and change in the Pacific Northwest of the United States. J. Clim. 27(5): 2125-2142.

Armstrong, D. A., B. G. Stevens, and J. C. Hoeman. 1981. Distribution and abundance of Dungeness crab and Crangon shrimp and dredging related mortality of invertebrates and fish in Grays Harbor, Washington. Technical Report to: Washington Department of Fisheries and U.S. Army Corps of Engineers. July, 1981.

Asplund, T. R. 2000. The effects of motorized watercraft on aquatic ecosystems. Wisconsin Department of Integrated Science Services. University of Wisconsin, PUBL-SS-948-00, Madison, WI. March 17, 2000.

Bottom, D. L., C. A. Simenstad, J. Burke, A. M. Baptista, D. A. Jay, K. K. Jones, et al. 2005. Salmon at River's End: The role of the estuary in the decline and recovery of Columbia River salmon. U.S. Department of Commerce, NOAA Technical Memorandum NMFSNWFSC-68. Northwest Fisheries Science Center, Seattle, WA. August, 2005.

Boyd, F. C. 1976. Fraser River dredging guidelines. Tech. Rpt. Series No. PAC/T-75-2. Fisheries and Marine Service, Environment Canada. June, 1976.

Boysen, K. A. and J. J. Hoover. 2009. Swimming performance of juvenile white sturgeon (Acipenser transmontanus): Training and the probability of entrainment due to dredging. J. Appl. Ichthyol. 25 (Suppl 2): 54-59. doi: 10.1111/j.1439-0426.2009.01247.x

BPA (Bonneville Power Administration), USBR (U.S. Bureau of Reclamation), and USACE (U.S. Army Corps of Engineers). 2020. Biological assessment of effects of the operations and maintenance of the Federal Columbia River System on ESA-listed species. Bonneville Power Administration, Portland, OR. January, 2020.

Brodeur, R. D., T. D. Auth, and A. J. Phillips. 2019. Major shifts in pelagic micronekton and macrozooplankton community structure in an upwelling ecosystem related to an unprecedented marine heatwave. Front. Mar. Sci. 6: 212.

Brophy L. S., C. M. Greene, V. C. Hare, B. Holycross, A. Lanier, W. N. Heady, et al. 2019. Insights into estuary habitat loss in the western United States using a new method for mapping maximum extent of tidal wetlands. PLoS ONE 14(8): e0218558. https://doi.org/10.1371/journal.pone.0218558

Carlson, T. J., G. Ploskey, R. L. Johnson, R. P. Mueller, M. A. Weiland, and P. N. Johnson. 2001. Observations of the behavior and distribution of fish in relation to the Columbia River navigation channel and channel maintenance activities. PNNL-13595. Prepared for the U.S. Army Corps of Engineers by Pacific Northwest National Laboratory, Richland, WA. October, 2001.

Carrasquero, J. 2001. Overwater structures: freshwater issues. White paper submitted to Washington Department of Fish and Wildlife, Washington Department of Ecology and Washington Department of Transportation. Olympia, WA. April, 2001.

Carter, J. A., G. A. McMichael, I. D. Welch, R. A. Harnish, and B. J. Bellgraph. 2009. Seasonal juvenile salmonid presence and migratory behavior in the lower Columbia River. PNNL-18246, Pacific Northwest National Laboratory, Richland, WA. April, 2009.

Columbia River DART. 2021. 10-year average scroll case temperature at Bonneville Dam (2011-2020). Columbia Basin Research, University of Washington, Seattle, WA. Accessed April 1, 2021.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2004. COSEWIC assessment and update status report on the green sturgeon Acipenser medirostris in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa, ON.

Crozier, L. G., B. J. Burke, B. E. Chasco, D. L. Widener, and R. W. Zabel. 2021. Climate change threatens Chinook salmon throughout their life cycle. Commun. Biol. 4: 222. doi.org/10.1038/s42003-021-01734-w

Crozier, L. G., Hendry, A. P., Lawson, P. W., Quinn, T. P., Mantua, N. J., Battin, J., Shaw, R. G. and R. B. Huey. 2008. Potential responses to climate change in organisms with complex life histories: evolution and plasticity in Pacific salmon. Evol. Appl. 1(2): 252-270.

Crozier, L. G., M. D. Scheuerell, and E. W. Zabel. 2011. Using time series analysis to characterize evolutionary and plastic responses to environmental change: a case study of a shift toward earlier migration date in sockeye salmon. Am. Nat. 178(6): 755-773.

Dominguez, F., E. Rivera, D. P. Lettenmaier, and C. L. Castro. 2012. Changes in winter precipitation extremes for the western United States under a warmer climate as simulated by regional climate models. Geophys. Res. Lett. 39(5). L05803 http://dx.doi.org/10.1029/2011GL050762

Doney, S. C., M. Ruckelshaus, J. E. Duffy, J. P. Barry, F. Chan, C. A. English, et al. 2012. Climate change impacts on marine ecosystems. Annu. Rev. Mar. Sci. 4: 11-37. doi:10.1146/annurev-marine-041911-111611

Dumbauld, B. R., D. L. Holden, and O. P. Langness. 2008. Do sturgeon limit burrowing shrimp populations in Pacific Northwest estuaries? Environ. Biol. Fish. 83: 283-296. doi:10.1007/s10641-008-9333-y

Dutta, L. K., and P. Sookachoff. 1975. A review of suction dredge monitoring in the lower Frasier River, 1971-1975. Fisheries and Marine Service, Environment Canada, Technical Report Series No. PAC/T-75-27.

Feely, R. A., T. Klinger, J. A. Newton, and M. Chadsey (eds.). 2012. Scientific summary of ocean acidification in Washington state marine waters. Washington Shellfish Initiative Blue Ribbon Panel on Ocean Acidification. NOAA Office of Atmospheric Research Special Report. Contribution No. 3934 from NOAA/Pacific Marine Environmental Laboratory, Seattle, WA. November, 2012.

Fresh, K. L., E. Casillas, L. L. Johnson, and D. L. Bottom. 2005. Role of the estuary in the recovery of Columbia River basin salmon and steelhead: An evaluation of the effects of selected factors on salmonid population viability. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-69, Northwest Fisheries Science Center, Seattle, WA. September, 2005.

Friesen, T. A. and D. L. Ward. 1999. Management of northern pikeminnow and implications for juvenile salmonid survival in the lower Columbia and Snake rivers. N. Am. J. Fish. Man. 19:406-420.

Fuhrer, G. J., D. Q. Tanner, J. L. Morace, S. W. McKenzie, and K. A. Skach. 1996. Water quality of the lower Columbia River basin: Analysis of current and historical water-quality data through 1994. U.S. Geological Survey, Water-Resources Investigations Report 95–4294, Portland, OR.

Glick, P., J. Clough, and B. Nunley. 2007. Sea-level rise and coastal habitats in the Pacific Northwest: An analysis for Puget Sound, Southwestern Washington, and Northwestern Oregon. National Wildlife Federation, Seattle, WA. July, 2007.

Goode, J. R., J. M. Buffington, D. Tonina, D. J. Isaak, R. F. Thurow, and S. Wenger. 2013. Potential effects of climate change on streambed scour and risks to salmonid survival in snow-dominated mountain basins. Hydrol. Process. 27(5): 750-765. doi:10.1002/hyp.9728

Grant, J. W. A., S. Ó. Steingrímsson, E. R. Keeley, and R. A. Cunjak. 1998. Implications of territory size for the measurement and prediction of salmonid abundance in streams. Can. J. of Fish. Aquat. Sci. 55 (Suppl. 1): 181-190. doi.org/10.1139/d98-018

Gustafson, R. G. (ed.). 2016. Status review update of eulachon (Thaleichthys pacificus) listed under the Endangered Species Act: Southern Distinct Population Segment. Northwest Fisheries Science Center, Seattle, WA. March 25, 2016.

Hansel, H. C., J. G. Romine, and R. W. Perry. 2017. Acoustic tag detections of green sturgeon in the Columbia River and Coos Bay estuaries, Washington and Oregon, 2010–11. U. S. Geological Survey Report 2017-1144. https://doi.org/10.3133/ofr20171144

Harvey, C., T. Garfield, G. Williams, and N. Tolimieri (eds.). 2019. California Current Integrated Ecosystem Assessment (CCIEA), California Current Ecosystem Status Report, 2019. Report to the Pacific Fishery Management Council, March 7, 2019. Northwest Fisheries Science Center, Seattle, WA. March, 2019.

Hay, D. E., and P. B. McCarter. 2000. Status of the eulachon Thaleichthys pacificus in Canada. Research Document 2000/145. Fisheries and Oceans Canada, Science Branch, Pacific Biological Station. Nanaimo, B.C., Canada.

Hicks, B. J., J. D. Hall, P. A. Bisson, and J. R. Sedell. 1991. Responses of salmonids to habitat changes. Chapter 14 in: Influences of forest and rangeland management on salmonid fishes and their habitats. Am. Fish. Soc. Spec. Publ. 19:483-519.

Hillson, T. 2020. RE: requesting help re. Columbia River chum and recent ocean conditions. Communication to L. Krasnow (NMFS) from T. Hillson (WDFW), April 13, 2020.

Homel, K. 2020. RE: requesting help re. Columbia River chum and recent ocean conditions. Communication to L. Krasnow (NMFS) from K. Homel (ODFW), April 13, 2020.

Hostetter, N.J., A.F. Evans, D.D. Roby, and K. Collis. 2012. Susceptibility of juvenile steelhead to avian predation: the influence of individual fish characteristics and river conditions. Trans. Am. Fish. Soc. 141:1586-1599. doi.org/10.1080/00028487.2012.716011

IPCC (Intergovernmental Panel on Climate Change). 2014. Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R. K. Pachauri and L. A. Meyer (eds.)]. IPCC, Geneva, Switzerland.

Isaak, D. J., S. Wollrab, D. Horan, and G. Chandler. 2012. Climate change effects on stream and river temperatures across the northwest US from 1980–2009 and implications for salmonid fishes. Climatic Change 113(2): 499-524.

ISAB (Independent Science Advisory Board) (ed.). 2007. Climate change impacts on Columbia River Basin fish and wildlife. In: Climate Change Report, ISAB 2007-2. Independent Scientific Advisory Board, Northwest Power and Conservation Council. Portland, OR. May 11, 2007.

ISAB (Independent Scientific Advisory Board). 2011. Columbia River food webs: Developing a broader scientific foundation for fish and wildlife Restoration. ISAB Report 2011-1, Portland, OR. January 7, 2011.

ISAB (Independent Science Advisory Board). 2015. Density dependence and its implications for fish management and restoration programs in the Columbia River basin. ISAB Report 2015-1, Portland, OR. February 25, 2015.

Johnson. G. E., K. L. Fresh, and N. K. Sather (eds). 2018. Columbia Estuary Ecosystem Restoration Program: 2018 Synthesis Memorandum. Final Report. Submitted by Pacific Northwest National Laboratory to U.S. Army Corps of Engineers, Portland District, Portland, OR. June, 2018.

Johnson, G. E., G. R. Ploskey, N. K. Sather, and D. J. Teel. 2015. Residence times of juvenile salmon and steelhead in off-channel tidal freshwater habitats, Columbia River, USA. Can. J. Fish. Aquat. Sci. 72: 684–696. dx.doi.org/10.1139/cjfas-2014-0085

Jones and Stokes Associates, Inc. 1998. Subtidal Epibenthic/Infaunal Community and Habitat Evaluation. East Waterway Channel Deepening Project, Seattle, WA. Prepared for the U.S. Army Corps of Engineers, Seattle District, Seattle, WA. November 3, 1998.

Kahler, T., M. Grassley, and D. Beauchamp. 2000. A summary of the effects of bulkheads, piers and other artificial structures and shorezone development on ESA-listed salmonids in lakes. Final Report to the City of Bellevue. The Watershed Company, Kirkland, WA. July 13, 2000.

Karnezis, J. 2019. FW: [EXTERNAL] Re: FW: [Non-DoD Source] Re: checking with you re. edits to env baseline. Communication to L. Krasnow (NMFS) from J. Karnezis (BPA), December 19, 2019.

Kidd, S. A., M. D. Schwartz, R. N. Fuller, R. McNatt, K. Poppe, T. D. Peterson, et al. 2019. Lower Columbia River Ecosystem Monitoring Program Annual Report for Year 14 (October 1, 2017 to September 30, 2018). Prepared by the Lower Columbia Estuary Partnership for the Bonneville Power Administration. Available from the Lower Columbia Estuary Partnership, Portland, OR. April, 2019.

Kjelland, M. E., C. M. Woodley, T. M. Swannack, and D. L. Smith. 2015. A review of the potential effects of suspended sediment on fishes: potential dredging-related physiological, behavioral, and transgenerational implications. Environ. Syst. Decis. 35: 334–350. doi: 10.1007/s10669-015-9557-2

Kukulka, T. and D. A. Jay. 2003. Impacts of Columbia River discharge on salmonid habitat: 2. Changes in shallow-water habitat. J. Geophys. Res. 108(C9): 3294. doi: 10.1029/2003JC001829

Kunkel, K. E., L. E. Stevens, S. E. Stevens, L. Sun, E. Janssen, D. Wuebbles, et al. 2013. Regional Climate Trends and Scenarios for the U.S. National Climate Assessment: Part 6. Climate of the Northwest U.S. NOAA Technical Report NESDIS 142-6. National Oceanic and Atmospheric Administration, National Environmental Satellite, Data, and Information Service, Washington, D.C. January, 2013.

Lawson, P. W., E. A. Logerwell, N. J. Mantua, R. C. Francis, and V. N. Agostini. 2004. Environmental factors influencing freshwater survival and smolt production in Pacific Northwest coho salmon (Oncorhynchus kisutch). Can. J. Fish. Aquat. Sci. 61(3): 360-373.

LCREP (Lower Columbia River Estuary Partnership). 2007. Lower Columbia River and estuary ecosystem monitoring: Water quality and salmon sampling report. Lower Columbia River Estuary Partnership, Portland, OR.

Maier, G. O. and C. A. Simenstad. 2009. The role of marsh-derived macrodetritus to the food webs of juvenile Chinook salmon in a large altered estuary. Est. Coasts 32: 984-998.

Mantua, N., I. Tohver, and A. Hamlet. 2009. Impacts of climate change on key aspects of freshwater salmon habitat in Washington State. In: The Washington Climate Change Impacts Assessment: Evaluating Washington's Future in a Changing Climate. M. M. Elsner, J. Littell, L. Whitely Binder (eds), 217-253. The Climate Impacts Group, University of Washington, Seattle, WA.

Mantua, N., I. Tohver, and A. Hamlet. 2010. Climate change impacts on streamflow extremes and summertime stream temperature and their possible consequences for freshwater salmon habitat in Washington State. Climatic Change 102(1): 187-223.

Marcoe, K. and S. Pilson. 2017. Habitat change in the lower Columbia River estuary, 1870-2009. J. Coast. Cons. 21: 505-525.

McCabe, G. T., Jr., S. A. Hinton, and R. L. Emmett. 1998. Benthic invertebrates and sediment characteristics in a shallow navigation channel of the lower Columbia River, before and after dredging. Northwest Sci. 72 (2): 116-126.

McCullough, D., S. Spalding, D. Sturdevant, and M. Hicks. 2001. Summary of technical literature examining the physiological effects of temperature. Issue Paper 5. Water Quality Criteria Guidance Development Project. U.S. Environmental Protection Agency, Region 10, Seattle, WA. EPA-910-D-01-005. May, 2001.

McMahon, T. E., and G. F. Hartman. 1989. Influence of cover complexity and current velocity on winter habitat use by juvenile coho salmon (Oncorhynchus kisutch). Can. J. Fish. Aquat. Sci. 46(9): 1551–1557.

Meyer, J. L., M. J. Sale, P. J. Mulholland, and N. L. Poff. 1999. Impacts of climate change on aquatic ecosystem functioning and health. JAWRA J. Am. Water Res. Asso. 35(6): 1373-1386.

Morgan, C. A., B. R. Beckman, L. A. Weitkamp, and K. L. Fresh. 2019. Recent ecosystem disturbance in the northern California Current. Am. Fish. Soc. 44(10): 465-474.

Morton, J. W. 1977. Ecological effects of dredging and dredge spoil disposal: a literature review. Tech. Paper 94. U.S. Fish and Wildlife Service. Washington D.C.

Moser, M. L., J. A. Israel, M. Neuman, S. T. Lindley, D. L. Erickson, B. W. McCovey Jr., and A. P. Klimley. 2016. Biology and life history of Green Sturgeon (Acipenser medirostris Ayres, 1854): State of the science. J. Appl. Ichthyol. 32 (Suppl. 1): 67–86.

Moser, M. L. and S. T. Lindley. 2007. Use of Washington estuaries by subadult and adult green sturgeon. Env. Biol. Fish. 79: 243–253.

Mosisch, T. D. and A. H. Arthington. 1998. The impacts of power boating and water skiing on lakes and reservoirs. Lakes & Reservoirs: Research and Management 3: 1-17.

Mote, P. W., A. K. Snover, S. Capalbo, S. D. Eigenbrode, P. Glick, J. Littell, et al. 2014. Ch. 21: Northwest. In: Climate Change Impacts in the United States: The Third National Climate Assessment, J. M. Melillo, T. C. Richmond, and G. W. Yohe (eds.), U.S. Global Change Research Program, 487-513. doi:10.7930/J04Q7RWX

Mote, P. W., D. E . Rupp, S. Li, D. J. Sharp, F. Otto, P. F. Uhe, et al. 2016. Perspectives on the cause of exceptionally low 2015 snowpack in the western United States. Geophys. Res. Lett. 43: 10980–10988. doi:10.1002/2016GLO69665

Moyle, P. B., P. J. Foley, and R. M. Yoshiyama. 1992. Status of green sturgeon, Acipenser medirostris, in California. Final Report submitted to National Marine Fisheries Service. University of California, Davis, CA. May, 1992.

Muck, J. 2010. Biological effects of sediment on bull trout and their habitat—guidance for evaluating effects. U.S. Fish and Wildlife Service, Washington Fish and Wildlife Office, Lacey, WA. July 13, 2010.

NMFS (National Marine Fisheries Service). 2005. Assessment of NOAA Fisheries' Critical Habitat Analytical Review Teams for 12 Evolutionarily Significant Units of West Coast salmon and steelhead. National Marine Fisheries Service, Protected Resources Division, Portland, OR. August, 2005.

NMFS (National Marine Fisheries Service). 2009. Middle Columbia River steelhead Distinct Population Segment ESA Recovery Plan. National Marine Fisheries Service, Northwest Region, Portland, OR. November 30, 2009.

NMFS (National Marine Fisheries Service). 2012. Endangered Species Act Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the reinitiation of Columbia River Navigation Channel operations and maintenance, mouth of the Columbia River to Bonneville Dam, Oregon and Washington (HUCS 1708000605, 1708000307, 1708000108). NMFS Consultation Number: 2011/02095. National Marine Fisheries Service, Northwest Region, Portland, OR.

NMFS (National Marine Fisheries Service). 2013. ESA Recovery Plan for Lower Columbia River coho salmon, Lower Columbia River Chinook salmon, Columbia River Chum salmon, and Lower Columbia River steelhead. National Marine Fisheries Service, Northwest Region. June, 2013.

NMFS (National Marine Fisheries Service). 2015a. ESA Recovery Plan for Snake River sockeye salmon (Oncorhynchus nerka). National Marine Fisheries Service, West Coast Region, Portland, OR. June 8, 2015.

NMFS (National Marine Fisheries Service). 2015b. Southern Distinct Population Segment of the North American Green Sturgeon (Acipenser medirostris) 5-Year review: Summary and evaluation. West Coast Region, Long Beach, CA.

NMFS (National Marine Fisheries Service). 2017a. ESA Recovery Plan for Snake River spring/summer Chinook salmon (Oncorhynchus tshawytscha) & Snake River Basin steelhead (Oncorhynchus mykiss). National Marine Fisheries Service, West Coast Region, Portland, OR. November, 2017.

NMFS (National Marine Fisheries Service). 2017b. ESA Recovery Plan for Snake River fall Chinook salmon (Oncorhynchus tshawytscha). National Marine Fisheries Service, Portland, OR. November, 2017.

NMFS (National Marine Fisheries Service). 2017c. Endangered Species Act Recovery Plan for the Southern Distinct Population Segment of eulachon (Thaleichthys pacificus). National Marine Fisheries Service, West Coast Region, Portland, OR.

NMFS (National Marine Fisheries Service). 2017d. Re: Recent sturgeon takes by suction dredge. Series of four e-mails from Z. Jylkka (NMFS Greater Atlantic Region Fisheries Office) sharing unpublished data and photos from four recent take reports for relatively large sturgeon taken during suction dredging of the Delaware River. November 27, 2017.

NMFS (National Marine Fisheries Service). 2018a. Recovery Plan for the Southern Distinct Population Segment of North American green sturgeon (Acipenser medirostris). National Marine Fisheries Service, West Coast Region, Sacramento, CA.

NMFS (National Marine Fisheries Service). 2018b. Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Maintenance Dredging Program for eight Federally-authorized navigation channels, Puget Sound and along the West Coast of Washington State. National Marine Fisheries Service, West Coast Region, Seattle, WA. January 26, 2018.

NMFS (National Marine Fisheries Service). 2020. Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response. Continued operation and maintenance of the Columbia River System. WCRO 2020-00113. National Marine Fisheries Service, West Coast Region, Portland, OR. July 24, 2020.

NWFSC (Northwest Fisheries Science Center). 2015. Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest. Northwest Fisheries Science Center, Seattle, WA. December 21, 2015.

ODEQ (Oregon Department of Environmental Quality). 2008. Water quality standards: Beneficial uses, policies, and criteria for Oregon. Water Pollution, Division 41. Oregon Department of Environmental Quality, Portland, OR.

ODFW (Oregon Department of Fish and Wildlife). 2020. Green sturgeon catch data for Oregon. Email to S. Wang (NMFS) from P. Stevens (ODFW). Attachment: Excel spreadsheet with incidental catch of green sturgeon in the lower Columbia River during white sturgeon stock assessment work. Oregon Department of Fish and Wildlife, Clackamas, OR. August 28, 2020.

ODFW (Oregon Department of Fish and Wildlife). 2021. California sea lion questions and answers. Have the state's efforts to remove California sea lions been effective? Downloaded from www.dfw.state.or.us/fish/sealion/faqs.asp. Accessed June 4, 2021.

ODFW (Oregon Department of Fish and Wildlife) and NMFS (National Marine Fisheries Service). 2011. Upper Willamette River Conservation and Recovery Plan for Chinook salmon and steelhead. National Marine Fisheries Service, Northwest Region, Portland, OR. August 5, 2011.

PFMC (Pacific Fishery Management Council). 1998. Description and identification of Essential Fish Habitat for the Coastal Pelagic Species Fishery Management Plan. Appendix D to Amendment 8 to the Coastal Pelagic Species Fishery Management Plan. Pacific Fishery Management Council, Portland, OR. December, 1998.

PFMC (Pacific Fishery Management Council). 2005. Amendment 18 (bycatch mitigation program), Amendment 19 (Essential Fish Habitat) to the Pacific Coast Groundfish Fishery Management Plan for the California, Oregon, and Washington groundfish fishery. Pacific Fishery Management Council, Portland, OR. November, 2005.

PFMC (Pacific Fishery Management Council). 2007. U.S. West Coast highly migratory species: Life history accounts and essential fish habitat descriptions. Appendix F to the Fishery Management Plan for the U.S. West Coast Fisheries for Highly Migratory Species. Pacific Fishery Management Council, Portland, OR. June, 2007.

PFMC (Pacific Fishery Management Council). 2014. Appendix A to the Pacific Coast Salmon Fishery Management Plan, as modified by Amendment 18 to the Pacific Coast Salmon Plan. Identification and description of Essential Fish Habitat, adverse impacts, and recommended conservation measures for salmon. Pacific Fishery Management Council, Portland, OR. September, 2014.

PFMC (Pacific Fishery Management Council). 2020. Pacific Coast Groundfish Fishery Management Plan for the California, Oregon, and Washington Groundfish Fishery. Pacific Fishery Management Council, Portland, OR. August, 2020.

PNNL (Pacific Northwest National Laboratory) and NMFS (National Marine Fisheries Service). 2020. Restoration Action Effectiveness Monitoring and Research in the lower Columbia River and estuary, 2016-2017. Final technical report submitted by PNNL and NMFS to the U.S. Army Corps of Engineers, Portland District, Portland, OR. June, 2020.

R2 Resource Consultants, Inc. 1999. Entrainment of outmigrating fish by hopper dredge at Columbia River and Oregon coastal sites. Prepared for the U.S. Army Corps of Engineers, Portland, OR. July, 1999.

Reine, K. and D. Clarke. 1998. Entrainment by hydraulic dredges-A review of potential impacts. Technical Note DOER-E1. U.S. Army Corps of Engineers, Environmental Laboratory, Vicksburg, MS. October, 1998.

Roby D.D, A.F. Evans, and K. Collis (eds). 2021. Avian predation on salmonids in the Columbia River basin: A synopsis of ecology and management. A synthesis report submitted to the U.S Army Corps of Engineers, Walla Walla, WA; the Bonneville Power Administration, Portland, OR; the Grant County Public Utility District/Priest Rapids Coordinating Committee, Ephrata, Washington; and the Oregon Department of Fish and Wildlife, Salem, Oregon. March 31, 2021.

Roegner, G. C., G. E. Johnson, and A. M. Coleman. 2021. Indexing habitat opportunity for juvenile anadromous fishes in tidal-fluvial wetland systems. Ecological Indicators 124. https://doi.org/10.1016/j.ecolind.2021.107422

Sather, N. K. 2020. Pre-construction benthos sampling at a dredge material placement site in the lower Columbia River. Memo from N. K. Sather (PNNL) to I. Royer and C. Studebaker (USACE). Pacific Northwest National Laboratory. May 1, 2020.

Sather, N. K., G. E. Johnson, D. J. Teel, A. J. Storch, J. R. Skalski, and V. I. Cullinan. 2016. Shallow tidal freshwater habitats of the Columbia River: spatial and temporal variability of fish communities and density, size, and genetic stock composition of juvenile Chinook salmon. Trans. Am. Fish. Soc. 145: 734–753. doi:10.1080/00028487.2016.1150878

Scheuerell, M. D., and J. G. Williams. 2005. Forecasting climate-induced changes in the survival of Snake River spring/summer Chinook salmon (Oncorhynchus tshawytscha). Fish. Ocean. 14: 448-457.

Schreier, A. D. and P. Stevens. 2020. Further evidence for lower Columbia River green sturgeon spawning. Environ. Biol. Fish. 103: 201-208. doi.org/10.1007/s10641-019-00945-9

Sherwood, C. R., D. A. Jay, R. B. Harvey, P. Hamilton, and C. A. Simenstad. 1990. Historical changes in the Columbia River estuary. Prog. Ocean. 25: 299-352.

Simenstad, C. A., L. F. Small, and C. D. McIntyre. 1990. Consumption processes and food web structure in the Columbia River estuary. Prog. Ocean. 25: 271-298.

Simenstad, C. A., D. A. Jay, and C. R. Sherwood. 1992. Impacts of watershed management on land-margin ecosystems: The Columbia River estuary. In: Watershed Management, R. J. Naiman (ed.), pp. 266-306.

Smith, W. E. and R. W. Saalfeld. 1955. Studies on Columbia River smelt Thaleichthys pacificus (Richardson). Washington Department of Fisheries, Olympia, WA. Fisheries Research 1(3): 3-26.

Stanford, B., K. Ridolfi, and B. Greenfield. 2009. Summary report: green sturgeon, longfin smelt, and dredging operations in the San Francisco estuary. SFEI Contribution # 598. Prepared for the U.S. Army Corps of Engineers. San Francisco Estuary Institute, Oakland, CA. December, 2009.

Sturdevant, M. V. 1999. Exxon Valdez oil spill, restoration project final report. Forage fish diet overlap, 1994-1996. National Marine Fisheries Service, Alaska Fisheries Science Center, Juneau, AK.

Sunda, W. G., and W. J. Cai. 2012. Eutrophication induced CO2-acidification of subsurface coastal waters: interactive effects of temperature, salinity, and atmospheric PCO2. Environ. Sci. Tech. 46(19): 10651-10659.

Tague, C. L., Choate, J. S., and Grant, G. 2013. Parameterizing sub-surface drainage with geology to improve modeling streamflow responses to climate in data limited environments. Hydrol. Earth System Sci. 17(1): 341-354.

Tetra Tech. 1996. The health of the river 1990-1996, integrated technical report. Final Report TC 0253-01. Prepared for The Lower Columbia River Bi-State Water Quality Program, Tetra Tech, Inc., Bellvue, WA. May 20, 1996.

Tillmann, P., and D. Siemann. 2011. Climate change effects and adaptation approaches in marine and coastal ecosystems of the North Pacific Landscape Conservation Cooperative Region. National Wildlife Federation. Funded by U.S. Fish and Wildlife Service Region 1 Science Applications Program. December, 2020.

USACE (U.S. Army Corps of Engineers). 2005. Parameters describing the convective descent of dredged material placed in open water by a hopper dredge. U. S. Army Corps of Engineers, Portland District, Portland, OR. February 26, 2005.

USACE (U.S. Army Corps of Engineers). 2021. Endangered Species Act Biological Assessment and Magnuson-Stevens Act Essential Fish Habitat Determination for anadromous salmonids, freen sturgeon, Pacific eulachon, for Federal Navigation Channel Operations and Maintenance Dredging Tongue Point, Clatsop County, Oregon; Elochoman Slough, Wahkiakum County, Washington; Lake River, Clark County, Washington; and Oregon Slough, Multnomah County, Oregon. U.S. Army Corps of Engineers, Portland District, Portland, OR. June 7, 2021.

USEPA (U.S. Environmental Protection Agency). 1993. Guidance specifying management measures for sources of nonpoint pollution in coastal waters. 840-B-92-002. EPA, Office of Water, Washington, D.C. January, 1993.

USEPA (U.S. Environmental Protection Agency). 1999. Columbia River Basin Fish Contaminant Survey: 1996 – 1998. EPA 910-R-02-006. U.S. Environmental Protection Agency, Region 10, Seattle, WA.

USEPA (U.S. Environmental Protection Agency). 2021. Portland Sediment Evaluation Team (PSET) Level 2B dredged material suitability determination for the U.S. Army Corps of Engineers - Portland District's (Corps) operations and maintenance (O&M) dredging for the Cathlamet Bay (CBY) Federal Navigation Channel (FNC) in the Columbia River at river mile (RM) 18.5. Memorandum for: U.S. Army Corps of Engineers – Portland District, Operations Division, Channels and Harbors, Waterways Maintenance Section (CENWP-ODN-W, Stokke). January 11, 2021.

Wainwright, T. C., and L. A. Weitkamp. 2013. Effects of climate change on Oregon Coast coho salmon: habitat and life-cycle interactions. Northwest Sci. 87(3): 219-242.

WDFW (Washington Department of Fish and Wildlife) and ODFW (Oregon Department of Fish and Wildlife). 2001. Washington and Oregon Eulachon Management Plan. Washington Department of Fish and Wildlife and Oregon Department of Fish and Wildlife. November, 2001.

WDOE (Washington Department of Ecology). 2002. Evaluating criteria for the protection of freshwater aquatic life in Washington's surface water quality standards: Dissolved oxygen. Draft discussion paper and literature summary. Revised. Publication Number 00-10-071. Washington Department of Ecology, Olympia, WA. December 10, 2002.

Werner, K., R. Zabel, D. Huff, and B. Burke. 2017. Ocean conditions and salmon returns for 2017-2018. Memorandum to M. Tehan (NMFS) West Coast Region. Northwest Fisheries Science Center, Seattle, WA. August 18, 2017.

Wilber, D. H. and D. G. Clark. 2001. Biological effects of suspended sediments: a review of suspended sediment impacts of fish and shellfish with relation to dredging activities in estuaries. N. Am. J. of Fish. Man. 21:855-875. doi.org/10.1577/1548-8675(2001)021<0855:BEOSSA>2.0.CO;2

Wilkens, J. L., A. W. Katzenmeyer, N. M. Hahn, J. J. Hoover, and B. C. Suedel. 2015. Laboratory tests of suspended sediment effects on short-term survival and swimming performance of juvenile Atlantic sturgeon (Acipenser oxyrinchus oxyrinchus, Mitchell, 1815). J. Appl. Ichth. 31: 984–990. doi: 10.1111/jai.12875

Williams, S., E. Winther, C. M. Barr, and C. Miller. 2017. Report on the predation index, predator control fisheries, and program evaluation for the Columbia River basin Northern Pikeminnow Sport Reward Program. 2017 Annual Report, April 1, 2017 through March 31, 2018. Pacific States Marine Fisheries Commission, Portland, OR.

Williams, S., E. Winther, C. M. Barr, and C. Miller. 2018. Report on the predation index, predator control fisheries, and program evaluation for the Columbia River basin Northern Pikeminnow Sport Reward Program. 2018 Annual report, April 1, 2018 through March 31, 2019. Pacific States Marine Fisheries Commission, Portland, OR.

Winder, M. and D. E. Schindler. 2004. Climate change uncouples trophic interactions in an aquatic ecosystem. Ecol. 85: 2100–2106.

Winther, E., C. M. Barr, C. Miller, and C. Wheaton. 2019. Report on the predation index, predator control fisheries and program evaluation for the Columbia River basin Northern Pikeminnow Sport Reward Program. 2019 Annual Report, April 1, 2019 through March 31, 2020. Pacific States Marine Fisheries Commission, Portland, OR.

Wissmar, R. C., J. E. Smith, B. A. McIntosh, H. W. Li, G. H. Reeves, and J. R. Sedell. 1994. Ecological Health of River Basins in Forested Regions of Eastern Washington and Oregon. Gen. Tech. Rep. PNW-GTR-326. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Portland, OR. February, 1994.

Zabel, R. W., M. D. Scheuerell, M. M. McClure, and J. G. Williams. 2006. The interplay between climate variability and density dependence in the population viability of Chinook salmon. Cons. Biol. 20(1): 190-200.

APPENDIX

Table A-1. Presence of ESA-listed fish species in the lower Columbia River by life stage. Work window months are highlighted in orange.

		=present				= relatively abundant				= peak occurrence			
Species	**Life Stage**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Eulachon													
Southern	Adult migr. & holding[1, 2]												
DPS	Adult spawning[2]												
	Egg incubation[3]												
	Larvae emigration												
Green Sturgeon													
Southern DPS	Sub-adult and adult foraging												
Salmon: Chinook													
Lower	Adult migr. & holding												
Columbia	Adult spawning												
	Eggs & pre-emergence												
	Juvenile rearing												
	Juvenile emigration												
Upper	Adult migr. & holding												
Columbia	Adult spawning												
	Eggs & pre-emergence												
	Juvenile rearing												
	Juvenile emigration												
Upper	Adult migr. & holding												
Willamette	Adult spawning												
	Eggs & pre-emergence												
	Juvenile rearing												
	Juvenile emigration												
Snake River -	Adult migr. & holding												
Spring/Summer	Adult spawning												
	Eggs & pre-emergence												
	Juvenile rearing												
	Juvenile emigration												
Snake River -	Adult migr. & holding												
Fall	Adult spawning												
	Eggs & pre-emergence												
	Juvenile rearing												
	Juvenile emigration												

		=present				= relatively abundant				= peak occurrence			
Species	**Life Stage**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Salmon: Chum													
Columbia River	Adult migr. & holding												
River	Adult spawning												
	Eggs & pre-emergence												
	Juvenile rearing												
	Juvenile emigration[4]												
Salmon: Coho													
Lower	Adult migr. & holding												
Columbia	Adult spawning												
	Eggs & pre-emergence												
	Juvenile rearing												
	Juvenile emigration												
Salmon: Sockeye													
Snake River	Adult migr. & holding												
	Adult spawning												
	Eggs & pre-emergence												
	Juvenile rearing												
	Juvenile emigration												
Steelhead													
Lower	Adult migr. & holding												
Columbia	Adult spawning												
	Eggs & pre-emergence												
	Juvenile rearing[5]												
	Juvenile emigration[6]												
Middle	Adult migr. & holding												
Columbia	Adult spawning												
	Eggs & pre-emergence												
	Juvenile rearing												
	Juvenile emigration												
Upper	Adult migr. & holding												
Columbia	Adult spawning												
	Eggs & pre-emergence												
	Juvenile rearing												
	Juvenile emigration												
Upper	Adult migr. & holding												
Willamette	Adult spawning												
	Eggs & pre-emergence												
	Juvenile rearing												
	Juvenile emigration												

=present | = relatively abundant | = peak occurrence

Species	Life Stage	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Snake River	Adult migr. & holding												
	Adult spawning												
	Eggs & pre-emergence												
	Juvenile rearing												
	Juvenile emigration												

[1] Eulachon Status Review Update, 20 January 2010. Available at: http://www.nwr.noaa.gov/Other-Marine-Species/upload/eulachon-review-update.pdf

[2] Personal communication. Conversation between WDFW (Brad James, Olaf Langness, and Steve West), ODFW (Tom Rien), and NMFS (Rob Markle, Bridgette Lohrman) regarding eulachon presence in the Columbia River. June 23, 2009.

[3] Eulachon egg incubation estimated relative to spawning timing and 20 to 40 day incubation period.

[4] Carter, J. A., G. A. McMichael, I. D. Welch, R. A. Harnish, and B. J. Bellgraph. 2009. Seasonal juvenile salmonid presence and migratory behavior in the lower Columbia River. PNNL-18246, Pacific Northwest National Laboratory, Richland, WA. April, 2009.

[5] Sol, S. Y., B. Anulacion, D. P. Lomax, P. Chittaro, P. Moran, G. M. Ylitalo, A. Hanson, C. Corbett, and L. L. Johnson. 2021. Juvenile salmon ecology in tidal freshwater wetlands in the Lower Columbia River Estuary. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-162. doi.org/10.25923/2bfz-ah24

[6] NMFS (National Marine Fisheries Service). 2013. ESA Recovery Plan for Lower Columbia River coho salmon, Lower Columbia River Chinook salmon, Columbia River Chum salmon, and Lower Columbia River steelhead. National Marine Fisheries Service, Northwest Region. June, 2013.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
1201 NE Lloyd Boulevard, Suite 1100
PORTLAND, OR 97232-1274

Refer to NMFS No.:

WCRO-2022-02520 February 16, 2023

Amy Gibbons
Chief, Environmental Resources Branch
Department of the Army
U.S. Army Corps of Engineers, Portland District
PO Box 2946
Portland, Oregon 97208-2946

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Lower Columbia River Federal Navigation Channel Dredged Material Transfer Sites (HUC170800060500, 170800030900, 170800030200)

Dear Ms. Gibbons:

This letter responds to the U.S. Army Corps of Engineers' (USACE) September 29, 2022, request for initiation of consultation with the National Marine Fisheries Service (NMFS) pursuant to Section 7 of the Endangered Species Act (ESA) for the subject action. Your request qualified for our expedited review and analysis because it met our screening criteria and contained all required information on, and analysis of, your proposed action and its potential effects to listed species and designated critical habitat.

We note here that you did not request to re-initiate consultation on "Columbia River Navigation Channel Operations and Maintenance, Mouth of the Columbia River to Bonneville Dam, Oregon and Washington" (NWR-2011-02095) based on this proposed action. The proposed action here is a modification to one existing transfer site, and the identification of six new transfer sites, which will temporarily store sediments dredged for the purpose of maintaining the Federal Navigation Channel (FNC) of the Columbia River. We note here that the USACE and NMFS are in Fish and Wildlife Coordination Act consultation on future management of Columbia River dredge sediment, in anticipation of an Environmental Impact Statement (EIS) that will evaluate a 20-year plan for disposal of dredged materials. NMFS will prepare a separate biological opinion on the effects of the 20-year dredge material management plan on ESA listed species once a preferred alternative is identified.

The current consultation's proposed transfer sites will exist contemporaneously with the existing maintenance dredging, and with the future 20-year dredge-disposal plan. The anticipated duration of these transfer sites is 25 years (see BA at page 1). This consultation focuses specifically on the effects of the 7 transfer sites.

Because the proposed action does not modify dredging operations and is regarding transfer sites for temporary placement only, rather than re-initiate NWR 2011-02095 for this proposed action, we recommended that the USACE prepare a BA that focused on 1) any changes in the status of species or critical habitat since 2012 and 2) that examined the effects of the proposed action as additional dredging and flow lane disposal as analyzed in NWR-2011-02095 because the transfer sites proposed will all be located in flow lanes where velocities are high, and in areas that are deeper in all cases than 20 feet and in most cases deeper than 30 feet.

We reviewed the USACE's consultation request and related initiation package. Where relevant, we have adopted the information and analyses you have provided and/or referenced but only after our independent, science-based evaluation confirmed they meet our regulatory and scientific standards. We adopt by reference:

- Biological Assessment (BA) Section 1.2.2.7 (Pre-Consultation Meetings and Correspondence) for Biological Opinion (BiOp) Section 1.2 (Consultation History).
- BA Section 1 (Federal Action Overview), Section 1.2.1 (Authority) and Section 3 (Proposed Action) for BiOp Section 1.3 (Proposed Federal Action).
- BA Section 1.4 (Listed Species and Designated Critical Habitat within the Action Area), Section 2.4 (Condition of Listed Species in the Action Area) and Section 2.5 (Condition of Critical Habitat in the Action Area) for BiOp Section 2.2 (Rangewide Status of the Species and Critical Habitat).
- BA Section 1.1 (Federal Action Location) and Section 1.3 (Action Area) for BiOp Section 2.3 (Action Area)
- BA Section 2 (Environmental Baseline) for BiOp Section 2.4 (Environmental Baseline)
- BA Section 4 (Effects of the Proposed Action) for BiOp Section 2.5 Effects of the Action

Background and Consultation History. BA Section 1.2.2.7 (Pre-Consultation Meetings and Correspondence) on pages 12 and 13 explains how the USACE and NMFS conducted the pre-consultation. Preconsultation between the USACE and NMFS occurred in 2022 including during a portion of the 2022 in-water work window for LCR FNC dredging. The USACE and NMFS agreed that the addition of transfer sites required a formal consultation. On August 29, 2022, the USACE sent NMFS the BA referenced here, and requested formal consultation. The USACE also requested that NMFS complete its Biological Opinion by September 30, 2022 so that transfer sites could be used in 2022. NMFS did not have staff to meet this deadline. The USACE then rescinded their request for formal consultation and requested NMFS technical assistance on use for one year of a single transfer site at river mile 60 that was necessary to complete 2022 FNC dredging. We replied with an email on September 28, 2022 agreeing to the use of this site in 2022. The USACE resubmitted their request for formal consultation on the continued use of the single transfer site, along with the six proposed transfer sites, for a period of 25 years, on September 29, 2022 and we initiated consultation on that date.

On July 5, 2022, the U.S. District Court for the Northern District of California issued an order vacating the 2019 regulations that were revised or added to 50 CFR part 402 in 2019 ("2019 Regulations," see 84 FR 44976, August 27, 2019) without making a finding on the merits. On September 21, 2022, the U.S. Court of Appeals for the Ninth Circuit granted a temporary stay of the district court's July 5 order. On November 14, 2022, the Northern District of California issued an order granting the government's request for voluntary remand without vacating the 2019 regulations. The District Court issued a slightly amended order two days later on November 16, 2022. As a result, the 2019 regulations remain in effect, and we are applying the 2019 regulations here. For purposes of this consultation and in an abundance of caution, we considered whether the substantive analysis and conclusions articulated in the biological opinion and incidental take statement would be any different under the pre-2019 regulations. We have determined that our analysis and conclusions would not be any different.

Proposed Action. The USACE proposes to establish six new transfer sites and modify one existing transfer site. The details of the site selection criteria, construction and use of transfer sites are described in BA Section 3 on pages 32 through 39 with best management practices (BMP) to minimize the effects of transfer sites on ESA listed species on pages 39 through 42. Transfer sites are large (16-28.8 acre) areas in the flow lane adjacent to the FNC where sediment dredged from the channel is stored until a pipeline dredge is available to move it to an upland or shoreline disposal site. Transfer sites are not proposed or analyzed in NWR 2011-02095. The USACE began using a transfer site at RM 43 (Puget Island) in 2013 and a transfer site at river mile 68 (Howard Island) in 2015. In both cases NMFS concurred that they did not alter the effects analysis in NWR 2011-02095 because their effects are essentially the same as the effects dredging and flow lane disposal that are analyzed in the BiOp.

Status of Species and Critical Habitat. We examined the status of each species that would be adversely affected by the proposed action to inform the description of the species' "reproduction, numbers, or distribution" as described in 50 CFR 402.02. We also examined the condition of critical habitat throughout the designated area and discuss the function of the physical or biological features essential to the conservation of the species that create the conservation value of that habitat. The BA lists the species affected by the proposed action in Table 2 on pages 13 and 14. The BA also summarizes the life history and migration timing of adults and juveniles of each species in Section 2.4 on pages 22 to 31. These summaries include basic life history descriptions for each species including adult and juvenile migration timing relative to the proposed action in water work window and the diets of juveniles migrating through the action area. They also include the most current risk assessment for each species at the time the BA was prepared. We supplement the information in this table with our most up to date summaries of the recovery status and limiting factors for each species in Table 1 below. Readers of NWR 2011-02095 should replace the status of species and critical habitat sections of that document with the following summary of the status of species and critical habitat.

Table 1. Listing classification and date, recovery plan reference, most recent status review, status summary, and limiting factors for each species considered in this opinion.

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Lower Columbia River (LCR) Chinook salmon	Threatened 6/28/05	NMFS 2013	NMFS 2022a; Ford 2022	This ESU comprises 32 independent populations. Relative to baseline VSP levels identified in the recovery plan (Dornbusch 2013), there has been an overall improvement in the status of a number of fall-run populations although most are still far from the recovery plan goals; Spring-run Chinook salmon populations in this ESU are generally unchanged; most of the populations are at a "high" or "very high" risk due to low abundances and the high proportion of hatchery-origin fish spawning naturally. Many of the populations in this ESU remain at "high risk," with low natural-origin abundance levels. Overall, we conclude that the viability of the Lower Columbia River Chinook salmon ESU has increased somewhat since 2016, although the ESU remains at "moderate" risk of extinction	• Reduced access to spawning and rearing habitat • Hatchery-related effects • Harvest-related effects on fall Chinook salmon • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Contaminant
Upper Columbia River (UCR) spring-run Chinook salmon	Endangered 6/28/05	Upper Columbia Salmon Recovery Board 2007	NMFS 2022b; Ford 2022	This ESU comprises four independent populations. Current estimates of natural-origin spawner abundance decreased substantially relative to the levels observed in the prior review for all three extant populations. Productivities also continued to be very low, and both abundance and productivity remained well below the viable thresholds called for in the Upper Columbia Salmon Recovery Plan for all three populations. Based on the information available for this review, the Upper Columbia River spring-run Chinook salmon ESU remains at high risk, with viability largely unchanged since 2016. .	• Effects related to hydropower system in the mainstem Columbia River • Degraded freshwater habitat • Degraded estuarine and nearshore marine habitat • Hatchery-related effects • Persistence of non-native (exotic) fish species • Harvest in Columbia River fisheries

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Snake River (SR) spring/summer-run Chinook salmon	Threatened 6/28/05	NMFS 2017a	NMFS 2022c; Ford 2022	This ESU comprises 28 extant and four extirpated populations. There have been improvements in abundance/productivity in several populations relative to the time of listing, but the majority of populations experienced sharp declines in abundance in the recent five-year period Overall, at this time we conclude that the Snake River spring/ summer-run Chinook salmon ESU continues to be at moderate-to-high risk.	Degraded freshwater habitat Effects related to the hydropower system in the mainstem Columbia River, Altered flows and degraded water quality Harvest-related effects Predation
Upper Willamette River (UWR) Chinook salmon	Threatened 6/28/05	NMFS 2011	NMFS 2016; Ford 2022	This ESU comprises seven populations. Abundance levels for all but Clackamas River DIP remain well below their recovery goals. Overall, there has likely been a declining trend in the viability of the Upper Willamette River Chinook salmon ESU since the last review. The magnitude of this change is not sufficient to suggest a change in risk category, however, so the Upper Willamette River Chinook salmon ESU remains at "moderate" risk of extinction.	Degraded freshwater habitat Degraded water quality Increased disease incidence Altered stream flows Reduced access to spawning and rearing habitats Altered food web due to reduced inputs of microdetritus Predation by native and non-native species, including hatchery fish Competition related to introduced salmon and steelhead Altered population traits due to fisheries and bycatch
Snake River fall-run Chinook salmon	Threatened 6/28/05	NMFS 2017b	NMFS 2022d; Ford 2022	This ESU has one extant population The single extant population in the ESU is currently meeting the criteria for a rating of "viable" developed by the ICTRT, but the ESU as a whole is not meeting the recovery goals described in the recovery plan for the species, which require the single population to be "highly viable with high certainty" and/or will require reintroduction of a viable population above the Hells Canyon Complex (NMFS 2017b). The Snake River fall-run Chinook salmon ESU therefore is considered to be at a moderate-to-low risk of extinction.	Degraded floodplain connectivity and function Harvest-related effects Loss of access to historical habitat above Hells Canyon and other Snake River dams Impacts from mainstem Columbia River and Snake River hydropower systems Hatchery-related effects Degraded estuarine and nearshore habitat.

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Columbia River (CR) chum salmon	Threatened 6/28/05	NMFS 2013	NMFS 2022a; Ford 2022	This species has 17 populations divided into 3 MPGs. 3 populations exceed the recovery goals established in the recovery plan (Dornbusch 2013). The remaining populations have unknown abundances. Abundances for these populations are assumed to be at or near zero. The viability of this ESU is relatively unchanged since the last review (moderate to high risk), and the improvements in some populations do not warrant a change in risk category, especially given the uncertainty regarding climatic effects in the near future.	Degraded estuarine and nearshore marine habitat Degraded freshwater habitat Degraded stream flow as a result of hydropower and water supply operations Reduced water quality Current or potential predation An altered flow regime and Columbia River plume Reduced access to off-channel rearing habitat in the lower Columbia River Reduced productivity resulting from sediment and nutrient-related changes in the estuary Juvenile fish wake strandings Contaminants
Lower Columbia River coho salmon	Threatened 6/28/05	NMFS 2013	NMFS 2022a; Ford 2022	Of the 24 populations that make up this ESUOnly six of the 23 populations for which we have data appear to be above their recovery goals. Overall abundance trends for the Lower Columbia River coho salmon ESU are generally negative. Natural spawner and total abundances have decreased in almost all DIPs, and Coastal and Gorge MPG populations are all at low levels, with significant numbers of hatchery-origin coho salmon on the spawning grounds. Improvements in spatial structure and diversity have been slight, and overshadowed by declines in abundance and productivity. For individual populations, the risk of extinction spans the full range, from "low" to "very high." Overall, the Lower Columbia River coho salmon ESU remains at "moderate" risk, and viability is largely unchanged since 2016.	Degraded estuarine and near-shore marine habitat Fish passage barriers Degraded freshwater habitat: Hatchery-related effects Harvest-related effects An altered flow regime and Columbia River plume Reduced access to off-channel rearing habitat in the lower Columbia River Reduced productivity resulting from sediment and nutrient-related changes in the estuary Juvenile fish wake strandings Contaminants

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Snake River sockeye salmon	Endangered 6/28/05	NMFS 2015	NMFS 2022f; Ford 2022	This single population ESU is at remains at “extremely high risk,” although there has been substantial progress on the first phase of the proposed recovery approach—developing a hatchery-based program to amplify and conserve the stock to facilitate reintroductions. Current climate change modeling supports the “extremely high risk” rating with the potential for extirpation in the near future (Crozier et al. 2020). The viability of the Snake River sockeye salmon ESU therefore has likely declined since the time of the prior review, and the extinction risk category remains “high.”	• Effects related to the hydropower system in the mainstem Columbia River • Reduced water quality and elevated temperatures in the Salmon River • Water quantity • Predation
Upper Columbia River steelhead	Threatened 1/5/06	Upper Columbia Salmon Recovery Board 2007	NMFS 2022b; Ford 2022	This DPS comprises four independent populations. The most recent estimates (five year geometric mean) of total and natural-origin spawner abundance have declined since the last report, largely erasing gains observed over the past two decades for all four populations (Figure 12, Table 6). Recent declines are persistent and large enough to result in small, but negative 15-year trends in abundance for all four populations. The overall Upper Columbia River steelhead DPS viability remains largely unchanged from the prior review, and the DPS is at high risk driven by low abundance and productivity relative to viability objectives and diversity concerns.	• Adverse effects related to the mainstem Columbia River hydropower system • Impaired tributary fish passage • Degraded floodplain connectivity and function, channel structure and complexity, riparian areas, large woody debris recruitment, stream flow, and water quality • Hatchery-related effects • Predation and competition • Harvest-related effects

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Lower Columbia River steelhead	Threatened 1/5/06	NMFS 2013	NMFS 2022a; Ford 2022	This DPS comprises 23 historical populations, 17 winter-run populations and 6 summer-run populations. 10 are nominally at or above the goals set in the recovery plan (Dornbusch 2013); however, it should be noted that many of these abundance estimates do not distinguish between natural- and hatchery- origin spawners. The majority of winter-run steelhead DIPs in this DPS continue to persist at low abundance levels (hundreds of fish), with the exception of the Clackamas and Sandy River DIPs, which have abundances in the low 1,000s. Although the five-year geometric abundance means are near recovery plan goals for many populations, the recent trends are negative. Overall, the Lower Columbia River steelhead DPS is therefore considered to be at "moderate" risk.,	• Degraded estuarine and nearshore marine habitat • Degraded freshwater habitat • Reduced access to spawning and rearing habitat • Avian and marine mammal predation • Hatchery-related effects • An altered flow regime and Columbia River plume • Reduced access to off-channel rearing habitat in the lower Columbia River • Reduced productivity resulting from sediment and nutrient-related changes in the estuary • Juvenile fish wake strandings • Contaminants
Upper Willamette River steelhead	Threatened 1/5/06	NMFS 2011	NMFS 2016; Ford 2022	This DPS has four demographically independent populations. Populations in this DPS have experienced long-term declines in spawner abundance. Although the recent magnitude of these declines is relatively moderate, continued declines would be a cause for concern. In the absence of substantial changes in accessibility to high-quality habitat, the DPS will remain at "moderate-to-high" risk. Overall, the Upper Willamette River steelhead DPS is therefore at "moderate-to-high" risk, with a declining viability trend.	• Degraded freshwater habitat • Degraded water quality • Increased disease incidence • Altered stream flows • Reduced access to spawning and rearing habitats due to impaired passage at dams • Altered food web due to changes in inputs of microdetritus • Predation by native and non-native species, including hatchery fish and pinnipeds • Competition related to introduced salmon and steelhead • Altered population traits due to interbreeding with hatchery origin fish

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Middle Columbia River steelhead	Threatened 1/5/06	NMFS 2009b	NMFS 2022h; Ford 2022	This DPS comprises 17 extant populations. Recent (five-year) returns are declining across all populations, the declines are from relatively high returns in the previous five-to-ten year interval, so the longer-term risk metrics that are meant to buffer against short-period changes in abundance and productivity remain unchanged. The Middle Columbia River steelhead DPS does not currently meet the viability criteria described in the Middle Columbia River steelhead recovery plan.	Degraded freshwater habitat Mainstem Columbia River hydropower-related impacts Degraded estuarine and nearshore marine habitat Hatchery-related effects Harvest-related effects Effects of predation, competition, and disease
Snake River basin steelhead	Threatened 1/5/06	NMFS 2017a	NMFS 2022i; Ford 2022	This DPS comprises 24 populations. Based on the updated viability information available for this review, all five MPGs are not meeting the specific objectives in the draft recovery plan, and the viability of many individual populations remains uncertain. Of particular note, the updated, population-level abundance estimates have made very clear the recent (last five years) sharp declines that are extremely worrisome, were they to continue.	Adverse effects related to the mainstem Columbia River hydropower system Impaired tributary fish passage Degraded freshwater habitat Increased water temperature Harvest-related effects, particularly for B-run steelhead Predation Genetic diversity effects from out-of-population hatchery releases

The BA provides a brief summary of the critical habitat of each listed species in the action area in Section 2.5 on pages 31 and 32. We supplement this information with descriptions of the status of designated critical habitat affected by the proposed action by examining the condition and trends of the essential physical and biological features of that habitat throughout the designated areas. These features are essential to the conservation of the ESA-listed species because they support one or more of the species' life stages (e.g., sites with conditions that support spawning, rearing, migration and foraging).

For most salmon and steelhead, NMFS's critical habitat analytical review teams (CHARTs) ranked watersheds within designated critical habitat at the scale of the fifth-field hydrologic unit code (HUC5) in terms of the conservation value they provide to each ESA-listed species that they support (NMFS 2005). The conservation rankings were high, medium, or low. To determine the conservation value of each watershed to species viability, the CHARTs evaluated the quantity and quality of habitat features, the relationship of the area compared to other areas within the species' range, and the significance to the species of the population occupying that area. Even if a location had poor habitat quality, it could be ranked with a high conservation value if it were essential due to factors such as limited availability, a unique contribution of the population it served, or is serving another important role.

A summary of the status of critical habitats, considered in this opinion, is provided in Table 2, below.

Table 2. Critical habitat, designation date, federal register citation, and status summary for critical habitat considered in this opinion

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
Lower Columbia River Chinook salmon	9/02/05 70 FR 52630	Critical habitat encompasses 10 subbasins in Oregon and Washington containing 47 occupied watersheds, as well as the lower Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some, or high potential for improvement. We rated conservation value of HUC5 watersheds as high for 30 watersheds, medium for 13 watersheds, and low for four watersheds.
Upper Columbia River spring-run Chinook salmon	9/02/05 70 FR 52630	Critical habitat encompasses four subbasins in Washington containing 15 occupied watersheds, as well as the Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition. However, most of these watersheds have some, or high, potential for improvement. We rated conservation value of HUC5 watersheds as high for 10 watersheds, and medium for five watersheds. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.
Snake River spring/summer-run Chinook salmon	10/25/99 64 FR 57399	Critical habitat consists of river reaches of the Columbia, Snake, and Salmon rivers, and all tributaries of the Snake and Salmon rivers (except the Clearwater River) presently or historically accessible to this ESU (except reaches above impassable natural falls and Hells Canyon Dam). Habitat quality in tributary streams varies from excellent in wilderness and roadless areas, to poor in areas subject to heavy agricultural and urban development (Wissmar et al. 1994). Reduced summer stream flows, impaired water quality, and reduced habitat complexity are common problems. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.
Upper Willamette River Chinook salmon	9/02/05 70 FR 52630	Critical habitat encompasses 10 subbasins in Oregon containing 56 occupied watersheds, as well as the lower Willamette/Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition. However, most of these watersheds have some, or high, potential for improvement. Watersheds are in good to excellent condition with no potential for improvement only in the upper McKenzie River and its tributaries (NMFS 2005). We rated conservation value of HUC5 watersheds as high for 22 watersheds, medium for 16 watersheds, and low for 18 watersheds.

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
Snake River fall-run Chinook salmon	10/25/99 64 FR 57399	Critical habitat consists of river reaches of the Columbia, Snake, and Salmon rivers, and all tributaries of the Snake and Salmon rivers presently or historically accessible to this ESU (except reaches above impassable natural falls, and Dworshak and Hells Canyon dams). Habitat quality in tributary streams varies from excellent in wilderness and roadless areas, to poor in areas subject to heavy agricultural and urban development (Wissmar et al. 1994). Reduced summer stream flows, impaired water quality, and reduced habitat complexity are common problems. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.
Columbia River chum salmon	9/02/05 70 FR 52630	Critical habitat encompasses six subbasins in Oregon and Washington containing 19 occupied watersheds, as well as the lower Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 16 watersheds, and medium for three watersheds.
Lower Columbia River coho salmon	2/24/16 81 FR 9252	Critical habitat encompasses 10 subbasins in Oregon and Washington containing 55 occupied watersheds, as well as the lower Columbia River and estuary rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 34 watersheds, medium for 18 watersheds, and low for three watersheds.
Snake River sockeye salmon	10/25/99 64 FR 57399	Critical habitat consists of river reaches of the Columbia, Snake, and Salmon rivers; Alturas Lake Creek; Valley Creek; and Stanley, Redfish, Yellow Belly, Pettit and Alturas lakes (including their inlet and outlet creeks). Water quality in all five lakes generally is adequate for juvenile sockeye salmon, although zooplankton numbers vary considerably. Some reaches of the Salmon River and tributaries exhibit temporary elevated water temperatures and sediment loads that could restrict sockeye salmon production and survival (NMFS 2015b). Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
Upper Columbia River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses 10 subbasins in Washington containing 31 occupied watersheds, as well as the Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 20 watersheds, medium for eight watersheds, and low for three watersheds.
Lower Columbia River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses nine subbasins in Oregon and Washington containing 41 occupied watersheds, as well as the lower Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of HUC5 watersheds as high for 28 watersheds, medium for 11 watersheds, and low for two watersheds.
Upper Willamette River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses seven subbasins in Oregon containing 34 occupied watersheds, as well as the lower Willamette/Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. Watersheds are in good to excellent condition with no potential for improvement only in the upper McKenzie River and its tributaries (NMFS 2005). We rated conservation value of HUC5 watersheds as high for 25 watersheds, medium for 6 watersheds, and low for 3 watersheds.
Middle Columbia River steelhead	9/02/05 70 FR 52630	Critical habitat encompasses 15 subbasins in Oregon and Washington containing 111 occupied watersheds, as well as the Columbia River rearing/migration corridor. Most HUC5 watersheds with PCEs for salmon are in fair-to-poor or fair-to-good condition (NMFS 2005). However, most of these watersheds have some or a high potential for improvement. We rated conservation value of occupied HUC5 watersheds as high for 80 watersheds, medium for 24 watersheds, and low for 9 watersheds.
Snake River basin steelhead	9/02/05 70 FR 52630	Critical habitat encompasses 25 subbasins in Oregon, Washington, and Idaho. Habitat quality in tributary streams varies from excellent in wilderness and roadless areas, to poor in areas subject to heavy agricultural and urban development (Wissmar et al. 1994). Reduced summer stream flows, impaired water quality, and reduced habitat complexity are common problems. Migratory habitat quality in this area has been severely affected by the development and operation of the dams and reservoirs of the Federal Columbia River Power System.

We also supplement the status of species and critical habitat information provided in the BA with the following assessment of the effects of climate change on the species and critical habitat affected by the proposed action. Climate change is likely to play an increasingly important role in determining the abundance and distribution of ESA-listed species, and the conservation value of designated critical habitats, in the Pacific Northwest. These changes will not be spatially homogeneous across the Pacific Northwest. Major ecological realignments are already occurring in response to climate change (IPCC, 2022)). Long-term trends in warming have continued at global, national and regional scales. Global surface temperatures in the last decade (2010s) were estimated to be 1.09 °C higher than the 1850-1900 baseline period, with larger increases over land ~1.6 °C compared to oceans ~0.88 (IPCC WGI, 2021). The vast majority of this warming has been attributed to anthropogenic releases of greenhouse gases (IPCC WGI, 2021). Globally, 2014-2018 were the 5 warmest years on record both on land and in the ocean (2018 was the 4th warmest) (NOAA NCEI 2022). Events such as the 2013-2016 marine heatwave (Jacox et al. 2018) have been attributed directly to anthropogenic warming in the annual special issue of Bulletin of the American Meteorological Society on extreme events (Herring et al. 2018). Global warming and anthropogenic loss of biodiversity represent profound threats to ecosystem functionality (IPCC WGII 2022). These two factors are often examined in isolation, but likely have interacting effects on ecosystem function.

Updated projections of climate change are similar to or greater than previous projections (IPCC, 2021). NMFS is increasingly confident in our projections of changes to freshwater and marine systems because every year brings stronger validation of previous predictions in both physical and biological realms. Retaining and restoring habitat complexity, access to climate refuges (both flow and temperature) and improving growth opportunity in both freshwater and marine environments are strongly advocated in the recent literature (Siegel and Crozier 2020). Climate change is systemic, influencing freshwater, estuarine, and marine conditions. Other systems are also being influenced by changing climatic conditions. Literature reviews on the impacts of climate change on Pacific salmon (Crozier, 2011, 2012, 2013, 2014, 2015, 2016, 2017; Crozier and Siegel, 2018; Siegel and Crozier, 2019, 2020) have collected hundreds of papers documenting the major themes relevant for salmon. Here we describe habitat changes relevant to Pacific salmon and steelhead, prior to describing how these changes result in the varied specific mechanisms impacting these species in subsequent sections.

Forests

Climate change will impact forests of the western U.S., which dominate the landscape of many watersheds in the region. Forests are already showing evidence of increased drought severity, forest fire, and insect outbreak (Halofsky et al. 2020). Additionally, climate change will affect tree reproduction, growth, and phenology, which will lead to spatial shifts in vegetation. Halofsky et al. (2018) projected that the largest changes will occur at low- and high-elevation forests, with expansion of low-elevation dry forests and diminishing high-elevation cold forests and subalpine habitats.

Forest fires affect salmon streams by altering sediment load, channel structure, and stream temperature through the removal of canopy. Holden et al. (2018) examined environmental factors contributing to observed increases in the extent of forest fires throughout the western U.S.

They found strong correlations between the number of dry-season rainy days and the annual extent of forest fires, as well as a significant decline in the number of dry-season rainy days over the study period (1984-2015). Consequently, predicted decreases in dry-season precipitation, combined with increases in air temperature, will likely contribute to the existing trend toward more extensive and severe forest fires and the continued expansion of fires into higher elevation and wetter forests (Alizedeh 2021).

Agne et al. (2018) reviewed literature on insect outbreaks and other pathogens affecting coastal Douglas-fir forests in the Pacific Northwest and examined how future climate change may influence disturbance ecology. They suggest that Douglas-fir beetle and black stain root disease could become more prevalent with climate change, while other pathogens will be more affected by management practices. Agne et al. (2018) also suggested that due to complex interacting effects of disturbance and disease, climate impacts will differ by region and forest type.

Freshwater Environments

The following is excerpted from Siegel and Crozier (2019), who present a review of recent scientific literature evaluating effects of climate change, describing the projected impacts of climate change on instream flows:

Cooper et al. (2018) examined whether the magnitude of low river flows in the western U.S., which generally occur in September or October, are driven more by summer conditions or the prior winter's precipitation. They found that while low flows were more sensitive to summer evaporative demand than to winter precipitation, interannual variability in winter precipitation was greater. Malek et al. (2018), predicted that summer evapotranspiration is likely to increase in conjunction with declines in snowpack and increased variability in winter precipitation. Their results suggest that low summer flows are likely to become lower, more variable, and less predictable.

The effect of climate change on ground water availability is likely to be uneven. Sridhar et al. (2018) coupled a surface-flow model with a ground-flow model to improve predictions of surface water availability with climate change in the Snake River Basin. Projections using RCP 4.5 and 8.5 emission scenarios suggested an increase in water table heights in downstream areas of the basin and a decrease in upstream areas.

As cited in Siegel and Crozier (2019), Isaak et al. (2018), examined recent trends in stream temperature across the Western U.S. using a large regional dataset. Stream warming trends paralleled changes in air temperature and were pervasive during the low-water warm seasons of 1996-2015 (0.18-0.35°C/decade) and 1976-2015 (0.14-0.27°C/decade). Their results show how continued warming will likely affect the cumulative temperature exposure of migrating sockeye salmon *O. nerka* and the availability of suitable habitat for brown trout *Salmo trutta* and rainbow trout *O. mykiss*. Isaak et al. (2018) concluded that most stream habitats will likely remain suitable for salmonids in the near future, with some becoming too warm. However, in cases where habitat access is currently restricted by dams and other barriers salmon and steelhead will be confined to downstream reaches typically most at risk of rising temperatures unless passage is restored (FitzGerald et al. 2020, Myers et al. 2018).

Streams with intact riparian corridors and that lie in mountainous terrain are likely to be more resilient to changes in air temperature. These areas may provide refuge from climate change for a number of species, including Pacific salmon. Krosby et al. (2018), identified potential stream refugia throughout the Pacific Northwest based on a suite of features thought to reflect the ability of streams to serve as such refuges. Analyzed features include large temperature gradients, high canopy cover, large relative stream width, low exposure to solar radiation, and low levels of human modification. They created an index of refuge potential for all streams in the region, with mountain area streams scoring highest. Flat lowland areas, which commonly contain migration corridors, were generally scored lowest, and thus were prioritized for conservation and restoration. However, forest fires can increase stream temperatures dramatically in short time-spans by removing riparian cover (Koontz et al. 2018), and streams that lose their snowpack with climate change may see the largest increases in stream temperature due to the removal of temperature buffering (Yan et al. 2021). These processes may threaten some habitats that are currently considered refugia.

Marine and Estuarine Environments

Along with warming stream temperatures and concerns about sufficient groundwater to recharge streams, a recent study projects nearly complete loss of existing tidal wetlands along the U.S. West Coast, due to sea level rise (Thorne et al. 2018). California and Oregon showed the greatest threat to tidal wetlands (100%), while 68% of Washington tidal wetlands are expected to be submerged. Coastal development and steep topography prevent horizontal migration of most wetlands, causing the net contraction of this crucial habitat.

Rising ocean temperatures, stratification, ocean acidity, hypoxia, algal toxins, and other oceanographic processes will alter the composition and abundance of a vast array of oceanic species. In particular, there will be dramatic changes in both predators and prey of Pacific salmon, salmon life history traits and relative abundance. Siegel and Crozier (2019) observe that changes in marine temperature are likely to have a number of physiological consequences on fishes themselves. For example, in a study of small planktivorous fish, Gliwicz et al. (2018) found that higher ambient temperatures increased the distance at which fish reacted to prey. Numerous fish species (including many tuna and sharks) demonstrate regional endothermy, which in many cases augments eyesight by warming the retinas. However, Gliwicz et al. (2018) suggest that ambient temperatures can have a similar effect on fish that do not demonstrate this trait. Climate change is likely to reduce the availability of biologically essential omega-3 fatty acids produced by phytoplankton in marine ecosystems. Loss of these lipids may induce cascading trophic effects, with distinct impacts on different species depending on compensatory mechanisms (Gourtay et al. 2018). Reproduction rates of many marine fish species are also likely to be altered with temperature (Veilleux et al. 2018). The ecological consequences of these effects and their interactions add complexity to predictions of climate change impacts in marine ecosystems.

Perhaps the most dramatic change in physical ocean conditions will occur through ocean acidification and deoxygenation. It is unclear how sensitive salmon and steelhead might be to the direct effects of ocean acidification because of their tolerance of a wide pH range in freshwater (although see Ou et al. 2015 and Williams et al. 2019), however, impacts of ocean acidification and hypoxia on sensitive species (e.g., plankton, crabs, rockfish, groundfish) will likely affect salmon indirectly through their interactions as predators and prey. Similarly, increasing frequency and duration of harmful algal blooms may affect salmon directly, depending on the toxin (e.g., saxitoxin vs domoic acid), but will also affect their predators (seabirds and mammals). The full effects of these ecosystem dynamics are not known but will be complex. Within the historical range of climate variability, less suitable conditions for salmonids (e.g., warmer temperatures, lower streamflows) have been associated with detectable declines in many of these listed units, highlighting how sensitive they are to climate drivers (Ford 2022, Lindley et al. 2009, Williams et al. 2016, Ward et al. 2015). In some cases, the combined and potentially additive effects of poorer climate conditions for fish and intense anthropogenic impacts caused the population declines that led to these population groups being listed under the ESA (Crozier et al. 2019).

Climate change effects on salmon and steelhead

In freshwater, year-round increases in stream temperature and changes in flow will affect physiological, behavioral, and demographic processes in salmon, and change the species with which they interact. For example, as stream temperatures increase, many native salmonids face increased competition with more warm-water tolerant invasive species. Changing freshwater temperatures are likely to affect incubation and emergence timing for eggs, and in locations where the greatest warming occurs may affect egg survival, although several factors impact intergravel temperature and oxygen (e.g., groundwater influence) as well as sensitivity of eggs to thermal stress (Crozier et al. 2020). Changes in temperature and flow regimes may alter the amount of habitat and food available for juvenile rearing, and this in turn could lead to a restriction in the distribution of juveniles, further decreasing productivity through density dependence. For migrating adults, predicted changes in freshwater flows and temperatures will likely increase exposure to stressful temperatures for many salmon and steelhead populations, and alter migration travel times and increase thermal stress accumulation for ESUs or DPSs with early-returning (i.e. spring- and summer-run) phenotypes associated with longer freshwater holding times (Crozier et al. 2020, FitzGerald et al. 2020). Rising river temperatures increase the energetic cost of migration and the risk of *en route* or pre-spawning mortality of adults with long freshwater migrations, although populations of some ESA-listed salmon and steelhead may be able to make use of cool-water refuges and run-timing plasticity to reduce thermal exposure (Keefer et al. 2018, Barnett et al. 2020).

Marine survival of salmonids is affected by a complex array of factors including prey abundance, predator interactions, the physical condition of salmon within the marine environment, and carryover effects from the freshwater experience (Burke et al., 2013; Holsman et al., 2012). It is generally accepted that salmon marine survival is size-dependent, and thus larger and faster growing fish are more likely to survive (Gosselin et al., 2021). Furthermore, early arrival timing in the marine environment is generally considered advantageous for populations migrating through the Columbia River. However, the optimal day of arrival varies across years, depending on the seasonal development of productivity in the California Current, which affects prey available to salmon and the risk of predation (Chasco et al., 2021). Siegel and Crozier (2019) point out the concern that for some salmon populations, climate change may drive mismatches between juvenile arrival timing and prey availability in the marine environment. However, phenological diversity can contribute to metapopulation-level resilience by reducing the risk of a complete mismatch. Carr-Harris et al. (2018), explored phenological diversity of marine migration timing in relation to zooplankton prey for sockeye salmon *O. nerka* from the Skeena River of Canada. They found that sockeye migrated over a period of more than 50 days, and populations from higher elevation and further inland streams arrived in the estuary later, with different populations encountering distinct prey fields. Carr-Harris et al. (2018) recommended that managers maintain and augment such life-history diversity.

Synchrony between terrestrial and marine environmental conditions (e.g., coastal upwelling, precipitation and river discharge) has increased in spatial scale causing the highest levels of synchrony in the last 250 years (Black et al. 2018). A more synchronized climate combined with simplified habitats and reduced genetic diversity may be leading to more synchrony in the productivity of populations across the range of salmon (Braun et al., 2016). For example, salmon productivity (recruits/spawner) has also become more synchronized across Chinook populations from Oregon to the Yukon (Dorner et al. 2018, Kilduff et al. 2014). In addition, Chinook salmon have become smaller and younger at maturation across their range (Ohlberger 2018). Other Pacific salmon species (Stachura el al. 2014) and Atlantic salmon (Olmos et al. 2020) also have demonstrated synchrony in productivity across a broad latitudinal range.

At the individual scale, climate impacts on salmon in one life stage generally affect body size or timing in the next life stage and negative impacts can accumulate across multiple life stages (Healey 2011; Wainwright and Weitkamp 2013, Gosselin et al. 2021). Changes in winter precipitation will likely affect incubation and/or rearing stages of most populations. Changes in the intensity of cool season precipitation, snow accumulation, and runoff could influence migration cues for fall, winter and spring adult migrants, such as coho and steelhead. Egg survival rates may suffer from more intense flooding that scours or buries redds. Changes in hydrological regime, such as a shift from mostly snow to more rain, could drive changes in life history, potentially threatening diversity within an ESU (Beechie et al. 2006). Changes in summer temperature and flow will affect both juvenile and adult stages in some populations, especially those with yearling life histories and summer migration patterns (Crozier and Zabel 2006; Crozier et al. 2010, Crozier et al. 2019).

At the population level, the ability of organisms to genetically adapt to climate change depends on how much genetic variation currently exists within salmon populations, as well as how selection on multiple traits interact, and whether those traits are linked genetically. While genetic diversity may help populations respond to climate change, the remaining genetic diversity of many populations is highly reduced compared to historic levels. For example, Johnson et al. (2018), compared genetic variation in Chinook salmon from the Columbia River Basin between contemporary and ancient samples. A total of 84 samples determined to be Chinook salmon were collected from vertebrae found in ancient middens and compared to 379 contemporary samples. Results suggest a decline in genetic diversity, as demonstrated by a loss of mitochondrial haplotypes as well as reductions in haplotype and nucleotide diversity. Genetic losses in this comparison appeared larger for Chinook from the mid-Columbia than those from the Snake River Basin. In addition to other stressors, modified habitats and flow regimes may create unnatural selection pressures that reduce the diversity of functional behaviors (Sturrock et al. 2020). Managing to conserve and augment existing genetic diversity may be increasingly important with more extreme environmental change (Anderson et al. 2015), though the low levels of remaining diversity present challenges to this effort (Freshwater 2019). Salmon historically maintained relatively consistent returns across variation in annual weather through the portfolio effect (Schindler et al., 2015), in which different populations are sensitive to different climate drivers. Applying this concept to climate change, Anderson et al (2015) emphasized the additional need for populations with different physiological tolerances. Loss of the portfolio increases volatility in fisheries, as well as ecological systems, as demonstrated for Fraser River and Sacramento River stock complexes (Freshwater et al., 2019; Munsch et al., 2022).

Action Area. "Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). BA Section 1.1 on pages 2 through 8 describes the location and dimensions of the six proposed new transfer sites and provides google map images of each transfer site. BA Figure 1 is reproduced below to help orient the reader to the several locations that comprise the action area. The transfer sites are discrete locations but BA section 1.3 on page 13 makes it clear that the action area is the continuous FNC and flow lane from river mile 28 to river mile 101.

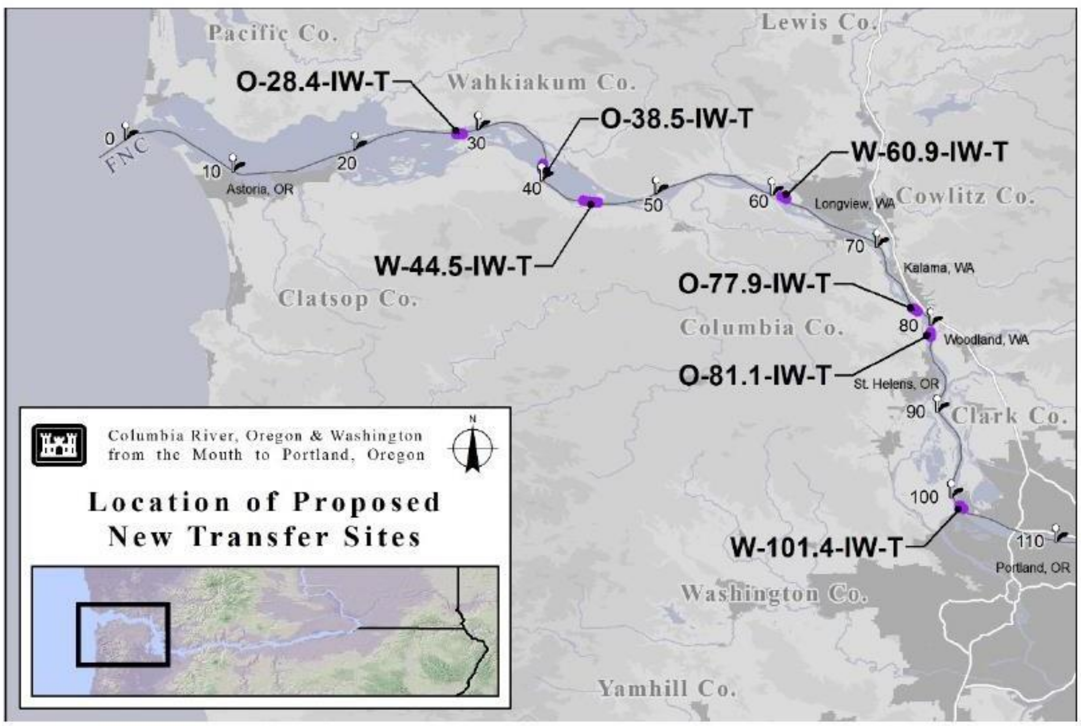


Figure 1. Map of proposed transfer sites (Site W-44.5-IW-T is existing).

Environmental Baseline. The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultations, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

The BA provides a very thorough description of the environmental baseline in Section 2 from pages 14 through 22 that establishes the context for all of the stressors in the effects analysis including; vessel and dredging noise, sediment quality, channel bathymetry, water quality, bedload, benthic habitat, primary production, listed species prey, listed species predators, and aquatic vegetation. In Section 2.4 on pages 22 through 31 , the BA combines Status of the Species information described above with information about juvenile rearing and migration times in the action area. In Section 2.5 on pages 31 and 32, the BA lists the critical habitat physical and biological features (PBFs) in the action area for salmon and steelhead. We add here that every population of every species covered by this opinion migrates through and forages in all or part of the action area. Salmon and steelhead migrate through the action area as both adults and juveniles (smolts).

Effects of the Action. Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.17). In our analysis, which describes the effects of the proposed action, we considered 50 CFR 402.17(a) and (b).

The biological assessment provides a detailed discussion and comprehensive assessment and review of the effects of the proposed action and relies on effects that were analyzed in by NMFS in NWR 2011-02095 (see for example BA Section 4 from page 43 to 48). NMFS considers its previous effects analysis to provide an accurate presentation of the pathways of exposure to project effects, and response of species and habitat, to be relevant and valid, and thus it is adopted here (50 CFR 402.14(h)(3)). NMFS has evaluated this section and after our independent, science-based evaluation determined it meets our regulatory and scientific standards.

We supplement the analysis in the BA as follows. The analysis of NWR 2011-02095, which informs the BA for this consultation, quantifies the effects of dredging to salmon, steelhead, eulachon and green sturgeon in terms of the spatial fraction of Columbia River deep water (>20 feet) habitat that is disrupted by dredging. The proposed action adds deep water riverbed surface area to the numerator, making the calculations in NWR 2011-02095 incorrect starting in the 2023 in water work window and going forward. In ***Table 3*** we add the area of the proposed transfer sites to the disturbed benthic surface areas in NWR 2012-02095 Table 36 (page 93) (and Table A2-13 on page A2-11) for salmon and steelhead smolts that utilize deep water habitat.

Table 3. Estimated Lower Columbia Smolt Migratory Corridor (estimated smolt habitat equals the sum of the flowlane used for placement + the flowlane used for transfer sites plus the flowlane not used for placement) from 2023 going forward in time.

River segment (RM_i-RM_{i+1}, miles)	2023 Total transfer site area (acres)	Area of navigation channel that needs dredging to maintain depth (acres)	2011 Area of flow lane deeper than -20 feet contour dused for placement (acres)	Area of navigation channel that does not need dredging to maintain depth (acres)	Area of flow land deeper than -20 feet contour not used for placement (acres)	Total estimated smolt migratory habitat (acres)	2011 Estimated percent habitat potentially affected	2023 Estimated percent habitat potentially affected	Percent change from 2011 Estimate
1 (3-25.2)	0	1,208	138	1,790	23,382	23,521	5.7	5.7	0
2 (25.2-48.2)	92.1	885	358	1,110	8,631	8,989	13.8	14.9	+1.1
3 (48.2-67.2)	24.2	438	330	1,270	4,870	4,200	14.8	15.2	+0.4
4 (67.2-83.8)	54.6	412	248	1,222	4,393	4,641	14.2	15.4	+1.2
5 (83.8-97.8	0	315	193	955	3,158	3,351	15.2.	15.2	0
6 (97.8-105.3)	27.5	42	28	656	2,113	2,141	3.3	4.6	+1.3
7 (105.3-125.3)	0	81	110	910	3,200	3,310	5.8	5.8	0
8 (125.3-136.4)	0	12	27	437	2,123	466	8.4	8.4	0
9 (136.4-145.3)	0	1	0	330	1,220	2,330	0	0	0

The proposed transfer sites add up to 1.3 percent to the area of the Columbia River streambed surface that is affected by dredging and dredge material management. We've thoroughly reviewed the effects analysis in NWR 2011-02095 and can find no instance where that prior analysis, or the BA that references it, would be changed by this small increase in streambed surface disturbance.

Cumulative Effects. "Cumulative effects" are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02 and 402.17(a)). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. BA Section 4.7 on pages 48 to 40 describe cumulative effects in the action area.

Integration and Synthesis. The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action to the environmental baseline and the cumulative effects, taking into account the status of the species and critical habitat, to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) Reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat as a whole for the conservation of the species.

ESA listed salmon and steelhead listed in Table 1 are at a low level of persistence and moderate risk of extinction. The BA Section 2.4 makes it clear that individuals from all Table 1 species are likely to migrate into or near the action area and some salmon species are likely to rear and forage in the action area for weeks to months. BA Section 2 makes it clear that all fish in the action area will encounter habitat conditions that have been degraded by human activity. BA Section 4.1 shows that the FNC maintenance dredging will result in direct effects to a few juvenile salmon and steelhead such as entrainment in dredge equipment or dredge material disposal plumes and exposure to suspended sediment that will result in injury or death. Since the proposed action allows the USACE to essentially dredge the same material twice, once from the FNC and a second time from the transfer site, it increases the likelihood of exposure to entrainment and suspended sediment. However, following the effects analysis protocol in NWR 2011-02095, we find that this increase in additional exposure is much too small to change the conclusions of NWR 2011-02095, even when combined with any changes to the status of salmon and steelhead species since 2012.

Similarly, the addition of transfer sites may increase the area of Columbia Riverbed disturbed by dredging in any given year but this increase is much too small to alter the critical habitat conclusions in NWR 2011-02095.

Conclusion. After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of LCR Chinook salmon, UCR spring run Chinook salmon, SR spring/summer Chinook salmon, UWR Chinook salmon, SR fall-run Chinook salmon, CR chum salmon, LCR coho salmon, SR sockeye salmon, UCR steelhead, LCR steelhead, UWR steelhead, MCR steelhead, or SRB steelhead or destroy or adversely modify their designated critical habitat.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS.

Amount or Extent of Take

Dredging and dredge material disposal necessary to complete the proposed maintenance of the Columbia River navigation channel, including dredging or dredge disposal at sites identified in the Mouth of the Columbia River Regional Sediment Management Plan (RSMP), the nine side channels, and in the Portland-Vancouver Anchorage, will occur when ESA listed salmon and steelhead, southern green sturgeon and eulachon will be present. Those actions are reasonably certain to cause incidental take when juvenile salmon, steelhead, or green sturgeon, or juvenile or adult eulachon, are entrained and injured or killed by dredge suction, captured and injured or killed in a mechanical dredge, or when injured or killed by contact with dredged material as it falls through the water column during in-water disposal. Additional incidental take is reasonable liely to occur due to harm caused by adverse alteration of channel substrate and prey resources, and reduced DO, increased turbidity, and other impaired water quality conditions caused by maintenance of the side channels and anchorage.

This incidental take will occur in the Columbia River, between RM -3.0 and 145.0, at disposal sites identified in the RSMP, in the nine side channels, and in the Portland-Vancouver Anchorage. Incidental take within those areas that meets the terms and conditions of this incidental take statement will be exempt from the taking prohibition.

Take caused by the habitat-related effects of this action cannot be accurately quantified as a number of fish because the distribution and abundance of fish that occur within the action area are affected by habitat quality, competition, predation, and the interaction of processes that influence genetic, population and environmental characteristics. These biotic and environmental processes interact in ways that may be random or directional, and may operate across far broader temporal and spatial scales that are affected by the proposed action. Thus, the distribution and abundance of fish within the action area cannot be attributed entirely to habitat conditions, nor can NMFS precisely predict the number of fish that are reasonably certain to be injured or killed in their habitat is modified or degraded by the proposed action. In such circumstances, NMFS uses the causal link established between the activity and the likely changes in habitat conditions affecting the listed species to describe the extent of take as a numerical level of habitat disturbance.

Here, the best available indicators for the extent of take are: (1) the area likely to be disturbed each year by active dredging and disposal operations relative to routine (preferred) dredging period, measured as acres; (2) the time that will be required to complete dredging and disposal operations, measured as day of actual active dredging or disposal operations relative to the routine dredging period; and (3) the total number of side channels dredged in a year. Because the amount of take increases with the tie spent dredging and the area disturbed by dredging and disposal, these indicators are proportional to extent of incidental take attributable to this project. The extent of take indicators in the following tables were derived using the salmon, eulachon and green sturgeon impact analyses and additional information received from the USACE regarding their operations (Smith 2012p). Although the USACE' proposed action would have authorized dredging to occur the entire length of the river, year-around, with some timing and area restrictions; the following extent of take indicators limit the potential effects to ESA-listed species and designated critical habitat to those effects assessed in this opinion.

Table 4. Amount and Extent of Take - Days Dredging and Disposal

River Segment	Annual Operation Duration-Dredging (Days of actual dredging)		Annual Operation Duration-Disposal (Days of actual disposal)	
	Completed During Routine Dates	Completed During Non-Routine Dates	Completed During Routine Dates	Completed During Non-Routine Dates
River Mouth RM-3 to RM +3	52	0	NA*	NA
RM+3 to RM 145	160	30	105	16

*NMFS determined the potential effects to ESA listed fish due to ocean disposal are insignificant.

Table 5. Amount and Extent of Take - Acres

River Segment	Annual Dredging Area (Acres)		Annual Disposal Area (Acres)	
	Completed During Routine Dates	Completed During Non-Routine Dates	Completed During Routine Dates	Completed During Non-Routine Dates
River Mouth RM-3 to RM +3	6,100	0	NA	NA
RM+3 to RM 145	7000	1,400	12,000	1,800

Historically, not all the side channels and Portland-Vancouver Anchorage are dredged each year, allowing habitat to recover. Here the best indicator for the extent of take is the amount of side channel habitat disturbed in a given year. This disturbance is best expressed as, an average of three side channels (including Portland-Vancouver Anchorage) dredged per year in a 5-year period, other than Baker Bay which may be dredged every year.

Exceeding any of these limits will trigger the reinitiation provisions of this opinion.

Effect of the Take

In the accompanying opinion, NMFS determined that this level of anticipated take is not likely to result in jeopardy to the species.

Reasonable and Prudent Measures

"Reasonable and prudent measures" are nondiscretionary measures to minimize the amount or extent of incidental take (50 CFR 402.02

The following reasonable and prudent measures are necessary and appropriate to minimize take of listed species resulting from implementation of the proposed action. The reasonable and prudent measures will also minimize adverse effects to critical habitat. The USACE shall:

1. Minimize incidental take caused by maintenance of the Columbia River navigation channel by limiting the time and manner of dredging to create and utilize the transfer sites, and dredged material disposal.
2. Ensure completion of a comprehensive monitoring and reporting program to confirm this opinion is meeting its objective of minimizing take from the proposed action.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, USACE must comply with the following terms and conditions. The USACE or any applicant or contractor has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

Section 2.8.4 of NWR 2011-02095 lists 13 terms and conditions to implement RPM 1 and three terms and conditions to implement RPM 2. The addition of 198 acres of transfer sites does not alter these terms and conditions in any way. We re-iterate the terms and conditions here.

1. To implement Reasonable and Prudent Measure #1 (dredging and dredge material disposal), the USACE shall:

a. Apply these terms and conditions to its own actions when carrying out FNC O&M work, to the actions of any contractor hired by the USACE for that purpose, and to the actions of any party licensed by the USACE to dredge sand from the FNC for commercial purposes.

b. Complete all dredging and in-water placement during the following times (the "routine" or "preferred" O&M season):

i. The mouth of the Columbia River at RM -3.0 to the Interstate 5 Bridge at RM 106.5 from June 1 through December 15.

c. Dredging and in-water placement may be completed outside the preferred O&M season as necessary to resolve shoaling conditions that cause, or are likely to cause, significant draft restrictions for commercial vessels if left unmanaged until the next preferred O&M season.

i. Whenever possible, limit dredging outside the preferred O&M season to April 1 through May 31.

ii. No in-water disposal is allowed between December 1 and May 31 Cowlitz River at RM 63 to 70,

iii. When alternative sites are available, there will be no in-water placement near the mouths of the Kalama River at RM 71 to 75, or the Lewis River at RM 85-89 December 1 and May 31.

iv. Testing and calibration of dredge equipment outside the preferred O&M season must occur upstream the Lewis River at RM 89.

d. Prior to any dredging taking place, the USACE must develop and implement a Water Quality Sampling and Monitoring Plan for dredging and disposal that has been reviewed and approved by NMFS. The plan must include the following minimum requirements for turbidity monitoring during periods of active dredging, disposal, and dewatering of upland facilities.

i. A properly and regularly calibrated turbidimeter is recommended, however visual gauging is acceptable

ii. Locations of turbidity samples or observations must be identified and described in the plan. At a minimum, monitoring must take place at the following distance, and within any visible plumes:

1. Dredging and in-water disposal activities (flowlane and beach placement) – Upcurrent (background) and 900 feet down current from the point of discharge (bucket, cutterhead, draghead, or pipeline) and no more than 150 feet laterally from the vessel or shoreline.

2. Other disposal activities (upland) – Upcurrent (background) and 300 feet downcurrent from the discharge point.

3. If a meter is used the USACE must identify a depth between 10 and 20 feet, or at mid-depth if in shallow areas (less than 20 feet in depth), to collect all samples.

iii. Monitoring must occur when dredging and disposal is being conducted and must meet the following requirements;

1. Active Dredging – once a day during a flood tide and once a day during an ebb tide.

2. In-Water Disposal (Flowlane and Beach Placement) – once a day during a flood tide and once a day during an ebb tide during a disposal activity.

3. Background turbidity NTU or observation, location, tidal stage, and time must be recorded prior to monitoring downcurrent

iv. Compliance:

1. Turbidity must be measured or observed and recorded as described above during periods of active dredging, disposal, and dewatering of upland facilities. Results must be compared to the background sample or observation taken during that monitoring event.

2. If an exceedance over the background level (as defined below Table 49) occurs at the second monitoring interval the activity must stop until the

turbidity levels return to background. At that time, activity may resume with the minimum frequency of monitoring while maintaining compliance

Table 6. Turbidity Exceedance and Actions Required

<table>
<tr><th rowspan="3">Turbidity Causing Action</th><th colspan="3">Allowable Exceedance Turbidity Level</th><th rowspan="3">Action Required at 1st Monitoring Interval</th><th rowspan="3">Action Required at 2nd Monitoring Interval</th></tr>
<tr><th colspan="2">Turbidimeter</th><th rowspan="2">Visual</th></tr>
<tr><th>Background <50 NTU</th><th>Background > 50 NTU</th></tr>
<tr><td>Dredging & In-Water Disposal</td><td rowspan="2">0 to 5 NTU above background</td><td rowspan="2">10% over background</td><td rowspan="2">Visible Plume</td><td>Modify activity and continue to monitor at ebb or flood tide</td><td>Stop activity until levels return to background and continue to monitor at ebb or flood tide</td></tr>
<tr><td>Upland Disposal</td><td>Modify activity and continue to monitor every 4 hours</td><td>Stop activity until levels return to background and continue to monitor every 4 hours</td></tr>
</table>

f. Keep dragheads and cutterheads at or buried in the substrate when suction dredges are working, and no more than 3.0 feet above the substrate for the minimum time necessary to clean or purge the dragheads.

g. Discharge material from a pipeline dredge at depths of 20.0 feet or more below the water surface.

h. Require use of an enclosed-bucket whenever a clamshell dredge or back-hoe will be used to dredge materials that are not approved for in-water disposal due to contaminant concerns.

i. Use the SEF (2009; or the most recent version) to determine the suitability of sediment for in-water disposal or beneficial use.

2. To Implement Reasonable and Prudent Measure #2 (monitoring), the Corps shall:

a. Include in its existing monitoring report (per NWR 2011-02095), sent to NMFS by February 15 each year, data on the volume dredged and locations utilized for placement

b. As previously required, submit the annual monitoring report to: projectreports.wcr@noaa.gov

c. The Corps must attend an annual coordination meeting with NMFS by March 1 each year to discuss the annual report and any actions that can improve conservation under this opinion, or make the maintenance program more efficient or accountable. The Corps is also encouraged to invite representatives from the Oregon Department of Environmental Quality, the Washington Department of Ecology, the Oregon Department of Fish and

Wildlife, the Washington Department of Fish and Wildlife and the U.S. Environmental Protection Agency to attend.

Reinitiation of Consultation

Reinitiation of consultation is required and shall be requested by the USACE or by NMFS, where discretionary Federal involvement or control over the action has been retained or is authorized by law and (1) the amount or extent of incidental taking specified in the ITS is exceeded, (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this biological opinion; or if (4) a new species is listed or critical habitat designated that may be affected by the identified action.

Species and Critical Habitat Not Likely to be Adversely Affected

Eulachon. We concur with the USACE that the proposed action is not likely to adversely affect eulachon because the June 1-December 15 in water work window has minimal overlap with eulachon migration. Adults return migration does include the month of June, and the early part of December causing some overlap with the effects of the proposed action, however we do not expect encountering turbidity associated with use of the transfer sites to impair adult migration to spawning areas. Adults spawn from December through May. Eulachon eggs incubate for 3-4 weeks so most eggs deposited in the Columbia River in May hatch before the middle of June. Eulachon larvae drift downstream in the current. In June the Lower Columbia River current is approximately 1 meter per second so larvae travel the length of the action area in 2 to 3 days. Eggs and larvae drift downstream along with sediment and we do not expect the co-occurrence of the drifting eggs/larvae and sediment from the use of the transfer sites to reduce survival of at this life stage. Effects to eulachon and to the water quality component of critical habitat for eulachon are insignificant.

Green Sturgeon. The BA describes the status of green sturgeon and their occurrence in the action area in Section 2.4.3 on pages 29-31. We concur with the USACE that in the action area, green sturgeon are large, strong swimming fish that can easily avoid or escape the effects of dredging or temporary placement of dredge materials at the transfer sites. There is low likelihood that subadult and adult green sturgeon would be entrained, and green sturgeon do not appear to have negative response to high levels of suspended sediment. Effects to species and the water quality component of critical habitat for green sturgeon are insignificant.

ESSENTIAL FISH HABITAT

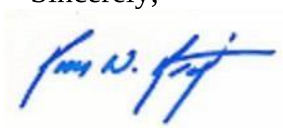
NMFS also reviewed the proposed action for potential effects on essential fish habitat (EFH) designated under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), including conservation measures and any determination you made regarding the potential effects of the action. This review was conducted pursuant to section 305(b) of the MSA, implementing regulations at 50 CFR 600.920, and agency guidance for use of the ESA consultation process to complete EFH consultation.

BA Section 6.1 on pages 53-54 provides a complete description and analysis of the effects of the proposed action transfer sites on Pacific Coast Salmon. NWR 2011-02095 provided two EFH conservation recommendations to protect EFH and the addition of transfer sites does not alter these conservation recommendations. We have no additional EFH conservation recommendations at this time.

This letter underwent pre-dissemination review using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The biological opinion will be available through NOAA Institutional Repository https://appscloud.fisheries.noaa.gov/suite/sites/eco. A complete record of this consultation is on file at Lacey, Washington.

Please contact Tom Hausmann, in Portland, Oregon, at tom.hausmann@noaa.gov, or 360-231-2315 if you have any questions concerning this consultation, or if you require additional information

Sincerely,



Kim W. Kratz, Ph.D
Assistant Regional Administrator
Oregon Washington Coastal Office

cc: Elizabeth Santana, USACE

References

Braun, D.C., Moore, J.W., Candy, J., and Bailey, R.E. (2016). Population diversity in salmon: linkages among response, genetic and life history diversity. Ecography *39*, 317-328.

Burke, B.J., Peterson, W.T., Beckman, B.R., Morgan, C., Daly, E.A., and Litz, M. (2013). Multivariate models of adult Pacific salmon returns. Plos One *8*, e54134.

Chasco, B.E., Burke, B.J., Crozier, L.G., and Zabel, R.W. (2021). Differential impacts of freshwater and marine covariates on wild and hatchery Chinook salmon marine survival. PLoS ONE *16*, e0246659. https://doi.org/0246610.0241371/journal.pone.0246659.

Crozier, L. (2011). Impacts of Climate Change on Columbia River Salmon: A review of the scientific literature published in 2010. Pages D1-D50 in Endangered Species Act Section 7(a)(2) supplemental biological opinion: consultation on remand for operation of the Federal Columbia River Power System US National Marine Fisheries Service, Northwest Region.

Crozier, L. (2012). Impacts of Climate Change on Columbia River Salmon: A review of the scientific literature published in 2011. Pages D1-D50 in Endangered Species Act Section 7(a)(2) supplemental biological opinion: consultation on remand for operation of the Federal Columbia River Power System US National Marine Fisheries Service, Northwest Region.

Crozier, L. (2013). Impacts of Climate Change on Columbia River Salmon: A review of the scientific literature published in 2012. Pages D1-D50 in Endangered Species Act Section 7(a)(2) supplemental biological opinion: consultation on remand for operation of the Federal Columbia River Power System US National Marine Fisheries Service, Northwest Region.

Crozier, L. (2014). Impacts of Climate Change on Columbia River Salmon: A review of the scientific literature published in 2013. Pages D1-D50 in Endangered Species Act Section 7(a)(2) supplemental biological opinion: consultation on remand for operation of the Federal Columbia River Power System US National Marine Fisheries Service, Northwest Region.

Crozier, L. (2015). Impacts of Climate Change on Columbia River Salmon: A review of the scientific literature published in 2014. Pages D1-D50 in Endangered Species Act Section 7(a)(2) supplemental biological opinion: consultation on remand for operation of the Federal Columbia River Power System US National Marine Fisheries Service, Northwest Region.

Crozier, L. (2016). Impacts of Climate Change on Columbia River Salmon: A review of the scientific literature published in 2015. Pages D1-D50 in Endangered Species Act Section 7(a)(2) supplemental biological opinion: consultation on remand for operation of the Federal Columbia River Power System US National Marine Fisheries Service, Northwest Region.

Crozier, L. (2017). Impacts of Climate Change on Columbia River Salmon: A review of the scientific literature published in 2016. Pages D1-D50 in Endangered Species Act Section 7(a)(2) supplemental biological opinion: consultation on remand for operation of the Federal Columbia River Power System US National Marine Fisheries Service, Northwest Region.

Crozier, L.G., and Siegel, J. (2018). Impacts of Climate Change on Columbia River Salmon: A review of the scientific literature published in 2017. Pages D1-D50 in Endangered Species Act Section 7(a)(2) supplemental biological opinion: consultation on remand for operation of the Federal Columbia River Power System US National Marine Fisheries Service, Northwest Region.

Freshwater, C., Anderson, S.C., Holt, K.R., Huang, A.M., and Holt, C.A. (2019). Weakened portfolio effects constrain management effectiveness for population aggregates. Ecological Applications *29*, 14.

Gosselin, J.L., Buhle, E.R., Van Holmes, C., Beer, W.N., Iltis, S., and Anderson, J.J. (2021). Role of carryover effects in conservation of wild Pacific salmon migrating regulated rivers. Ecosphere *12*, e03618.

Holsman, K.K., Scheuerell, M.D., Buhle, E., and Emmett, R. (2012). Interacting Effects of Translocation, Artificial Propagation, and Environmental Conditions on the Marine Survival of Chinook Salmon from the Columbia River, Washington, USA. Conserv Biol *26*, 912-922.

IPCC (2021). Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. In, V. Masson-Delmotte, P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu and B. Zhou ed. (Cambridge University Press (https://www.ipcc.ch/report/ar6/wg1/#FullReport)).

IPCC (2022). Climate Change 2022: Impacts, Adaptation and Vulnerability: Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.

Munsch, S.H., Greene, C.M., Mantua, N.J., and Satterthwaite, W.H. (2022). One hundred-seventy years of stressors erode salmon fishery climate resilience in California's warming landscape. Global Change Biology.

Schindler, D.E., Armstrong, J.B., and Reed, T.E. (2015). The portfolio concept in ecology and evolution. Frontiers in Ecology and the Environment *13*, 257-263.

Siegel, J., and Crozier, L.G. (2019). Impacts of Climate Change on Columbia River Salmon: A review of the scientific literature published in 2018. Pages D1-D50 in Endangered Species Act Section 7(a)(2) supplemental biological opinion: consultation on remand for operation of the Federal Columbia River Power System US National Marine Fisheries Service, Northwest Region.

Siegel, J., and Crozier, L.G. (2020). Impacts of Climate Change on Columbia River Salmon: A review of the scientific literature published in 2019. US National Marine Fisheries Service, Northwest Region https://doiorg/1025923/jke5-c307.

Determination of compatibility with provisions in Clatsop, Columbia, and Multnomah County's acknowledged comprehensive plan and land use regulations that relate to water quality

for Columbia River Navigation Channel Operations and Maintenance

(Clean Water Act Section 401 WQC Submittal #43780)

U.S. Army Corps of Engineers

Portland District, Civil Works

1. Contents

1. Introduction

The U.S. Army Corps of Engineers, Portland District (Corps) proposes to continue ongoing operations and maintenance (O&M) of federal navigation channels (FNCs) in the Columbia River (CR). Dredging of the CR is necessary to maintain deep-draft navigation in the CR FNC and the auxiliary FNCs so large vessels can safely sail to and from the Pacific Ocean.

The description of provisions in Clatsop, Columbia, and Multnomah County's acknowledged comprehensive plan and land use regulations that relate to water quality, and findings that the project is compatible with those land use factors which relate to water quality, are provided in connection with the Corps' Joint Permit Application for Clean Water Act Section 401 Water Quality Certification (WQC). This WQC would apply to the discharge of dredged material associated with the continued operation and maintenance of the CR FNC and the auxiliary FNCs between River Mile (RM) 3 and 145 in Clatsop, Columbia, and Multnomah Counties, Oregon.

1.1 Proposed Action

The Corps operates and maintains the CR FNCs which includes dredging and dredged material placement to maintain congressionally authorized project dimensions. The intent of the action is to ensure year-round channel access at those dimensions. The authorization does not specify the alignment of the channel or turning basins. When needed, the Corps may coordinate with the U.S. Coast Guard and NOAA to improve navigational safety by changing the alignment to reflect the reality of present-day infrastructure and usage more accurately. All depths are based on Mean Lower Low Water (MLLW) or Columbia River Datum in feet (ft) as appropriate. The Corps proposes to dredge 7 to 9 million cubic yards of material annually.

The Corps is authorized to maintain these federal navigation projects in order to provide safe, reliable channels for the transport of commerce, national security, and recreation. Shoaling occurs in areas where the natural depth of the river is less than the authorized depth of the channel. Dredging is necessary to remove shoals that restrict the movement of vessels. Advanced maintenance dredging is the practice of excavating shoals to a depth and/or width greater than the authorized navigation channel dimensions for the purpose of maintaining the authorized dimensions for a longer period of time between maintenance dredging events. Due to the inaccuracies of dredging, incidental removal of material may occur below the advanced maintenance depth.

The proposed O&M activities currently have a WQC, WQC NWPOP-CLA-F05-001-FR, dated May 19, 2014, as amended on September 3, 2015, August 2, 2019, March 23, 2022, and October 19, 2022. The Corps is not proposing any changes to dredging or dredged material placement locations.

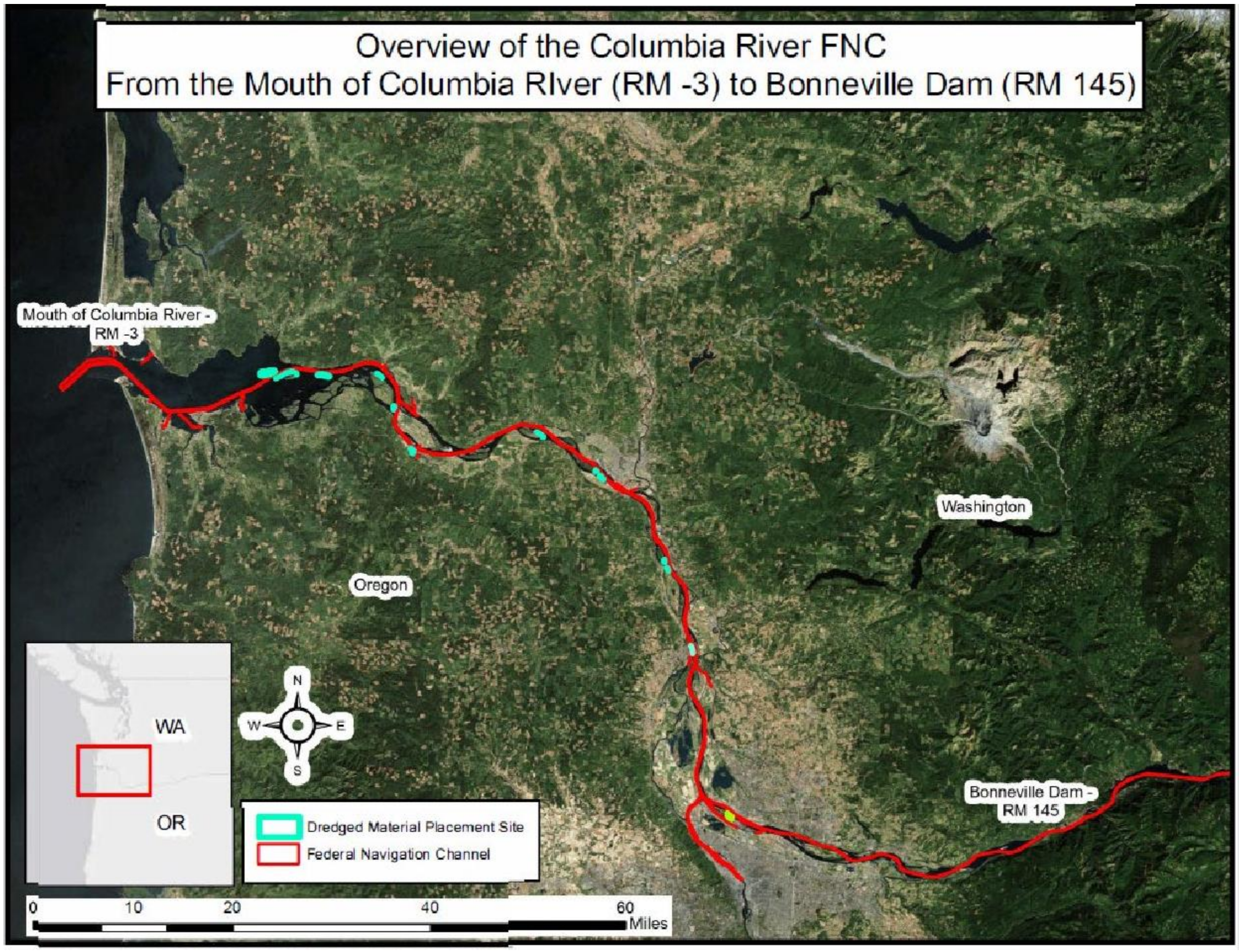


Figure 1. Columbia River FNC

Specific Areas located partially or wholly within the State of Oregon to be maintained by dredging include:

- **Lower Columbia River FNC; deep draft channel and associated turning basins (RM 3 to RM 106.5).**
  - The authorized channel is generally 600' wide and 43' deep from RM 3 to 105.5 and 35' deep from RM 105.5 to 106.5, with an advanced maintenance depth (AMD) of 5' and overwidth of 100' if necessary.
- **Columbia River FNC; Vancouver, Washington to Bonneville Dam (RM 106.5 to RM 145).**
  - The authorized channel is 300' wide and 27' deep; however, this reach is typically maintained to a depth of 17', with AMD of 2' and variable overwidth up to 100'.
- **Columbia River FNC; side channels.**
  - <u>Skipanon:</u> This channel extends from the Columbia River to the Skipanon RM 2, and is authorized to 30' deep, with a width of 200'. Typically, the Corps maintains this reach to 16' deep, with 2' AMD and variable overwidth.
  - <u>Tongue Point:</u> This channel is authorized to 34' deep and 350' wide, with a length of 1.6 miles, with 2' AMD and variable overwidth.

- Westport Slough: This channel is authorized to 28' deep, and 200' wide, with a length of 3500'. Typically, the USACE maintains this reach to 20' deep with a 2' AMD and variable overwidth. The entrance channel for the ferry is maintained to 9’ deep with 2’ AMD and variable overwidth.
- Oregon Slough: The downstream entrance from the Columbia Channel to Oregon Slough RM 1.5 is part of the deep draft channel authorized to 43' deep. The Oregon Slough side channel RM 1.5 to 3.8 is maintained to 20’ deep by 200’ wide with 2’ AMD and variable overwidth. The upstream entrance side channel is maintained to 10' deep by 300' wide, with a length of 5,800’ with 2’ AMD and variable overwidth.
- Reminder: Although the riverward ends of Baker Bay and Chinook FNCs in the Columbia River are located within the State of Oregon, the Corps will continue the existing practice of following State of Washington 401 compliance when dredging those FNCs.

Portland/Vancouver Anchorage Project

- Anchorage area A: This area is located between RM 102+36.5 and RM 103+3.5, adjacent to the Columbia River FNC. This area is 2000' long by 370' to 550' wide, and is maintained to 43' deep with 2' AMD and variable overwidth.
- Anchorage area B: This area is located between RM 1-03 and RM 103.5, and is approximately 500' outside of the FNC. This will be maintained to a depth of 25' with 2' AMD and variable overwidth.

Material to be dredged at the dredge locations are from the LCR FNC. The proposed dredging and placement sites occur in substrates composed primarily of sand (29% to 99%) and gravel (<1% to >99%); the fines (silt and clay) fraction is less than 1% across all sites.

1.2 Dredged Material Placement

The Corps has five options for dredged material placement: in-water placement in areas of the Columbia River greater than 20 feet deep, upland placement, shoreline (beach nourishment), transfer/rehandle sites, or ocean placement. From RM 3 to 145 (Bonneville Dam), the decision to place material in-water, upland or for beach nourishment, depends on type of dredge used and both the availability and access to the placement site. From RM 3 to 30, the decision to haul material to the ocean site is dependent on type of dredge used and availability of in-water placement sites in the Columbia River. The CR FNC is maintained annually by three hopper dredges and one pipeline dredge. Additionally, clamshell dredges, which remove shoals mechanically using buckets operated by floating cranes on barges, may be used occasionally in the FNC for maintenance. In-water placement of material dredged from federal navigation projects in Oregon and Washington occurs in depths greater than 20 feet within or outside the navigation channel throughout the mainstem Columbia River from RM 3 to RM 145.

Table 1. Specific sites located partially or wholly within the State of Oregon used for upland and/or shoreline placement, or in-water transfer of material dredged from the LCR FNC and associated turning basins RM 3 to RM 106.5:

Site Name	RM	Type	County
Rice Island	W-21.0-UP	Upland & Shoreline	Clatsop (RM 0 – RM 44)
Miller Sands Island	O-23.5-BN	Shoreline	Clatsop
Pillar Rock Island	O-27.2-UP	Upland & Shoreline	Clatsop
Welch Island	O-34.0-UP	Upland	Clatsop
Tenasillahe Island	O-38.3-UP	Upland	Clatsop
James River	O-42.9-UP	Upland	Clatsop
Puget Transfer	W-44.5-IW-T	In-Water Transfer	Columbia (RM 44 - RM 96)
Crims Island	O-57.0-UP	Upland	Columbia
Lord Island	O-63.5-UP	Upland	Columbia
Dibblee Point	O-64.8-UP	Upland	Columbia
Howard Island Transfer	O-69.6-IW-T	In-Water Transfer	Columbia
Sandy Island	O-75.8-UP	Upland	Columbia
Lower Deer Island	O-77.0-UP	Upland	Columbia
O-77.9-IW-T Transfer	O-77.9-IW-T	In-Water Transfer	Columbia
O-81.1-IW-T Transfer	O-81.1-IW-T	In-Water Transfer	Columbia
Sand Island	O-86.2-BN	Shoreline	Columbia
West Hayden Island	O-105.0-UP	Upland	Multnomah (RM 96 – RM 147)

1.3 Duration and Timing

Dredging in the CR FNC between RM 3 and 106.5 may occur at any time of year, although most dredging occurs between 1 June and 15 December. Maintenance dredging of the CR FNC between RM 106.5 and 145 will occur 1 August through 30 September. Side channel dredging will occur 1 August through 15 December. These work windows are in accordance with the most current 2012, 2021 and 2023 Biological Opinions from National Marine Fisheries Service (NMFS).

1.4 Best Management Practices

The best management practices (BMPs) associated with the ongoing Columbia River FNC operations and maintenance program would be included as part of the proposed action. BMPs are implemented to minimize impacts on water quality, aquatic species, federal Endangered Species Act (ESA)-listed fish, and sediments during dredging, transportation, and placement of materials. Standard methods for handling hazardous materials spills would also be implemented. During any operation and maintenance actions, there would be potential for contaminants to enter the water. If a spill were to occur, the Corps follows a Spill Response Plan, a single consolidated document to meet multiple spill response planning requirements, as identified under the Occupational Safety and Health Administration's Standard, the Resource Conservation and Recovery Act's Contingency Plan, Superfund Amendment and Reauthorization Act, Title III's Emergency Planning and Community Right to Know Act, the Oil Pollution Act, the CWA, and the state, local, regional, and National Contingency Plans for spill response. Implementation of the National Contingency Plans requires a nationwide network of regional response plans, including the Corps' Spill Response Plan. Operations Project Managers, Dredge Incident Commanders, and emergency-system First Responders use this plan as their primary guidance for responding to oil and hazardous substance spill emergencies at the Corps, Portland District.

Table 2 outlines the BMPs and spill control measures that are currently in place for the Columbia River O&M program.

Table 2. Dredging Best Management Practices (BMPs) and Spill Control Measures Included as Part of the Proposed Maintenance Dredging

Dredging BMPs

Measure	Justification	Duration	Ongoing Management
Hopper Dredging			
Drag or cutterheads will be buried in the substrate and will not exceed an elevation of 3 feet off the bottom for when cleaning the hopper or reverse purging dragheads. If water is pumped through dragheads to clean the hopper, dragheads will be 20 ft below the surface while dredging between RM 3 and RM 106.5; dragheads will be 9 ft below the surface between RM 106.5 and RM 145, and in shallow-draft side channels.	To minimize potential entrainment of juvenile salmonids	Continuous throughout dredging operations	Maintain unless new information warrants change(s)

Pipeline Dredging			
Maintain dragheads and/or cutterheads buried, or no more than 3 ft elevation of the river bottom when cleaning, for dredging between RM 3 and RM 106.5; within 9 ft between RM 106.5 and RM 145, and in shallow-draft side channels.	To minimize potential entrainment of juvenile salmonids	Continuous throughout dredging operations	Maintain unless new information warrants change(s)
All Dredging			
Dredging of shallow water areas (< 20 ft) will occur during recommended in-water work windows to minimize effects to ESA-listed species.	These shallow water areas are considered migratory habitat for salmonids. Dredging and placement activities could adversely affect food resources or delay migration.	Continuous throughout dredging operations	Maintain unless new information warrants change(s)
Contractor(s) shall not release any trash, garbage, oil, grease, chemicals, or other contaminants into waterways	Protection of aquatic resources	Life of contract or action	Any unintentional in-water release will be immediately reported to the U.S. Coast Guard Unit for appropriate response. If material is released, it shall be immediately cleaned up/removed and the affected area shall be restored to a condition approximating adjacent undisturbed areas. Contaminated soils shall be excavated and removed.
Contractor(s), where possible, will use or propose for use materials considered environmentally friendly in that waste from such materials is not regulated as hazardous or is not considered harmful to the environment. If hazardous wastes are generated, disposal shall be done in accordance with 40 CFR parts 260-272 and 49 CFR parts 100-177.	Minimize and ensure safe disposal of hazardous waste	Life of contract or action	Any unintentional in-water release will be immediately reported to the U.S. Coast Guard Unit for appropriate response. If material is released, it shall be immediately cleaned up/removed and the affected area shall be restored to a condition approximating adjacent undisturbed areas. Contaminated soils shall be excavated and removed.

Dredged Material Placement BMPs

Measure	Justification	Duration	Ongoing Management
In-River Placement			
Spread out dredged material to prevent mounding	Reduces depth of material to minimize effects to fish and invertebrates	Life of contract or action	Maintain unless new information warrants change(s)
Maintain discharge pipe of pipeline dredge at or below 20 ft depth during placement	Reduce impact of placement, suspended sediment, and turbidity to migrating juvenile salmonids	Continuous throughout placement operations	Maintain unless new information warrants change(s)
Shoreline Placement			
Grade placement site to slope of 10-15%, with no swales, to reduce the possibility of stranding juvenile salmonids	Ungraded slopes can create small pools or flat slopes that can strand juvenile salmon washed ashore by waves	Continuous throughout placement operations	Maintain unless new information warrants change(s)
Ocean Placement			
Place material in accordance with the applicable site management and monitoring plan	Reduce suspended sediments and turbidity in runoff water	Continuous throughout placement operations	Maintain unless new information warrants change(s)
Upland Placement			
Berm upland placement sites (slope at 1.5 to 1 or flatter) to maximize the settlement of fine materials in runoff water	Ungraded slopes can create small pools or flat slopes that can strand juvenile salmon washed ashore by waves	Continuous throughout placement operations	Maintain unless new information warrants change(s)
Only clean dredged material will be placed at upland sites, unless specifically authorized otherwise	Protection of riparian and aquatic resources	Life of contract or action	Maintain unless new information warrants change(s)
Land-based construction equipment that enters within the wetted perimeter of a water body shall be cleaned before use and shall use environmentally acceptable lubricants and other fluids.	Protection of riparian and aquatic resources	Life of contract or action	Maintain unless new information warrants change(s)
Vegetation along the water shall be left in its natural conditions unless removal of such vegetation was authorized in the EIS and required to achieve authorized purposes	Maintain habitat functions/values of riparian and aquatic areas	Continuous throughout operations	Maintain unless new information warrants change(s)

Erosion control measures shall be utilized during upland placement actions to prevent erosion into the Columbia River. Dredged material containment berms with weir systems are measures used to maximize sediment retention within the site.	Minimize potential deleterious effects to water quality and aquatic resources	Life of contract or action	Maintain unless new information warrants change(s)
Construction access routes and barge ramps will be limited to the smallest footprint practicable to minimize potential discharge into areas waterward of OHW or MHHW.	Minimize potential deleterious effects to water quality and aquatic resources	Life of contract or action	Maintain unless new information warrants change(s)
Construction debris (e.g., fuel and oil containers and barrels, misc. litter, etc.) shall be removed by the contractor(s) and no equipment shall be abandoned.	Minimize and ensure safe disposal of hazardous waste, protection of aquatic resources	Life of contract or action	Any unintentional in-water release will be immediately reported to the U.S. Coast Guard Unit for appropriate response. If material is released, it shall be immediately cleaned up/removed and the affected area shall be restored to a condition approximating adjacent undisturbed areas. Contaminated soils shall be excavated and removed.
If contamination is suspected, discovered, or occurs during operations, testing of potentially contaminated media must occur. If contaminated soil or groundwater is apparent or revealed through testing, DEQ will be notified.	Minimize and ensure safe disposal of hazardous waste, protection of aquatic resources	Life of contract or action	Any unintentional in-water release will be immediately reported to the U.S. Coast Guard Unit and DEQ for appropriate response. If material is released, it shall be immediately cleaned up/removed and the affected area shall be restored to a condition approximating adjacent undisturbed areas. Contaminated soils shall be excavated and removed.
Berms will be constructed, as needed, to prevent material from entering areas below OHW/MHHW	Maintain habitat functions/values of aquatic resources	Continuous throughout operations	Maintain unless new information warrants change(s)
No construction materials shall be abandoned on site at project completion.	Maintain habitat functions/values of riparian and aquatic areas	Life of contract or action	Maintain unless new information warrants change(s)

All Placement			
Contractor(s), where possible, will use or propose for use materials considered environmentally friendly in that waste from such materials is not regulated as hazardous or is not considered harmful to the environment. If hazardous wastes are generated, disposal shall be done in accordance with 40 CFR parts 260-272 and 49 CFR parts 100-177.	Minimize and ensure safe disposal of hazardous waste	Life of contract or action	Any unintentional in-water release will be immediately reported to the U.S. Coast Guard Unit for appropriate response. If material is released, it shall be immediately cleaned up/removed and the affected area shall be restored to a condition approximating adjacent undisturbed areas. Contaminated soils shall be excavated and removed.

2. 2. Oregon's Statewide Planning Goals, Clatsop County's Comprehensive Plan, and Local Land Use Regulations

Under ORS 197.175, the Statewide Planning Goals in Oregon are to be implemented by local governments through the adoption of comprehensive plans that are compatible with the goals. In turn, the comprehensive plans are to be implemented through adoption and enforcement of land use regulations. Therefore, any proposed activity that is compatible with the acknowledged comprehensive plan and its implementing land use regulations would, by extension, be compatible with Statewide Planning Goals.

In this section the Corps has described those provisions of Clatsop County's acknowledged comprehensive plan and land use regulations that relate to water quality and made affirmative findings that its project is compatible with those land use factors which relate to water quality. The Corps' provision of this applicable land use information ensures that DEQ's WQC decision is compatible with those factors that relate to water quality. FNC dredging and placement site locations used for upland and/or shoreline placement, or in-water transfer of material are listed by county in section 1.2, Table 1 above.

2.1 Compatibility with Applicable Clatsop County Comprehensive Plan Provisions

The Clatsop County Comprehensive Plan contains goals of the county. Those that pertain to water quality or the control and abatement of water pollution in relation to the proposed Project are goals 16 & 17 Estuarine Resources; the sections that are applicable to the proposed action are addressed below.

P20.5 – Dredging and dredged material disposal.

1. Dredging shall be allowed only:

(a) If required for navigation or other water-dependent uses that require an estuarine location or if specifically allowed by the applicable

> *management unit requirements and, (b) If a need (i.e., a substantial public benefit) is demonstrated and the use or alteration does not unreasonably interfere with public trust rights; and, (c) If no feasible alternative upland locations exist; and, (d) If adverse impacts are minimized.*

This provision relates to water quality because it concerns the protection of estuarine water resources. The proposed action is compatible because Congress has authorized the Corps to establish and maintain the CR FNCs. Maintaining the CR FNCs will not unreasonably interfere with public trust rights because Project activities would not materially impede or substantially impair the public rights to use the waters for navigation, fishing, commerce, and recreation. Project activities are temporary and will not preclude public use of the river because river users are able to move around the dredge equipment. The Corps is not proposing any changes to dredging or dredged material placement locations from the current WQC, as amended. Alternative dredged material placement sites associated with the implementation of the Columbia River Channel Improvement Plan (CRCIP) and subsequent operations and maintenance were evaluated in the Final EIS and 2003 Supplemental EIS. The Corps has evaluated practicable and reasonable project alternatives of the proposed action under the CWA Section 404(b)(1) guidelines. Moreover, adverse impacts will be minimized by the use of Best Management Practices as explained above in section 1.4. For these reasons, the proposed action is compatible with provision P20.5 (1).

> *2. Dredging and dredged material disposal shall not disturb more than the minimum area necessary for the project and shall be conducted so as to minimize impacts on wetlands and other estuarine resources. Loss or disruption of fish and wildlife habitat and damage to essential properties of the estuarine resource shall be minimized by careful location, design, and construction of: (a) Facilities requiring dredging, (b) Sites designated to receive dredged material, and (c) Dredging operation staging areas and equipment marshalling yards.*
>
> *Dredged materials shall not be placed in intertidal or tidal marsh habitats or in other areas that local, state, or federal regulatory agencies determine to be unsuitable for dredged material disposal. Exceptions to the requirement concerning disposal in an intertidal or tidal marsh area include use of dredged material as a fill associated with an approved fill project or placement of dredged materials in the sandy intertidal area of a designated beach nourishment site. Land disposal shall enhance or be compatible with the final use of the site area.*

This provision relates to water quality because it concerns the minimization of impacts on wetlands and other estuarine water resources. The proposed action is compatible because as a matter of practice, the Corps only dredges the minimum area necessary to maintain the CR FNCs' dimensions and placement sites are designed to be the smallest acreage needed to accommodate the fill. Dredging and placement activities would occur in areas that have been previously used for this purpose. Through the careful siting and minimal design, the Corps is minimizing loss or disruption of fish and wildlife habitat and damage to estuarine resource properties. Biological resources within the Columba River system are diverse. There are four primary habitats that encompass the Lower Columbia River system: Estuarine, Riverine, Riparian, and Upland. Each of these habitats carries an intricate level of biologic complexity. The Project operates within each of the habitats to a varying degree. The Corps has already undergone consultation with NMFS and USFWS for the current O&M dredging of FNCs in the Columbia River. The Corps follows established BMPs to minimize adverse impacts to the aquatic and terrestrial environment; the most recent set of both dredging and placement BMPs were detailed in section 1.3 of the NMFS's Biological Opinion: *Reinitiation of Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Columbia River Navigation Channel and Operations and Maintenance, Mouth of the Columbia River to Bonneville Dam, Oregon and Washington, NMFS BiOp # 2011/02095 (*NMFS 2012 BiOp) that included an incidental take statement for salmon, steelhead, green sturgeon, and eulachon for inadvertent take occurring during proposed maintenance of the CR FNCs. These baseline activities associated with maintenance dredging of the CR FNCs have not changed; and implementation of these BMPs has been successful in minimizing potential adverse impacts to the aquatic environment. NMFS also issued a Biological Opinion on June 16, 2021 (2021 BiOp) titled Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Operations and Maintenance Dredging of the Federal Navigation Channels at Tongue Point, Clatsop County, Oregon; Elochoman Slough, Wahkiakum County, Washington; Lake River, Clark County, Washington; and Oregon Slough, Multnomah County, Oregon. NMFS issued a Biological Opinion on February 16, 2023 (2023 BiOp) titled Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Lower Columbia River Federal Navigation Channel Dredged Material Transfer Sites (HUC170800060500, 170800030900, 170800030200). The Corps will follow the BMPs outlined in the 2012, 2021 and 2023 BiOps unless or until superseded by a later BiOp. The USFWS concurred with the Corps' determination that the action would have no effect on the following listed species: western snowy plover, northern spotted owl, short-tailed albatross, Oregon silverspot butterfly, water howellia, and yellow-billed cuckoo and "may affect, but is not likely to adversely affect" bull trout, marbled murrelet, and Columbian white-tailed deer (Service reference# 13420-2010-I-0165). In 2014, the USFWS issued a BiOp stating that the program may affect and is likely to adversely affect streaked horned lark, but because the Proposed Action maintains breeding habitat and minimizes adverse effects, the action would not jeopardize the continued existence of streaked horned lark or cause adverse modification of critical habitat. The Corps will follow all of the RPMs and Conservation Measures outlined in the current BiOp. For these reasons, the proposed action is compatible with provision P20.5 (2).

> *3. The timing of dredging and dredged material disposal operations shall be coordinated with state and federal resource agencies, local governments, and private interests to protect estuarine aquatic and shoreland resources, minimize interference with recreational and commercial fishing operations, including snag removal from gillnet drifts, and insure proper flushing of sediment and other materials introduced into the water by the project.*

This provision relates to water quality because it concerns the protection of estuarine aquatic resources. The proposed action is compatible because timing for use of placement sites is intended to protect estuarine aquatic and shoreland resources. For example, the Corps will follow the work windows in the most current 2012, and 2021 and 2023 Biological Opinions from National Marine Fisheries Service (NMFS) for the ongoing O&M activities. The project will not interfere with recreational or commercial fishing operations; river users would need to avoid dredge equipment in the same manner that they avoid other vessels. For these reasons, the proposed action is compatible with provision P20.5 (3).

> *4. The effects of both initial and subsequent maintenance dredging, as well as dredging equipment marshalling and staging, shall be considered prior to approval of new projects or expansion of existing projects. Projects will not be approved unless disposal sites with adequate capacity to meet initial excavation dredging and at least five (5) years of expected maintenance dredging requirements are available.*

This provision could potentially relate to water quality inasmuch as the effects associated with new dredging projects could have additional effects on water quality. However, the Corps is not proposing any new or expanded areas to be dredged. For this reason, the proposed action is compatible with provision P20.5 (4).

> *7. Where a dredged material disposal site is vegetated, disposal should occur on the smallest land area consistent with sound disposal methods (e.g., providing for adequate dewatering of dredged sediments, avoiding degradation of receiving waters). Clearing of land should occur in stages and only as needed. It may, however, be desirable to clear and fill an entire site at one time, if the site will be used for development immediately after dredged material disposal. Reuse of existing disposal sites is preferred to the creation of new sites provided that the dikes surrounding the site are adequate or can be made adequate to contain the dredged materials.*

This provision relates to water quality because it concerns the protection of estuarine aquatic resources. Placement of dredged fill material will not disturb more than the minimum area necessary for the action. The continued O&M operations have not materially changed, dredging will occur in the same locations as approved in previous compliance and will reuse existing dredge material placement sites. Alternative dredged material placement sites associated with the implementation of the Columbia River Channel Improvement Plan (CRCIP) and subsequent operations and maintenance were evaluated in the Final EIS and 2003 Supplemental EIS. The Corps has evaluated practicable and reasonable project alternatives of the proposed action under the CWA Section 404(b)(1) guidelines. No impacts to wetlands are proposed. For these reasons, the proposed action is compatible with provision P20.5 (7).

> *8. Disposal of dredged materials in intertidal areas shall only be allowed at designated beach nourishment sites or to provide fill material for an approved intertidal fill project.*

This provision relates to water quality because it concerns the protection of estuarine aquatic resources. The Corps will reuse existing dredged material placement sites. Placement of dredged materials will only occur in areas that are currently authorized and designated for use. The Corps has five options for dredged material placement as described in section 1.2 above. The Corps will implement measures to restore and maintain the chemical, physical, and biological integrity of waters of the United States by minimizing discharges and following the guidelines.

For these reasons, the proposed action is compatible with provision P20.5 (8).

> *9. When identifying land dredged material disposal sites, emphasis shall be placed on sites where:*
>
> > *(a) The local comprehensive plan land use designation is Development, provided that the disposal does not preclude future development at the site;*
> > *(b) The potential for the site's final use will benefit from deposition of dredged materials;*
> > *(c) Material may be stockpiled for future use;*
> > *(d) Dredged spoils containing organic, chemical, and/or other potentially toxic or polluted materials will be properly contained, presenting minimal health and environmental hazards due to leaching or other redistribution of contaminated materials;*
> > *(e) Placement of dredged material will help restore degraded habitat; or where*
> > *(f) Wetlands would not be impacted.*
>
> *Important fish and wildlife habitat, or areas with scenic, recreational, archaeological, or historical values that would not benefit from dredged material disposal and sites where the present intensity or type of use is inconsistent with dredged material disposal shall be avoided. The use of agricultural or forest lands for dredged material disposal shall occur only when the project sponsor can demonstrate that the soils can be restored to agricultural or forest productivity after disposal use in completed. In cases where this demonstration cannot be made, an exception to the Agricultural Lands Goal or Forest Lands Goal must be taken and included as an amendment to the Comprehensive Plan*

> *prior to the use of the site for dredged material disposal. The use of shoreland water dependent development sites for dredged material disposal shall occur only when the project sponsor can demonstrate that the dredged material placed on the site will be compatible with current or future water dependent development. Dredged material disposal shall not occur in significant Goal 17 shorelands or wetlands habitats. Engineering factors to be considered in site selection shall include: size and capacity of the site; dredging method; composition of the dredged materials; distance from dredging operation; control of drainage from the site; elevation; and the costs of site acquisition, preparation and revegetation.*

This standard relates to water quality because it concerns the protection of estuarine water resources. The Corps has a nondiscretionary statutory responsibility to continue maintaining FNCs and appurtenant works to achieve authorized dimensions. The Corps will reuse existing placement sites that are currently authorized and designated for use. Alternative dredged material placement sites associated with the implementation of the Columbia River Channel Improvement Plan (CRCIP) and subsequent operations and maintenance were evaluated in the Final EIS and 2003 Supplemental EIS. The Corps has evaluated practicable and reasonable project alternatives of the proposed action under the CWA Section 404(b)(1) guidelines. No impacts to wetlands are proposed. The Corps implements BMPs to minimize impacts on water quality, aquatic species, federal Endangered Species Act (ESA)-listed fish, and sediments during dredging, transportation, and placement of materials. Sediment testing has been performed and is described below in section 4.232 (5). For these reasons, the proposed action is compatible with provision P20.5 (9).

> *10. Estuarine in-water disposal sites shall be in areas identified as low in benthic productivity, unless the disposal is to provide fill material for an approved fill project, and where disposal at the site will not have adverse hydraulic effects.*

This provision relates to water quality because it concerns the protection of estuarine water resources. The Corps has five options for dredged material placement: upland placement, in-water (flowlane) placement (in areas of the Columbia River greater than 20 feet deep), transfer/rehandle sites, beach nourishment, or ocean placement. Benthic organisms would be buried or displaced by the in-water discharge. However, the mid-depth habitat created is expected to provide a suitable substrate for re-colonization by organisms from adjacent benthic communities. The dredged material would also have benthic organisms that would be relocated from the dredging areas and may re-establish at the placement site. Beach nourishment sites will leave unfilled intertidal sand areas to allow organisms to recolonize to the maximum extent practicable. Sand will be spread in thin layers to minimize mortality by burial. In-water placement sites are generally located in the flowlane where velocities are high, water is deeper than 20 feet, with naturally unstable or shifting substrate. Lower benthic productivity is expected at these depths. There have been multiple studies to support the conclusion that benthic densities are significantly lower in areas deeper than 20 feet and that benthic primary production consists of shallower, subtidal and intertidal habitats. For example, the study "In-water restoration between Miller Sands and Pillar Rock Island, Columbia River: Environmental surveys, 1992-93” by Hinton, S.A., G.T. McCabe, Jr., and R.L. Emmett, 1995. Organisms common to areas of unstable substrates are adapted to physically stressful conditions and have life cycles that allow them to withstand the stresses imposed by dredged material placement activities. Dredged material discharged at placement sites that have a naturally unstable or shifting substrate due to wave or current action tends to be more quickly dispersed. Also, the Corps minimizes physical impacts by choosing placement sites with a similar substrate as the dredge material. Impacts to benthic organisms are minimized when sand is placed on a sandy bottom, thus avoiding harmful changes in substrate composition. The Corps will reuse existing placement sites. Therefore, the Corps understands that the project sites will be low in benthic productivity and the project is compatible with provision P20.5 (10).

> *11. Flow lane disposal sites shall only be allowed in development designated areas within or adjacent to a channel where (a) sediments can reasonably be expected to be transported down-stream without excessive shoaling, (b) Interference with recreational and commercial fishing operations will be minimal or can be minimized by applying specific timing restrictions, (c) adverse hydraulic effects will be minimal, (d) adverse effects on estuarine resources will be minimal, and (e) the disposal site depth is between 20 and 65 feet below MLLW.*
>
> This provision relates to water quality because it concerns the protection of estuarine water resources. This provision is intended to ensure that dredged material placement sites are located in particular areas to avoid adverse effects.

Clatsop County Comprehensive Plan Goal 16, Section P30.5 (source: https://www.clatsopcounty.gov/media/29593) states that “the main navigation channel and a flowlane disposal area on each side of the channel (extending either 600 feet or to the 20-foot bathymetric contour, whichever is narrowest) are designated Development. All other areas are Conservation”. However, the Clatsop County Webmaps (source: https://delta.co.clatsop.or.us/apps/ClatsopCounty/index.html directed from https://www.clatsopcounty.gov/landuse/page/find-your-zoning-information) show parts of the CR FNCs and in-water placement locations zoned as Aquatic Conservation 2 (AC-2).

The Corps is not proposing any changes to dredging or dredged material placement locations from the current WQC, as amended. Regarding (a) downstream shoaling, analysis for hydraulics, sedimentation, and morphology change consist of areas within the CR, including in-water and beach nourishment placement locations. General shoaling metrics within the river are defined in terms of how and when shoals are formed by seasonal variation in river flow. The relevance of shoaling metrics is based on how and when the shoaling processes affect CR navigation, motivating the need for dredging or the imposition of navigation restrictions. The purpose of the action is to accommodate maintenance dredging of the CR FNCs. The Corps is not proposing any changes to dredging or dredged material placement locations. Any effects associated with the proposed action would be temporary, localized, and minor with respect to the hydraulics and sediment transport conditions of the Columbia River. CR dredged sand can be remobilized after placement on the riverbed when river currents exceed 0.35 meter/sec (1.1 ft/sec). As river current speed increases beyond 0.35 m/sec, the associated sediment transport rate increases exponentially. In-water placement occurs in locations that will not result in excessive FNC shoaling from remobilized placed sediment. The proposed action would not (b) interfere with recreational or commercial fishing and will follow the work windows in the most current 2012, and 2021 and 2023 Biological Opinions from National Marine Fisheries Service (NMFS) for the ongoing O&M activities, and (c) would not have adverse hydraulic effects (explained above for P20.5(10)) or (d) adverse effects on estuarine resources because the Corps will follow Best Management Practices for the protection of water quality as explained above in section 1.4. Regarding (e), dredged material will continue to be placed in-water in depths 20 feet or greater. These areas are not all located in a development designated area, so the proposed action is compatible to the maximum extent possible with provision P20.5 (11).

> *12. Dredged material disposal at beach nourishment sites shall only be used to offset the erosion and not to create new beach or land areas. Beach nourishment sites shall not be designated in areas where placement or subsequent erosion of the dredged materials would adversely impact tidal marshes or productive intertidal or shallow subtidal areas.*

This provision relates to water quality because it concerns the protection of estuarine water resources. The Corps will reuse existing placement sites to offset erosion and therefore, the proposed action is compatible with provision P20.5 (12).

20.6. Estuarine Construction: Piling and Dolphin Installation, Shoreline Stabilization and Navigational Structures.

The policies in this subsection apply to over-the-water and in-water structures such as docks, bulkheads, moorages, boat ramps, boat houses, jetties, pile dikes, breakwaters and other structures involving installation of piling or placement of riprap in Columbia River Estuary aquatic areas. Also covered under these policies are shoreline stabilization and aquatic area fills. The sections that are applicable to the proposed action are addressed below.

> *2. Navigational structures, such as breakwaters, jetties, groins, and pile dikes are major estuarine alterations with long term biological and physical effects. Proposals for new or enlarged navigational structures, or for removal of existing structures, must demonstrate that expected benefits outweigh potential adverse impacts on estuarine* productivity.
> *4. Where structural shoreline stabilization is shown to be necessary, an impact assessment is required and will include consideration of effects on shoreland and aquatic habitats, effects on fishing areas, uses of the adjacent shoreland and aquatic areas, and potential for adverse impacts in adjacent areas due to the project.*

This provision relates to water quality because it concerns the protection of estuarine aquatic resources. No new or enlarged over-the-water or in-water structures are proposed.

For these reasons, the proposed action is compatible with provision *P20.6 (*2 & 4).

P30.2 Baker Bay – The Columbia River Estuary Study Taskforce prepared a regional management plan that included subareas with elements affecting land use. The elements are designed to provide background information. This provision relates to water quality because it concerns the protection of estuarine aquatic resources.

This subarea includes the aquatic areas of Baker Bay and the Sand Islands. The navigation channels at Baker Bay and Chinook are designated Development. The Corps maintains the Baker Bay and Chinook FNCs. The proposed action is compatible with provision P30.2.

P30.3 Estuary Channels – The Columbia River Estuary Study Taskforce prepared a regional management plan that included subareas with elements affecting land use. The elements are designed to provide background information. This provision relates to water quality because it concerns the protection of estuarine aquatic resources.

This subarea includes the deep-water portions of the estuary from Jetty A (RM 3) to the upper end of Rice Island (RM 22.5). The subarea contains the authorized navigation channel. The boundary of the subarea generally follows the 20-foot bathymetric contour; however, it varies from the contour in the vicinity of cities and other subareas containing deep channels. The description for human use includes navigation improvements, dredging and dredged material disposal. The aquatic designation states that the main navigation channel and a flowlane disposal area on each side of the channel (extending either 600 feet or to the 20-foot bathymetric contour, whichever is narrowest) are designated Development. All other areas are Conservation.

The Corps is not proposing any changes to dredging or dredged material placement locations from the current WQC, as amended. As stated in P20.5 (11), the Corps places dredged material in-water to avoid excessive shoaling, adverse hydraulic effects and adverse effects on estuarine resources, and uses Best Management Practices for the protection of water quality as explained above in section 1.4. The majority but not all of the ongoing FNC dredging and in-water placement areas are located within 600 feet of the FNC in the area designated Development, so the proposed action is compatible to the maximum extent possible with provision P30.3.

P30.4 Estuary Sands – The Columbia River Estuary Study Taskforce prepared a regional management plan that included subareas with elements affecting land use. The elements are designed to provide background information. This provision relates to water quality because it concerns the protection of estuarine aquatic resources.

This subarea includes the dredged material disposal island of Rice Island. The description for human use includes dredged material disposal. The Corps places dredged material at Rice Island. The proposed action is compatible with provision P30.4.

P30.5 River Channels – The Columbia River Estuary Study Taskforce prepared a regional management plan that included subareas with elements affecting land use. The elements are designed to provide background information. This provision relates to water quality because it concerns the protection of estuarine aquatic resources.

This subarea includes the deep-water portions (deeper than 20 feet below MLLW) of the authorized navigation channel and adjacent slopes between Harrington Point (RM 22.5) and the western end of Puget Island. The description for human use includes navigation improvements, dredging and dredged material disposal. The aquatic designation states that the main navigation channel and a flowlane disposal area on each side of the channel (extending either 600 feet or to the 20-foot bathymetric contour, whichever is narrowest) are designated Development. All other areas are Conservation.

The Corps is not proposing any changes to dredging or dredged material placement locations from the current WQC, as amended. As stated in P20.5 (11), the Corps places dredged material in-water to avoid excessive shoaling, adverse hydraulic effects and adverse effects on estuarine resources and uses Best Management Practices for the protection of water quality as explained above in section 1.4. The majority but not all of the ongoing FNC dredging and in-water placement areas are located within 600 feet of the FNC in the area designated Development, so the proposed action is compatible to the maximum extent possible with provision P30.5.

P30.6 Snag Islands – The Columbia River Estuary Study Taskforce prepared a regional management plan that included subareas with elements affecting land use. The elements are designed to provide background information. This provision relates to water quality because it concerns the protection of estuarine aquatic resources.

This subarea includes the dredged material disposal islands of Miller Sands and Jim Crow Sands. The description for human use includes navigation improvements and dredged material disposal. The Corps places dredged material at Miller Sands and Pillar Rock Island, formerly called Jim Crow Sands. The proposed action is compatible with provision P30.6.

P30.8 Upper Marsh Islands – The Columbia River Estuary Study Taskforce prepared a regional management plan that included subareas with elements affecting land use. The elements are designed to provide background information. This provision relates to water quality because it concerns the protection of estuarine aquatic resources.

This subarea includes the dredged material disposal island of Welch Island. The description for human use includes dredged material disposal. The Corps places dredged material at Welch Island. The proposed action is compatible with provision P30.8.

P30.9 Tenasillahe Island – The Columbia River Estuary Study Taskforce prepared a regional management plan that included subareas with elements affecting land use. The elements are designed to provide background information. This provision relates to water quality because it concerns the protection of estuarine aquatic resources.

This subarea includes the dredged material disposal island of Tenasillahe Island. The description for human use includes dredged material disposal. The Corps places dredged material at Tenasillahe Island. The proposed action is compatible with provision P30.9.

P30.15 Tongue Point – The Columbia River Estuary Study Taskforce prepared a regional management plan that included subareas with elements affecting land use. The elements are designed to provide background information. This provision relates to water quality because it concerns the protection of estuarine aquatic resources.

This subarea includes the Tongue Point FNC which is designated Development. The Corps maintains the Tongue Point FNC. The proposed action is compatible with provision P30.15.

2.2 Clatsop County land and water development and use ordinances

The applicable county ordinances are found in S4.200 Columbia River Estuary Shoreland and Aquatic Use and Activity Standards.

The Columbia River estuary shoreland and aquatic area standards are requirements that apply to development uses and activities proposed for the following management designations: Marine Industrial Shorelands Zone (MI); Conservation Shorelands Zone (CS); Natural Shorelands Zone (NS); Aquatic Development Zone (AD); Aquatic Conservation Two Zone (AC-2); Aquatic Conservation One Zone (AC-1); Aquatic Natural Zone (AN); and those areas included in the Shorelands Overlay District (SO). These standards are intended to protect the unique economic, social, and environmental values of the Columbia River Estuary.

County Ordinance 3.660-3.674 Conservation Shorelands Zone (CS)

This ordinance relates to water quality because the purpose of the Conservation Shorelands Zone is to conserve Columbia River Estuary shorelands which provide important resource or ecosystem support functions and to designate areas for long term uses of renewable resources that do not require major alterations of the estuary, except for the purpose of restoration. They are managed for the protection and maintenance of water quality, fish and wildlife habitat, water-dependent uses, economic resources, aesthetic values and recreation. Uses of these shorelands shall be compatible with characteristics and uses of the adjacent estuarine waters. Permitted developments include “dredged material disposal including beach nourishment at sites designated in the Comprehensive Plan”. The Corps places material at Rice Island, Miller Sands, Pillar Rock, Welch Island and Tenasillahe Island which are all designated in the Comprehensive Plan and therefore, the proposed action is compatible with County Ordinance 3.660-3.674.

County Ordinance 3.740-3.756 Aquatic Development (AD) Zone

The purpose of the AD zone is to provide for navigation, and other identified needs for public, commercial, and industrial water-dependent uses, consistent with the level of development or alteration allowed by this zone and the need to minimize damage to the Columbia River estuarine ecosystem. The objective of the AD zone is to ensure optimum utilization of appropriate aquatic areas by providing for intensive development.

Such areas include deepwater areas adjacent to or near the shoreline, navigation channels, turning basins, subtidal areas for in-water disposal of dredged materials, areas of minimal biological significance needed for uses requiring alteration of the estuary not included in Aquatic Conservation-Two Zone, Aquatic Conservation-One Zone, and Aquatic Natural Zone, and areas for which an exception to Statewide Planning Goal 16, Estuarine Resources, has been adopted.

The following uses and activities, and their accessory uses and activities, are permitted in the AD Zone under a Type I procedure, which are actions that involve permitted uses or developments governed by clear and objective review criteria, and are subject to general development zone standards:

1) *Undeveloped low intensity water-dependent recreation.*
2) *Passive restoration measures.*
3) *Navigational aids.*
4) *Vegetative shoreline stabilization.*
5) *Research and educational observation.*
6) *Maintenance and repair of existing structures or facilities, including dikes.*
7) *Temporary dikes for emergency flood protection, subject to state and federal requirements.*
8) *Projects for the protection of habitat, nutrient, fish, wildlife, and aesthetic resources.*
9) *Water-dependent commercial, industrial, and port uses including but not limited to:*

A. *docks, moorages, piers, or wharves*
B. *fuel storage and dispensing facilities*
C. *cargo loading and unloading facilities*
D. *vessel construction, maintenance, or repair facilities*
E. *seafood receiving, processing, and storage*
F. *cargo marshaling, assembly, and storage facilities*
G. *ice making and sales establishments*
H. *integrated manufacturing and shipping facility where a significant portion of the operation is water-dependent*
I. *marine railway facilities*
J. *other water-dependent uses meeting Water-dependent Use criteria.*

10) *Piling and dredging in conjunction with permitted uses 3, and 5 through 9 listed above, pursuant to the applicable standards.*

11) Fill in conjunction with permitted uses 6 through 9 listed above, pursuant to the applicable standards.

12) Communication facilities subject to the standards in S4.700.

Proposed dredging (10) and in-water disposal of dredged materials (11) in conjunction with permitted use (9) is a use and activity consistent with applicable standards established under S4.232 and/or S4.208. This use and activity is required in order to maintain the Congressionally authorized dimensions of the LCR FNC. For this reason, the proposed action is consistent with this enforceable policy.

County Ordinance 3.784–3.792 Aquatic Conservation Two Zone (AC-2)

This ordinance relates to water quality because the purpose of the Aquatic Conservation Two Zone is to conserve areas of the Columbia River Estuary to protect and conserve natural resources. The purpose of the AC-2 zone is to conserve designated areas of the Columbia River estuary for long term uses of renewable resources that do not require major alterations of the estuary, except for the purpose of restoration. The AC-2 zone is managed for the protection and conservation of the natural resources and benefits found in these areas. The AC-2 zone includes areas needed for maintenance and enhancement of biological productivity, recreational resources, aesthetic values, aquaculture, and open water portions of the estuary. The AC-2 zone includes areas of smaller or of less biological importance than those in the Aquatic Natural zone and Aquatic Conservation One zone. Areas that are partially altered and adjacent to existing development of low to moderate intensity which do not possess the resource characteristics of other aquatic areas are also included in this zone.

The statutory responsibility to continue operating and maintaining the CR FNCs to their authorized dimensions is non-discretionary. No material changes are proposed to the ongoing O&M operations. The existing condition and functionality of the LCR would remain the same. Specifically, the action would not preclude long term uses of renewable resources, conservation of natural resources, nor alter the Columbia River estuary from its existing baseline condition. The Corps is not proposing any changes to dredging or dredged material placement locations from the current WQC, as amended. As stated in P20.5 (11), the Corps places dredged material in-water to avoid excessive shoaling, adverse hydraulic effects and adverse effects on estuarine resources and uses Best Management Practices for the protection of water quality as explained above in section 1.4. The majority but not all of the ongoing FNC dredging and in-water placement areas are located within 600 feet of the FNC in the area designated Development. In-water placement that occurs more than 600 feet from the FNC is in the AC-2 zone, which does not include dredged material placement as an approved use. In-water placement restores sediment within the AC-2 zone for the long-term protection and conservation of natural resources.

For this reason, the proposed action is compatible to the maximum extent possible with County Ordinance 3.784–3.792.

2.3 Clatsop County Development Standards

Clatsop County Development Standards are enforceable requirements incorporated into the County's land use regulations.

4.208. Estuarine Construction

Standards in this subsection are applicable to all Piling and Dolphin Installation, Shoreline Stabilization, and Navigational Structures. The standards in this subsection apply to over-the-water and in-water structures such as docks, bulkheads, moorages, boat ramps, boat houses, jetties, pile dikes, breakwaters and other structures involving installation of piling or placement of riprap in Columbia River Estuary aquatic areas.

> *(3) Jetties, groins and breakwaters shall be constructed of clean, erosion-resistant materials from upland sources. In-stream gravels shall not be used, unless part of an approved mining project. Material size shall be appropriate for predicted wave, tide and current conditions.*

This provision relates to water quality because it concerns the protection of estuarine aquatic resources. No new over-the-water or in-water structures are proposed.

For this reason, the proposed action is compatible with provision *4.208 (3)*.

> *(6) Jetties, groins, breakwaters and piers requiring aquatic fill may be allowed only if all of the following criteria are met:*
>
> > *(A) The proposed use is required for navigation or other water-dependent use requiring an estuarine location, or if specifically allowed in the applicable aquatic zone; and*
> > *(B) If a need (i.e. a substantial public benefit) is demonstrated; and*
> > *(C) The proposed use does not unreasonably interfere with public trust rights; and*
> > *(D) Feasible alternative upland locations do not exist; and*
> > *(E) Potential adverse impacts, as identified in the impact assessment, are minimized.*

Applicable responses for this standard is addressed above in 2.1 [P20.5 (1)].

> *(14) Bulkheads installed as a shoreland stabilization and protective measure shall be designed and constructed to minimize adverse physical effects (i.e. erosion, shoaling, reflection of wave energy or interferences with sediment transport in adjacent shoreline areas) resulting from their placement.*

No new over-the-water or in-water structures are proposed.

For this reason, the proposed action is compatible with provision *4.208 (14)*.

4.209. Deep-Water Navigation, Port and Industrial Development.

The standards in this subsection apply to port and industrial development occurring in and over Columbia River estuarine waters, and on adjacent shorelands. This section also applies to navigation projects related to deep-draft maritime activities, such as channel, anchorage and turning basin development or expansion.

> *2. New or expanded facilities for deep-water navigation, port or industrial development requiring aquatic area dredging or filling may be allowed only if all of the following criteria are met:*
>
> > *(A) The proposed use is required for navigation or other water-dependent use requiring an estuarine location, or if specifically allowed in the applicable aquatic zone; and*
> > *(B) If a need (i.e. a substantial public benefit) is demonstrated; and*
> > *(C) The proposed use does not unreasonably interfere with public trust rights; and*
> > *(D) Feasible alternative upland locations do not exist; and*
> > *(E) Potential adverse impacts, as identified in the impact assessment are minimized.*
>
> *3.Deep-water navigation, port or industrial development requiring new piling or dolphin installation, construction of pile-supported structures, or other uses or activities which could alter the estuary may be permitted only if all of the following criteria are met:*
>
> > *(A) A need (i.e. a substantial public benefit) is demonstrated; and*
> > *(B) The proposed use does not unreasonably interfere with public trust rights; and*
> > *(C) Feasible alternative upland locations do not exist; and*
> > *(D) Potential adverse impacts, as identified in the impact assessment are minimized.*

No new or expanded over-the-water or in-water structures or facilities are proposed.

For this reason, the proposed action is compatible with provision *4.209*.

S4.230. Bankline and Streambed Alteration.

Standards in this subsection are applicable to an alteration of a stream bank or streambed in the Columbia River Estuary, either within or outside of its normal high-water boundary.

> *(1) Alterations to stream banks or streambeds shall:*
>
> > *(A) Maintain stream surface area where feasible; and*
> > *(B) Make maximum use of natural or existing deep-water channels; and*
> > *(C) Avoid creation of undesirable hydraulic conditions; and*
> > *(D) Minimize impacts on estuarine aquatic and shoreland resources.*

This standard relates to water quality because it concerns the protection of estuarine water resources. The Corps has a nondiscretionary statutory responsibility to continue maintaining

FNCs and appurtenant works to achieve authorized dimensions. No changes in river current or hydraulic conditions are expected as the proposed O&M operations will remain the same as currently authorized. Placement of material at the placement sites may influence current patterns and flow. However, the effects would be minimal, temporary, and local. The Corps implements BMPs to minimize impacts on water quality, aquatic species, federal Endangered Species Act (ESA)-listed fish, and sediments during dredging, transportation, and placement of materials. The proposed action would maintain stream surface area where feasible, make maximum use of natural or existing deep-water channels, avoid creation of undesirable hydraulic conditions, and minimize impacts on estuarine aquatic and shoreland resources.

For these reasons, the proposed action is compatible with provision 4.230 (1).

4.232 : Dredging and Dredged Material Disposal
Standards in this subsection are applicable to all Columbia River estuary estuarine dredging operations and to both estuarine shoreline and aquatic dredged material disposal:

1. *Dredging in estuarine aquatic areas, subject to dredging and dredged material disposal policies and standards, shall be allowed only:*
   (A) If specifically allowed by the applicable aquatic zone and required for one or more of the following uses and activities:
      1) *Navigation or navigational access*

This development standard relates to water quality because it concerns the protection of estuarine water resources. The proposed action is compatible with S4.232 (1) because it is for purposes of navigation, i.e., is required to maintain the congressionally authorized CR FNCs and is specifically allowed in the Aquatic Development zone.

2. *When dredging is permitted, the dredging shall be the minimum necessary to accomplish the proposed use.*

This development standard relates to water quality because it concerns the protection of water resources by minimizing adverse impacts to aquatic areas. The Corps removes the minimum amount of material necessary from its FNCs as a matter of practice; therefore, the proposed action is compatible with S4.232 (2).

3. *Undesirable erosion, sedimentation, increased flood hazard, and other changes in circulation shall be avoided at the dredging and disposal site and in adjacent areas.*

This standard relates to water quality because its purpose is to reduce shoaling and turbidity in aquatic areas. Any effects associated with the proposed action would be temporary, localized, and minor with respect to the hydraulics and sediment transport conditions of the Columbia River. There would be no direct or indirect impacts on the geologic or hydrologic regime as a result of the project relative to the current baseline conditions. Changes to existing patterns of erosion, deposition, and flooding would not be expected. For these reasons the proposed action is compatible with 4.232 (3).

4. *The timing of dredging and dredged material disposal operations shall be coordinated with state and federal resource agencies, local governments, and private interests to protect estuarine aquatic and shoreland resources, minimize interference with commercial and recreational fishing, including snag removal from development drifts, and insure proper flushing of sediment and other materials introduced into the water by the project.*

This provision relates to water quality because it concerns the protection of estuarine aquatic resources. The proposed action is compatible because the timing of the proposed dredging and dredged material placement operations is in conjunction with the O&M activities that have previously been coordinated with WDFW, ODFW, and NMFS under the CWA, CZMA, and ESA, as appropriate. For this reason, the proposed action is compatible with 4.232 (4).

5. *Bottom sediments in the dredging area shall be characterized by the applicant in accordance with EPA and DEQ standards. Information that may be required includes, but is not limited to, sediment grain size distribution, organic content, oil and grease, selected heavy metals, pesticides and other organic compounds, and benthic biological studies.*

   The types of sediment tests required would depend on dredging and placement techniques, sediment grain size, available data at the dredging site, and proximity to contaminant sources. Generally, projects involving in-water disposal of fine sediments require a higher level of sediment testing than projects involving disposal of coarse sediments. Projects involving upland disposal may be exempted from the testing requirement, depending on the nature of the sediments and the amount of existing sediment data available. Unavailable burdens on the permit applicant shall be minimized by considering the economic cost of performing the sediment evaluation, the utility of the data to be provided, and the nature and magnitude of any potential environmental effect.

This standard relates to water quality because its purpose is to insure that dredged sediments meet state water quality standards. The Corps performs regular dredged material evaluations in the FNCs to determine whether sediments are suitable for unconfined in-water placement or exposure, according to the requirements of the CWA or the MPRSA, as appropriate. The Corps characterizes sediments present within proposed dredge areas in accordance with national dredged material testing manual protocols (Ocean Testing Manual), Inland Testing Manual, and by using the Sediment Evaluation Framework for the Pacific Northwest (SEF). The Corps, as lead member of the regional Portland Sediment Evaluation Team (PSET), evaluates the discharge of dredged material through the SEF. WDOE and DEQ are also members of PSET. This framework is based on applicable provisions of CWA Section 404 or MPRSA Section 103. A summary of the most recent results and suitability determinations for locations within Clatsop County is below:

•Lower Columbia River FNC; deep draft channel and associated turning basins (RM 3 to RM 106.5): A total of 59 stations were sampled within the LCR FNC. All sediment samples consisted of more than 97 percent coarse-grained sediments (gravel and sand) suitable for unconfined, aquatic placement. The total organic carbon (TOC) results for all samples is less than 0.2%.

•Skipanon FNC: Dredge prism sediments are predominantly silt (77-86%) with some clay (12-20%) and minor amounts of sand and gravels (<3%) suitable for unconfined, aquatic placement. TOC in the dredge prism sediments ranged from 2.14 to 2.79%. Total solids in the dredge prism sediments ranged from 35 to 42%.

•Tongue Point FNC: The outer shoal dredge prism was 96.4% sand and the inner shoal averaged 46.9% sand, 45.7% silt, and 7.3% clay suitable for unconfined, aquatic placement.

The Corps will continue to sample and evaluate sediment periodically in the future in accordance with the SEF. Dredged material would only be placed in water after the Corps, in coordination with PSET, determines that sediments are suitable for unconfined aquatic placement and unconfined aquatic exposure, in accordance with the SEF. Sediments that are tested and deemed to be unsuitable (that is, not suitable for unconfined in-water placement) would not be placed in water but would instead be placed in upland sites. For these reasons, the proposed action is compatible with 4.232 (5).

6. *Adverse short term adverse effects of dredging and placement of dredged materials such as increased turbidity, release of organic and inorganic materials or toxic substances, depletion of dissolved oxygen, disruption of the food chain, loss of benthic productivity, and disturbance of fish runs and important localized biological communities shall be minimized.*

This standard relates to water quality because its purpose is to insure that dredged sediments and placement of those do not adversely affect water quality where work occurs. The proposed action would result in temporary and localized reduction in water quality during the course of dredging and in-water placement sites, which could suspend sediments in the water column. These impacts would be minor and temporary in nature and would cease shortly after dredging and placement activities are complete. The Corps will continue to utilize the same BMPs as required by WQC No. NWPOP-CLA-F05-001-FR, or subsequent Order, to ensure that direct and indirect impacts are less than significant. Sediments that are disturbed into suspension would be redistributed to areas downstream by natural hydraulic processes after the project is complete. Turbidity would be monitored during dredging operations in accordance with the WQC, the BiOps, and the Corps' BMPs to ensure that turbidity does not increase above acceptable levels. Because the proposed action would adhere to the WQC conditions and implement BMPs to protect water quality, no significant direct or indirect impacts are anticipated. As previously explained, all materials to be dredged are suitable for unconfined aquatic placement and would not add to the contamination burden of the lower Columbia River nor mobilize hazardous materials in the water column.

Placement of dredged at in-water sites may temporarily disturb aquatic species. Few individual fish that encounter the dredge within the migration corridor will alter their pathway or delay their rate of migration. Adult fish are intent on moving upstream, and a small deviation from the migration path will not significantly change overall distribution or risk of predation. Juvenile salmonids will largely avoid the project activities, as they tend to travel closer to the shoreline. This level of avoidance will be minor and within the normal migration patterns, and thus not likely to increase the risk of predation or otherwise harm these fish. For these reasons, the proposed action is compatible with 4.232 (6).

7. *Impacts on areas adjacent to the dredging site, such as destabilization of fine textured sediments, erosion, accretion, and other undesirable changes in circulation patterns shall be minimized.*

The standard relates to water quality because its purpose is to ensure that dredging activities do not adversely affect water quality where work occurs. The proposed action would result in temporary and localized destabilization of sediments during dredging and in-water placement sites, which could suspend sediments in the water column. These impacts would be minor and temporary in nature and would cease shortly after dredging and placement activities are complete. The Corps disturbs the minimum amount of material necessary from its federal navigation channels and placement sites as a matter of practice. For these reasons, the proposed action is compatible with 4.232 (7).

8. *The effects of both initial and subsequent maintenance dredging, as well as dredging equipment marshaling and staging shall be considered prior to approval of new projects or expansion of existing projects. Projects will not be approved unless disposal sites with adequate capacity to meet initial excavation dredging and at least five years of expected maintenance dredging requirements are available.*

This standard relates to water quality because it concerns the protection of estuarine water resources by minimizing development of new dredged material placement sites. The purpose for this action is to provide continued reliable, safe, and efficient transportation of waterborne commerce and uninterrupted transit for vessels in the CR FNCs. Continued maintenance is warranted based on the significant economic benefits of the Columbia-Snake River Navigation System as well as other commercial and recreational benefits. The Corps has a nondiscretionary statutory responsibility to continue maintaining FNCs and appurtenant works to achieve authorized dimensions. Corps maintenance activities include the dredging of FNCs and the placement of dredged material at Corps-designated sites. There are no material changes proposed as part of the WQC renewal of O&M operations. However, sites that have real estate easements and rights of entry for existing upland placement sites, as well as in-water locations, are reaching placement capacity. It is expected that the majority of the existing placement sites would reach capacity within 10 dredging seasons. Pursuant to policy, the Corps prepares federal DMMPs to ensure that sufficient capacity exists to accommodate the material it dredges from FNCs. Therefore, the need to update and implement the DMMP is required, as established by the Corps of Engineers policy ER 1105-2-100 (April 22, 2000), which states that all federally maintained navigation projects must demonstrate that dredged material placement sites have the capacity to accommodate maintenance dredging for a minimum of 20 years. The Corps expects to submit a separate WQC application for the DMMP in the next few months. Therefore, the proposed action is compatible with 4.232 (8).

13. *Dredged material disposal shall occur only at designated sites or at new sites which meet the requirements of the Dredged Material Disposal Site Selection Policies.*

This standard relates to water quality because it concerns the protection of estuarine water resources. The Corps is not proposing any changes to dredging or dredged material placement locations from the current WQC, as amended. The Corps places material at Rice Island, Miller Sands, Pillar Rock, Welch Island and Tenasillahe Island which are all designated in the Comprehensive Plan. As stated in P20.5 (11), the Corps places dredged material in-water to avoid excessive shoaling, adverse hydraulic effects and adverse effects on estuarine resources and uses Best Management Practices for the protection of water quality as explained above in section 1.4. The majority but not all of the ongoing FNC dredging and in-water placement areas are located within 600 feet of the FNC in the area designated Development. In-water placement that occurs more than 600 feet from the FNC is in the AC-2 zone, which does not include dredged material placement as an approved use. In-water placement restores sediment within the AC-2 zone for the long-term protection and conservation of natural resources. The Corps implements BMPs to minimize impacts on water quality, aquatic species, federal Endangered Species Act (ESA)-listed fish, and sediments during dredging, transportation, and placement of materials. For these reasons, the proposed action is compatible to the maximum extent possible with provision 4.232 (13).

14. *Proposals for in-water disposal of dredged materials, including flowlane disposal, beach nourishment, estuarine open-water disposal, ocean disposal, and agitation dredging, shall:*
    a. *Demonstrate the need for the proposed project and that there are no feasible alternative disposal sites or methods that entail less damaging environmental impacts;*
    b. *Demonstrate that the dredged sediments meet state and federal sediment testing requirements and water quality standards (see Dredging Standard 5); and*
    c. *Not be permitted in the vicinity of a public water intake.*

This standard relates to water quality because it concerns the protection of estuarine water resources. The Corps has a nondiscretionary statutory responsibility to continue maintaining FNCs and appurtenant works to achieve authorized dimensions. The Corps proposes to continue ongoing O&M of the FNCs in the CR. The Corps is not proposing any changes to dredging or dredged material placement locations from the current WQC, as amended. Alternative dredged material placement sites associated with the implementation of the Columbia River Channel Improvement Plan (CRCIP) and subsequent operations and maintenance were evaluated in the Final EIS and 2003 Supplemental EIS. As stated in P20.5 (11), the Corps places dredged material in-water to avoid excessive shoaling, adverse hydraulic effects and adverse effects on estuarine resources. The Corps has evaluated practicable and reasonable project alternatives of the proposed action under the CWA Section 404(b)(1) guidelines. The Corps implements BMPs to minimize impacts on water quality, aquatic species, federal Endangered Species Act (ESA)-listed fish, and sediments during dredging, transportation, and placement of materials. Sediment testing has been performed and is described above in section 4.232 (5). There are no known public water intakes near the proposed placement sites.

For these reasons, the proposed action is compatible with provision 4.232 (14).

16. *Flowlane disposal, estuarine open water disposal and agitation dredging shall be monitored to assure that estuarine sedimentation is consistent with the resource capabilities and purposes of affected natural and conservation designations. The monitoring program shall be established prior to undertraining disposal. The program shall be designated to both characterize baseline conditions prior to disposal and monitor the effects of the disposal. The primary goals of the monitoring are to determine if the disposal is resulting in measurable adverse impacts and to establish methods to minimize impacts. Monitoring shall include, at minimum, physical measurements such as bathymetric changes and may include biological monitoring. Specific monitoring requirements shall be based on, at minimum, sediment grain size at the dredging and disposal site, presence of contaminants, proximity to sensitive habitats and knowledge of resources and physical characteristics of the disposal site.*

This standard relates to water quality because it requires monitoring to reduce adverse impacts to estuarine water resources. The Corps regularly monitors the FNCs and performs dredging and placement to maintain the channels as is Congressionally authorized. Placement site depths will be surveyed before and after operations. Factors considered when planning for annual maintenance dredging include equipment availability, results of bathymetric surveys, placement site capacity, environmental resource concerns, and funding. The mechanism of dredging and placement is decided based on the severity, type, and location of the shoal. The project will follow all Portland Sediment Evaluation Team (PSET) recommendations for each dredging event and comply with the Sediment Evaluation Framework for the Pacific Northwest (SEF) (May 2018). The most recent sediment sampling results and suitability determinations are summarized in 4.232(5) above.

For these reasons, the proposed action is compatible with provision 4.232 (16).

17. *Flowlane disposal shall be in Aquatic Development areas identified as low in benthic productivity and use of these areas shall not have adverse hydraulic effects. Use of flowlane disposal areas in the estuary shall be allowed only when no feasible alternative land or ocean disposal sites with less damaging environmental impacts can be identified and the biological and physical impacts of flowlane disposal are demonstrated to be insignificant.*

Applicable responses for these standards are addressed above in P20.5 (10).

18. *Ocean disposal shall be conducted such that:*
    (A) The amount of material deposited at a site is compatible with benthic productivity, other marine resources, and other uses of the area;
    (B) Interference with sport and commercial fishing is minimized;
    (C) Disposal is strictly confined to the sites designated by the U.S. Environmental Protection Agency; and
    (D) The disposal site does not shoal excessively and create dangerous wave and swell conditions.

This provision relates to water quality because it concerns the protection of ocean resources. Material dredged from the Columbia River between RM 3 and RM 30 may be placed in the ocean at the U.S. EPA designated Deep-Water Site. The site has a disposal area of ~4,296 acres with a depth range of 190-300 feet and overall disposal capacity of around 225 MCY shared between the Columbia River navigation project and the Mouth of the Columbia River navigation project. The Deep-Water Site was first used in 2004. Most recently, approximately 1 MCY and 425 KCY of material was placed at the site in 2018 and 2019, respectively. Any new placement related to maintenance of the CR FNC would be coordinated as part of the Annual Use Plan.

For these reasons, the proposed action is compatible with Standard 4.232 (18).

19. *Beach nourishment shall only be conducted at sites identified in the Dredged Material Management Plan. New sites may be added to the Plan by amendment after an exception to Oregon Statewide Planning Goal 16 for the site has been approved. Beach nourishment shall be conducted such that:*
    (A) The beach is not widened beyond its historical profile. The historical profile shall be defined as the widest beach profile that existed prior to June 1986.
    (B) The material placed on the beach consists of sand of equal or greater grain size than the sand existing on the beach.

(C) Placement and subsequent erosion of the materials does not adversely impact tidal marshes or productive intertidal and shallow subtidal areas.
(D) Efforts are made to maintain a stable beach profile.
(E) Dredged material is graded at a uniform slope and contoured to minimize juvenile fish stranding and hazards to beach users.

This standard relates to water quality because it concerns the protection of estuarine water resources. Ongoing O&M Operations will utilize the same beach nourishment sites that are currently authorized by permitting agencies and identified in the Dredged Material Management Plan. Beaches would be widened consistent with their historical profile, material placed on the beach consists of sand of equal or greater grain size than the sand existing on the beach, placement and subsequent erosion of the materials would not adversely impact tidal marshes or productive intertidal and shallow subtidal areas, BMPs would be in place to maintain a stable beach profile, and the dredged material would be graded at a uniform slope and contoured to minimize juvenile fish stranding and hazards to beach users.

For these reasons, the proposed action is compatible with provision 4.232 (19).

20. *Except as noted below, land disposal and site preparation shall be conducted such that:*
    (A) Surface runoff from disposal sites is controlled to protect water quality and prevent sedimentation of adjacent water bodies, wetlands, and drainage ways. Disposal runoff water must enter the receiving waterway through a controlled outfall at a location with adequate circulation and flushing characteristics. Underground springs and aquifers must be identified and protected;

Applicable responses for these standards are addressed above in 3.3 [II.B & III.C.1.a.ii].

(B) Dikes are constructed according to accepted engineering standards and are adequate to support and contain the maximum potential height and volume of dredged materials at the site, and form a sufficiently large containment area to encourage proper ponding and to prevent the return of dredged materials into the waterway or estuary. Containment ponds and outfall weirs shall be designed to maintain adequate standing water at all times to further encourage settling of dredged materials. The dikes shall be constructed within the boundaries of the disposal site and shall be constructed of material obtained from within the site or other approved source. Clean dredged material placed on land disposal sites located directly adjacent to designated beach nourishment sites may be allowed to flow directly into the waterway without conforming to (A) and (B) of this Section, provided that all policies and standards for in-water disposal and beach nourishment are met and the dredged materials are not allowed to enter wetlands or the waterway in areas other than the designated beach nourishment site.

The existing sites will continue to be raised using dikes that meet these criteria.

For this reason, the proposed action is compatible with provision *4.232 (20B)*.

21. *Land disposal sites which are not intended for dredged material disposal or development use within a two-year period following disposal shall be revegetated as soon as site and weather conditions allow, unless habitat management plans agreed upon by resource management agencies specify that open sand areas should remain at the site. The project sponsor shall notify the City and state and federal permitting and resource management agencies when disposal is completed and shall coordinate revegetation with these agencies. The notification shall be sent to at least the following agencies: the local jurisdiction, U.S. Army Corps of Engineers, Soil Conservation Service, Division of State Lands, Oregon Department of Fish and Wildlife. Revegetation of a disposal site does not preclude future use of the sites for dredged material disposal.*

    The disposal site design shall be reviewed to determine if wetlands or other habitats will form on the site during the period between disposal actions. The disposal permit may be conditioned to allow future disposal actions to fill the created wetlands or habitats.

This provision relates to water quality because it concerns the minimization of impacts on wetlands and other estuarine water resources. Upland placement sites are typically prepped for placement of dredged material by removing shrubby vegetation and grading the site to accommodate weir placements and/or settling ponds. Once the dredged materials have been placed, the area is graded to an appropriate slope for beach nourishment operations and leveled for upland placement. The material being placed is xeric in nature and does not lend itself to support re-vegetation efforts. Equipment and construction debris will be removed prior to vacating the placement site. Placement of dredged fill material will not disturb more than the minimum area necessary for the project and shall minimize impacts on wetlands and other estuarine resources. The Corps will follow all BMPs as addressed above in P20.5 (2).

For these reasons, the proposed action is compatible with Standard 4.232 (21) to the maximum extent possible.

22. *The final height and slope after each use of a land dredged material disposal site shall be such that:*
    (A) The site does not enlarge itself by sloughing and erosion into adjacent areas;
    (B) Loss of materials from the site during storms and freshets is minimized; and
    (C) Interference with the view from nearby residences, scenic points, and parks does not occur.

Applicable responses for these standards are addressed above in P20.5 (10).

4.235. Filling of Aquatic Areas and Non-Tidal Wetlands

This subsection applies to the placement of fill material in tidal wetlands and waters of the Columbia River Estuary. These standards also apply to fill in non-tidal wetlands in shoreline designations that are identified as "significant" wetlands under Statewide Planning Goal 17.

1) *Fill in estuarine aquatic areas may be permitted only if all of the following criteria are met:*
   a. *If required for navigation or for other water-dependent uses requiring an estuarine location, or if specifically allowed under the applicable aquatic zone;*
   b. *If a need (i.e. a substantial public benefit) is demonstrated;*
   c. *The proposed fill does not unreasonably interfere with public trust rights;*
   d. *Feasible alternative upland locations do not exist; and*
   e. *Adverse impacts, as identified in the impact assessment, are minimized.*

Applicable responses for these standards are addressed above in P20.5 (1).

2) *The fill shall cover no more than the minimum necessary to accomplish the proposed use.*

Applicable responses for this standard are addressed above in P20.5 (2).

3) *Aquatic areas shall not be used for disposal of solid waste.*

This standard relates to water quality for the protection of water resources. No solid waste would be disposed of at the placement sites. The sediments which the Corps dredges from the CR FNCs are regulated under the CWA and MPRSA, as appropriate, and are not considered solid waste themselves. Therefore, the proposed action is compatible with this standard.

4.239 Fish and Wildlife Habitat

This subsection applies to uses and activities with potential adverse impacts on fish or wildlife habitat in Columbia River Estuary aquatic and shoreline areas.

(1) *Projects affecting endangered, threatened, or sensitive species habitat, as identified by the US Fish and Wildlife Service or Oregon Department of Fish and Wildlife, shall be designed to minimize potential adverse impacts. This shall be accomplished by one or more of the following:*
   a) *Soliciting and incorporating agency recommendations into local permit reviews;*
   b) *Dedicating and setting aside undeveloped on-site areas for habitat;*
   c) *Providing on or off-site compensation for lost or degraded habitat;*

d) *Retaining key habitat features (for example: roosting trees, riparian vegetation, feeding areas).*

(2) *In-water construction activity in aquatic areas shall follow the recommendation of state and federal fisheries agencies with respect to project timing to avoid unnecessary impacts on migratory fish.*

(3) *Uses and activities with the potential for adversely affecting fish and wildlife habitat may be approved only if the following impact mitigation actions are incorporated into the permit where feasible. These impact mitigation actions are listed from highest to lowest priority:*
   a) *Avoiding the impact altogether by not taking a certain action or parts of an action;*
   b) *Minimizing impacts by limiting the degree or magnitude of an action and its implementation;*
   c) *Rectifying the impact by repairing, rehabilitating, restoring the affected environment (this may include removing wetland fills, rehabilitation of a resource use and/or extracting site when its economic life is terminated, etc.);*
   d) *Reducing or eliminating the impact over time by preservation and maintenance operations.*

(4) *Projects involving subtidal or intertidal aquatic area fill or intertidal aquatic dredging with the potential for adversely affecting aquatic habitat must provide compensatory mitigation, consistent with Mitigation and Restoration Standards (subsection S4.218).*

This provision relates to water quality because it concerns the protection of estuarine water resources. The Corps has consulted with the US Fish and Wildlife Service (USFWS) on the maintenance of the Columbia River navigation projects between the Mouth of the Columbia River and Bonneville Dam, addressing effects to several ESA-listed species as described in P20.5 (2) above.

For these reasons, the proposed action is compatible with Standard 4.239.

S4.242. Water Quality Maintenance.

The standards in this subsection are intended to help protect and enhance the quality of water in the Columbia River Estuary. Impacts on water quality in aquatic areas and in tide gated sloughs in shoreland areas are covered.

(3) *The potential adverse impacts on water quality from dredging, fill, in-water dredged material disposal, in-water log storage, water intake or withdrawal, and slip or marina development will be assessed during permit review. Parameters to be addressed include:*
   (A) Turbidity
   (B) Dissolved oxygen
   (C) Biochemical oxygen demand
   (D) Contaminated sediments

(E) Salinity
(F) Water temperature
(G) Flushing
(4) New or expanded

This provision relates to water quality because it concerns potential adverse impacts to water quality in aquatic areas from dredge/fill activities.

Direct and indirect water quality effects:

In water placement would have minor short-term adverse effects to water quality indicators and negligible adverse indirect effects to water quality indicators. Turbidity would increase slightly during in-water placement, but medium to fine-grain sized dredged material would be placed upon medium- to fine-grain size sand, and combined disturbance would have brief turbidity that would settle out shortly after placement. Water temperature and dissolved oxygen levels would not change from existing conditions appreciably because placement of dredged sand (suitable for unconfined in-water placement) within in-water placement sites would not introduce dissolved organics or nutrient loaded material into deep water areas. Negligible long-term indirect effects to turbidity would occur from long-term dispersion of sediment in the vicinity of the site. These effects would not differ from background levels of existing conditions for water quality indicators at the site vicinity.

Shoreline placement would have minor short-term adverse effects to water quality indicators and negligible adverse indirect effects to water quality indicators. Turbidity would increase during shoreline placement until perimeter of shoreline placement area is established. Practicable avoidance and minimization measures for water quality described in section 1.4 would effectively minimize the effects of placement and construction at the shoreline site. Water temperature and dissolved oxygen levels would not change from existing conditions appreciably because placement of dredged sand at shoreline sites would not introduce dissolved organics or nutrient loaded material into nearshore areas. Negligible long-term indirect effects to turbidity would occur from long-term dispersion of sediment in the vicinity of the site. These effects would not differ from background levels of existing conditions for water quality indicators at the site vicinity.

Transfer placement would have minor short-term adverse effects to water quality indicators and negligible adverse indirect effects to water quality indicators. Turbidity would increase slightly during site preparation (dredging of material to attain sufficient depth), during in-water placement, and during site restoration of pre-construction contours. Turbidity plumes would settle out quickly because material dredged and placed at transfer sites would be composed of medium- to fine-grain sized sand. Water temperature and dissolved oxygen levels would not be appreciably affected by placement of dredged sand at and through transfer sites because it would not introduce dissolved organic or nutrient loaded material into water within the site vicinity. Negligible long-term indirect effects to turbidity would occur from long-term dispersion of sediment in the vicinity of the site. These effects would not differ from background levels of existing conditions for water quality indicators at the site vicinity.

Cumulative water quality effects:

Negligible short- and medium-term and minor long-term additive cumulative effects would occur at a regional scale when compared to past, present, and reasonably foreseeable future effects. Dredging, placement and construction would have negligible additive adverse cumulative effects to water quality indicators because they would contribute localized minimal amounts of turbidity in the vicinity of dredging, placement, and construction. Depletion of placement capacity that retains sediment in the system would lead to minor indirect adverse cumulative effects at the regional level through erosional loss of aquatic ecosystem features at areas where there would be no replacement of sediment at eroded features.

For these reasons, the proposed action is compatible with Standard 4.242.

3. Oregon's Statewide Planning Goals, Columbia County's Comprehensive Plan, and Local Land Use Regulations

In this section the Corps has described those provisions of Columbia County's acknowledged comprehensive plan and land use regulations that relate to water quality and made affirmative findings that its project is compatible with those land use factors which relate to water quality. The Corps' provision of this applicable land use information ensures that DEQ's WQC decision is compatible with those factors that relate to water quality.

Columbia County does not have any land use regulations that apply to work or development within the waterway. However, the Zoning Ordinance, Comprehensive Plan, and the Stormwater & Erosion Control Ordinance may be applicable for grading activities and discharges of fill placed on land depending on the location and size of land disturbance. FNC dredging and placement site locations used for upland and/or shoreline placement, or in-water transfer of material are listed by county in section 1.2, Table 1 above.

3.1 Compatibility with Applicable Columbia County Comprehensive Plan Provisions

The Columbia County Comprehensive Plan contains goals of the county. Those that pertain to water quality or the control and abatement of water pollution in relation to the proposed Project are located in Article VI – Special Districts, Overlay Districts and Special Provisions. The sections that are applicable to the proposed action are addressed below.

VIII.H - Fish and Wildlife Habitat.

This subsection applies to uses and activities with potential adverse impacts on fish or wildlife habitat in Columbia County

> *9. Prohibit diversion or impoundment of stream courses, which adversely impact fish and wildlife habitat.*

This provision relates to water quality because it concerns the protection of estuarine water resources. Dredging and placement activities will not divert or impound stream courses. Placement sites will be constructed with a slope of 10-15%, with no swales, to reduce the possibility of stranding juvenile salmonids consistent with the BMPs stated in Table 2 above. For these reasons, the proposed action is compatible with this standard.

15. *Protect significant streams, lakes and wetlands from the adverse affects of development and other land use practices.*

Applicable responses for this standard is addressed above in 2.1 [P20.5 (2)].

IX.F Natural Areas

This subsection applies to the protection of remaining ecologically significant natural features in Columbia County.

1. *Protect ecologically significant natural features and areas by restricting land use activities which may degrade their unique characteristics and direct incompatible land uses away from such areas.*

This standard relates to water quality because the purpose is to conserve areas of the Columbia River and to protect and conserve natural resources. The effects associated with new dredging projects could have additional effects on ecologically significant natural features. However, the Corps is not proposing new areas to be dredged or new areas for dredge material placement. Intermittent dredging and placement activities are compatible with the resource capabilities of the proposed placement areas because the resources of the area will be able to assimilate the site's use, activity, and their affects. In addition, affected sites will continue to function in a manner which protects ecologically significant natural features, natural biological productivity, recreation, and aesthetic values. Therefore, the proposed action is compatible with this standard.

X.A. Water Resources

This subsection seeks to the protect and maintain the quality of water resources in Columbia County.

2. *Protect areas significant for the recharge of groundwater resources such as wetlands and riparian areas.*

Applicable responses for this standard are addressed above in 2.1 [P20.5 (2)].

9. Maintain rivers and streams in their natural state to the maximum extent practicable through sound land and water management practices. Consideration shall be given to natural, scenic, historic, economic, cultural, and recreational qualities of the rivers and adjacent lands.

Applicable responses for this standard are addressed above in 2.1 [P20.5 (1), P20.5 (2), P20.5 (3)] and 2.3 [4.232 (8)].

13. Apply erosion and sediment reduction practices along riparian areas to assist in maintaining water quality.

Applicable responses for this standard are addressed above in 2.1 [P20.5 (2)] and 2.3 [4.232 (3)].

14. Protect marshes, swamps, and other wetlands from filling, draining, or other alterations which would destroy or reduce their biological value.

Applicable responses for this standard are addressed above in 2.1 [P20.5 (2)], and below in 3.2 [1173] and 3.2 [1184.C].

23. Protect water quality by applying Riparian Corridor and Wetland Overlay Zones which discourage development in sensitive areas that affect the water resource.

Responses to applicable water quality provisions in the Riparian Corridor and Wetland Overlay Zones are addressed in sections 3.2 [1173] and 3.2 [1184.C] below.

3.2 Columbia County Zoning Ordinance

The applicable county ordinances are found in S1170 Riparian Corridors, Wetlands, Water Quality, and Fish and Wildlife Habitat Protection Overlay Zone

The following activities are prohibited within a riparian corridor boundary, except as provided for in Sub-sections 1175 and 1176 of the Columbia County Zoning Ordinance:

1173 Activities Prohibited within the Riparian Corridor Boundary

- *A. The alteration of a riparian corridor by grading, placement of fill material, and/or impervious surfaces, including paved or gravel parking areas, or paths, and/or the construction of buildings or other structures which require a building permit under the State of Oregon Uniform Building Code, as amended.*
- *B. The removal of riparian trees or vegetation.*

This provision relates to water quality because it concerns the protection of estuarine water resources. Upland placement sites are typically prepped for placement of dredged material by removing shrubby vegetation and grading the site to accommodate weir placements and/or settling ponds. Once the dredged materials have been placed, the area is graded to an appropriate slope for beach nourishment operations and leveled for upland placement. Although USACE will not, in the absence of Congressional direction, apply for any local building permit, consistent with sub-section 1175 A.2 of the Columbia County Zoning Ordinance (Permitted Uses and Activities), vegetation will only be removed if it is necessary to complete O&M operations. Vegetation along the water shall be left in its natural condition to the maximum extent practicable. Placement of dredged fill material will not disturb more than the minimum area necessary for the project and shall minimize impacts on estuarine resources to the maximum extent practicable as addressed above in 2.1 [P20.5 (2)].

For these reasons, the proposed action is compatible with Standard S1173.

1184.C Activities Prohibited within the Wetland Riparian Corridor Boundary

A. The alteration of a wetland riparian corridor by grading, the placement of fill material, and/or impervious surfaces, including paved or gravel parking areas, or paths, and/or the construction of buildings or other structures which require a building permit under the State of Oregon Uniform Building Code, as amended.
B. The removal of riparian trees or vegetation.

This provision relates to water quality because it concerns the protection of wetland and riparian water resources. Upland placement sites are typically prepped for placement of dredged material by removing shrubby vegetation and grading the site to accommodate weir placements and/or settling ponds. Once the dredged materials have been placed, the area is graded to an appropriate slope for beach nourishment operations and leveled for upland placement. Although USACE will not, in the absence of Congressional direction, apply for any local building permit, consistent with sections 1184.E.1.b., 1184.E.2.b, and 1184.G.1 of the Columbia County Zoning Ordinance (Exceptions of prohibited activities), vegetation will only be removed if it is necessary to complete O&M operations. Vegetation along the water shall be left in its natural conditions unless removal of such vegetation is necessary to complete O&M operations. Placement of dredged fill material will not disturb more than the minimum area necessary for the project and shall minimize impacts on other estuarine resources to the maximum extent possible as addressed above in 2.1 [P20.5 (2)]. No impacts to wetlands are proposed.

For these reasons, the proposed action is compatible to the extent possible with Standard S1184C.

1185 Natural Area Overlay

> *The Natural Area Overlay zone applies to all public land areas that are identified as being significant Natural Areas in the Oregon State Registry of National Heritage Resources, Natural Areas owned by The Nature Conservancy, and to areas which are identified as being significant Natural Areas in the Comprehensive Plan. The Oregon State Registry of National Heritage Resources is attached to the Comprehensive Plan in the Technical Appendix, Part XVI, Article IX.*

This standard relates to water quality for the protection of ecologically significant natural features and areas in Columbia County by restricting land use activities which may degrade the land's unique characteristics. Consistent with section 1188.A (Natural Area Overlay, Permitted Uses), the proposed beach nourishment and upland placement sites would have ecological beneficial uses and will not result in permanent disturbance or destruction of the sensitive, fragile, or otherwise unique characteristics of natural areas. The proposed action could result in temporary and localized soil disturbance at upland and shoreline placement sites, which could result in erosion that can adversely affect water quality, plant, animal, and aquatic life. The Corps disturbs the minimum amount of material necessary from its federal navigation channels and placement sites as a matter of practice. All reasonable Best Management Practices (BMPs) would be employed to control erosion, encourage settling, and reduce turbidity levels from upland placement locations to the maximum extent practicable. Potential affected sites would continue to function in a manner which conserves the long-term ecological significance, natural biological productivity, recreation, and aesthetic values.

For these reasons, the proposed action is compatible with provision 1185.

3.3 Columbia County Stormwater & Erosion Control Ordinance

The purpose of this ordinance is to: Prevent water quality degradation of the county's water resources; Prevent damage to property from increased runoff rates and volumes; Protect the quality of waters for drinking water supply, contact recreation, fisheries, irrigation, and other beneficial uses; Establish sound developmental policies which protect and preserve the county's water and land resources; Protect county roads and rights-of-way from damage due to inadequately controlled runoff and erosion; Protect the health, safety, and welfare of the inhabitants of the county; Maintain existing instream flows; and Preserve and enhance the aesthetic quality of the county's water resources. The sections that are applicable to the proposed action are addressed below.

II. General Requirements

B. Drainage leaving a site

1. Runoff discharges from a site shall occur at their natural location and elevation, unless runoff is conveyed in a constructed system, approved by the county.

2. Surface runoff exiting a parcel shall be discharged with adequate energy dissipators within the development site to prevent downstream damage.

The standard relates to water quality because its purpose is to ensure that grading and soil disturbance activities do not adversely affect water quality where work occurs. No expansion of impervious surface is proposed. Baseline activities associated with continued maintenance dredging and use of upland and shoreline placement sites have not appreciably changed. Implementation of the BMPs described in Section 1.4 above have been successful in minimizing potential adverse impacts to the aquatic environment. Dredged material containment berms with weir systems are measures used to maximize sediment retention within the site. All reasonable Best Management Practices (BMPs) would be employed to encourage settling, infiltration, and reduce turbidity levels from the upland and shoreline placement locations to the maximum extent practicable. Measures employed will be inspected and maintained daily to ensure their proper function. Runoff discharges from placement sites will occur at their natural location, mimic pre-project flow conditions, and will be discharged into waters such that no downstream damage will occur.

For these reasons, the proposed action is compatible with provision II.B.

D. Fills in flood storage areas

In order to control flooding of downstream properties, all wetland fills and fills of low areas where runoff is naturally stored during 100-year storms, must be mitigated by creation of an equivalent amount of runoff storage within 1000 feet of the filled site.

This provision relates to water quality because it concerns the protection of wetland and estuarine resources. Runoff discharges from placement sites will occur at their natural location, mimic pre-project flow conditions, and will be discharged into waters such that no downstream damage will occur. No impacts to wetlands are proposed. Impacts to floodplains associated with the implementation of the Columbia River Channel Improvement Plan (CRCIP) and subsequent operations and maintenance were evaluated in the Final EIS and 2003 Supplemental EIS. The project, including disposal, is anticipated to have minimal effect on the floodplain or flood levels. The proposed action does not fill within flood levees. The proposed action maintains existing FNCs, rather than creating new channels or increasing channel capacity; therefore, the action would not change the likelihood or rate of floodplain development in any way. Removal of accumulated sediments from the FNCs could decrease the potential for flooding locally. Placement of dredged material in the Columbia River would not raise flood elevations because the volumes placed are negligible compared to the bedload of the Columbia River and because the placement does introduce new material in the stream; in-water placement only moves material within the same river system.

For these reasons, the proposed action is compatible with provision II.D.

III. Standards Specific to Activities

C. Grading Permits

Grading permits that involve disturbing more than 2000 square feet of land or activities disturbing more than 1000 square feet of land on sites with known and apparent erosion problems.

1. Erosion Control

a. Required Measures

ii. Where slopes exceed 5%, a Sediment Fence (ECM-Section 3.3.2) shall be installed at the base of the disturbed area or dirt stockpiles.

The standard relates to water quality because its purpose is to ensure that grading and soil disturbance activities do not adversely affect water quality where work occurs. Although USACE will not, in the absence of Congressional direction, apply for any local grading permit, the proposed action is compatible because implementation of the BMPs described in Section 1.4 above, have been successful in minimizing potential adverse impacts to the aquatic environment. The proposed action would result in temporary and localized soil disturbance and destabilization at upland and shoreline placement sites, which could result in erosion that can adversely affect water quality, plant, animal, and aquatic. The Corps disturbs the minimum amount of material necessary from its federal navigation channels and placement sites as a matter of practice. All reasonable BMPs would be employed to control erosion, encourage settling, and reduce turbidity levels from upland placement locations to the maximum extent practicable. Measures employed will be inspected and maintained daily to ensure their proper function. Runoff discharges from placement sites will occur at their natural location, mimic pre-project flow conditions, and will be discharged into waters such that no downstream damage will occur.

For these reasons, the proposed action is compatible with provision III.C.1.a.ii.

iii. As an alternative to a sediment fence, vegetated and undisturbed buffers at the base of the slope on the subject property can be utilized. Slopes above the buffer cannot exceed 10% and the buffer width must be at least equal to the uphill-disturbed area draining to it.

Applicable responses for this standard are addressed above in 2.1 [P20.5 (2)] and 3.3 [III.C.1.a.ii].

iv. During wet weather, October 1-April 30, a 6-mil plastic sheet cover (ECM-Section 3.3.9) or a minimum 2" of straw mulch cover shall be required on stockpiles where sediment is eroding and leaving the subject property or entering a water resource.

Applicable responses for this standard *are addressed above* in 2.1 [P20.5 (2)] and 3.3 [III.C.1.a.ii].

v. Ground cover shall be reestablished prior to removing the erosion control measures described above (ECM-Section 3.3.6).

Applicable responses for this standard *are addressed above* in 2.1 [P20.5 (2)] and 3.3 [III.C.1.a.ii].

G. Drainage Modifications

Drainage modifications involving the construction of storm pipes, culverts, channels, embankments, or other flow-altering structures in any stream, stormwater facility, or wetland

1. Erosion Control

a. Required Measures

i. During wet weather, October 1-April 30, a 6-mil plastic sheet cover (ECM-Section 3.3.9) or a minimum 2" of straw mulch cover shall be required on areas of exposed earth where sediment is eroding and entering a water resource.

Applicable responses for this standard *are addressed above* in 2.1 [P20.5 (2)] and 3.3 [III.C.1.a.ii].

ii. Ground cover shall be reestablished prior to removing erosion control measures (ECM-Section 3.3.6).

Applicable responses for this standard *are addressed above* in 2.1 [P20.5 (2)] and 3.3 [III.C.1.a.ii].

b. Erosion Control Plan

i. A Final Erosion Control Plan is required if more than 2000 square feet, or 1000 square feet on sites with known and apparent erosion problems, will be disturbed by the drainage modification.

ii. The plan shall be prepared by an Engineer.

iii. The plan shall specify use of the erosion control measures outlined above, plus additional measures as may be necessary to prevent sediment from entering a water resource.

iv. The plan shall be completed in the format specified in Section IV.

v. Construction on the site shall not begin until the plan is approved by the county.

Applicable responses for this standard *are addressed above* in 2.1 [P20.5 (2), (P20.5 (3)] and 3.3 [III.C.1.a.ii].

4. Oregon's Statewide Planning Goals, Multnomah County's Comprehensive Plan, and Local Land Use Regulations

In this section the Corps has described those provisions of Multnomah County's acknowledged comprehensive plan and land use regulations that relate to water quality and made affirmative findings that its project is compatible with those land use factors which relate to water quality. The Corps' provision of this applicable land use information ensures that DEQ's WQC decision is compatible with those factors that relate to water quality. FNC dredging and placement site locations used for upland and/or shoreline placement, or in-water transfer of material are listed by county in section 1.2, Table 1 above.

4.1 Compatibility with Applicable Multnomah County Comprehensive Plan Provisions

The Multnomah County Comprehensive Plan contains goals of the county. Those that pertain to water quality or the control and abatement of water pollution in relation to the proposed Project are Goals 5 (Natural Resources, Scenic and Historic Areas, and Open Spaces) and 6 (Air, Water, and Land Resources Quality). These goals and their associated administrative rules call for cities and counties to inventory significant natural resources and create and implement programs to protect them from impacts associated with land use and development. The sections that are applicable to the proposed action are addressed below.

General Policies and Strategies (County-wide)

5.2 - Protect natural areas from incompatible development and specifically limit those uses which would significantly damage the natural area values of the site.

Applicable responses for this standard are addressed above in 3.1 [IX.F.1] and 3.2 [1185]

5.6 - Protect vegetated riparian corridors in order to maintain their water quality functions including the following:

1. *Providing shade to maintain or reduce stream temperatures to meet state water quality standards;*
2. *Supporting wildlife in the stream corridors;*
3. *Minimizing erosion, nutrient, and pollutant loading into water;*
4. *Maintaining natural hydrology; and*
5. *Stabilizing slopes to prevent landslides that contribute to sedimentation of water.*

Applicable responses for these standards are addressed above in 2.1 [P20.5 (2)] and 3.3 [III.C.1.a.ii].

5.11 - Protect water quality of streams by controlling runoff that flows into them.

Applicable responses for this standard are addressed above in 3.3 [II.B & III.C.1.a.ii].

5.12 - Limit visible and measurable erosion from development in substantial compliance with the water quality standards of Title 3 of the Metro Urban Growth Management Functional Plan*.*

Applicable responses for this standard are addressed above in 2.3 [S4.232 (3) & S4.232 (7)].

5.14 - Stormwater drainage for new development and redevelopment shall prioritize water quality and natural stream hydrology in order to manage stormwater runoff in accordance with the following:

1. The run-off from the site shall not adversely affect the water quality in adjacent streams, ponds, or lakes, or alter the drainage on adjoining lands, or cause damage to adjacent property or wildlife habitat.

Applicable responses for this standard are addressed above in 3.3 [II.B].

2. Stormwater infiltration and discharge standards shall be designed to protect watershed health by requiring onsite detention and/or infiltration in order to mimic pre-development hydraulic conditions so that post-development runoff rates and volumes do not exceed pre-development conditions.

Applicable responses for this standard are addressed above in 3.3 [II.B & II.D].

3. Apply Low Impact Development Approaches (LIDA) in order to conserve existing resources, minimize disturbance, minimize soil compaction, minimize imperviousness, and direct runoff from impervious areas onto pervious areas.

Applicable responses for this standard are addressed above in 3.3 [II.B & II.D].

4. Protect and maintain natural stream hydrology (or flow), with an emphasis on reducing hydromodification impacts such as stream incision and widening.

Applicable responses for these standards are addressed above in P20.5 (10).

Wild and Scenic Waterways

5.16 – Protect all state or federal designated scenic waterways from incompatible development and prevent the establishment of conflicting uses within scenic waterways.

The Columbia River is not a designated Wild and Scenic waterway.

5.27 – Protect significant native fish and wildlife habitat and wildlife corridors and specifically limit conflicting uses within these habitats and sensitive big game winter habitat areas.

Applicable responses for this standard are addressed above in 2.1 [P20.5 (2)].

4.2 Chapter 39 – Multnomah County Zoning Code

39.5045 Watercourse Relocation and Alteration

(A) No relocation, encroachment or alteration of a watercourse shall be permitted unless a detailed hydraulic analysis, certified by a State of Oregon Registered Professional Engineer, is provided which demonstrates that:

(1) The flood carrying capacity for the altered or relocated portion of the watercourse will be maintained;

(2) The area subject to inundation by the base flood discharge will not be increased;

(3) The alteration or relocation will cause no measurable increase in base flood levels.

Applicable responses for these standards are addressed above in 2.1 [P20.5 (10)].

39.5090 Geologic Hazards Permit Standards

(E) Fills shall not encroach on any water body unless an Oregon licensed Professional Engineer certifies in writing that the altered portion of the waterbody will continue to provide equal or greater flood carrying capacity for a storm of 10-year design frequency.

Applicable responses for these standards are addressed above in 2.1 [P20.5 (10)].

(F) Fill generated by dredging may be deposited on Sauvie Island only to assist in flood control or to improve a farm's soils or productivity, except that it may not be deposited in any SEC overlay, WRG overlay, or designated wetland.

Applicable responses for these standards are addressed above in 4.1 [5.53].

(H) Stripping of vegetation, ground disturbing activities, or other soil disturbance shall be done in a manner which will minimize soil erosion, stabilize the soil as quickly as practicable, and expose the smallest practical area at any one time during construction.

Applicable responses for these standards are addressed above in sections 3.2 [1173] and 3.2 [1184.C].

(I) Development Plans shall minimize cut or fill operations and ensure conformity with topography so as to create the least erosion potential and adequately accommodate the volume and velocity of surface runoff.

Applicable responses for this standard are addressed above in 2.1 [P20.5 (2)] and 3.3 [II.B & III.C.1.a.ii].

(J) Temporary vegetation and/or mulching shall be used to protect exposed critical areas during development.

Applicable responses for this standard *are addressed above* in 2.1 [P20.5 (2) & P20.5 (3)] and 3.3 [III.C.1.a.ii].

(K) Whenever feasible, natural vegetation shall be retained, protected, and supplemented;

(1) A 100-foot undisturbed buffer of natural vegetation shall be retained from the top of the bank of a stream, or from the ordinary high watermark (line of vegetation) of a water body, or within 100-feet of a wetland;

(2) The buffer required in subsection (K)(1) may only be disturbed upon the approval of a mitigation plan which utilizes erosion, sediment, and stormwater control measures designed to perform as effectively as those prescribed in the most recent edition of the City of Portland Erosion and Sediment Control Manual and the City of Portland Stormwater Management Manual and which is consistent with attaining equivalent surface water quality standards as those established for the Tualatin River drainage basin in OAR 340-041-0345(4).

Applicable responses for these standards are addressed above in sections 3.2 [1173] and 3.2 [1184.C].

(L) Permanent plantings and any required structural erosion control and drainage measures shall be installed as soon as practical.

Applicable responses for these standards are addressed above in sections 2.1 [P20.5 (2)] and 3.3 [III.C.1.a.ii].

(M) Provisions shall be made to effectively accommodate increased runoff caused by altered soil and surface conditions during and after development. The rate of surface water runoff shall be structurally retarded where necessary.

Applicable responses for this standard are addressed above in 3.3 [II.B & II.D].

(N) Sediment in the runoff water shall be trapped by use of debris basins, silt traps, or other measures until the disturbed area is stabilized.

Applicable responses for this standard are addressed above in 3.3 [II.B].

(O) Provisions shall be made to prevent surface water from damaging the cut face of excavations or the sloping surface of fills by installation of temporary or permanent drainage across or above such areas, or by other suitable stabilization measures such as mulching or seeding.

Applicable responses for this standard are addressed above in 2.1 [P20.5 (2)] and 3.3 [II.B, II.D & III.C.1.a.ii].

(P) All drainage measures shall be designed to prevent erosion and adequately carry existing and potential surface runoff to suitable drainageways such as storm drains, natural water bodies, drainage swales, or an approved drywell system.

Applicable responses for this standard are addressed above in 2.1 [P20.5 (2)] and 3.3 [II.B, II.D & III.C.1.a.ii].

(Q) Where drainage swales are used to divert surface waters, they shall be vegetated or protected as required to minimize potential erosion.

Applicable responses for this standard are addressed above in 2.1 [P20.5 (2)] and 3.3 [II.B, II.D & III.C.1.a.ii].

(R) Erosion and sediment control measures must be utilized such that no visible or measurable erosion or sediment shall exit the site, enter the public right-of-way or be deposited into any water body or storm drainage.

Applicable responses for this standard are addressed above in 2.1 [P20.5 (2)] and 3.3 [II.B, II.D & III.C.1.a.ii].

(S) Disposed spoil material or stockpiled topsoil shall be prevented from eroding into water bodies by applying mulch or other protective covering; or by location at a sufficient distance from water bodies; or by other sediment reduction measures;

Applicable responses for this standard are addressed above in 2.1 [P20.5 (2)] and 3.3 [II.B & III.C.1.a.ii].

(T) Such non-erosion pollution associated with construction such as pesticides, fertilizers, petrochemicals, solid wastes, construction chemicals, or wastewaters shall be prevented from leaving the construction site through proper handling, disposal, continuous site monitoring and clean-up activities.

This standard relates to water quality for the protection of water resources. The sediments which the Corps dredges from the CR FNCs are regulated under the CWA and MPRSA, as appropriate, and are not considered solid waste themselves. During any operation and maintenance actions, there would be potential for contaminants to enter the water. BMPs would be implemented to prevent petrochemicals, solid wastes, construction chemicals, or wastewaters from leaving the proposed dredging and placement sites. The proposed action does not involve the release of pesticides or fertilizers. Standard methods for handling hazardous materials spills are addressed in section 1.4 above. Therefore, the proposed action is compatible this standard.

(V) Ground disturbing activities within a water body shall use instream best management practices designed to perform as prescribed in the City of Portland Erosion and Sediment Control Manual and the City of Portland Stormwater Management Manual.

Applicable responses for this standard are addressed above in P20.5 (2).

4.3 Chapter 38 – Columbia River Gorge National Scenic Area

The purposes of the Columbia River Gorge National Scenic Area Districts are to protect and provide for the enhancement of the scenic, cultural, recreational, and natural resources of the Columbia River Gorge, and to protect and support the economy of the Columbia River Gorge by encouraging growth to occur in existing urban areas and by allowing future eco-nomic development in a manner that protects and enhances the scenic, cultural, recreational, and natural resources of the Gorge.

This standard relates to water quality for the protection of ecologically significant natural features and areas in Columbia River Gorge National Scenic Area by restricting land use activities which may degrade the land's unique characteristics. The statutory responsibility to continue operating and maintaining the CR FNCs to their authorized dimensions is non-discretionary. No material changes are proposed to the ongoing O&M operations. O&M operations would continue in the same manner and for the same purpose and use. The existing baseline condition and functionality of the LCR would remain the same. Further, General Policies and Guidelines for the Management Plan of the Scenic Area include Savings Policies that ensure certain uses are exempted from management or regulation under the Scenic Area Act. For example, water transportation activities on the Columbia River or its tributaries are exempt from regulation under the Management Plan or land use ordinances adopted by counties or the Gorge Commission. And the term "activities" includes those facilities necessary for navigation, including the federal navigation channels and facilities which accommodate material dredged from the channels. Further, the operation, maintenance, and improvement of navigation facilities at Bonneville Dam (except for the offsite disposal of excavation material) are exempt from regulation under the Management Plan or land use ordinances.

For these reasons, the proposed action is compatible with Chapter 8 – Columbia River Gorge National Scenic Area.

5. Summary of Findings

As described above, the Corps has determined that the proposed action is compatible with those provisions in Clatsop, Columbia, and Multnomah County's comprehensive plans, land use regulations, and development standards that relate to water quality. Therefore, DEQ's decision to issue a WQC under CWA Section 401 for the proposed action will be compatible with relevant portions of the acknowledged comprehensive plan and local land use regulations.

CONTINUING LCR FLOWLANE CONVERSATION

Develop responses to these complex questions together over a series of meetings.

Goal/Agenda 31 Jan: to build some foundation in order to answer these questions.

1. Corps' approach to flowlane/thalweg placement and effects to river sediment fate and transport (lead: Rod Moritz, Coastal & Hydraulic Engineer)
2. Results from our approach to GIS mapping of County Plan criteria for flowlane placement. Quantify channel maintenance flowlane placement volume. (lead: Jessica Stokke, Project Manager)

These pieces will help inform discussion to be continued at next meeting.

QUESTIONS 1 - 5

1. What are the quantifiable adverse effects to Corps operations if in-river DMD were to adhere to the state enforceable policy regarding flowlane disposal, restricting this practice to within the FNC plus a 600-ft area on either side?
2. What would be the comparative effects to river sediment fate and transport of either: a) adhering to the state definition of flowlane disposal; or b) practicing DMD consistent with the Corps-preferred definition of the flowlane?
3. How much flowlane disposal is currently used now for FNC maintenance, and how much is proposed to occur under the new 20-year DMMP?
4. How would the Corps propose to construct a “Thalweg-Based” definition of the flowlane that would be able to be spatially confined and stable within a regulatory context (i.e., that would not be subject to frequent unrecorded and unevaluated change)?
5. What administrative or procedural steps would the Corps be willing to take in support of a proposal to amend the current definition of flowlane disposal, as codified in the Clatsop County Comprehensive Plan? What information or other resources would the Corps be able to provide to support such a proposal, with special emphasis on effects to biological resources, sediment transport and accumulation, habitat disturbance, and river users?

US Army Corps of Engineers

Portland District's Approach for Inwater Placement of LCR Dredged Sediment Evolved during 1990s to 2012

1998 LCR DMMP (Flowlane): Flowlane placement was done throughout the federal navigation channel (FNC) where depths ranged between 35 and 65 feet, typically below 45 feet. The location of flowlane sites varied, depending on the condition of the FNC each year. 50% of LCR dredging was placed in Flowlane sites. At the same time, river morphology outside FNC was changing and becoming unstable.

Post 2010-12: Flowlane placement method was no longer sustainable. Most deep areas within or adjacent to the FNC were filling up and their continued re-use as placement sites was feeding dredged sediment directly back into the FNC where it would immediately contribute to channel shoaling.

Current Practice (Thalweg): Portland District now manages dredged sediment placement to emulate the natural river processes. Conduct LCR dredged sediment placement within the river thalweg. The thalweg is the "action area", where the river is moving the most sediment during the year.

Portland District's view is that river thalweg is within the 20 ft depth contour, contiguous along the FNC. Distribute dredged sediment within the river thalweg to not harm living resources, not adversely affect other uses of the river, sustain the thalweg, and not rapidly return to the FNC. Success requires constant adaptation as the river continuously relocates the dredged sediment placed inwater each year. We cannot rely on a pre-determined fixed set of inwater placement sites. We carefully target suitable placement sites & coordinate placement within candidate sites to avoid conflicts with other uses.

Thalweg Placement: Requires that we have the flexibility to use different inwater placement sites each year, as the river dynamics dictate. The river's sediment supply is finite and we need to manage it as such. Our manta is to work with the natural system that affects sedimentation and to "do no harm".

Portland District is managing LCR & MCR dredged material in alignment with Oregon Statewide Planning Goals (OCMP Coastal Goals), by:

- Providing immediate and direct benefit for estuary processes (16)
- Providing indirect benefit for coastal shorelands (17)
- Providing indirect benefit for beaches and dunes (18).

US Army Corps of Engineers

OCMP Coastal Statewide Planning Goals, Clatsop County Land Use Zoning, and USACE Thalweg Placement Strategy

GOAL 16: Protect the long-term values, diversity, and benefits of estuaries and associated wetlands and provide for appropriate restoration and development. The goal relies on a classification system that specifies the level of development allowed in each estuary. All local governments with authority over an estuary must prepare and adopt a management plan and land use regulations according to the following four classifications.

1. **Deep-draft development for estuaries with maintained jetties and channels more than 22 feet deep;**
2. **Shallow-draft development for estuaries with maintained jetties and channels up to 22 feet deep;**
3. **Conservation for estuaries without a maintained jetty or channel within or adjacent to an urban area with altered shorelines;**
4. **Natural for estuaries without a maintained jetty or channel not adjacent to an urban area and with little development.**

Within the LCRE, USACE currently limits its placement of dredged sediment to areas located within the main flow-way of the river (thalweg) where water depth is greater than 20 ft and less than 65 ft. USACE thalweg-based dredged material placement sustains the morphology of the LCRE without adversely affecting its living resources; progressing to MCR.

Goal 17: Requires shorelands that are "especially suited for water dependent uses" be protected for such uses, and that local zoning regulations prevent the establishment of uses which would preempt the availability of such lands for water dependent development.

USACE management of river sediment dredged within the LCRE and MCR does not degrade the riverbed morphology, substrate, nor adversely affect water dependent uses of the estuary. USACE placement of dredged sediment within the thalweg of the LCRE emulates the process of morphology evolution that naturally occurs within the thalweg. Thalweg-based dredged material placement sustains river morphology and shorelands that are essential for water dependent uses, while maintaining the viability of the LCR FNC.

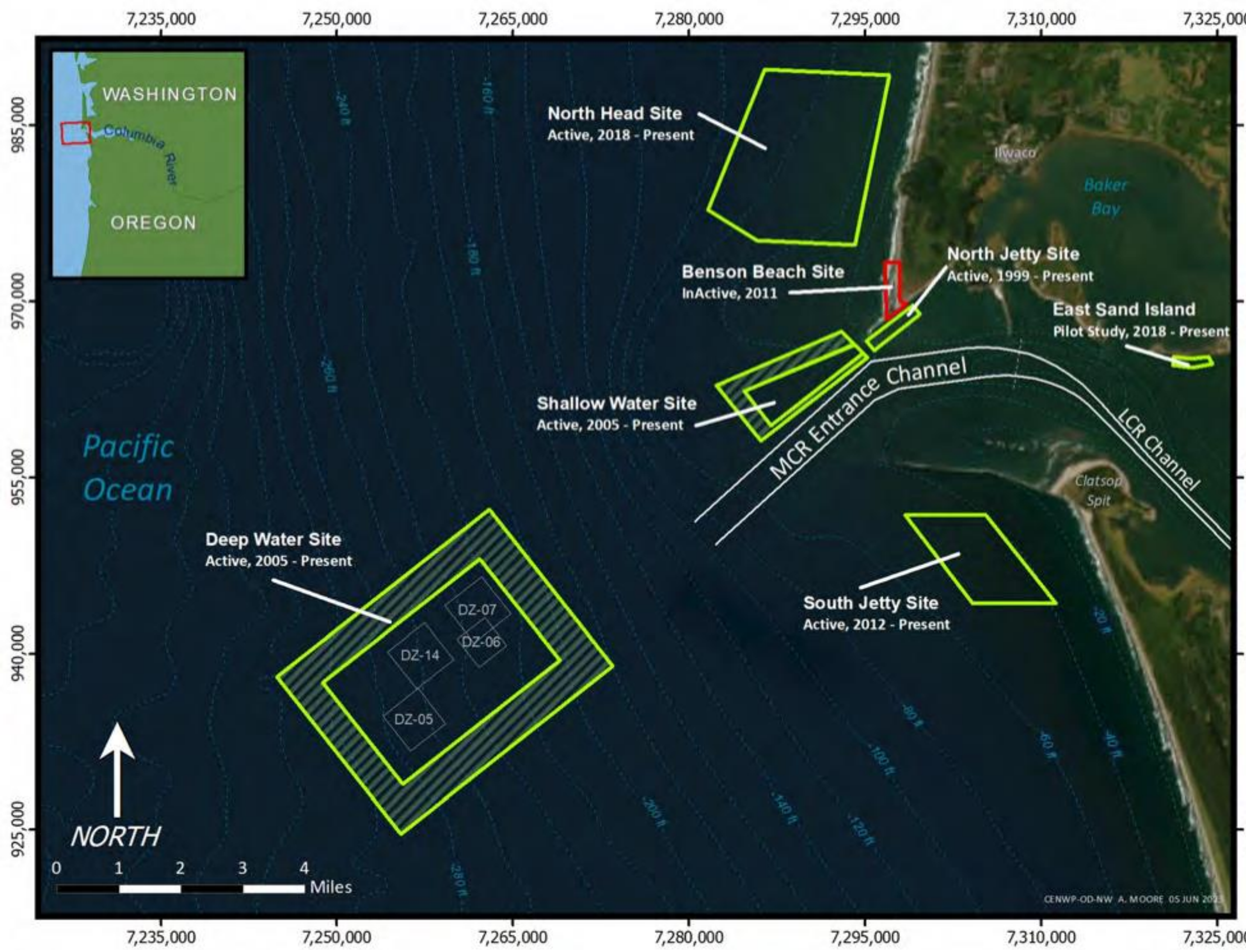
Goal 18: Prohibits development on the most sensitive and hazardous landforms in the beach and dune environment, including beaches, active foredunes and other dune areas subject to severe erosion or flooding. This requirement has been instrumental in preventing inappropriate development on these critical landforms.

USACE management of dredged river sediments within LCRE and MCR sustains the sandy morphology of the coastal margin along Clatsop Plains and Long Beach Peninsula. River sediment dredged from the LCRE FNC is managed to emulate the natural downstream movement of river sediment to the estuary's ocean entrance, where much of the sediment is then transported to coastal margin adjacent to the mouth of the Columbia River feeding the coastal sediment budget.

REGIONAL SEDIMENT MANAGEMENT

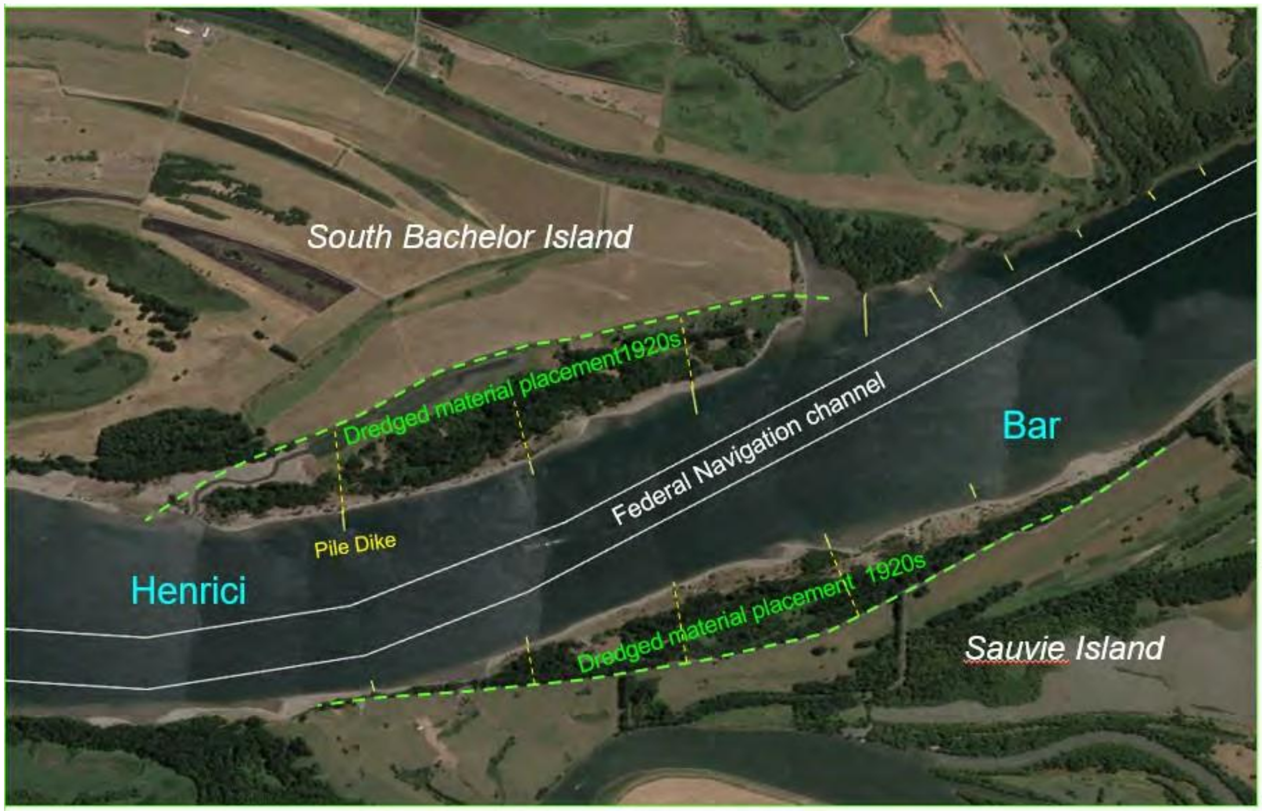
– Corps-wide systems approach using best management practices for more efficient and effective use of sediments in **coastal**, estuarine, and inland environments for healthier and more resilient systems.

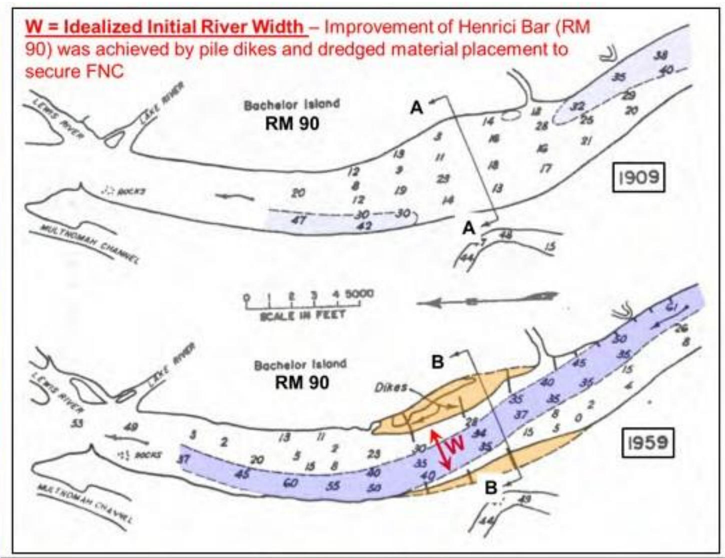
– Corps within Columbia River:
  - Shoals and dredging
  - In-river, upland, shoreline, nearshore placement and ocean disposal
  - Jetty, pile dike infrastructure
  - Other beneficial uses

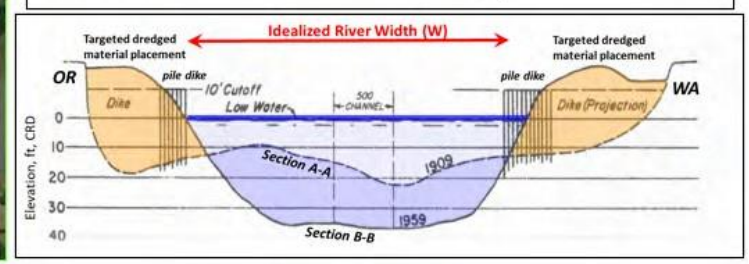


ENGINEERING WITH NATURE

– Corps-wide initiative is the intentional alignment of natural and engineering processes to efficiently and sustainably deliver economic, environmental, and social benefits through collaboration. Columbia River example:







BENEFICIAL USES OF DREDGED MATERIAL

– Corps-wide Chief of Engineer's national goal to beneficially use 70% or more dredged material by 2030.

– Corps within Columbia River:
  - Fish and wildlife habitat development (ex: salmon, streaked horned larks)
  - Recreation
  - Commercial

General Hydraulic Conditions in LCRE

Thalweg Extent for depth > 20 ft

Currents for Sand Movement

(areas far beyond the FNC are active)

Large Scale Morphology Change

Lower Estuary = RM 0 to 18

(sediment is moving all over the place)

Examples of Thalweg Placement Sites

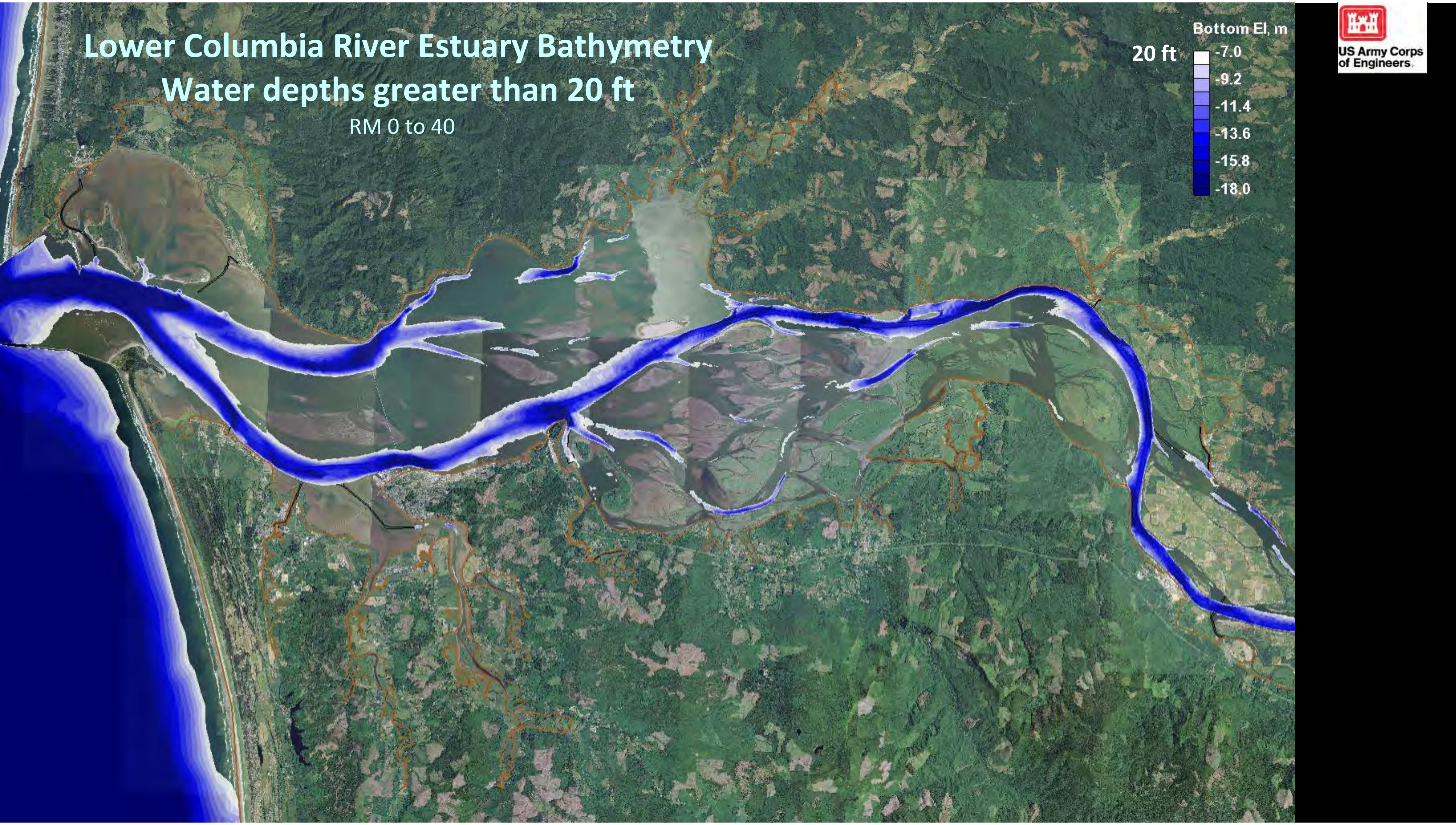
RM 26 to 29 (in active zone)

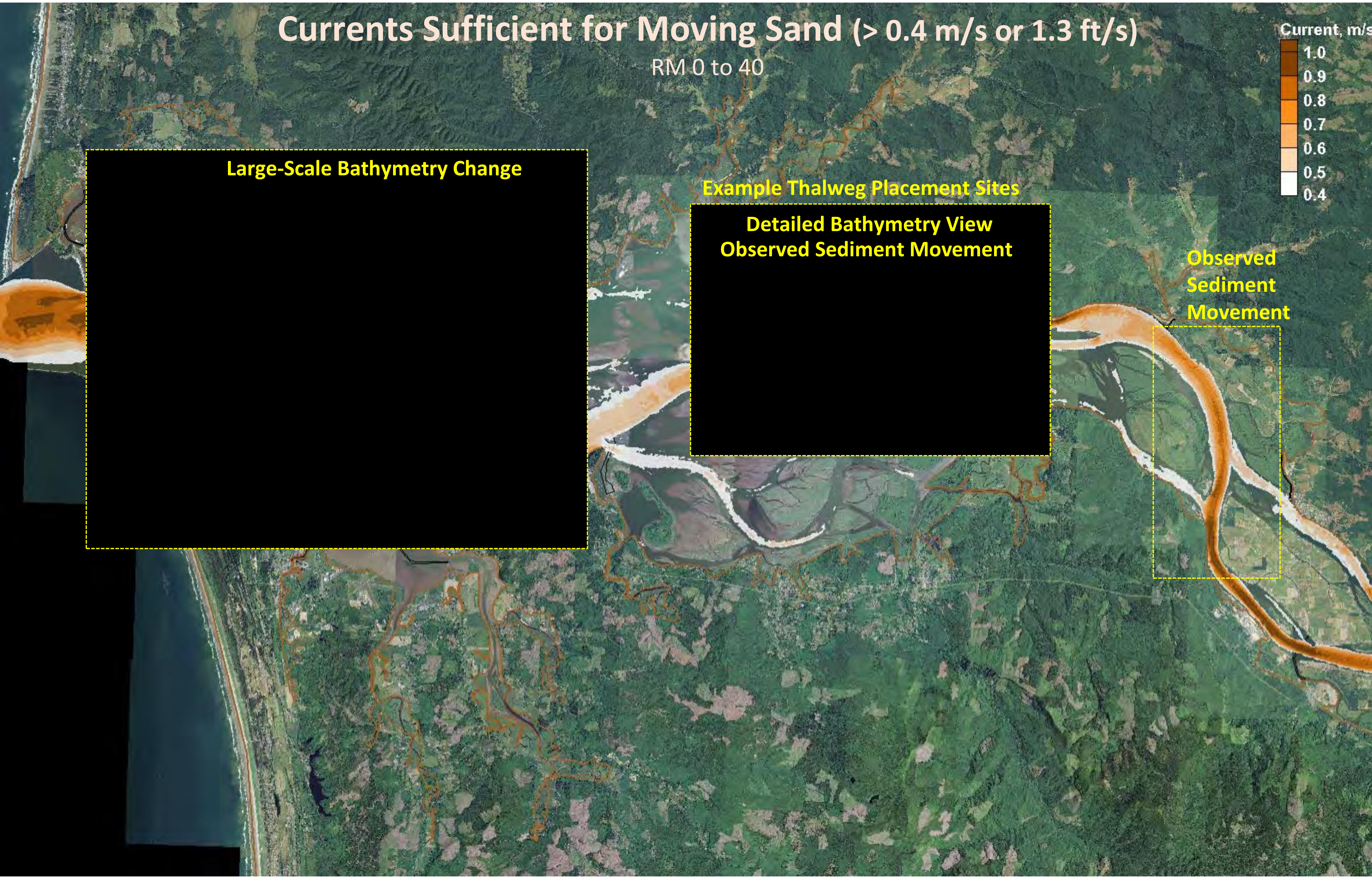
Detailed View of LCR Bathymetry

RM 22 to 29 (types of FNC shoaling)

Sediment Movement at Placement Sites

RM 26 to 40 (observed transport)


Lower Columbia River Estuary Bathymetry
Water depths greater than 20 ft
RM 0 to 40
20 ft
Bottom El, m
-7.0
-9.2
-11.4
-13.6
-15.8
-18.0
US Army Corps of Engineers



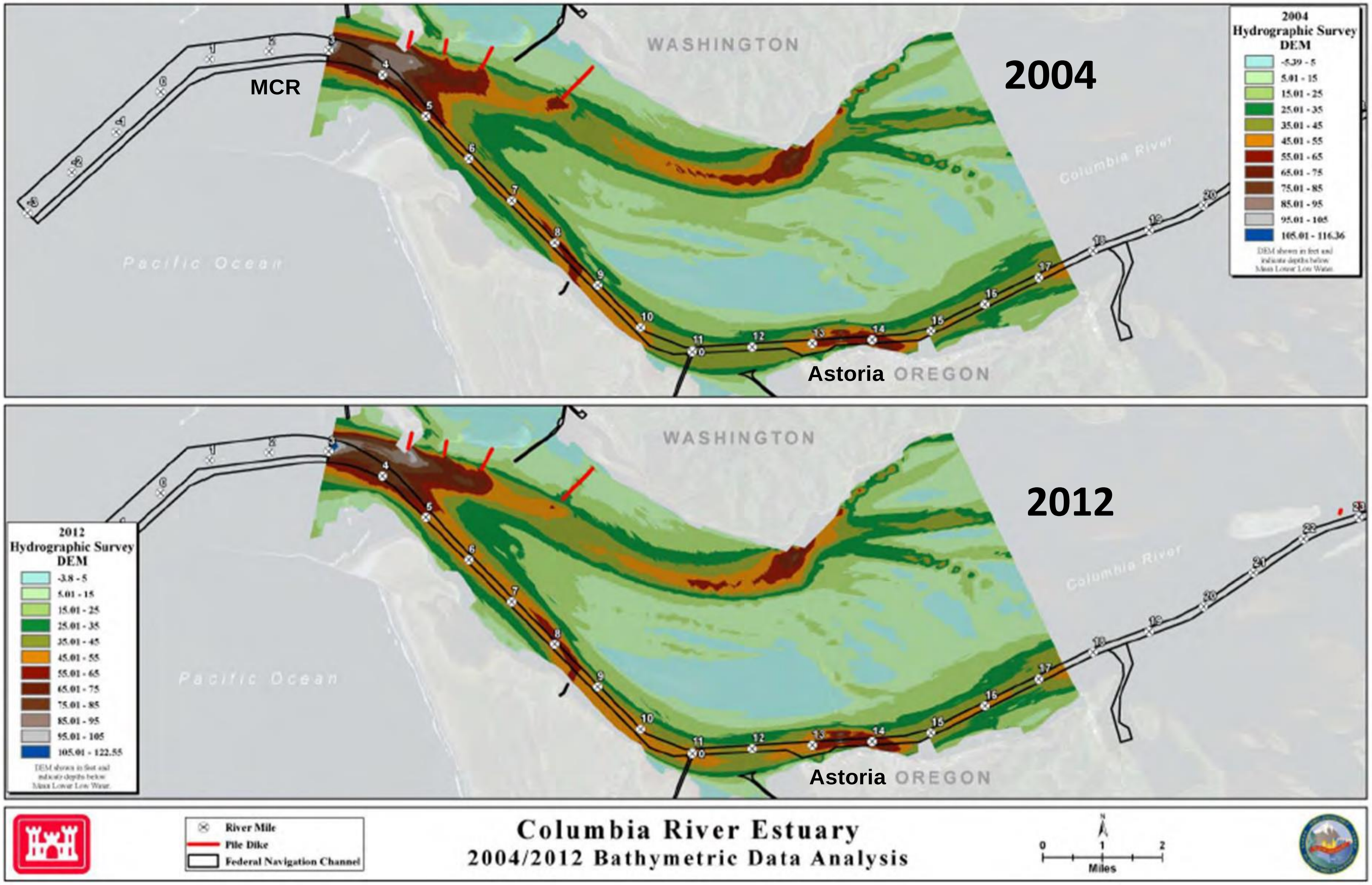
US Army Corps of Engineers

Large Scale Morphology Change within the Lower Columbia River Estuary

RM 0 to 18 2004-

2012

Figure 1: Top graphic is 2004 (CRCI Pre-Construction) and bottom graphic is 2012 (CRCI Post-Construction) Bathymetry

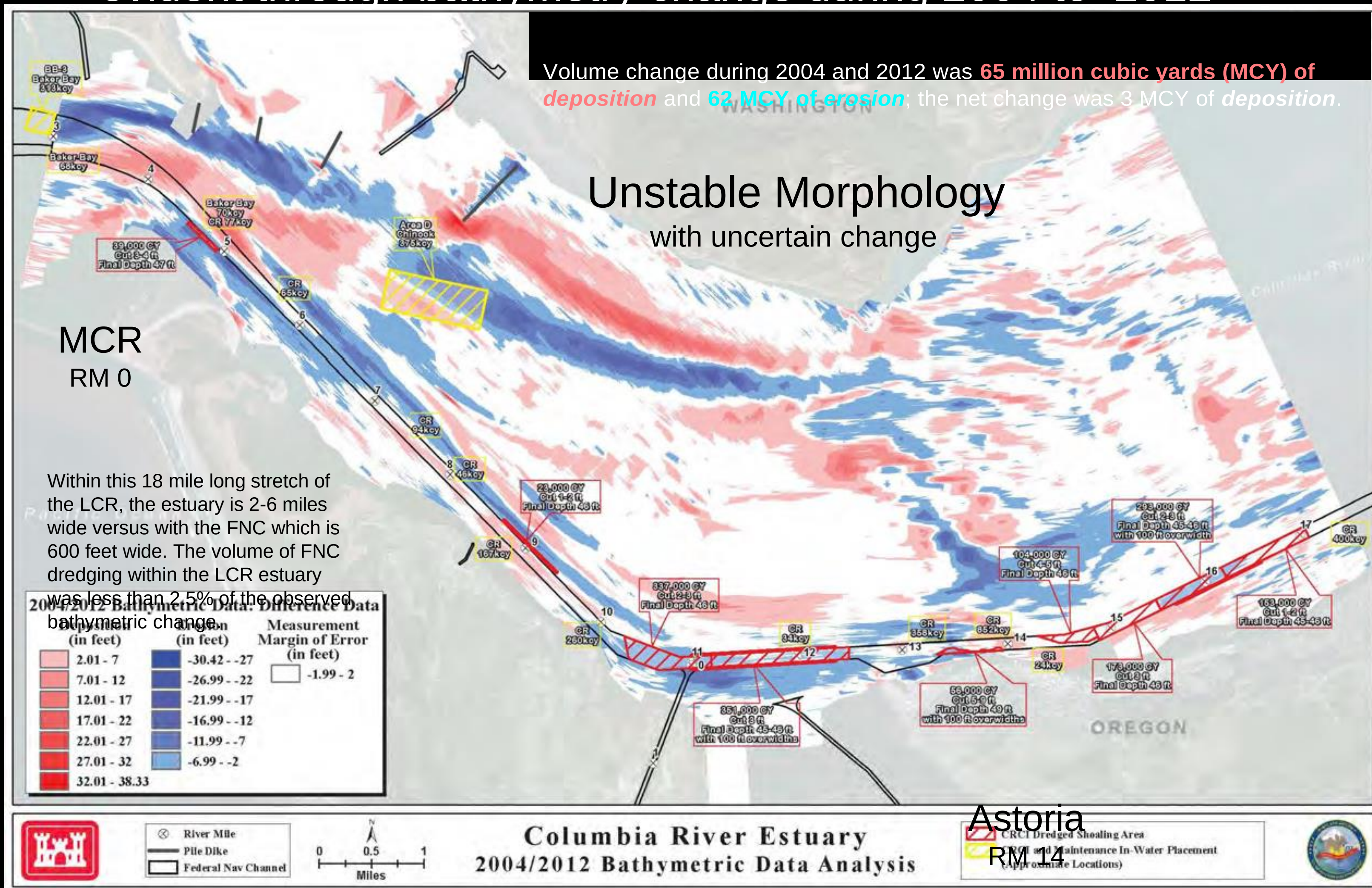


Active Sediment Redistribution within the LCR Estuary

evident through bathymetry change during 2004 to 2012

Erosion >10 ft

Deposition >10 ft



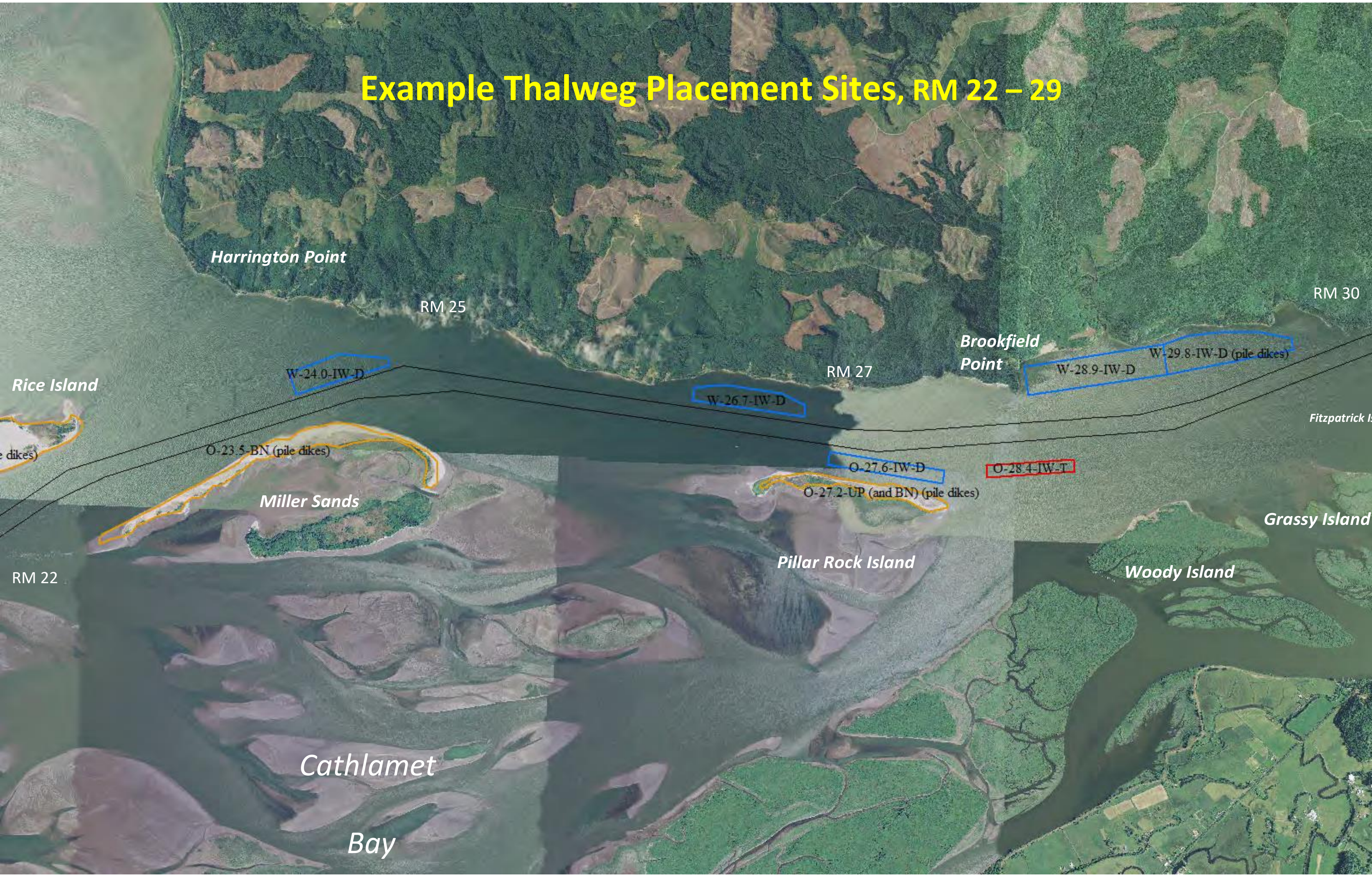
Volume change during 2004 and 2012 was **65 million cubic yards (MCY) of *deposition*** and **62 MCY of *erosion***; the net change was 3 MCY of ***deposition***.

Within this 18 mile long stretch of the LCR, the estuary is 2-6 miles wide versus with the FNC which is 600 feet wide. The volume of FNC dredging within the LCR estuary was less than 2.5% of the observed bathymetric change.

LCR FNC

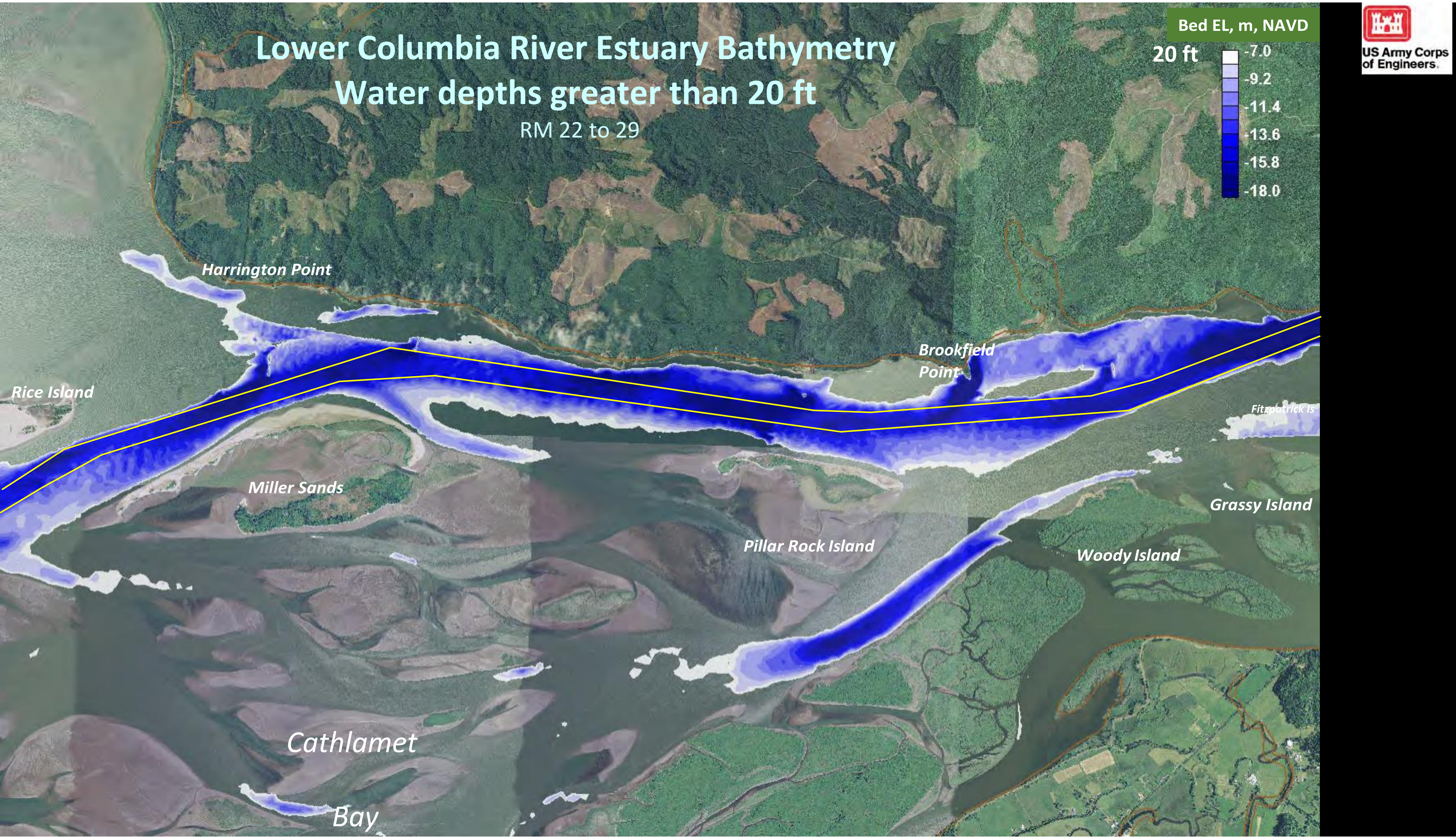
= 600 ft wide

(-43 ft)

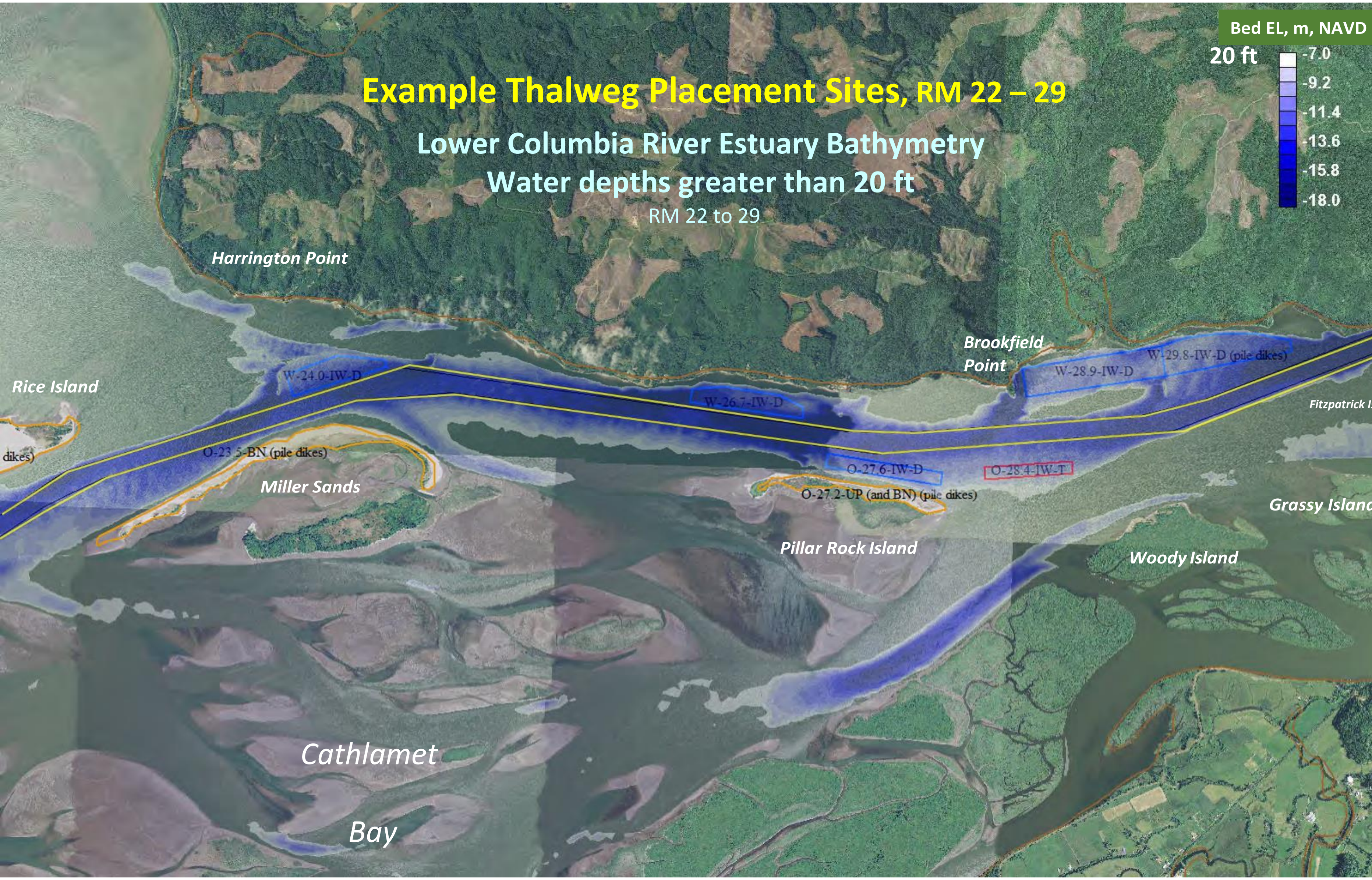


US Army Corps of Engineers

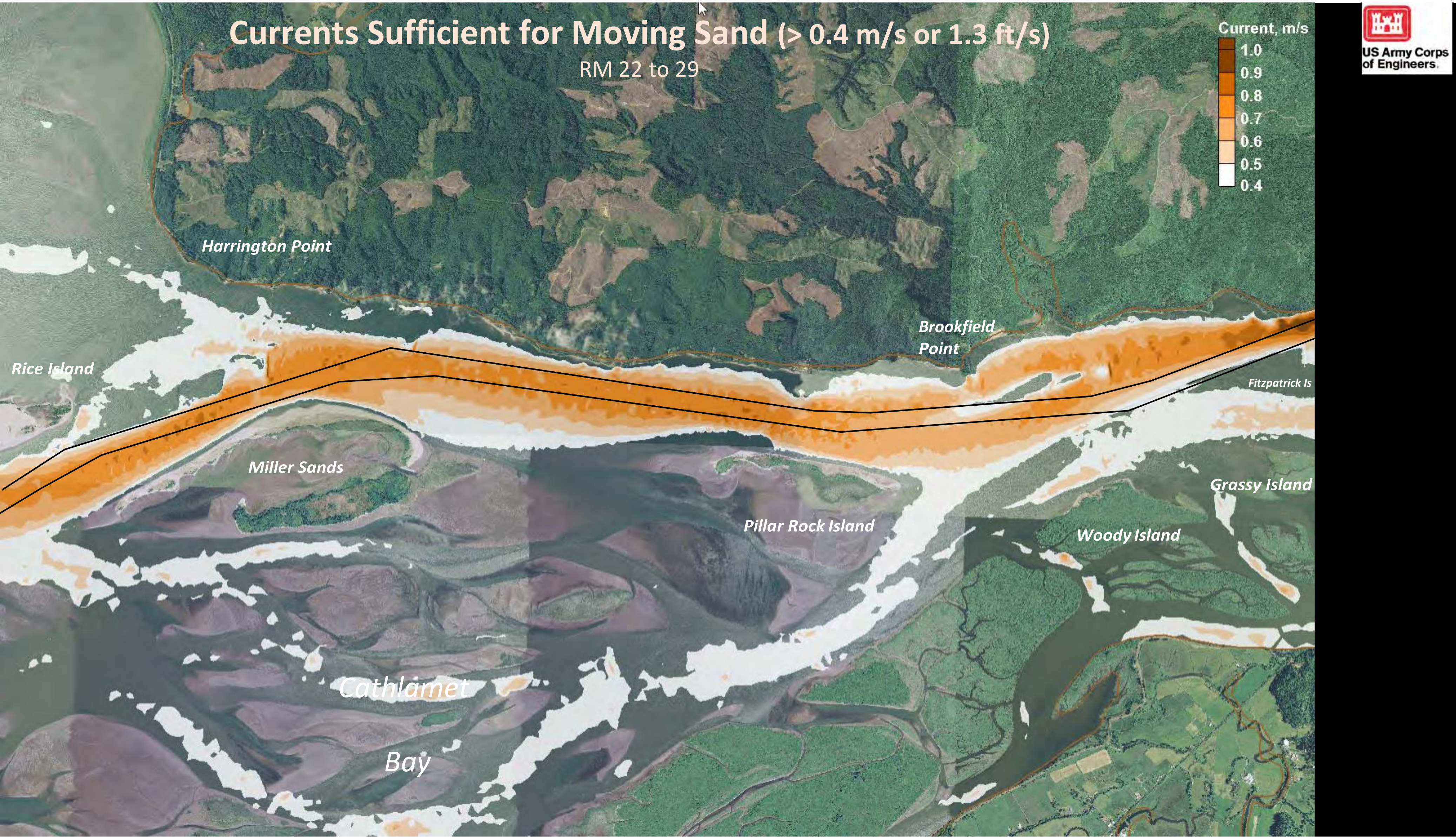
LCR FNC
= 600 ft wide
(-43 ft)



Lower Columbia River Estuary Bathymetry
Water depths greater than 20 ft
RM 22 to 29
Bed EL, m, NAVD
20 ft
-7.0
-9.2
-11.4
-13.6
-15.8
-18.0
US Army Corps of Engineers
Harrington Point
Rice Island
Brookfield Point
Fitzpatrick Is
Miller Sands
Grassy Island
Pillar Rock Island
Woody Island
Cathlamet
Bay

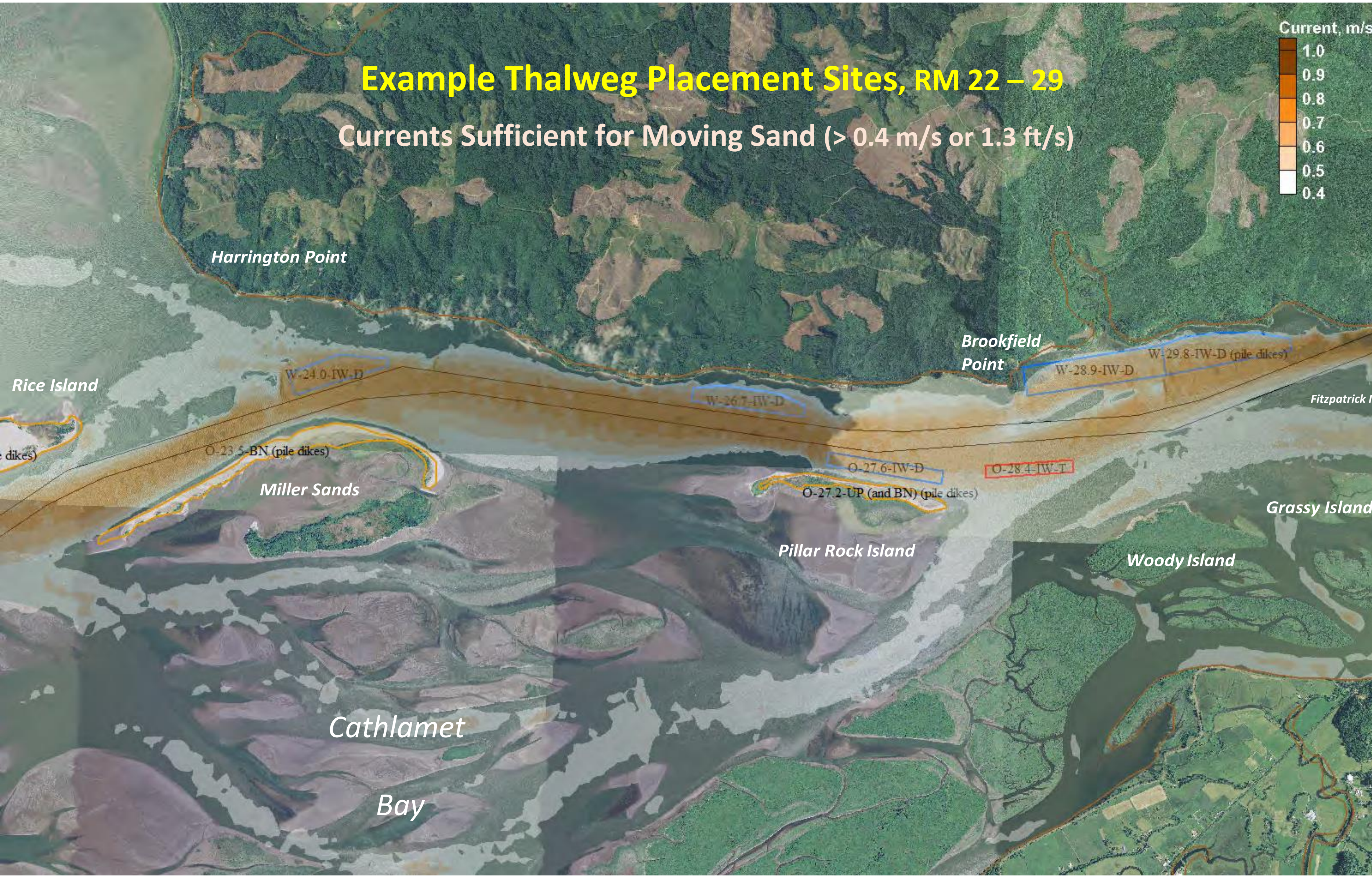


US Army Corps of Engineers


Currents Sufficient for Moving Sand (> 0.4 m/s or 1.3 ft/s)
RM 22 to 29
Current, m/s
1.0
0.9
0.8
0.7
0.6
0.5
0.4
US Army Corps of Engineers
Harrington Point
Rice Island
Brookfield Point
Fitzpatrick Is
Miller Sands
Pillar Rock Island
Grassy Island
Woody Island
Cathlamet
Bay

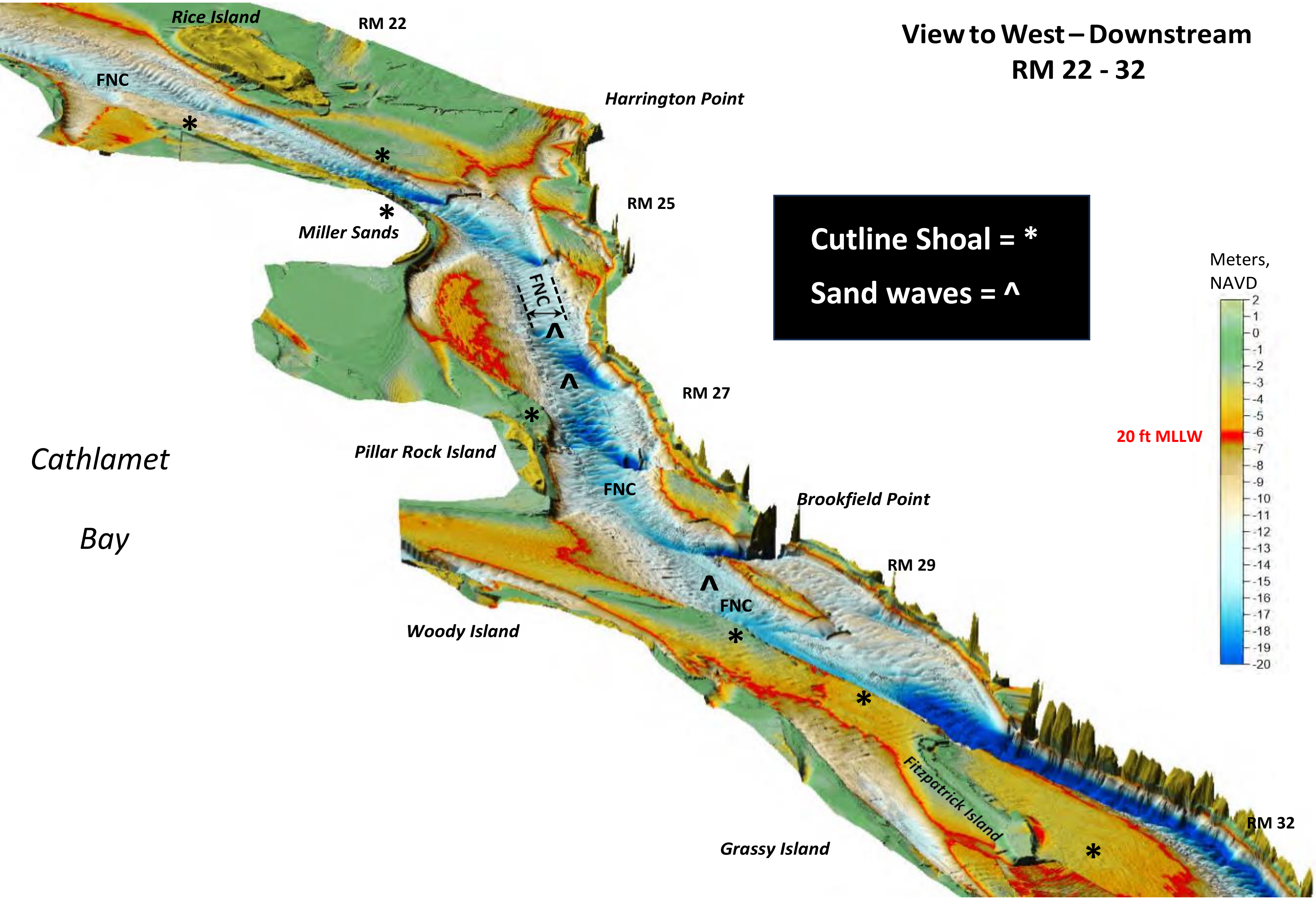
Example Thalweg Placement Sites, RM 22 – 29

Currents Sufficient for Moving Sand (> 0.4 m/s or 1.3 ft/s)



US Army Corps of Engineers

View to West – Downstream
RM 22 - 32

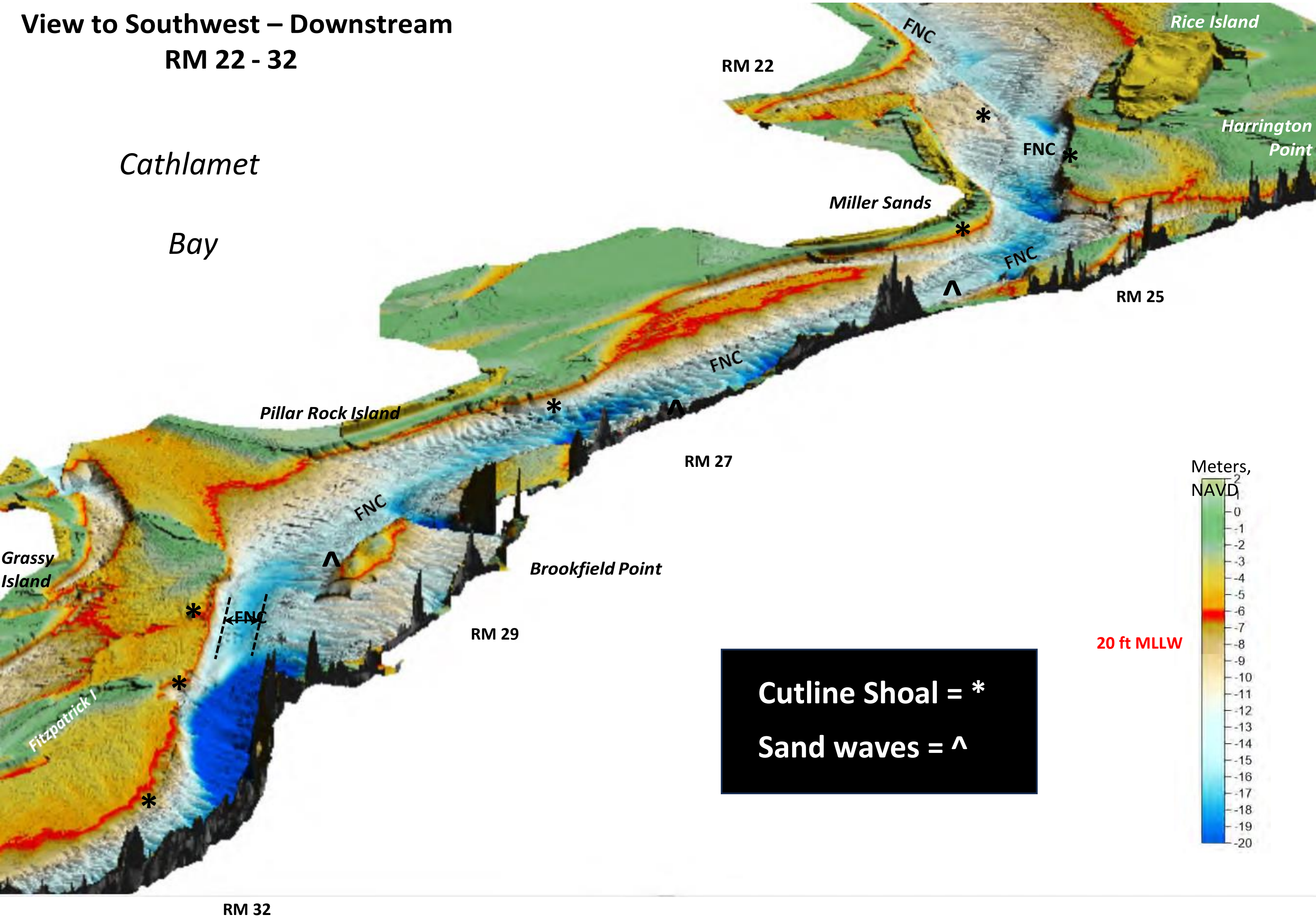


US Army Corps of Engineers

Detailed View of LCR Bathymetry
RM 22 to 29

(types of FNC shoaling)

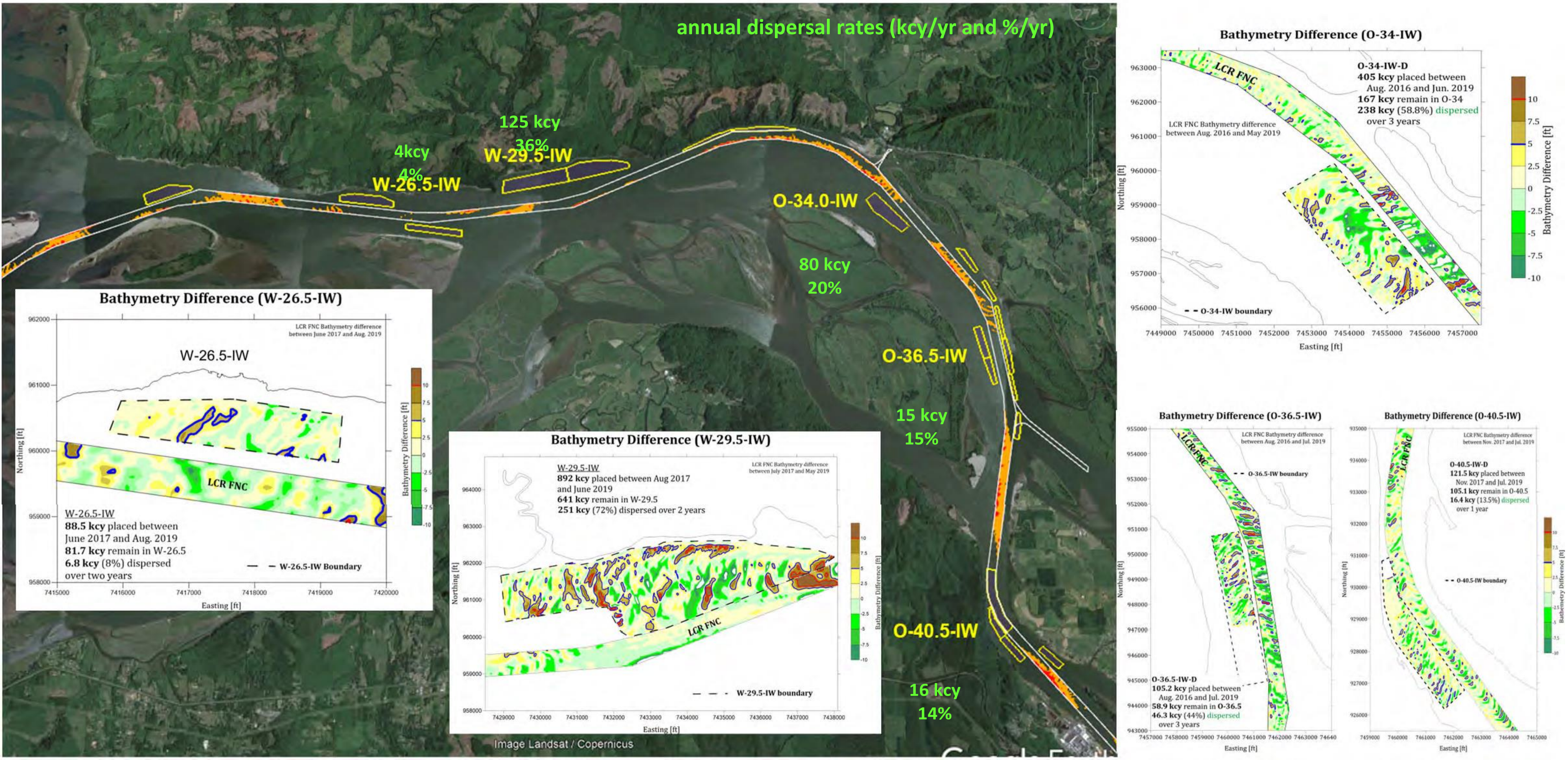
View to Southwest – Downstream
RM 22 - 32



Detected View of LCR Bathymetry
RM 22 to 29

(types of FNC shoaling)

Examples of Bathymetric Differencing to Evaluate Sediment Transport at In-Water Placement Sites



Consequences of an Imbalanced Sediment Budget

Sediment Supply Deficit

with Respect to

River Transport Capacity

What happens when: Transport capacity > Sediment Supply ?

Columbia River Regulation has altered the HYDROLOGY and SEDIMENT BUDGET of the lower river

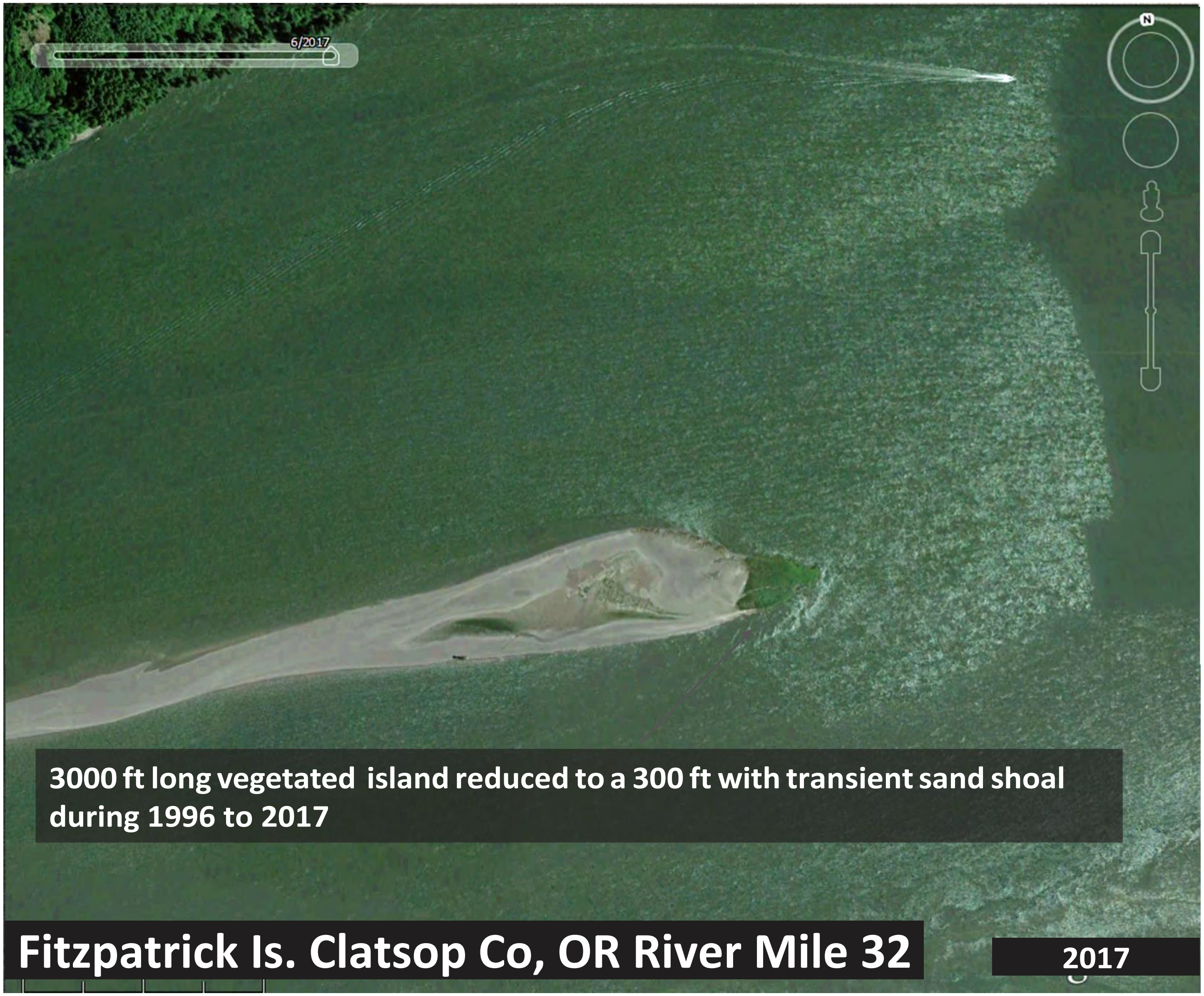
(post-regulation = 1974)

Mainstem FLOW:
Annual peak for LCR Seasonal Flow (June Freshet) has been reduced from 500 kcfs to 300 kcfs.
Minimum Seasonal Flow (SEP-OCT) increased from 50 kcfs to 80 kcfs.

LCR SEDIMENT BUDGET:
Reduced by Reservoir impoundment upstream of Bonneville Dam - RM 147 (Sediment supply).
Altered by transport capacity of the river below Bonneville Dam (Flow alteration).

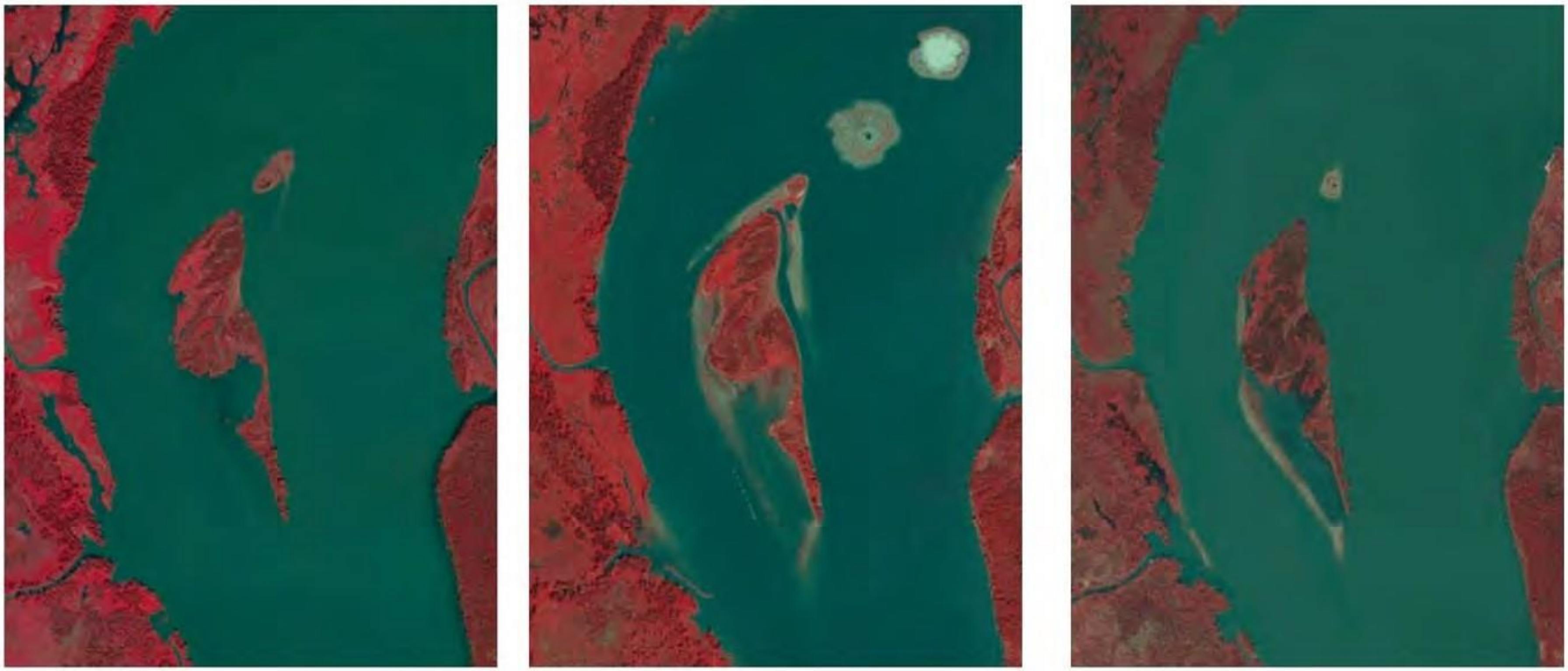
Pre-regulation sediment transport = 5 to 15 million cy/year.
Post-regulation sediment transport = 2 to 6 million cy/year, due to flow reduction.

LCR STAGE:
Peak Season Stage during Freshet reduced due to reduced river flow (annual peak: 21 to 16 ft NAVD at RM 95).
Minimum Seasonal stage increased due to increased minimum flow.


6/2017
3000 ft long vegetated island reduced to a 300 ft with transient sand shoal during 1996 to 2017
Fitzpatrick Is. Clatsop Co, OR River Mile 32
2017

STRATEGIC IN-WATER PLACEMENT

Example of Strategically Placing Material to Disperse and Redeposit Sediment



Note: From left to right, images show an island before dredged material placement, material that has been placed in locations upstream of the island, and material that has eroded over time and redeposited downstream on the backside of the island.

CHALLENGE: MAPPING COUNTY PLAN CRITERIA

Collectively, we don't know:

1. which areas meet all County Plan criteria = available for flowlane placement
2. the flowlane placement capacity (maximum annual volume of dredged material)

County Plan or CREST DMMP does not assess. Corps has not previously assessed.

Clatsop County Plan 20.5(11) Flow lane disposal sites shall:

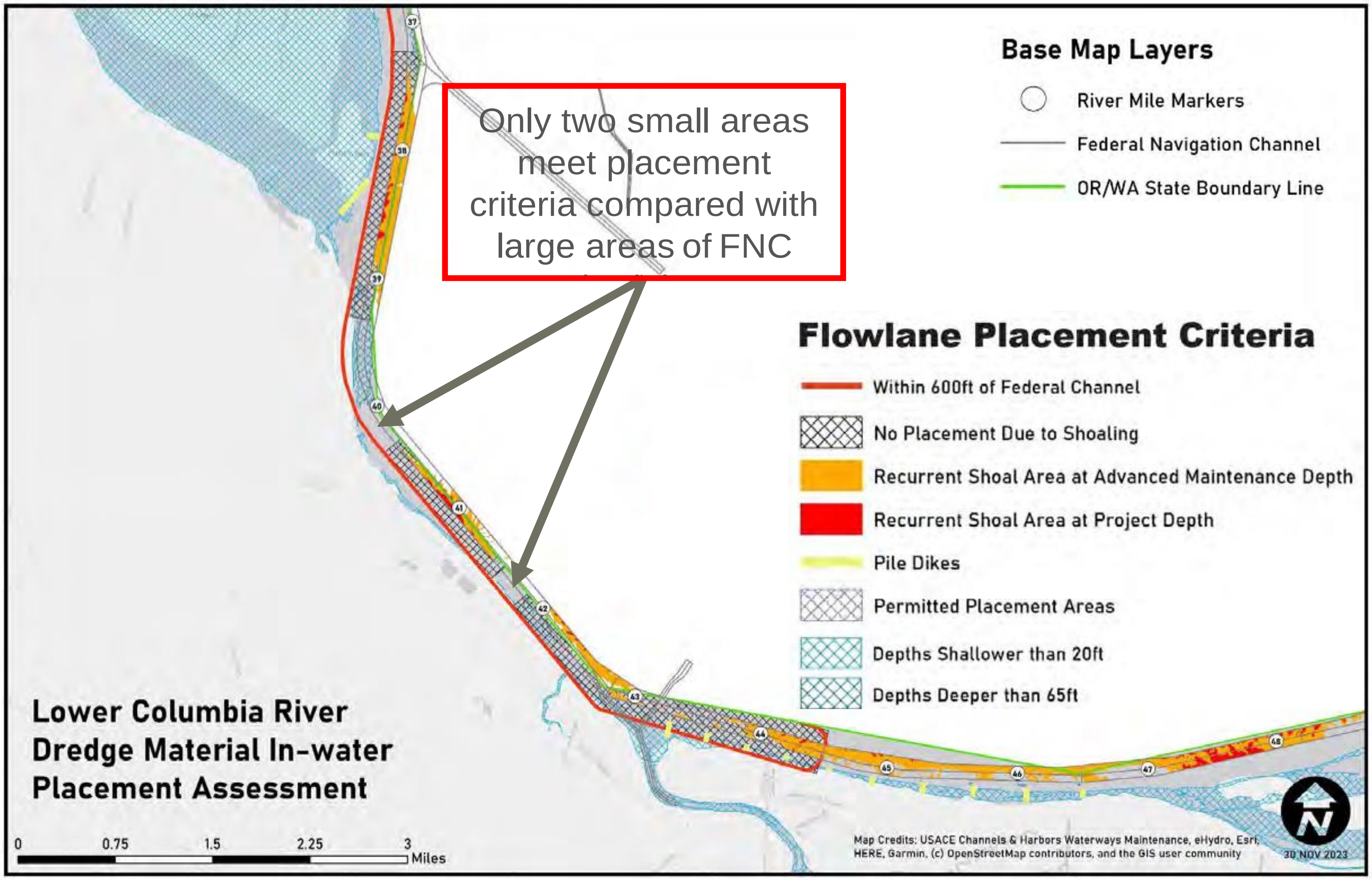
- *only be allowed in development designated areas [within 600 ft of the FNC] where*
- *(a) sediments can reasonably be expected to be transported down-stream without excessive shoaling,*
- *(b) Interference with recreational and commercial fishing operations will be minimal or can be minimized by applying specific timing restrictions,*
- *(c) adverse hydraulic effects will be minimal,*
- *(d) adverse effects on estuarine resources will be minimal, and*
- *(e) the disposal site depth is between 20 and 65 feet below MLLW.*

CORPS' GIS ASSESSMENT

GIS analysis screened out areas within 600 ft of FNC (Clatsop County AD zone) that are not available for Corps placement based on other criteria as follows:

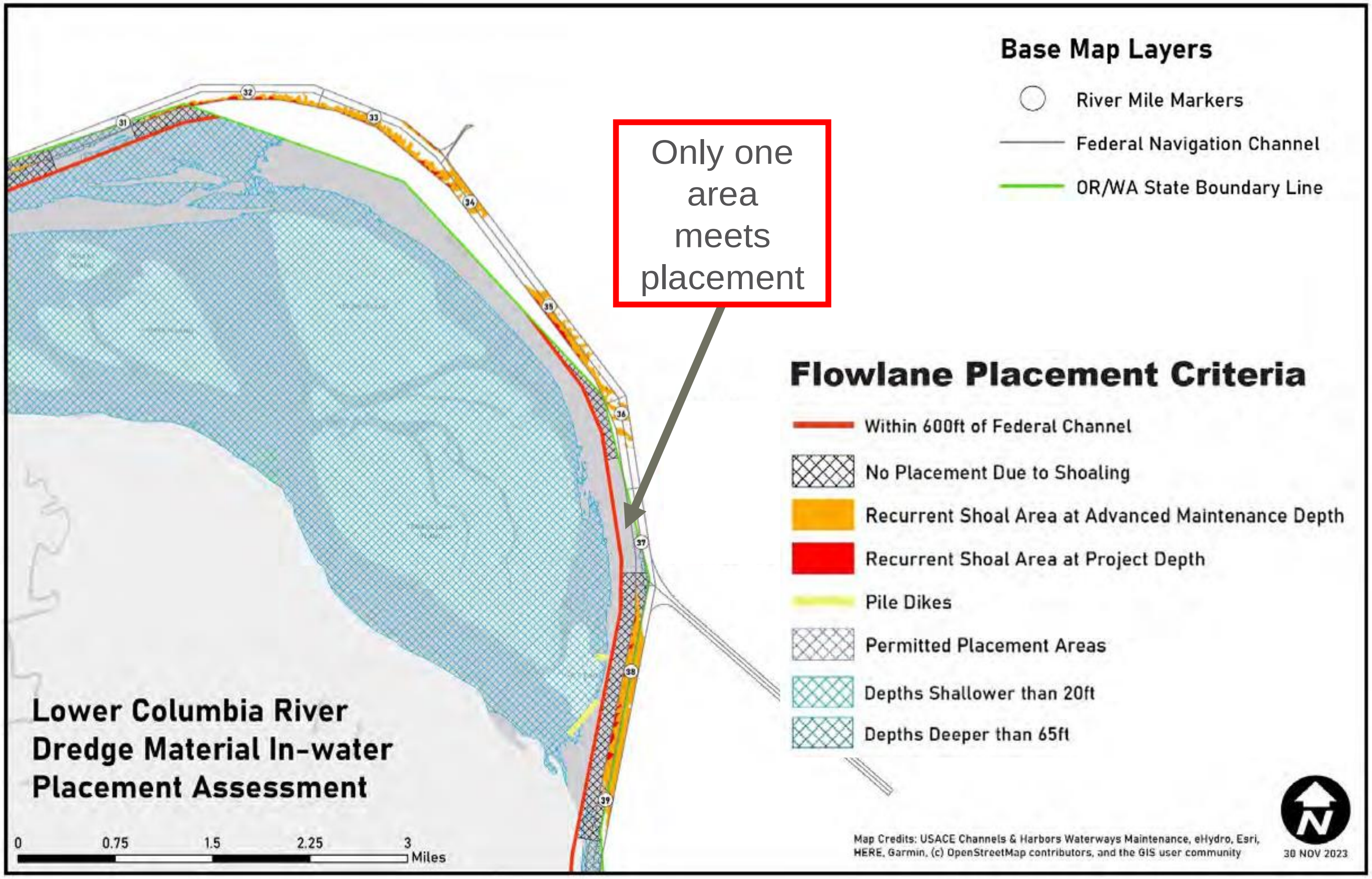
1. County & Corps criteria: No placement where it will result in excessive shoaling. Corps defined it to prohibit placement:
   - on shoals within the federal channel
   - on the adjacent source of shoal material which would increase the rate of shoaling in the federal channel
   - on shoals within U.S. Coast Guard Designated Anchorages
   - in areas already being used by others (such as Port of Astoria) for placement
2. County & Corps criteria: No placement shallower than 20 feet.
3. County further restricts: No placement deeper than 65 feet.

MAP 1 OF 5

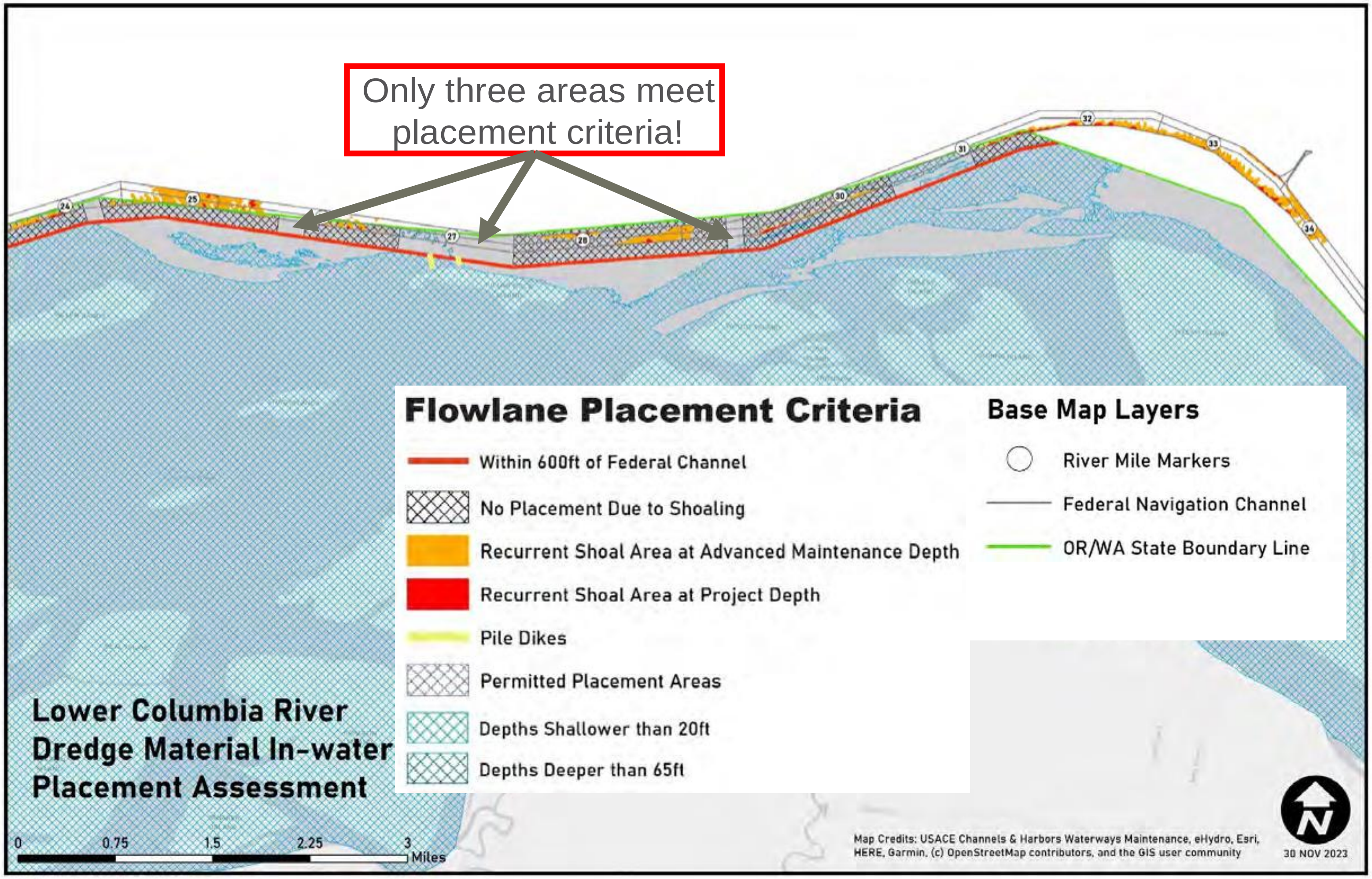


Only two small areas meet placement criteria compared with large areas of FNC
Base Map Layers
River Mile Markers
Federal Navigation Channel
OR/WA State Boundary Line
Flowlane Placement Criteria
Within 600ft of Federal Channel
No Placement Due to Shoaling
Recurrent Shoal Area at Advanced Maintenance Depth
Recurrent Shoal Area at Project Depth
Pile Dikes
Permitted Placement Areas
Depths Shallower than 20ft
Depths Deeper than 65ft
Lower Columbia River Dredge Material In-water Placement Assessment
0 0.75 1.5 2.25 3 Miles
Map Credits: USACE Channels & Harbors Waterways Maintenance, eHydro, Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
30 NOV 2023

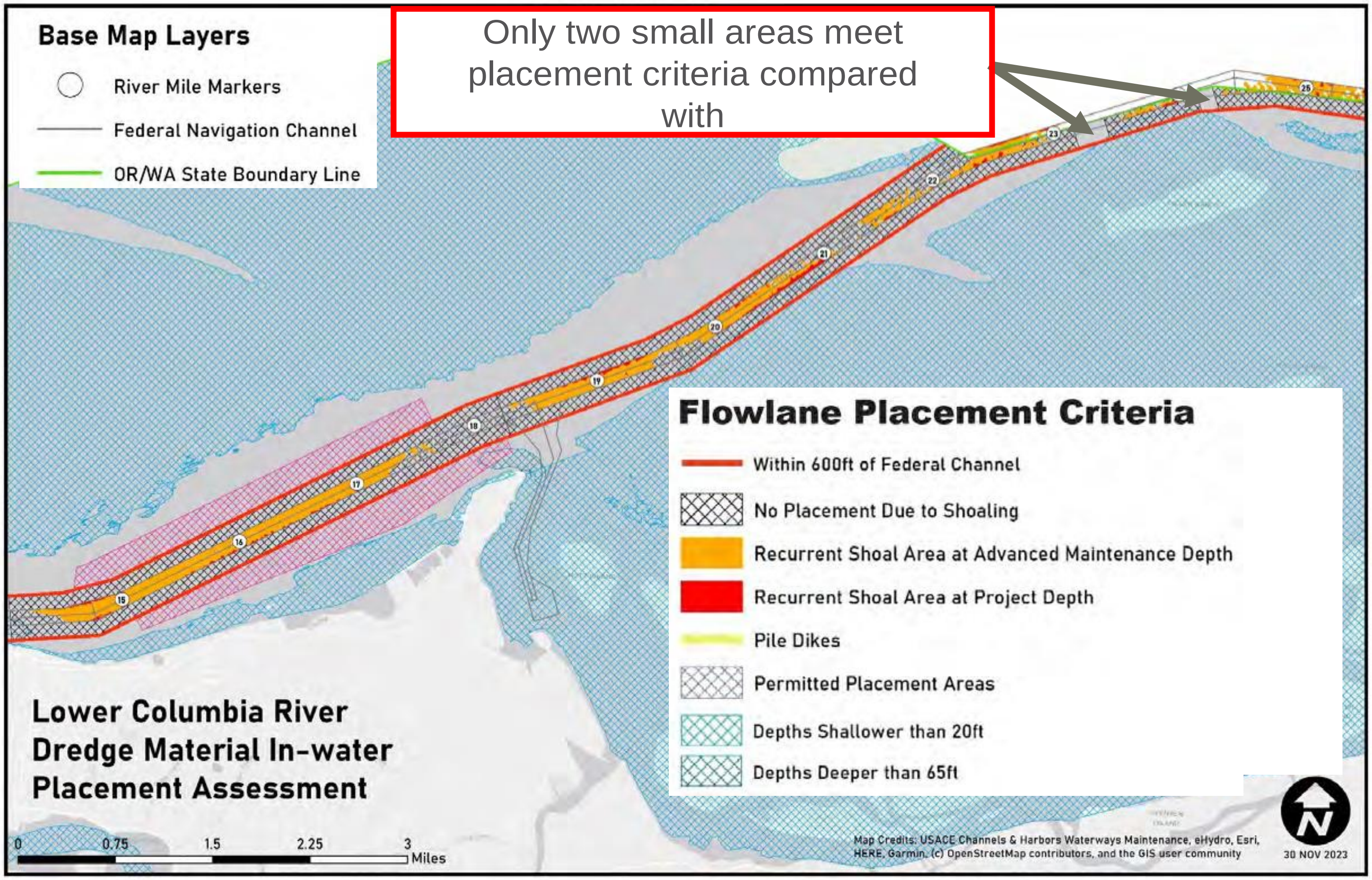
MAP 2 OF 5


Only one area meets placement
Base Map Layers
River Mile Markers
Federal Navigation Channel
OR/WA State Boundary Line
Flowlane Placement Criteria
Within 600ft of Federal Channel
No Placement Due to Shoaling
Recurrent Shoal Area at Advanced Maintenance Depth
Recurrent Shoal Area at Project Depth
Pile Dikes
Permitted Placement Areas
Depths Shallower than 20ft
Depths Deeper than 65ft
Lower Columbia River
Dredge Material In-water
Placement Assessment
0
0.75
1.5
2.25
3
Miles
Map Credits: USACE Channels & Harbors Waterways Maintenance, eHydro, Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
30 NOV 2023

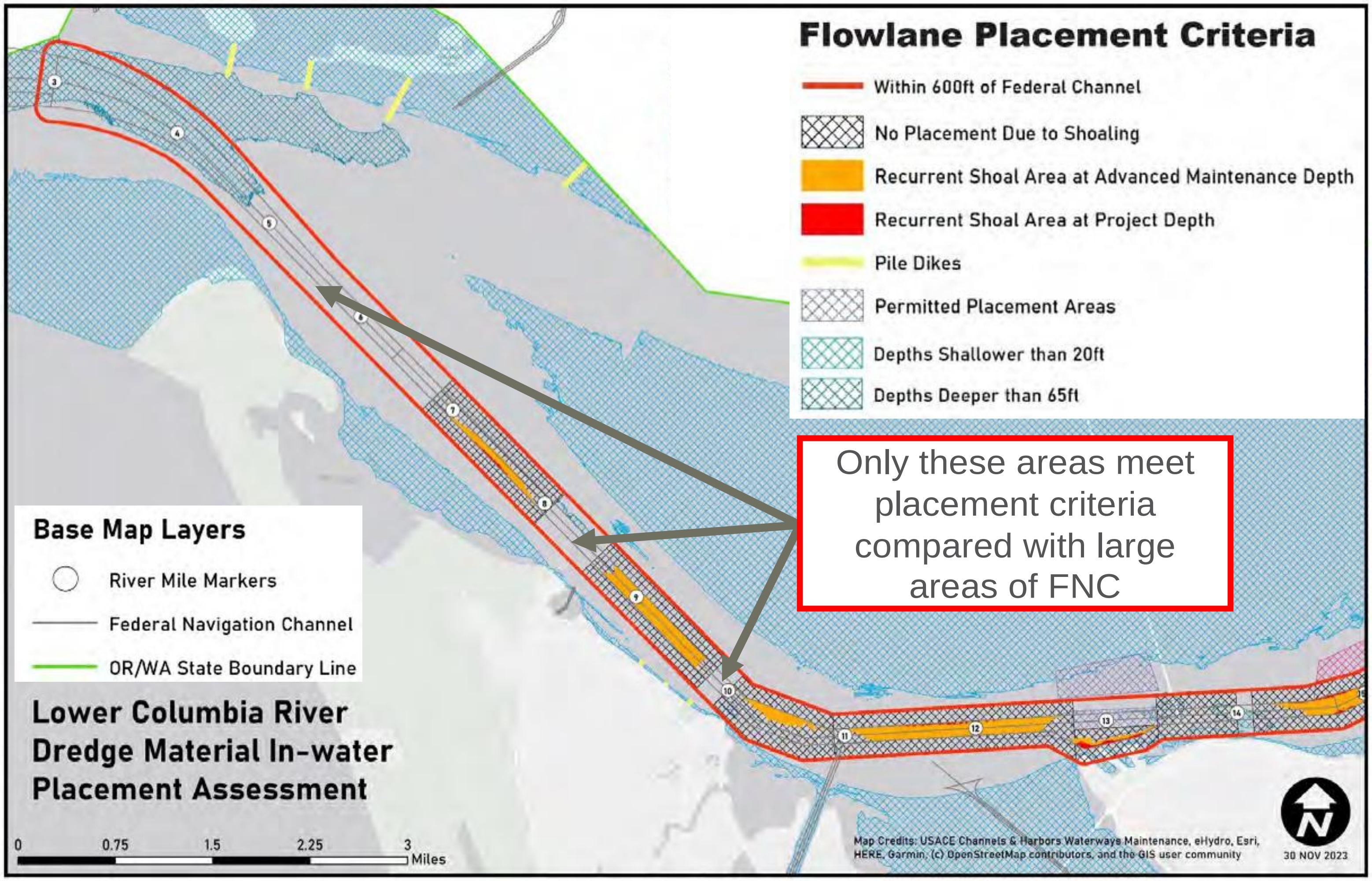
MAP 3 OF 5


Only three areas meet placement criteria!
Flowlane Placement Criteria
Within 600ft of Federal Channel
No Placement Due to Shoaling
Recurrent Shoal Area at Advanced Maintenance Depth
Recurrent Shoal Area at Project Depth
Pile Dikes
Permitted Placement Areas
Depths Shallower than 20ft
Depths Deeper than 65ft
Base Map Layers
River Mile Markers
Federal Navigation Channel
OR/WA State Boundary Line
Lower Columbia River
Dredge Material In-water
Placement Assessment
0 0.75 1.5 2.25 3 Miles
Map Credits: USACE Channels & Harbors Waterways Maintenance, eHydro, Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
30 NOV 2023

MAP 4 OF 5


Only two small areas meet placement criteria compared with
Base Map Layers
River Mile Markers
Federal Navigation Channel
OR/WA State Boundary Line
Flowlane Placement Criteria
Within 600ft of Federal Channel
No Placement Due to Shoaling
Recurrent Shoal Area at Advanced Maintenance Depth
Recurrent Shoal Area at Project Depth
Pile Dikes
Permitted Placement Areas
Depths Shallower than 20ft
Depths Deeper than 65ft
Lower Columbia River
Dredge Material In-water
Placement Assessment
0 0.75 1.5 2.25 3 Miles
Map Credits: USACE Channels & Harbors Waterways Maintenance, eHydro, Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
30 NOV 2023

MAP 5 OF 5


Flowlane Placement Criteria
Within 600ft of Federal Channel
No Placement Due to Shoaling
Recurrent Shoal Area at Advanced Maintenance Depth
Recurrent Shoal Area at Project Depth
Pile Dikes
Permitted Placement Areas
Depths Shallower than 20ft
Depths Deeper than 65ft
Only these areas meet placement criteria compared with large areas of FNC
Base Map Layers
River Mile Markers
Federal Navigation Channel
OR/WA State Boundary Line
Lower Columbia River Dredge Material In-water Placement Assessment
0
0.75
1.5
2.25
3
Miles
Map Credits: USACE Channels & Harbors Waterways Maintenance, eHydro, Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
30 NOV 2023

CORPS' GIS ASSESSMENT

Findings:

1. GIS shows very limited area within AD zone that meets all County Plan criteria.
2. Likely some areas screened out by GIS shoaling criteria can accept limited placement volume with additional hydraulic engineering input. *Example: deep area on an outside bend where velocity is directed away from FNC.*
3. Likely some areas not screened out by GIS shoaling criteria would be screened out with additional hydraulic engineering input. *Example: very small area in high energy location between two FNC shoals.*
4. GIS shows most available area within 600 feet of FNC between RM 4.8 to 6.8. Limited capacity for dredged material because excessive concentration of sediment in one location would violate County Plan criteria (and Corps criteria) to minimize adverse hydraulic effects.

CHALLENGE: FLOWLANE PLACEMENT VOLUME

Flowlane placement volume for FNC maintenance varies each year for many reasons.

1. Multiple FNC dredging sources:
   - Lower Columbia River deep draft channel (20+ shoal areas)
   - Baker Bay, Chinook, Skipanon, Tongue Point, Skamokawa Creek, Elochoman Slough, Wahkiakum Ferry and Westport Slough channels
2. Corps' placement options include flowlane, shoreline and upland sites, and ocean disposal. In-water transfer sites used for temporary storage. Placement area & volume for each dredge event depends on dredge location & volume, and dredge equipment availability, capabilities & constraints.
3. Flowlane placement event areas & volumes based on surveys and river dynamics. Not broken down by state or county. Total RM 3 to 40 = 2 million CY/year average.

1.4 Best Management Practices

The best management practices (BMPs) associated with the ongoing Columbia River FNC operations and maintenance program would be included as part of the proposed action. BMPs are implemented to minimize impacts on water quality, aquatic species, federal Endangered Species Act (ESA)-listed fish, and sediments during dredging, transportation, and placement of materials. Standard methods for handling hazardous materials spills would also be implemented. During any operation and maintenance actions, there would be potential for contaminants to enter the water. If a spill were to occur, the Corps follows a Spill Response Plan, a single consolidated document to meet multiple spill response planning requirements, as identified under the Occupational Safety and Health Administration's Standard, the Resource Conservation and Recovery Act's Contingency Plan, Superfund Amendment and Reauthorization Act, Title III's Emergency Planning and Community Right to Know Act, the Oil Pollution Act, the CWA, and the state, local, regional, and National Contingency Plans for spill response. Implementation of the National Contingency Plans requires a nationwide network of regional response plans, including the Corps' Spill Response Plan. Operations Project Managers, Dredge Incident Commanders, and emergency-system First Responders use this plan as their primary guidance for responding to oil and hazardous substance spill emergencies at the Corps, Portland District.

Table 2 outlines the BMPs and spill control measures that are currently in place for the Columbia River O&M program.

Table 2. Dredging Best Management Practices (BMPs) and Spill Control Measures Included as Part of the Proposed Maintenance Dredging

<u>Dredging BMPs</u>

Measure	Justification	Duration	Ongoing Management
Hopper Dredging			
Drag or cutterheads will be buried in the substrate and will not exceed an elevation of 3 feet off the bottom for when cleaning the hopper or reverse purging dragheads. If water is pumped through dragheads to clean the hopper, dragheads will be 20 ft below the surface while dredging between RM 3 and RM 106.5; dragheads will be 9 ft below the surface between RM 106.5 and RM 145, and in shallow-draft side channels.	To minimize potential entrainment of juvenile salmonids	Continuous throughout dredging operations	Maintain unless new information warrants change(s)

Pipeline Dredging			
Maintain dragheads and/or cutterheads buried, or no more than 3 ft elevation of the river bottom when cleaning, for dredging between RM 3 and RM 106.5; within 9 ft between RM 106.5 and RM 145, and in shallow-draft side channels.	To minimize potential entrainment of juvenile salmonids	Continuous throughout dredging operations	Maintain unless new information warrants change(s)
All Dredging			
Dredging of shallow water areas (< 20 ft) will occur during recommended in-water work windows to minimize effects to ESA-listed species.	These shallow water areas are considered migratory habitat for salmonids. Dredging and placement activities could adversely affect food resources or delay migration.	Continuous throughout dredging operations	Maintain unless new information warrants change(s)
Contractor(s) shall not release any trash, garbage, oil, grease, chemicals, or other contaminants into waterways	Protection of aquatic resources	Life of contract or action	Any unintentional in-water release will be immediately reported to the U.S. Coast Guard Unit for appropriate response. If material is released, it shall be immediately cleaned up/removed and the affected area shall be restored to a condition approximating adjacent undisturbed areas. Contaminated soils shall be excavated and removed.
Contractor(s), where possible, will use or propose for use materials considered environmentally friendly in that waste from such materials is not regulated as hazardous or is not considered harmful to the environment. If hazardous wastes are generated, disposal shall be done in accordance with 40 CFR parts 260-272 and 49 CFR parts 100-177.	Minimize and ensure safe disposal of hazardous waste	Life of contract or action	Any unintentional in-water release will be immediately reported to the U.S. Coast Guard Unit for appropriate response. If material is released, it shall be immediately cleaned up/removed and the affected area shall be restored to a condition approximating adjacent undisturbed areas. Contaminated soils shall be excavated and removed.

Dredged Material Placement BMPs

Measure	Justification	Duration	Ongoing Management
In-River Placement			
Spread out dredged material to prevent mounding	Reduces depth of material to minimize effects to fish and invertebrates	Life of contract or action	Maintain unless new information warrants change(s)
Maintain discharge pipe of pipeline dredge at or below 20 ft depth during placement	Reduce impact of placement, suspended sediment, and turbidity to migrating juvenile salmonids	Continuous throughout placement operations	Maintain unless new information warrants change(s)
Shoreline Placement			
Grade placement site to slope of 10-15%, with no swales, to reduce the possibility of stranding juvenile salmonids	Ungraded slopes can create small pools or flat slopes that can strand juvenile salmon washed ashore by waves	Continuous throughout placement operations	Maintain unless new information warrants change(s)
Ocean Placement			
Place material in accordance with the applicable site management and monitoring plan	Reduce suspended sediments and turbidity in runoff water	Continuous throughout placement operations	Maintain unless new information warrants change(s)
Upland Placement			
Berm upland placement sites (slope at 1.5 to 1 or flatter) to maximize the settlement of fine materials in runoff water	Ungraded slopes can create small pools or flat slopes that can strand juvenile salmon washed ashore by waves	Continuous throughout placement operations	Maintain unless new information warrants change(s)
Only clean dredged material will be placed at upland sites, unless specifically authorized otherwise	Protection of riparian and aquatic resources	Life of contract or action	Maintain unless new information warrants change(s)
Land-based construction equipment that enters within the wetted perimeter of a water body shall be cleaned before use and shall use environmentally acceptable lubricants and other fluids.	Protection of riparian and aquatic resources	Life of contract or action	Maintain unless new information warrants change(s)
Vegetation along the water shall be left in its natural conditions unless removal of such vegetation was authorized in the EIS and required to achieve authorized purposes	Maintain habitat functions/values of riparian and aquatic areas	Continuous throughout operations	Maintain unless new information warrants change(s)

Erosion control measures shall be utilized during upland placement actions to prevent erosion into the Columbia River. Dredged material containment berms with weir systems are measures used to maximize sediment retention within the site.	Minimize potential deleterious effects to water quality and aquatic resources	Life of contract or action	Maintain unless new information warrants change(s)
Construction access routes and barge ramps will be limited to the smallest footprint practicable to minimize potential discharge into areas waterward of OHW or MHHW.	Minimize potential deleterious effects to water quality and aquatic resources	Life of contract or action	Maintain unless new information warrants change(s)
Construction debris (e.g., fuel and oil containers and barrels, misc. litter, etc.) shall be removed by the contractor(s) and no equipment shall be abandoned.	Minimize and ensure safe disposal of hazardous waste, protection of aquatic resources	Life of contract or action	Any unintentional in-water release will be immediately reported to the U.S. Coast Guard Unit for appropriate response. If material is released, it shall be immediately cleaned up/removed and the affected area shall be restored to a condition approximating adjacent undisturbed areas. Contaminated soils shall be excavated and removed.
If contamination is suspected, discovered, or occurs during operations, testing of potentially contaminated media must occur. If contaminated soil or groundwater is apparent or revealed through testing, DEQ will be notified.	Minimize and ensure safe disposal of hazardous waste, protection of aquatic resources	Life of contract or action	Any unintentional in-water release will be immediately reported to the U.S. Coast Guard Unit and DEQ for appropriate response. If material is released, it shall be immediately cleaned up/removed and the affected area shall be restored to a condition approximating adjacent undisturbed areas. Contaminated soils shall be excavated and removed.
Berms will be constructed, as needed, to prevent material from entering areas below OHW/MHHW	Maintain habitat functions/values of aquatic resources	Continuous throughout operations	Maintain unless new information warrants change(s)
No construction materials shall be abandoned on site at project completion.	Maintain habitat functions/values of riparian and aquatic areas	Life of contract or action	Maintain unless new information warrants change(s)

All Placement			
Contractor(s), where possible, will use or propose for use materials considered environmentally friendly in that waste from such materials is not regulated as hazardous or is not considered harmful to the environment. If hazardous wastes are generated, disposal shall be done in accordance with 40 CFR parts 260-272 and 49 CFR parts 100-177.	Minimize and ensure safe disposal of hazardous waste	Life of contract or action	Any unintentional in-water release will be immediately reported to the U.S. Coast Guard Unit for appropriate response. If material is released, it shall be immediately cleaned up/removed and the affected area shall be restored to a condition approximating adjacent undisturbed areas. Contaminated soils shall be excavated and removed.

2. 2. Oregon's Statewide Planning Goals, Clatsop County's Comprehensive Plan, and Local Land Use Regulations

Under ORS 197.175, the Statewide Planning Goals in Oregon are to be implemented by local governments through the adoption of comprehensive plans that are compatible with the goals. In turn, the comprehensive plans are to be implemented through adoption and enforcement of land use regulations. Therefore, any proposed activity that is compatible with the acknowledged comprehensive plan and its implementing land use regulations would, by extension, be compatible with Statewide Planning Goals.

In this section the Corps has described those provisions of Clatsop County's acknowledged comprehensive plan and land use regulations that relate to water quality and made affirmative findings that its project is compatible with those land use factors which relate to water quality. The Corps' provision of this applicable land use information ensures that DEQ's WQC decision is compatible with those factors that relate to water quality. FNC dredging and placement site locations used for upland and/or shoreline placement, or in-water transfer of material are listed by county in section 1.2, Table 1 above.

2.1 Compatibility with Applicable Clatsop County Comprehensive Plan Provisions

The Clatsop County Comprehensive Plan contains goals of the county. Those that pertain to water quality or the control and abatement of water pollution in relation to the proposed Project are goals 16 & 17 Estuarine Resources; the sections that are applicable to the proposed action are addressed below.

P20.5 – Dredging and dredged material disposal.

1. Dredging shall be allowed only:

    (a) If required for navigation or other water-dependent uses that require an estuarine location or if specifically allowed by the applicable

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, PORTLAND DISTRICT
PO BOX 2946
PORTLAND, OR 97208-2946

July 28, 2023

SUBJECT: Request for Clean Water Act Section 401 Water Quality Certification for the Columbia River Navigation Channel Operations and Maintenance Project

Jeffrey Brittain
Oregon Department of Environmental Quality
700 NE Multnomah St, Suite 600
Portland, OR 97232-4101
401applications@deq.state.or.us

Dear Jeffrey Brittain:

The U.S. Army Corps of Engineers, Portland District (Corps) is requesting the Oregon Department of Environmental Quality (DEQ) to issue a new ten-year Clean Water Act (CWA) Section 401 Water Quality Certification (WQC) for the Columbia River Navigation Channel Operations and Maintenance Project.

In order to maintain necessary navigational depths, the U.S. Army Corps of Engineers (Corps) proposes to continue ongoing operations and maintenance (O&M) of federal navigation channels (FNCs) in the Columbia River (CR) from RM 3 to RM 145. These projects are authorized by Congress to specified dimensions. The intent of the authorization is to ensure year-round channel access at those dimensions. The authorization does not specify the alignment of the channel or turning basins. When needed, the Corps may coordinate with the U.S. Coast Guard and NOAA to improve navigational safety by changing the alignment to more accurately reflect the reality of present-day infrastructure and usage. These O&M activities are currently authorized under Water Quality Certification (WQC) NWPOP-CLA-F05-001-FR, dated May 19, 2014, as amended on September 3, 2015, August 2, 2019, March 23, 2022, and October 19, 2022. All depths in this WQC application are based on Mean Lower Low Water (MLLW) or Columbia River Datum in feet (ft) as appropriate. The Corps proposes to dredge 7 to 9 million cubic yards of material annually.

The Corps has five options for dredged material placement: in-water placement in areas of the Columbia River greater than 20 feet deep, upland placement, shoreline (beach nourishment), transfer/rehandle sites, or ocean placement. From RM 3 to 145 (Bonneville Dam), the decision to place material in-water, upland or for beach nourishment, depends on type of dredge used and both the availability and access to the placement site. From RM 3 to 30, the decision to haul material to the ocean site is dependent on type of dredge used and availability of in-water placement sites in the Columbia River. Dredging and dredged material placement locations have not changed since the most recent WQC, as amended.

The Corps requests one WQC for ten years. This certification request is consistent with the requirements under 40 CFR Part 121. A pre-filing meeting request (40 CFR 121.4) was submitted using DEQ's online system (YourDEQ) on December 8, 2022. The Corps has verified that the contents of this certification request with its enclosures meets the requirements provided in 40 CFR 121.5.

The Corps' regulation governing timing on requests for 401 WQC for Corps' dredging projects provides that the time period is generally two months, 33 CFR 336.1(b)(8)(iii). In accordance with Corps' regulations and 40 CFR 121.6, the Corps has established a reasonable period of time to act on this certification request of 6 months from the date of this request, which will be January 22, 2024. This reasonable period of time was selected because this is an operations and maintenance action requiring no more than standard coordination, is similar to ongoing actions, and a stormwater management review is not required. Any request from DEQ to extend the reasonable period of time should be made in writing to the Corps.

If DEQ requires any additional information regarding this request, please contact Darren Bradford of my staff by email at Darren.L.Bradford@usace.army.mil or phone at 503-808-4663. Thank you for your assistance.

Sincerely,

Amy Gibbons
Chief, Environmental Resources Branch

Enclosure
Page

Joint Permit Application

This is a joint application, and must be sent to all agencies (Corps, DSL, and DEQ). Alternative forms of permit applications may be acceptable; contact the Corps and DSL for more information.

Date Stamp

U.S. Army Corps of Engineers Portland District	Oregon Department of State Lands	Oregon Department of Environmental Quality
Action ID Number	Number	

(1) TYPE OF PERMIT(S) IF KNOWN (check all that apply)

Corps: ☐ Individual ☐ Nationwide No.: ________ ☐ Regional General Permit ________ ☐ Other (specify): ______

DSL: ☐ Individual ☐ GP Trans ☐ GP Min Wet ☐ GP Maint Dredge ☐ GP Ocean Energy ☐ No Permit ☐ Waiver

(2) APPLICANT AND LANDOWNER CONTACT INFORMATION

	Applicant	Property Owner (if different)	Authorized Agent (if applicable) ☐ Consultant ☐ Contractor
Name (Required) Business Name Mailing Address 1 Mailing Address 2 City, State, Zip	Amy Gibbons USACE, Portland District Attn: Elizabeth Santana PO Box 2946 Portland, OR 97204		Darren Bradford
Business Phone Cell Phone Fax Email	503-808-4389 Amy.C.Gibbons@usace.army.mil		503-808-4663 Darren.L.Bradford@usace.army.mil

(3) PROJECT INFORMATION

A. Provide the project location.

Project Name	Latitude & Longitude*
Columbia River Navigation Channel Operations and Maintenance Project	Multiple (See Attachment A)

Project Address / Location	City (nearest)	Counties
Multiple (See Attachment A)	Warrenton, OR to Cascade Locks, OR	Clatsop, Columbia, Multnomah

Township	Range	Section	Quarter / Quarter	Tax Lot
(See Attachment A)				

Brief Directions to the Site:
(See Attachment A)

B. What types of waterbodies or wetlands are present in your project area? (Check all that apply.)

☐ River / Stream ☐ Non-Tidal Wetland ☐ Lake / Reservoir / Pond

☐ Estuary or Tidal Wetland ☐ Other ☐ Pacific Ocean

Waterbody or Wetland Name**	River Mile	6th Field HUC Name	6th Field HUC (12 digits)
Columbia River	3 to 145 + side channels		(See Attachment A)

* In decimal format (e.g., 44.9399, -123.0283)
** If there is no official name for the wetland or waterbody, create a unique name (such as "Wetland 1" or "Tributary A").

C. Indicate the project category. (Check all that apply.)		
☐ Commercial Development	☐ Industrial Development	☐ Residential Development
☐ Institutional Development	☐ Agricultural	☐ Recreational
☐ Transportation	☐ Restoration	☐ Bridge
☐ Dredging	☐ Utility lines	☐ Survey or Sampling
☐ In- or Over-Water Structure	☐ Maintenance	☐ Other:

(4) PROJECT DESCRIPTION

A. Summarize the overall project including work in areas both in and outside of waters or wetlands.

In order to maintain necessary navigational depths, the U.S. Army Corps of Engineers (Corps) proposes to continue ongoing operations and maintenance (O&M) of federal navigation channels (FNCs) in the Columbia River (CR) from RM 3 to RM 145. These projects are authorized by Congress to specified dimensions. The intent of the authorization is to ensure year-round channel access at those dimensions. The authorization does not specify the alignment of the channel or turning basins. When needed, the Corps may coordinate with the U.S. Coast Guard and NOAA to improve navigational safety by changing the alignment to more accurately reflect the reality of present-day infrastructure and usage. These O&M activities are currently authorized under Water Quality Certification (WQC) NWPOP-CLA-F05-001-FR, dated May 19, 2014, as amended on September 3, 2015, August 2, 2019, March 23, 2022, and October 19, 2022.

The Corps requests one WQC for ten years. All depths in this WQC application are based on Mean Lower Low Water (MLLW) or Columbia River Datum in feet (ft) as appropriate. The Corps proposes to dredge 7 to 9 million cubic yards of material annually.

The Corps has five options for dredged material placement: in-water placement in areas of the Columbia River greater than 20 feet deep, upland placement, shoreline (beach nourishment), transfer/rehandle sites, or ocean placement. From RM 3 to 145 (Bonneville Dam), the decision to place material in-water, upland or for beach nourishment, depends on type of dredge used and both the availability and access to the placement site. From RM 3 to 30, the decision to haul material to the ocean site is dependent on type of dredge used and availability of in-water placement sites in the Columbia River. Dredging and dredged material placement locations have not changed since the most recent WQC, as amended.

B. Describe work within waters and wetlands.

The Corps is authorized to maintain these federal navigation projects in order to provide safe, reliable channels for the transport of commerce, national security, and recreation. Shoaling occurs in areas where the natural depth of the river is less than the authorized depth of the channel. Dredging is necessary to remove shoals that restrict the movement of vessels. Advanced maintenance dredging is the practice of excavating shoals to a depth and/or width greater than the authorized navigation channel dimensions for the purpose of maintaining the authorized dimensions for a longer period of time between maintenance dredging events. Due to the inaccuracies of dredging, incidental removal of material may occur below the advanced maintenance depth.

Specific Areas located partially or wholly within the State of Oregon to be maintained by dredging include:

- **Lower Columbia River FNC; deep draft channel and associated turning basins (RM 3 to RM 106.5).**
- The authorized channel is generally 600' wide and 43' deep from RM 3 to 105.5 and 35’ deep from RM 105.5 to 106.5, with an advanced maintenance depth (AMD) of 5' and overwidth of 100' if necessary.
- **Columbia River FNC; Vancouver, Washington to Bonneville Dam (RM 106.5 to RM 145).**
- The authorized channel is 300' wide and 27' deep; however, this reach is typically maintained to a depth of 17', with AMD of 2' and variable overwidth up to 100’.
- **Columbia River FNC; side channels.**
  - Skipanon: This channel extends from the Columbia River to the Skipanon RM 2, and is authorized to 30' deep, with a width of 200'. Typically, the Corps maintains this reach to 16' deep, with 2' AMD and variable overwidth.
  - Tongue Point: This channel is authorized to 34' deep and 350' wide, with a length of 1.6 miles, with 2' AMD and variable overwidth.
  - Westport Slough: This channel is authorized to 28' deep, and 200' wide, with a length of 3500'. Typically, the USACE maintains this reach to 20' deep with a 2' AMD and variable overwidth. The entrance channel for the ferry is maintained to 9’ deep with 2’ AMD and variable overwidth.
  - Oregon Slough: The downstream entrance from the Columbia Channel to Oregon Slough RM 1.5 is part of the deep draft channel authorized to 43' deep. The Oregon Slough side channel RM 1.5 to 3.8 is maintained to 20’ deep by 200’ wide with 2’ AMD and variable overwidth. The upstream entrance side channel is maintained to 10' deep by 300' wide, with a length of 5,800’ with 2’ AMD and variable overwidth.

- Reminder: Although the riverward ends of Baker Bay and Chinook FNCs in the Columbia River are located within the State of Oregon, the Corps will continue the existing practice of following State of Washington 401 compliance when dredging those FNCs.

- **Portland/Vancouver Anchorage Project**
  - Anchorage area A: This area is located between RM 102+36.5 and RM 103+3.5, adjacent to the Columbia River FNC. This area is 2000' long by 370' to 550' wide, and is maintained to 43' deep with 2' AMD and variable overwidth.
  - Anchorage area B*:* This area is located between RM 1-03 and RM 103.5, and is approximately 500' outside of the FNC. This will be maintained to a depth of 25' with 2' AMD and variable overwidth.

C. Construction Methods. Describe how the removal and/or fill activities will be accomplished to minimize impacts to waters and wetlands.

Several different types of shoaling occur within the CR channels. The most common shoals occurring in the mainstem CR are continuous cutline shoals and sandwave (continuous or isolated) formations. Cutline shoals are defined by bedload material that is moving in from the side slopes (parallel edges) of the channel, typically longer than 1,000 feet in length (upstream to downstream); cutline shoaling is more continuous than sand waves and usually forms slowly and steadily. These kinds of shoals are more common in the lower river. Sand wave shoals are where bedload material forms peaks and troughs along the channel, around 15 feet in height and 200 feet long (upstream to downstream); sand-wave shoaling is more intermittent, and forms more dynamically compared to cutline shoaling. Usually only the peaks of the sand waves encroach into the authorized channel or advanced maintenance depth and require dredging. These kinds of shoals are typically found in the upper reaches of the river. A third kind of shoal, low-energy accretionary depositional shoals (shoals formed by settling of sediment out of the water column due to low water movement through the area) are typically fund in the lower energy side channels.

Maintenance of the CR channels is conducted via hydraulic or mechanical dredges. Hydraulic dredges consist of hopper or pipeline. Mechanical dredges consist of clamshell or backhoe. Both types of dredging actions will occur within the Columbia River system.

Hopper dredges currently dredge about 4.7 MCY of material annually from the mainstem FNC (RM 3 to RM 145). Hopper dredges are highly mobile and maneuverable, making them the preferred choice for limited sandwave shoals within the FNC and large-volume continuous cutline shoals located in the tidally influenced environment from RM 3 - 30. The Corps hopper dredges are capable of placing dredged sediment only at in-water sites (including the ocean); the Corps may contract out hopper dredges for upland/shoreline placement.

Pipeline dredges are used for large continuous cutline shoals and continuous sandwave shoals. Pipelines are typically mobilized to a reach and continuous dredging is performed until the shoal is cleared; due to the reduced mobility of the pipeline, these dredges are preferred for large shoals. Pipeline dredges are capable of placing dredged sediment at in-water, upland, and beach nourishment sites. Currently, about 2.5 MCY annually is dredged from the mainstem FNC using a pipeline dredge.

Clamshell dredging is performed using a bucket operated from a crane mounted on a barge (or from the shore). Backhoe dredging is performed using a bucket operated on the end of a backhoe arm. Sediment from either the clamshell or backhoe dredge is placed on a barge for transport to disposal the placement site. Depending on the barge used, dredged sediment can be placed at in-water, upland, beach nourishment, and ocean sites. Clamshells are used mainly for side channel projects, since they are able to dredge areas where pipelines and hopper dredges are not able to access, like shallow areas and narrow channels. Backhoe dredges can be used in space restricted areas, shallow channels, and are used to remove rock, hard-packed materials, and fine-grained sediments.

In-River placement: Hopper dredges collect material in the hopper of the vessel until it fills to capacity. When filled, the vessel moves to an in-river site. As the dredge is moving, the hopper doors open and the material is discharged at varying rates depending upon how far the hopper doors are opened. The dredge releases the material gradually while moving to avoid mounding. In-water discharge from pipeline dredges differs from hoppers in that with a pipeline dredge, material is continuously discharged during dredging operations, whereas hoppers must stop dredging when full and move to another location to discharge material. Pipeline dredge placement of material at in-water sites is done using a down-pipe with a diffuser plate at the end. This downpipe extends 20 feet below the water surface to minimize or avoid impacts to migrating juvenile salmonids.

Upland Placement: Upland placement is primarily accomplished using a pipeline dredge but can also be accomplished with clamshell or hopper dredges. Pipeline and hopper dredges pump dredged material as sand and water slurry directly into a diked, upland site near the dredging area. Some clearing of shoreline vegetation, grading and fill material may be required to provide access for the slurry and return water pipelines and to offload shore equipment from the landing barge, but this would be minimized to the extent practicable. Containment berms are typically created around the perimeter of the placement area to prevent runoff. These berms are created by pushing existing material from the center of the upland placement area out to the perimeter. As the site is filled, sand may be continually pushed to the perimeter to raise the containment berm. Once placement is complete, the final berm will be roughly 2 feet higher than the main placement area. The fill area at placement sites is also typically terraced to allow for incremental increases in elevation. During placement, the dredge material slurry pipeline is positioned to place material at the farthest landward area first, then moved over the course of placement to achieve a relatively uniform layer of dredged material over the full area enclosed by the berm. Primary and secondary ponds may be constructed within the containment area to facilitate longer retention of fine sediments prior to reaching a spillway weir. Weir systems are typically installed and removed with each placement event. Discharge of water from the final settling pond back into the river is controlled by the use of weirs. The return water discharge pipe will be submerged at least -20 foot depth. Clamshell-dredged material deposited onto a barge can be off-loaded at a transfer point to be taken to an upland site. Some upland placement sites are within the 100-year floodplain.

Shoreline, also called Beach Nourishment: Shoreline placement is primarily accomplished by a pipeline dredge. It involves pumping dredged material through a floating discharge pipe to an existing shoreline. The dredge first pumps a landing on the shoreline to establish a point from which further material placement occurs. Dredged material is pumped in a slurry of 20% sand and 80% water. As the sand exits the shore pipe, the sand settles out on the shoreline while the water returns to the river. Settling rates of Columbia River sands are very quick and turbidity from these operations is minimal. After sufficient sand has settled out and begins to increase in height, it is moved by bulldozers to match the elevation of the existing shoreline at approximately the high-water line. During beach nourishment, a temporary sand berm is constructed to retain sand on the beach during pump-out. The berms are built gradually by earth-moving equipment as pump-out continues and are created from existing beach sand, pumped sand, or both. A typical shoreline placement operation lasts from 5 to 15 days and the width of the shoreline created is approximately 100 to 150 feet. The process continues by adding to the shore pipe and proceeding longitudinally along the shoreline. The length of shoreline replaced is dependent on the quantity of material to be dredged from the shoal in the channel. After placement, the slope of the shoreline is groomed to a steepness of 10 to 15 percent to prevent the possibility of creating areas where juvenile fish could be stranded from vessel wakes on the new shoreline. Placement of material for beach nourishment will always occur at the sand/water interface, not in open water. Beach nourishment sites are within the 100-year floodplain.

In-water transfer: In some cases, dredged material may be temporarily placed in-water nearby to clear shoaling quickly and then transferred/rehandled by another dredge to a final placement site, usually upland. Near those upland sites, a dredge creates a temporary sump which is a deeper area of the river bottom outside of the main channel for temporary in-water storage of dredged material before it is transferred into the final upland site. Each transfer site is operated in a cycle. First, a self-propelled hopper dredge collects materials from LCR FNC shoals in the hopper of the vessel until it is full, then moves to the transfer site to discharge the material by releasing material gradually from the bottom of the dredge while moving to avoid mounding and then repeats until the shoals are removed and the transfer site is full. A pipeline dredge then removes the material collected within the transfer site, plus some existing underlying river-bottom material, and pumps it continuously through a discharge pipe to the final destination placement site. Finally, a hopper dredge would refill the transfer site storage basin using material dredged from the LCR FNC, leaving the site in about the same condition that it began in prior to any activity. This cycle is scheduled within a single dredge season. The cycle may occur more than once within a dredge season or there may be years between cycles.

Factors considered when planning for annual maintenance dredging include: equipment availability, results of bathymetric surveys, placement site capacity, environmental resource concerns, and funding. The mechanism of dredging and placement is decided based on the severity, type, and location of the shoal. The project will follow all Portland Sediment Evaluation Team (PSET) recommendations for each dredging event and comply with the Sediment Evaluation Framework for the Pacific Northwest (SEF) (May 2018). All dredging and placement for the CR channels follow established Best Management Practices (BMPs) (See Attachment B).

(4) PROJECT DESCRIPTION (continued)

D. Describe source of fill material and disposal locations if known.

Dredged Material Placement: Prior to any dredged material placement, all areas proposed to be dredged will be reviewed by the Portland Sediment Evaluation Team (PSET) to characterize sediment and determine suitability of sediment for in-water or upland placement. All material placed in-water will be determined to be suitable for this use.

In-water placement of material dredged from federal navigation projects in Oregon and Washington occurs in depths greater than 20 feet within or outside the navigation channel throughout the mainstem Columbia River from RM 3 to RM 145. Placement areas vary depending on survey depths each year. As deeper areas are filled with dredged material, new deep areas are formed elsewhere as a result of natural river processes.

Specific sites located partially or wholly within the State of Oregon used for upland and/or shoreline placement, or in-water transfer of material dredged from the LCR FNC and associated turning basins RM 3 to RM 106.5:

Site Name	RM	Type
Rice Island	W-21.0-UP	Upland & Shoreline
Miller Sands Island	O-23.5-BN	Shoreline
Pillar Rock Island	O-27.2-UP	Upland & Shoreline
Welch Island	O-34.0-UP	Upland
Tenasillahe Island	O-38.3-UP	Upland
James River	O-42.9-UP	Upland
Puget Transfer	W-44.5-IW-T	In-Water Transfer
Crims Island	O-57.0-UP	Upland
Lord Island	O-63.5-UP	Upland
Dibblee Point	O-64.8-UP	Upland
Howard Island Transfer	O-69.6-IW-T	In-Water Transfer
Sandy Island	O-75.8-UP	Upland
Lower Deer Island	O-77.0-UP	Upland
O-77.9-IW-T Transfer	O-77.9-IW-T	In-Water Transfer
O-81.1-IW-T Transfer	O-81.1-IW-T	In-Water Transfer
Sand Island	O-86.2-BN	Shoreline
West Hayden Island	O-105.0-UP	Upland

E. Construction timeline.

What is the estimated project start date? Ongoing/Recurring O&M

What is the estimated project completion date? N/A

Is any of the work underway or already complete? If yes, please describe. **Yes**

F. Removal Volumes and Dimensions (if more than 7 impact sites, include a summary table as an attachment)

Wetland / Waterbody Name *	Removal Dimensions					Time Removal is to remain**	Material***
	Length (ft.)	Width (ft.)	Depth (ft.)	Area (sq.ft. or ac.)	Volume (c.y.)		
Columbia River RM 3 to 145, Skipanon FNC, Tongue Point FNC, Westport Slough FNC, Oregon Slough FNC	~150 miles	Varies	Varies	See Project Description 4.B	Annual average of ~7-9 MCY from RM 3 to 145; variable for side channels	Intermittent; maintenance dredging is recurring action	Shoaled sediment (primarily Sand and gravel)

G. Total Removal Volumes and Dimensions			
Total Removal to Wetlands and Other Waters	**Length (ft.)**	**Area (sq. ft or ac.)**	**Volume (c.y.)**
Total Removal to Wetlands			
Total Removal Below Ordinary High Water			~7-9 MCY/year
Total Removal Below Highest Measured Tide			
Total Removal Below High Tide Line			
Total Removal Below Mean High Water Tidal Elevation			

H. Fill Volumes and Dimensions (if more than 7 impact sites, include a summary table as an attachment)

Wetland / Waterbody Name*	Fill Dimensions					Time Fill is to remain**	Material***
	Length (ft.)	Width (ft.)	Depth (ft.)	Area (sq. ft. or ac.) ☐	Volume (c.y.) ☐		
Columbia River RM 3 to 145 (in-water placement areas and transfer sites)	~150 miles	Varies	Varies	See Project Description 4.B	Annual average of ~7-9 MCY from RM 3 to 145; variable for side channels	Intermittent; in-water placement areas are erosive and transfer sites are temporary fill	Dredged material (see Removal section)

(4) PROJECT DESCRIPTION (CONTINUED)

I. Total Fill Volumes and Dimensions			
Total Fill to Wetlands and Other Waters	**Length (ft.)**	**Area (sq. ft or ac.)**	**Volume (c.y.)**
Total Fill to Wetlands			
Total Fill Below Ordinary High Water			~7-9 MCY/year
Total Fill Below Highest Measured Tide			
Total Fill Below High Tide Line			
Total Fill Below Mean High Water Tidal Elevation			

*If there is no official name for the wetland or waterbody, create a unique name (such as “Wetland 1” or “Tributary A”).
**Indicate whether the proposed area of removal or fill is permanent or, if you are proposing temporary impacts, specify the days, months or years the fill or removal is to remain.
*** Example: soil, gravel, wood, concrete, pilings, rock etc.

(5) PROJECT PURPOSE AND NEED

Provide a statement of the purpose and need for the overall project.

Dredging of the Columbia River is necessary to maintain deep-draft navigation in the CR FNC and the auxiliary FNCs so large vessels can safely sail to and from the Pacific Ocean. The CR FNC is important to local, regional, national, and global economies. The Columbia River is the largest wheat export channel for the United States. Approximately 100,000 jobs are indirectly or directly tied to the Columbia River maritime commerce, generating $1.8 billion of personal wealth. In order to ensure the continuity of safe passage through this system, a total of 7-9 MCY of material may need to be dredged annually and placed in upland or in-water dredged material placement sites.

(6) DESCRIPTION OF RESOURCES IN PROJECT AREA

A. Describe the existing physical, chemical, and biological characteristics of each wetland or waterbody. Reference the wetland and waters delineation report if one is available. Include the list of items provided in the instructions.

Channel and bank conditions

Channels and banks of the Columbia River are deeply incised river valleys, where banks are typically vegetated and consist of basalt, silt, and clay deposit. The river thalweg is primarily comprised of fine and medium grained sand. The Columbia River has been highly modified since the 1890s. Pre-1890s, the shore edge of the Columbia River was dynamic; there were sections of the Columbia River where sand dominate the morphology and other parts where silt/hardpan dominated. Present topography is a result of both the excavation of a portion of the deposited gravels by the Columbia River, and of the subsequent post-glacial sea level rise of about 300 ft. The lower Columbia River valley flooded during the sea level rise causing extensive deposition of silt and clay materials in a low energy estuarine-lacustrine environment. These deposits form the majority of the bank materials that are found in the current Columbia River lowlands. Present river geometry is controlled by these erosion-resistant silt and clay materials (Dodge, 1971). Current thalweg depths are typically around 50 ft deep with deeper spots occurring along outside bends.

The most common sediment movement along the riverbed in the mainstem Columbia River consists of cutline shoals or sand wave formations. Cutline shoals are defined by bed load material moving toward deeper areas from the side slopes of the channel; this type of sediment movement is more continuous at steady rates and is more common in the lower river. Sand waves occur where bed load material forms peaks and troughs like ripples along the river bottom; this type of sediment movement is more intermittent and dynamic. Sand waves are typically larger in deeper water and smaller in shallower water and are most commonly found in the upper reaches of the river. Low-energy accretionary depositional shoals (formed by sediment settling out of the water column due to low water movement) are typically found in the Columbia River side channels. The natural riverbanks consist of a 10-foot-to-20-foot deep layer of clay-silt, overlying much deeper sand deposits. Sandy beaches occur only where dredged material has been placed along the shore. There has been little change in the river's location in the last 100 years. However, river bathymetry has drastically changed since the turn of the twentieth century. Navigation development has deepened the channel in all reaches, and riverine and entrance channels have been narrowed. Dredge material disposal has been used to create shoreline and in-water fills that have also narrowed the river and created small side channels. The systems of pile dikes are in place to prevent erosion of shoreline and upland placement sites. The riverbed side slopes remain generally flat, with slightly steeper slopes near shorelines that are protected by pile dikes.

Chemical

The LCR was evaluated in two studies (Tetra Tech 1995, 1996). The studies concluded that the river is classified as “marginally healthy” base on levels of dissolved oxygen, toxins, and habitat conditions. The Oregon Department of Environmental Quality lists placed it on the CWA 303(d) list for the following parameters: RM 0 to 35.2 for water temperature; fecal coliform; DDE 4,4; dioxin (2,3,7,8-TCDD); polychlorinated biphenyls (PCBs); and arsenic; from RM 35.2 to 98 for arsenic, dichlorodiphenyl trichlorethane (DDT), PCBs, and temperature; and from RM 98 to 142 for temperature; arsenic, DDT, PCBs, and polycyclic aromatic hydrocarbons (PAHs). Hazardous materials, such as fuels, oils, and lubricants are likely to be present on the dredge or in other equipment during construction; however, the Corps and its contractors do not store any hazardous waste in reportable quantities on dredge vessels and BMPs are used to avoid, minimize, control, and contain spills, consistent with state and federal laws (Attachment B). Should a spill occur, the Corps will follow Spill Response Plan, a single consolidated document to meet multiple spill response planning requirements, as identified under the Occupational Safety and Health Administration’s Standard; the Resource Conservation and Recovery Act (RCRA) Contingency Plan; Superfund Amendment and Reauthorization Act; Title III’s Emergency Planning and Community Right To Know Act; Oil Pollution Act; CWA; and state, area, regional, and National Contingency Plans (NCPs) for spill response. Implementation of the NCP requires a nationwide network of regional response plans, including the Corps’ Spill Response by Portland District. Operation project managers, dredge incident commanders, and emergency system first responders will use this plan as their primary guidance for responding to oil and hazardous substance spill emergencies in the Portland District.

Sediment Characterization

Sediments from the FNCs are evaluated to determine if they are suitable for in-water placement according to the requirements of the CWA and Marine Protection Reserve and Sanctuaries Act (MPRSA). The Corps began collection sediment quality data from its projects in the 1970s. These data are available at https://www.nwp.usace.army.mil/Missions/Environmental-Stewardship/DMM.

The Corps Portland District uses the most recent 2018 version of the Sediment Evaluation Framework (SEF) for the Pacific Northwest to ensure that civil works projects and the projects permitted by the Regulatory Program comply with the CWA and MPRSA. The SEF aids federal and state agencies in Washington, Oregon, and Idaho in evaluating the suitability of dredged material for unconfined, aquatic placement in inland waters and disposal in ocean waters. It is periodically updated to incorporate the latest technical and scientific advances and incorporate changes in regional policy.

The most recent dredged material suitability determinations are included as Attachment C and summarized below. Sediments will continue to be routinely sampled and evaluated in the future in accordance with the SEF. Sediment that is suitable for unconfined aquatic placement is also suitable for placement upland and along shorelines and other beneficial uses.

•Lower Columbia River FNC; deep draft channel and associated turning basins (RM 3 to RM 106.5): A total of 59 stations were sampled within the LCR FNC. All sediment samples consisted of more than 97 percent coarse-grained sediments (gravel and sand) suitable for unconfined, aquatic placement. The total organic carbon (TOC) results for all samples is less than 0.2%.

•Columbia River FNC; Vancouver, Washington to Bonneville Dam (RM 106.5 to RM 145): Coarse sands and gravels (>98%) with low TOC content (<0.2%) suitable for unconfined, aquatic placement.

•Skipanon FNC: Dredge prism sediments are predominantly silt (77-86%) with some clay (12-20%) and minor amounts of sand and gravels (<3%) suitable for unconfined, aquatic placement. TOC in the dredge prism sediments ranged from 2.14 to 2.79%. Total solids in the dredge prism sediments ranged from 35 to 42%.

•Tongue Point FNC: The outer shoal dredge prism was 96.4% sand and the inner shoal averaged 46.9% sand, 45.7% silt, and 7.3% clay suitable for unconfined, aquatic placement.

•Westport Slough FNC: Material is composed of an average of 83.1% sand and 15.2% fines suitable for unconfined, aquatic placement. The TOC content is 0.698%.

•Oregon Slough FNC downstream entrance from the Columbia Channel to Oregon Slough RM 1.5: Composite samples consisted of 73 to 82% sand and 18 to 27% fines with trace gravel (<0.4%) suitable for unconfined, aquatic placement. The TOC ranged from 0.62 to 1.27%. Total solids ranged from 60.7 to 63.8%.

•Oregon Slough FNC RM 1.5 to 3.8: Samples were composed predominately of sand (91.4% to 94.2%) with little gravel (2.8% to 8.2%), trace silt (0.6% to 4.5%), and trace clay (0.3% to 0.4%). Subsurface samples were composed predominately of sand (67% to 95.7%) with little gravel (0.5% to 6.6%), some silt (0.8% to 26.3%), and trace clay (0.1% to 6.2%). All material is suitable for unconfined, aquatic placement.

•Oregon Slough FNC upstream entrance: Sediment was composed of 96.8% sand, 2.0% fines, and 0.3% gravel at one sample location and 78.6% sand and 21.3% fines at the other sample location. All material is suitable for unconfined, aquatic placement.

•In-water Transfer sites: Substrates are composed primarily of sand (29% to 99%) and gravel(<1% to >99%); the fines (silt and clay) fraction is less than 1%. All material is suitable for unconfined, aquatic placement.

a. Statewide Narrative Criteria – The proposed action does not include new waste, discharges of waste, log handling, sand and gravel mining operations, road building activities, new tastes or odor, or toxic materials. The proposed action will not promote the development of fungi or other growths, nor formation of sludge deposits, nor floating solids, nor radioisotopes.
b. Bacteria – The proposed action does not include sewage, animal waste, or other pollution that would contribute to bacterial growth.
c. Biocriteria – The proposed action may result in temporary reduction of quality of benthic habitat in dredge locations; however, these areas are expected to recover within 1 to 3 years after the dredging event, and therefore, would not significantly degrade Waters of the State.
d. Dissolved Oxygen (DO) – DO is monitored during all side channel dredging per the current Biological Opinion. Dredging may not occur if DO is less than 6.5 mg/L. More frequent monitoring is required if the DO is below 8 Mg/L.
e. Nuisance Phytoplankton Growth – The proposed action is not expected to increase phytoplankton growth because activities are occurring in open, flowing waters.
f. pH – The proposed action would not modify the pH of Waters of the State.
g. Temperature – The proposed action would not modify the temperature of Waters of the State.
h. Total Dissolved Gas – The proposed action will not affect total dissolved gases in Waters of the State because no spill events or other activities or substances contributing to an increase in dissolved gases are associated with the proposed action.
i. Total Dissolved Solids (TDS) – The proposed action is not anticipated to contribute to TDS in Waters of the State because the proposed action does not include activities normally contributing such as agricultural runoff, residential runoff, or point source discharges.
j. Toxic Substances – No toxic substances are associated with the proposed action.
k. Turbidity – Turbidity is monitored during all dredging per the existing WQC. Dredging must stop if exceedance over background level occurs at second monitoring interval; dredging continues once turbidity levels return to background level.
l. Basin-Specific Criteria – Refer to previous responses.

m. Antidegradation – The proposed action does not include pollution and would not degrade water quality. The receiving waters are exposed to the same sources of contamination as the dredge areas; therefore, there is no potential for the activities to degrade Waters of the State. The sediments are suitable for aquatic placement and exposure per the 2018 SEF.

Type and condition of riparian vegetation

Estuarine vegetation habitat within the Lower Columbia River is typically comprised of fringing intertidal marshes and intertidal island marshes. From RM 11 to RM 35, over 14,000 acres of land adjacent to the river are diked, primarily for agricultural resources. West Sand Island, Rice, Miller Sands, Pillar Rock, and Tenasillahe Islands are sandy islands, either created as a result of natural shoaling processes, or intentionally developed via placement of dredged material. Active dredged material placement sites typically do not support established plant communities, due to lack of nutrients and xeric nature of the dredged material. West Sand Island retains probably the largest and best remaining native sand dune plant community. High tide lines that perimeter upland dredged material placement sites are more likely to support vegetative communities due to nutrient and debris deposited within this zone. Established estuarine riparian habitats commonly found are stands of cottonwoods and alders.

Riverine vegetation habitat upstream of RM 35 consists of fragmented, reduced riparian habitat. Approximately 162,000 acres of land have been converted for agricultural and industrial purposes. Unless modified or developed, a narrow band of vegetation lines the banks of the Columbia River. Cottonwood and Oregon ash stands are likely to populate areas that have yet been developed or altered for use. There are a number of refuges and wildlife management areas located within the Columbia River basin. These areas provide established natural and man-made wetland and riparian forest habitat for a variety of wildlife species.

Fish and wildlife (type, abundance, period of use, significance of site)

Biological resources within the Columba River system are diverse. There is a wide range of aquatic, terrestrial, and avian species that utilize one or more types of habitat found within the project area. There are four primary habitats that encompass the Lower Columbia River system: Estuarine, Riverine, Riparian, and Upland. Each of these habitats carries an intricate level of biologic complexity. CR O&M project operates within each of the habitats to a varying degree. NMFS issued a Biological Opinion on 11 July 2012 (2012 BiOp) titled Reinitiation of Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Columbia River Navigation Channel and Operations and Maintenance, Mouth of the Columbia River to Bonneville Dam, Oregon and Washington (HUCs 1708000605, 1708000307, 1708000108). NMFS No. 2011/02095. Northwest Region, Seattle, Washington, and a Biological Opinion on June 16, 2021 (2021 BiOp) titled Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Operations and Maintenance Dredging of the Federal Navigation Channels at Tongue Point, Clatsop County, Oregon; Elochoman Slough, Wahkiakum County, Washington; Lake River, Clark County, Washington; and Oregon Slough, Multnomah County, Oregon. The 2012 and 2021 BiOps concluded that the action would not jeopardize the continued existence of ESA listed species, including salmon, steelhead, green sturgeon, and eulachon, or cause adverse modifications to their critical habitats, because the Corps will follow Reasonable and Prudent Measures (RPMs) for timing of work, water quality sampling and monitoring, and operational constraints. The USFWS concurred with the Corps' determination that the action would have no effect on the following listed species: western snowy plover, northern spotted owl, short-tailed albatross, Oregon silverspot butterfly, water howellia, and yellow-billed cuckoo and "may affect, but is not likely to adversely affect" bull trout, marbled murrelet, and Columbian white-tailed deer (Service reference# 13420-2010-I-0165). In 2014, the USFWS issued a BiOp stating that the program may affect and is likely to adversely affect streaked horned lark, but because the Proposed Action maintains breeding habitat and minimizes adverse effects, the action would not jeopardize the continued existence of streaked horned lark or cause adverse modification of critical habitat. The Corps will follow all of the RPMs and Conservation Measures outlined in the current BiOp.

B. Describe the existing navigation, fishing and recreational use of the waterbody or wetland.

Navigation: In support of the regional and national economy, the Corps maintains the Columbia River FNC to provide reliable navigation. The Columbia River is the gateway for global imports and exports from the Columbia-Snake River navigation system. The Columbia River is the primary gateway on the West Coast for the export of wheat, wood products, and bulk minerals. In 2018, the deep-draft navigation channel supported an annual $23 billion import/export industry, transporting approximately 56 million tons of goods. More than 12,000 commercial vessels and 100,000 recreational/charter vessels navigate through the deep-draft navigation channel each year. According to the Pacific Northwest Waterways Association, more than 40,000 jobs along the lower Columbia River are directly dependent on seaport activity.

Fishing: Columbia River support treaty, non-treaty commercial, and recreational fisheries. These fisheries are highly regulated by state, federal, and tribal entities. A wide range of fish and aquatic species are harvested from the Columbia River. There are 13 ESA-listed Evolutionary Significant Unit (ESU) salmon that migrate into the Columbia River system. Additionally, five other ESA-listed fish species use the Columbia River system in some capacity. Overall, there are over 120 species of fish and aquatic species that are harvested from this region. The Columbia River supports a $410 million dollar fishery industry (salmon, crab, groundfish, etc.). (USFWS, 2006) (http://www.fws.gov/gorgefish/carson/reports/MA%20Fact%20Sheet%203_3_06.pdf)

Recreation: The Columbia River is unparalleled in terms of access to recreational activities. Recreational use of the Columbia River occurs year-round; river-based tourism and recreational activities are the driving economic force for a lot of the towns situated along the Columbia River. Fishing, hunting, swimming, water sports, and sightseeing are among the most popular activities to engage in with the Columbia River. Many attempts have been undertaken by various agencies to quantify the recreational opportunity spectrum for the Columbia River. Given the wide range of recreational opportunities and large geographic range the Columbia River encompasses, it is difficult to fully encapsulate the extrinsic and intrinsic value of recreation for this region.

(7) PROJECT SPECIFIC CRITERIA AND ALTERNATIVES ANALYSIS

Describe project-specific criteria necessary to achieve the project purpose. Describe alternative sites and project designs that were considered to avoid or minimize impacts to the waterbody or wetland.*

Dredging and dredged material placement locations have not changed since the most recent WQC, as amended. Alternative dredged material placement sites associated with the implementation of the Columbia River Channel Improvement Plan (CRCIP) and subsequent operations and maintenance were described in the Final EIS and 2003 Supplemental EIS.

The project will follow all Portland Sediment Evaluation Team (PSET) recommendations for each dredging event and comply with the Sediment Evaluation Framework for the Pacific Northwest (SEF) (May 2018).

(8) ADDITIONAL INFORMATION

Are there state or federally listed species on the project site?	**Yes** (highlighted)	No	Unknown
Is the project site within designated or proposed critical habitat?	**Yes** (highlighted)	No	Unknown
Is the project site within a national Wild and Scenic River ?	Yes	**No** (highlighted)	Unknown
Is the project site within a State Scenic Waterway?	Yes	**No** (highlighted)	Unknown
Is the project site within the 100-year floodplain?	**Yes** (highlighted)	No	Unknown

If yes to any above, explain in Block 6 and describe measures to minimize adverse effects to those resources in Block 7.

Is the project site within the Territorial Sea Plan (TSP) Area?	Yes	**No** (highlighted)	Unknown

If yes, attach TSP review as a separate document for DSL.

Is the project site within a designated Marine Reserve?	Yes	**No** (highlighted)	Unknown

If yes, certain additional DSL restrictions will apply.

Will the overall project involve ground disturbance of one acre or more? **If yes, you may need a 1200-C permit from the Oregon Department of Environmental Quality (DEQ).**	**Yes**	**No**	**Unknown**
Is the fill or dredged material a carrier of contaminants from on-site or off-site spills?	**Yes**	**No**	**Unknown**
Has the fill or dredged material been physically and/or chemically tested? **If yes, explain in Block 6 and provide references to any physical/chemical testing report(s).**	**Yes**	**No**	**Unknown**
Has a cultural resource (archaeological and/or built environment) survey been performed on the project area?	**Yes**	**No**	**Unknown**
Do you have any additional archaeological or built environment documentation, or correspondence from tribes or the State Historic Preservation Office? **If yes, provide a copy of the survey and/or documentation of correspondence with this application to the Corps only. Do not describe any resources in this document. Do not provide the survey or documentation to DSL.**	**Yes**	**No**	**Unknown**

---

* Not required by the Corps for a complete application, but is necessary for individual permits before a permit decision can be rendered.

☐ ☐ ☐

☐ ☐ ☐

☐ ☐ ☐

☐ ☐ ☐

☐ ☐ ☐

☐ ☐ ☐

☐ ☐ ☐

☐ ☐ ☐

☐ ☐ ☐

☐ ☐ ☐

☐ ☐ ☐

☐ ☐ ☐

Is the project part of a DEQ Cleanup Site? No☐ Yes☐ Permit number ___________________

DEQ contact._

Will the project result in new impervious surfaces or the redevelopment of existing surfaces? Yes ☐ No ☐

If yes, the applicant must submit a post-construction stormwater management plan as part of this application to DEQ's 401 WQC program for review and approval, see https://www.oregon.gov/deq/FilterDocs/401wqcertPostCon.pdf

Identify any other federal agency that is funding, authorizing or implementing the project.

Agency Name	Contact Name	Phone Number	Most Recent Date of Contact

List other certificates or approvals/denials required or received from other federal, state or local agencies for work described in this application.

Agency	Certificate / approval / denial description	Date Applied
Department of Land Conservation and Development	Consistency Determination Concurrence previously received for ongoing actions, varies by FNC	
National Marine Fisheries Service	Existing Biological Opinions 2012 and 2021	

Other DSL and/or Corps Actions Associated with this Site (Check all that apply.)

☐ Work proposed on or over lands owned by or leased from the Corps (may require authorization pursuant to 33 USC 408). These could include the federal navigation channel, structures, levees, real estate, dikes, dams, and other Corps projects.

State owned waterway	DSL Waterway Lease #:	
Other Corps or DSL Permits	Corps #	DSL #
☐ Violation for Unauthorized Activity	Corps #	DSL #
Wetland and Waters Delineation	Corps #	DSL #

Submit the entire delineation report to the Corps; submit only the concurrence letter (if complete) and approved maps to DSL. If not previously submitted to DSL, send under a separate cover letter

(9) IMPACTS, RESTORATION/REHABILITATION, AND COMPENSATORY MITIGATION

A. Describe unavoidable environmental impacts that are likely to result from the proposed project. Include permanent, temporary, direct, and indirect impacts.

Placement of dredge materials will be localized and minor with respect to the hydraulics and sediment transport conditions of the Columbia River. Therefore, changes to erosion and deposition is not expected. The project may result in temporary and localized reduction in water quality during the course of dredging and in-water placement, which would suspend sediments in the water column. These impacts would cease after O&M operations are complete.

The Corps will continue to follow the same monitoring, reporting and other BMPs as required by WQC No. NWPOP-CLA-F05-001-FR to ensure that direct and indirect impacts are less than significant. Sediments from the placement areas and from areas adjacent to the dredge footprint will be redistributed to downstream areas by natural hydraulic processes after dredging events are completed. The project will follow all Portland Sediment Evaluation Team (PSET) recommendations for each dredging event and comply with the Sediment Evaluation Framework for the Pacific Northwest (SEF) (May 2018).

Dredging in the FNC between RM 3 and 106.5 may occur at any time of year, although most dredging occurs between 1 June and 15 December. Maintenance dredging of the FNC between RM 106.5 and 145 will occur 1 August through 30 September. Side channel dredging will occur 1 August through 15 December. These work windows are in accordance with the most current 2012 and 2021 Biological Opinions from National Marine Fisheries Service (NMFS). O&M activities may have adverse and beneficial effects on ESA-listed species and their habitats. Few individual fish that encounter the dredging operations will alter their pathway or delay their rate of migration. Juvenile salmonids will largely avoid the dredging and adult fish are intent on moving upstream. Therefore, the project will not significantly change the overall distribution of fish or risk of predation. Salmonid smolts within a couple feet of a hydraulic cutterhead could become entrained, but most would be able to avoid the entrainment. Subyearling salmonids are less able to escape entrainment and are subject to a wider zone of potential entrainment due to less swimming stamina and speed. The number of subyearling salmonids that will be killed from entrainment cannot be quantified, but the numbers are expected to be low based on BMPs that reduce the chance of fish migrating through the project area during the in-water work window. For all designated salmonid and steel head critical habitats, the project would cause temporary disturbance to the migratory corridor, degradation of water clarity as fine sediments and organic matter are resuspended, and a temporary reduction in quantity of food organisms and benthic productivity. Therefore, effects on critical habitat will be temporary, low magnitude, and not significantly alter critical habitat within the project area.

A wildlife/wetland mitigation plan for offsetting anticipated impacts to agricultural, wetland, and riparian environments associated with the implementation of the Columbia River Channel Improvement Plan (CRCIP) and subsequent operations and maintenance was described in the Final EIS and 2003 Supplemental EIS. The final mitigation plan numbers were reported in the 2008 Columbia River Channel Improvement Project Supplemental Evaluation. The ongoing operations and maintenance of the Columbia River and side channels, including placement actions, will not result in any additional impacts outside the scope of what has already been mitigated. Thus, no further mitigation is proposed.

B. For temporary removal or fill or disturbance of vegetation in waterbodies, wetlands or riparian (i.e., streamside) areas, discuss how the site will be restored after construction to include the timeline for restoration.

Upland placement sites are typically prepped for placement of dredged material by removing shrubby vegetation and grading the site to accommodate weir placements and/or settling ponds. Once the dredged materials have been placed, the area is graded to an appropriate slope for beach nourishment operations and leveled for upland placement. Placement of dredged material on estuary islands may be contoured to reduce line-of-sight from land to water which may be effective in precluding double-crested cormorants or Caspian terns from nesting. The material being placed is xeric in nature and does not lend itself to support re-vegetation efforts. Equipment and construction debris will be removed prior to vacating the placement site.

Compensatory Mitigation

C. Proposed mitigation approach. Check all that apply:

☐ Permittee responsible Onsite Mitigation ☐ Permittee responsible Offsite Mitigation ☐ Mitigation Bank In-Lieu Fee Program ☐ Payment In-Lieu (Not approved for use with Corps permits)

D. Provide a brief description of proposed mitigation approach and the rationale for choosing that approach. If you believe mitigation should not be required, explain why.

N/A

Mitigation Bank / In-Lieu Fee Information:

Name of mitigation bank or in-lieu fee project:

Type and amount of credits to be purchased: N/A

If you are proposing permittee-responsible mitigation, have you prepared a compensatory mitigation plan?

☐ Yes. Submit the plan with this application and complete the remainder of this section.

☐ No. A mitigation plan will need to be submitted (for DSL, this plan is required for a complete application).

Mitigation Location Information (Fill out only if permittee-responsible mitigation is proposed)

Mitigation Site Name/Legal Description	Mitigation Site Address	Tax Lot #
County	City	Latitude & Longitude (in DD.DDDD format)

Township	Range	Section	Quarter/Quarter

(10) ADJACENT PROPERTY OWNERS FOR PROJECT AND MITIGATION SITE		
☐ Pre-printed mailing labels of adjacent property owners attached separately (if more than 30).	Project Site Adjacent Property Owners	Mitigation Site Adjacent Property Owners
Contact Name Address 1 Address 2 City, ST ZIP Code		
Contact Name Address 1 Address 2 City, ST ZIP Code		
Contact Name Address 1 Address 2 City, ST ZIP Code		

(11) CITY/COUNTY PLANNING DEPARTMENT LAND USE AFFIDAVIT (TO BE COMPLETED BY LOCAL PLANNING OFFICIAL)

I have reviewed the project described in this application and have determined that:

- ☐This project is not regulated by the comprehensive plan and land use regulations
- ☐This project is consistent with the comprehensive plan and land use regulations
- ☐This project is consistent with the comprehensive plan and land use regulations with the following:
  - ☐Conditional Use Approval
  - ☐Development Permit
  - ☐Other Permit (explain in comment section below)
- ☐This project is not currently consistent with the comprehensive plan and land use regulations. To be consistent requires:
  - ☐Plan Amendment
  - ☐Zone Change
  - ☐Other Approval or Review (explain in comment section below)

An application or variance request has ☐ has not ☐ been filed for the approvals required above.

Local planning official name (print)	Title	City / County
Signature	Date	
Comments:		

(12) COASTAL ZONE CERTIFICATION

If the proposed activity described in your permit application is within the Oregon Coastal Zone, the following certification is required before your application can be processed. The signed statement will be forwarded to the Oregon Department of Land Conservation and Development (DLCD) for its concurrence or objection. For additional information on the Oregon Coastal Zone Management Program and consistency reviews of federally permitted projects, contact DLCD at 635 Capitol Street NE, Suite 150, Salem, Oregon 97301 or call 503-373-0050 or click here.

CERTIFICATION STATEMENT

I certify that, to the best of my knowledge and belief, the proposed activity described in this application complies with the approved Oregon Coastal Zone Management Program and will be completed in a manner consistent with the program.

Print /Type Applicant Name	Title
Applicant Signature	Date

(13) SIGNATURES

Application is hereby made for the activities described herein. I certify that I am familiar with the information contained in the application, and, to the best of my knowledge and belief, this information is true, complete and accurate. I further certify that I possess the authority to undertake the proposed activities. By signing this application I consent to allow Corps or DSL staff to enter into the above-described property to inspect the project location and to determine compliance with an authorization, if granted. I hereby authorize the person identified in the authorized agent block below to act in my behalf as my agent in the processing of this application and to furnish supplemental information in support of this permit application. I understand that the granting of other permits by local, county, state or federal agencies does not release me from the requirement of obtaining the permits requested before commencing the project. I understand that payment of the required state processing fee does not guarantee permit issuance.

To be considered complete, the fee must accompany the application to DSL. The fee is not required for submittal of an application to the Corps.

Fee Amount Enclosed	$

Applicant Signature (required) must match the name in Block 2	
Print Name Amy Gibbons	Title Chief, Environmental Resources Branch
Signature GIBBONS.AMY.COLLEEN.1381427567 Digitally signed by GIBBONS.AMY.COLLEEN.1381427567 Date: 2023.07.28 12:11:41 -07'00'	Date 28 July 2023
Authorized Agent Signature	
Print Name Darren Bradford	Title Natural Resource Specialist
Signature BRADFORD.DARREN.LEE.1618666871 Digitally signed by BRADFORD.DARREN.LEE.1618666871 Date: 2023.07.28 11:48:35 -07'00'	Date 20 July 2023

Landowner Signature(s)*	
Landowner of the Project Site (if different from applicant)	
Print Name	Title
Signature	Date
Landowner of the Mitigation Site (if different from applicant)	
Print Name	Title
Signature	Date
Department of State Lands, Property Manager (to be completed by DSL)	
If the project is located on state-owned submerged and submersible lands, DSL staff will obtain a signature from the Land Management Division of DSL. A signature by DSL for activities proposed on state-owned submerged/submersible lands only grants the applicant consent to apply for a removal-fill permit. A signature for activities on state-owned submerged and submersible lands grants no other authority, express or implied and a separate proprietary authorization may be required.	
Print Name	Title
Signature	Date

* Not required by the Corps.

(14) ATTACHMENTS

- ☐ Drawings
  - ☐ Location map with roads identified
  - ☐ U.S.G.S topographic map
  - ☐ Tax lot map
  - ☐ Site plan(s)
  - ☐ Plan view and cross section drawing(s)
  - ☐ Recent aerial photo
  - ☐ Project photos
  - ☐ Erosion and Pollution Control Plan(s), if applicable
  - ☐ DSL / Corps Wetland Concurrence letter and map, if approved and applicable
- ☐ Pre-printed labels for adjacent property owners (Required if more than 30)
- ☐ Incumbency Certificate if applicant is a partnership or corporation
- ☐ Restoration plan or rehabilitation plan for temporary impacts
- ☐ Mitigation plan
- ☐ Wetland functional assessments, if applicable
  - ☐ Cover Page
  - ☐ Score Sheets
  - ☐ ORWAP OR, F, T, & S forms
  - ☐ ORWAP Reports
  - ☐ Assessment Maps
  - ☐ ORWAP Reports: Soils, Topo, Assessment area, Contributing area
- ☐ Stream Functional Assessments, if applicable
  - ☐ Cover Page
  - ☐ Score Sheets
  - ☐ SFAM PA, PAA, & EAA forms
  - ☐ SFAM Report
  - ☐ Assessment Maps
    - ☐ Aerial Photo Site Map and Topo Site Map (Both maps should document the PA, PAA, & EAA)
- ☐ Compensatory Mitigation (CM) Eligibility & Accounting Worksheet
  - ☐ Matching Quickguide sheet(s)
  - ☐ CM Eligibility & Accounting sheet
- ☐ Alternatives analysis
- ☐ Biological assessment (if requested by the Corps project manager during pre-application coordination)
- ☐ Stormwater management plan (may be required by the Corps or DEQ)
- ☐ Other
  - ☐ Please describe:

For U.S. Army Corps of Engineers send application to:

USACE Portland District
ATTN: CENWP-ODG-P
PO Box 2946
Portland, OR 97208-2946
Phone: 503-808-4373
portlandpermits@usace.army.mil

Counties:
Baker, Benton, Clackamas, Clatsop, Columbia, Gilliam, Grant, Hood River, Jefferson, Lincoln, Linn, Malheur, Marion, Morrow, Multnomah, Polk, Sherman, Tillamook, Umatilla, Union, Wallowa, Wasco, Washington, Wheeler, Yamhill

U.S. Army Corps of Engineers
ATTN: CENWP-ODG-E
211 E. 7th AVE, Suite 105
Eugene, OR 97401-2722
Phone: 541-465-6868
portlandpermits@usace.army.mil

Counties:
Coos, Crook, Curry, Deschutes, Douglas, Jackson, Josephine, Harney, Klamath, Lake, Lane

For Department of State Lands send application to:

West of the Cascades:
Department of State Lands
775 Summer Street NE, Ste 100
Salem, OR 97301-1279
Phone: 503-986-5200
https://www.oregon.gov/dsl/WW/Documents/uploadinstructions_removalfill.pdf

East of the Cascades:
Department of State Lands
951 SW Simpson Ave, Ste 104
Bend, OR 97702
Phone: 541-388-6112
https://www.oregon.gov/dsl/WW/Documents/uploadinstructions_removalfill.pdf

For Department of Environmental Quality:

Submit all application materials electronically through *Your DEQ Online*.

For questions related to *Your DEQ Online*, please visit the *Your DEQ Online help page*, email YourDEQOnline@deq.state.or.us, or call 503-229-6184

INSTRUCTIONS FOR PREPARING THE JOINT APPLICATION

This is a joint application and must be sent to all agencies (Corps, DSL, and DEQ), who administer separate permit or certification processes. For questions regarding these instructions or the form, contact the Corps, DSL and/or DEQ or refer to the following online resources:

- DSL's Removal-Fill Guide; or,
- The Corps Regulatory website: http://www.nwp.usace.army.mil/Missions/Regulatory.aspx
- DEQ's 401 Water Quality Certification website: https://www.oregon.gov/deq/wq/wqpermits/Pages/Section-401-Certification.aspx

General Instructions and Tips

- Provide the information in the appropriate blocks of the application form. If you need more space, provide a summary in the space provided and attach additional detail as an appendix to the application. Each appendix or attachment must reference which application block number it pertains to.
- Not all items on the application form will apply to all projects.
- Electronic submittal of applications and supporting material is preferred by the Corps. Both electronic and hard copies must be in 8 ½ x 11-inch sized format and reproducible in black and white. Currently DSL does not accept electronic submittals. DSL will accept color figures and 11 X 17. Use either all double sided or all single sided paper. Do not use staples or dividers. NOTE: If the electronic submittal of application and associated documents is 10 megabytes or more, check with each agency for how best to submit the document to that agency.
- **FEES:** Fees for water quality certification apply. Nationwide projects approved by DEQ will incur a fee of $985. Others will be evaluated on a case-by-case basis: https://www.oregon.gov/deq/wq/wqpermits/Pages/Section-401-Fees.aspx.

For complex projects or for those that may have more than minimal impacts, additional information may be necessary to complete the evaluation and make a permit decision. Alternative forms of permit applications may be acceptable; contact the Corps and DSL for more information.

Section 1. Type of Permit(s) if Known
If known, indicate the type of permit/authorization applying for.

Section 2. Applicant and Landowner Contact Information
Applicant: The applicant is the responsible party. If the applicant is an agency, business entity or other organization, indicate the name of the organization and a person that has the authority to sign the application. If applicant is a partnership or corporation, the applicant name must match the Incumbency Certificate, and the business name as listed on OR Secretary of State business registry. Applicant must not be "doing business as" or has an "assumed business name." In such cases the applicant must be an individual.
Applicant Contact Name: If the applicant is a business, provide the contact name for an individual representing the business.
Authorized Agent: An authorized agent is someone who has permission from the applicant to represent their interests and supply information to the agencies. An agent can be a consultant, an attorney, builder, contractor, or any other person or organization. An authorized agent is optional.
Landowner: Provide landowner information if different from the applicant. DSL requires the landowner's signature, unless the project qualifies as a linear project, e.g. road, pipeline, utility.

Section 3. Project Information
A. Provide location information. Latitude and longitude must be reported in decimal format and can be found by zooming in to your respective project location and reading off the coordinates displayed on the bottom many maps, such as Google Earth.

B. Provide information on wetlands and waterbodies within the project area. Indicate the category of activities that make up your project. For projects with multiple locations, provide latitude and longitude for each location. For linear projects, provide the latitude and longitude for the start and end points.

Section 4. Project Description

A. Overall Description: Provide a description of the overall project, including:

- All associated work with the project both outside and within waters or wetlands.
- Total ground disturbance for all associated work (i.e., area and volume of ground disturbance).
- Total area of impervious surfaces created or modified by the project, if applicable.

B. Work within Waters and Wetlands: Provide a description of the proposed work within waters and wetlands, including:

- Each removal or fill activity proposed in waters or wetlands, as well as any construction or maintenance of in-water or over-water structures.
- The number and dimensions of in-water or over-water structures (i.e., pilings, floating docks) proposed within waters or wetlands.

C. Construction Methods: Describe how the removal and/or fill activities will be accomplished, including the following:

- Construction methods, equipment to be used, access and staging areas, etc.
- Measures you will use during construction to minimize impacts to the waterbody or wetland. Examples may include isolating work areas, controlling construction access, site specific erosion and sediment control methods, site specific best management practices, and using specialized equipment or materials. Attach work area isolation and/or erosion and pollution control plans, if applicable.

D. Fill Material and Disposal: Provide a description of fill material and procedure for disposal of removed material, including:

- The source(s) of fill materials (if known).
- Locations for disposal area(s) for dredged material, if applicable. If dredged material is to be discharged on an upland site, identify the site and the steps to be taken (if necessary) to prevent runoff from the dredged material back into jurisdictional waters. If using an upland disposal area that is not a Department of Environmental Quality (DEQ)-regulated landfill, a Solid Waste Letter of Authorization or a Beneficial Use Determination from DEQ may be required.

E. Construction Timing: Provide the proposed start and completion dates for the project. Describe project work that is already complete, if applicable.

F. – I. Summary of Removal and Fill Activities: Summarize the dimensions, volume and type/composition of material being placed or removed in each waterbody or wetland. Describe each impact on a separate row. For instance, if two culverts are being removed from Clear Creek, use two rows. Add extra rows if needed or include an attachment.

The DSL and the Corps use different elevations for determining whether an activity in tidal waters is regulated by the State's Removal-Fill law, the Clean Water Act, and/or the Rivers and Harbors Act. DSL regulates activities below the highest measured tide. The Clean Water Act applies below the high tide line. The Rivers and Harbors Act applies below the mean high water.

If jurisdictional limits are not the same for each agency, prepare a table for each agency stating impacts within that agency's jurisdiction.

Section 5. Project Purpose and Need

Explain the purpose and need for the project. Also include a brief description of any related activities needed to accomplish the project objectives.

The following items are required by DSL, as applicable:

- ☐ If the removal-fill would satisfy a public need and the applicant is a public body, include any pertinent findings regarding public need and benefit.
- ☐ If the project involves fill in the estuary for a non-water dependent use, explain how the project is for public use and/or satisfies a public need.
- ☐ If the project is located within a marine reserve or marine protected area, explain how the project is needed to study, monitor, evaluate, enforce or protect the designated area.

Section 6. Description of Resources in Project Area

Territorial Sea: For activities in the Territorial Sea (mean lower low water seaward 3 nautical miles), provide a separate evaluation of the resources and effects determination.

For each wetland, include:

- ☐ Whether the wetland is freshwater or tidal, and the Cowardin class and Hydrogeomorphic (HGM) class.
- ☐ Source of hydrology and direction of flow (if any).
- ☐ Dominant plant species by layer (herb, shrub, tree).
- ☐ Assessment of the hydrologic, water quality, fish habitat, aquatic habitat, and ecosystem support functions and values of the wetland(s) to be permanently impacted. The assessment should be attached as a separate Excel document.
    - DSL requires the use of ORWAP for wetland impacts over 0.2 acre and any wetland that is an Aquatic Resource of Special Concern (ARSC), unless the impacts are to Agate Desert Vernal Pools (VPs). See Appendix B of the Removal Fill Guide for a list of ARSCs. The Vernal Pool Assessment Method is required for all VPs. For impacts to wetlands less than 0.2 acre that are not ARSCs or VPs Best Professional Judgment (BPJ) may be used.
- ☐ Identify any Aquatic Resources of Special Concern (ARSC) in or near the project area. ARSCs include alkali wetlands, bogs, cold water habitat, fens, hot springs, interdunal wetlands, kelp beds, mature forested wetlands, native eelgrass beds, off-channel habitats (alcoves and side channels), ultramafic soil wetlands, vernal pools (including Willamette Valley, Medford area, Modoc basalt, and Columbia Plateau vernal pools), wet prairies, or wooded tidal wetlands. See Appendix B of the Removal Fill Guide for a list of ARSCs.
- ☐ Include relevant summary information from the wetland delineation report if available. Provide a copy of the wetland delineation report to **the Corps,** if not previously provided to the Corps. If a delineation report has not been previously submitted to DSL, then submit to DSL under a separate cover.
- ☐ Describe existing uses, including fish and wildlife use (type, abundance, period of use, and significance of site).
- ☐ Next major downstream waterbody name.

For rivers, streams, other waterbodies, lakes and ponds, include a description of, as applicable:

- ☐ Streamflow regime (e.g., perennial year-round flow, intermittent seasonal flow, ephemeral event-driven flow). If flow is ephemeral, provide streamflow assessment data sheet or other information that supports your determination.
- ☐ Field indicators used to identify the Ordinary High Water Mark (OHWM).
- ☐ Channel and bank conditions.

- Type and condition of riparian (streamside) vegetation.
- Channel morphology (structure and shape).
- Stream substrate.
- Assessment of the hydrologic, geomorphic, biologic and water quality functions and values of waters to be permanently impacted.
    - DSL requires use of the Stream Function Assessment Methodology (SFAM) for wadable non-tidal streams. SFAM should be attached as a separate Excel document. For impacts to non-wadable or tidal streams, BPJ can be used. Sections 2.2 through 2.3 of the SFAM User Manual give guidance for the functions and values to be addressed for all streams, even if SFAM does not apply.
- Identify any Aquatic Resources of Special Concern (ARSC) in or near the project area. ARSCs include alkali wetlands, bogs, cold water habitat, fens, hot springs, interdunal wetlands, kelp beds, mature forested wetlands, native eelgrass beds, off-channel habitats (alcoves and side channels), ultramafic soil wetlands, vernal pools (including Willamette Valley, Medford area, Modoc basalt, and Columbia Plateau vernal pools), wet prairies, or wooded tidal wetlands.
- Fish and wildlife use (type, abundance, period of use, and significance of site).
- Water quality impairments, including waterways adjacent to impacted wetlands and waterway to be impacted and next major downstream waterbody

Section 7. Project Specific Criteria and Alternatives Analysis
Provide an explanation describing how impacts to waters and wetlands are being avoided and minimized on the project site. For DSL, the alternatives analysis must include:

- Project-specific criteria that are needed to accomplish the stated project purpose.
- A range of alternative sites and designs that were considered with less impact.
- An evaluation of each alternative site and design against the project criteria and a reason for why the alternative was not chosen.
- If the project involves fill in an estuary for a non-water dependent use, a description of alternative non-estuarine sites must be included.

The level of rigor required in this analysis should be commensurate with the level of impact proposed. Please note that additional information regarding alternatives may be necessary for Corps Individual Permits to comply with the Clean Water Act Section 404(b)(1) Guidelines. Please check with your local Corps contact early in the planning process to determine what level of analysis is required. An alternative analysis is not required for a complete application by the Corps; however, it may be required before a permit decision can be rendered.

Section 8. Additional Information
Any additional information you provide helps the reviewer(s) understand your project and the other approvals or reviews that may be required.

Section 9. Impacts, Restoration/Rehabilitation, and Compensatory Mitigation
A. Description of Impacts: Clearly identify the permanent, temporary, direct and indirect impacts. Provide a written analysis of potential changes the project may make to the hydrologic characteristics of the affected wetlands or waterbodies, and an explanation of measures taken to avoid or minimize any adverse effects of those changes, such as: impeding, restricting or increasing flows; relocating or redirecting flow; and potential flooding or erosion downstream of the project. Provide a table summarizing permanent and temporary impacts by HGM and Cowardin Classifications.

B. Site Restoration/Rehabilitation: For temporary disturbance of soils and/or vegetation in waterbodies, wetlands or riparian (streamside) areas, discuss how you will restore the site after construction. This may include the following:

- Grading plans to restore pre-existing elevations.
- Planting plans and species list (native species only) to replace vegetation in riparian or wetland areas.
- Maintenance and monitoring plans to document restoration to wetland condition and/or vegetation establishment.
- Associated erosion control for site stabilization.

C.-D. Compensatory Mitigation. Describe your proposed compensatory mitigation approach or explain why you believe compensatory mitigation is not required. If proposing permittee-responsible mitigation for permanent impacts to jurisdictional waters, see OAR 141-085-0705 and 33 CFR 332.4(c) for plan requirements. The Oregon Explorer Aquatic Mitigation topic page and map viewers may be a helpful resource.

For activities involving discharges of dredged or fill material into waters of the United States, the Corps requires the application to include a statement describing how impacts to waters of the United States are to be avoided and minimized. The application must also include either a statement describing how impacts to waters of the United States are to be compensated for or a statement explaining why compensatory mitigation should not be required for the proposed impacts.

Section 10. Adjacent Property Owners for Project and Mitigation Site(s)
Names and addresses for properties that are adjacent to the project site and permittee responsible mitigation site (if applicable), are required. “Adjacent” means those properties that share or touch upon a common property line or are across the street or stream. If more than 30, attach pre-printed labels. A list of property owners may be obtained by contacting the county tax assessor’s office.

Section 11. City/County Planning Department Land Use Affidavit
This section is required to demonstrate land use compatibility for removal fill permits and water quality certifications. Provide this form to your local planning official for them to complete and sign.

Section 12. Coastal Zone Certification
Your signature for this statement is **required** for projects within the coastal zone (generally, west of the summit of the Coast Range).

Section 13. Signatures
The application **must** be signed by the responsible party as identified in section 1. DSL also requires the landowner’s signature. Linear Facilities (e.g. road, pipeline, utility) do not require landowner signature for the impact sites; signatures are required for mitigation sites.

Section 14: Attachments
Project Drawings. A complete application must include a location map, site plan, and plan view and cross-section drawings. DSL also requires a recent aerial photo. All drawings should be clear, legible, and to scale. For the Corps, drawings must be on 8.5 x 11-inch paper and must be in black and white or clearly reproducible in black and white. DSL will accept color and 11 x 17, but all figures must be clear when reproduced in black and white. While illustrations need not be professionally prepared, they should be clear, accurate, and contain all necessary information, as follows:

Location maps (with project boundaries, including staging and construction access, scale bar and north arrow on all):
- Location map with roads identified
- U.S.G.S. Topographic map
- Tax lot map

Site plan(s), including:

- ☐ Entire project site and activity areas, which includes staging and construction access areas
- ☐ Existing and proposed contours
- ☐ Stormwater outfalls and other related features
- ☐ Location of Ordinary High Water Mark, wetland boundaries, and other jurisdictional boundaries. Clearly identify temporary, permanent, direct and indirect impact areas within waterbodies and wetlands
- ☐ Scale bar, legend, and north arrow
- ☐ Location of staging areas and construction access
- ☐ Location of cross section(s), as applicable
- ☐ Location of mitigation area, if applicable

Cross section drawing(s), including:

- ☐ Existing and proposed elevations
- ☐ Clearly identify temporary, permanent, direct and indirect impact areas within waterbodies and wetlands
- ☐ Ordinary High Water Mark, wetland boundaries, and other jurisdictional boundaries
- ☐ Scale bar (horizontal and vertical scale)

Recent Aerial Photo

- ☐ 1:200 resolution, or, if not available for your site, highest resolution possible

DSL Wetland Concurrence (map and letter only for DSL; the Corps requires the full wetland/waters delineation report if not already submitted)

Mitigation documents including:

- ☐ Functional assessment results for each impacted resource and mitigation area
    - o Results should include: Cover sheet, Score Sheet, assessment area maps
- ☐ Eligibility and Accounting Worksheet
    - o Matching "Quickguide" sheet(s)
    - o Compensatory Mitigation (CM) Eligibility & Accounting sheet

Do NOT submit the following items to DSL (unless specifically requested by DSL for your project):

- ☐ Wetland delineation report
- ☐ Biological assessment
- ☐ Cultural/archeological reports
- ☐ Stormwater calculations
- ☐ Geotechnical reports
- ☐ Marketing reports
- ☐ Contract agreements
- ☐ Applications for other agencies such as local land use applications
- ☐ Contractor/construction specifications
- ☐ Other extraneous drawings and information

Columbia River Navigation Channel O&M_Project Location Information (Upland and Shoreline Placement Sites)												
Site Name	RM	Placement Type	Property Owner	City (Nearest)	County	Latitude, Longitude	Township	Range	Section	Tax Lot	Adjacent Landowners	HUC
Rice Island	W-21.0-UP	Upland & Shoreline	ODSL and WDNR (state line thru site)	Astoria	Clatsop	46.251159, -123.704421	9N	8W	20	908000000200	Island surrounded by water	170800060500
Miller Sands Island	O-23.5-BN	Shoreline	ODSL	Astoria	Clatsop	46.245104, -123.653279	9N	8W	21, 22, 27		Island	170800060500
Pillar Rock Island	O-27.2-UP	Upland & Shoreline	ODSL	Brownsmead	Clatsop	46.251044, -123.584509	9N	7W	19, 20	907000000600	Island	170800060500
Welch Island	O-34.0-UP	Upland	ODSL	Westport	Clatsop	46.253755, -123.466113	9N	6W	18, 19, 20	906000000300	USA Int: PO Box 3737, Portland, OR 97208-3737	170800030900
Tenasillahe Island	O-38.3-UP	Upland	ODSL	Clifton	Clatsop	46.20786, -123.433726	8N	6W	4	806000003800		170800030802
James River	O-42.9-UP	Upland	Georgia Pacific Consumer Products	Westport	Clatsop	46.145078, -123.390561	8N	6W	26	806260000100		170800030802
Crims Island	O-57.0-UP	Upland	ODSL	Mayger	Columbia	46.175631, -123.122564	8N	4W	13, 14, 15	8413-00-00100	USFWS: 911 11th Ave. NE Portland, OR 97231	170800030900
Lord Island	O-63.5-UP	Upland	ODSL	Rainier	Columbia	46.132253, -123.020727	8N	3W	34, 35, 36	8300-00-00300	Columbia County: 230 Strand St, St Helens, OR 97051	170800030900
Dibblee Point	O-64.8-UP	Upland	ODSL	Rainier	Columbia	46.119306, -123.005135	7N	3W	1	7301-00-00100, 7207-00-00100	Columbia County: 230 Strand St, St Helens, OR 97051 U.S. Gypsum: P.O. BOX 6721, DEPT 179 CHICAGO, IL 60680	170800030404
Crims Island	O-75.8-UP	Upland	ODSL	Kalama	Columbia	46.008238, -122.862907	6N	1W	19	6118-00-00101	Columbia Tidelands LLC: 1151 Fairview Ave N, Ste 101, Seattle, WA	170800030900
Lower Deer Island	O-77.0-UP	Upland	ODSL	Deer Island	Columbia	45.984463, -122.848044	6N	1W	19	6119-00-00200	Columbia Land Trust: 850 Officers' Row, Vancouver, WA Sarbanand Enterprisces LLC: 2619 Road 192, Delano, CA 93215	170800030401
Sand Island	O-86.2-BN	Shoreline	ODSL	St. Helens	Columbia	45.556830, -122.200217	5N	1W	34	5134-00-00300	City of St Helens: 265 Strand St., St. Helens, OR 97051	170800010804
West Hayden Island	O-105.0-UP	Upland	Port of Portland	Portland	Multnomah	45.625177, -122.703871	2N	1E	33	R323351	Portland General Electric Company	170800030200

Dredging BMPs

Measure	Justification	Duration	Ongoing Management
Hopper and Pipeline Dredging			
Drag or cutterheads will be buried in the substrate and will not exceed an elevation of 3 feet off the bottom for when cleaning the hopper or reverse purging dragheads or clearing pipeline. If water is pumped through dragheads to clean the hopper or cutterhead to clear the pipeline, dragheads or cutterhead will be 20 ft below the surface while dredging between RM 3 and RM 106.5 and 9 ft below the surface between RM 106.5 and RM 145 and in shallow-draft side channels.	To minimize potential entrainment of juvenile salmonids	Continuous throughout dredging operations	Maintain unless new information warrants change(s)
All Dredging			
Contractor(s) shall not release any trash, garbage, oil, grease, chemicals, or other contaminants into waterways	Protection of aquatic resources	Life of contract or action	Any unintentional in-water release will be immediately reported to the National Spill Response Center, U.S. Coast Guard, and other federal and state agencies for appropriate response. If material is released, it shall be immediately cleaned up/removed and the affected area shall be restored to a condition approximating adjacent undisturbed areas. Contaminated soils shall be excavated and removed.
Contractor(s), where possible, will use or propose for use materials considered environmentally friendly in that waste from such materials is not regulated as hazardous or is not considered harmful to the environment. If hazardous wastes are generated, disposal shall be done in accordance with 40 CFR parts 260-272 and 49 CFR parts 100-177.	Minimize and ensure safe disposal of hazardous waste	Life of contract or action	Any unintentional in-water release will be immediately reported to the National Spill Response Center, U.S. Coast Guard, and other federal and state agencies for appropriate response. If material is released, it shall be immediately cleaned up/removed and the affected area shall be restored to a condition approximating adjacent undisturbed areas. Contaminated soils shall be excavated and removed.

<u>Dredged Material Placement BMPs</u>

Measure	Justification	Duration	Ongoing Management
In-Water Placement			
Spread out dredged material to prevent mounding	Reduces depth of material to minimize effects to fish and invertebrates	Life of contract or action	Maintain unless new information warrants change(s)
Maintain discharge pipe of pipeline dredge at or below 20 ft depth during placement	Reduce impact of placement, suspended sediment, and turbidity to migrating juvenile salmonids	Continuous throughout placement operations	Maintain unless new information warrants change(s)
Shoreline Placement			
Grade placement site to slope of 10-15%, with no swales, to reduce the possibility of stranding juvenile salmonids	Ungraded slopes can create small pools or flat slopes that can strand juvenile salmon washed ashore by waves	Continuous throughout placement operations	Maintain unless new information warrants change(s)
Upland Placement			
Construct dredge material containment berms with weir systems to maximize the settlement of fine materials in runoff water	Maintain habitat functions/values of aquatic resources	Continuous throughout operations	Maintain unless new information warrants change(s)
Construction access routes and barge ramps will be limited to the smallest footprint practicable to minimize potential discharge into areas waterward of OHW or MHHW.	Minimize potential deleterious effects to water quality and aquatic resources	Life of contract or action	Maintain unless new information warrants change(s)
All Placement			
Contractor(s), where possible, will use or propose for use materials considered environmentally friendly in that waste from such materials is not regulated as hazardous or is not considered harmful to the environment. If hazardous wastes are generated, disposal shall be done in accordance with 40 CFR parts 260-272 and 49 CFR parts 100-177.	Minimize and ensure safe disposal of hazardous waste	Life of contract or action	Any unintentional in-water release will be immediately reported to the National Spill Response Center, U.S. Coast Guard, and other federal and state agencies for appropriate response. If material is released, it shall be immediately cleaned up/removed and the affected area shall be restored to a condition approximating adjacent undisturbed areas. Contaminated soils shall be excavated and removed.

EPA-Region 10 5 July 2017
Office of Environmental Review & Assessment (Sediment Management Unit)

Memorandum for: U.S. Army Corps of Engineers – Portland District, Operations Division, Channels and Harbors, Waterways Maintenance Section (CENWP-OD-NW, Stokke)

Subject: Portland Sediment Evaluation Team (PSET) Level 2 dredged material suitability determination for the U.S. Army Corps of Engineers - Portland District's (Corps) operations and maintenance (O&M) dredging of the Lower Columbia River (LCR) deep-draft Federal Navigation Channel (FNC) in the Columbia River from River Mile (RM) 3 to 106.5 in Oregon and Washington.

Introduction: Per the *Sediment Evaluation Framework for the Pacific Northwest* (SEF)[1], this suitability memorandum (SDM) documents the consensus of the PSET agencies regarding the suitability of the dredged material for unconfined, aquatic placement. The PSET reviewed the Corps' 21 April 2017 "Sediment Quality Evaluation Report: Lower Columbia River Federal Navigation Channel (River Miles 3 to 106.5)" (SQER), prepared by Corps' Sediment Quality Team (SQT)[2]. Sediment physical testing results are summarized in the SQER; the analytical results were compared to the physical screening levels published in the 2016 SEF.

Suitability Summary:

Surface Sediments:	☑ Suitable	☐ Unsuitable
Post-Dredge Surface (PDS):	☑ Suitable	☐ Unsuitable

Reviewers: The PSET agencies include the Corps, U.S. Environmental Protection Agency – Region 10 (EPA), National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife (USFWS), Washington Department of Ecology (Ecology), and Oregon Department of Environmental Quality (ODEQ). Table 1 lists the PSET's review timeline for this project. Reviewers included:

☑ James Holm (Corps, Lead)	☑ Bridgette Lohrman (EPA, Co-Lead)	
☑ James McMillan (Corps)	☑ Pete Anderson (ODEQ)	☑ Laura Inouye (Ecology)
☑ Tom Hausmann (NMFS)	☐ Jeremy Buck (USFWS)	

Table 1. PSET Review Timeline

Sampling and analysis plan (SAP) received	9 March 2016
SAP consistency determination	9 March 2016[3]
Sampling date(s)	22-31 March 2016
SQER received by PSET	24 April 2017
Suitability determination memorandum issued	5 July 2017
Management area ranking	Very Low (deep-draft federal navigation channel)
Recency of data*	10 years from sampling date (expires March 2026)

* If site conditions or the proposed project change, or if new information related contaminants of concerns are discovered, additional project coordination with PSET may be required to determine the validity of this SDM.

[1] U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, Washington Department of Ecology, Washington Department of Natural Resources, Oregon Department of Environmental Quality, Idaho Department of Environmental Quality, National Marine Fisheries Service, and U.S. Fish and Wildlife Service. 2016. *Sediment Evaluation Framework for the Pacific Northwest*. Published July 2016, by the U.S. Army Corps of Engineers, Northwestern Division, 172 pp + Appendices.

[2] U.S. Army Corps of Engineers – Portland District. 2017. *Sediment Quality Evaluation Report – Lower Columbia River Federal Navigation Channel (RMs 3 to 106.5)*. Prepared by the Portland District Sediment Quality Team, 21 April 2017. 89 pp.

[3] Portland Sediment Evaluation Team (PSET). 2016. *PSET - SAP Approval for the LCR FNC and RSM Dredging.* Email issued 9 March 2016, by PSET. 2 pp.

Federal Regulatory Authorities:

☑ Section 10, Rivers and Harbors Act
☑ Section 404, Clean Water Act (CWA)
☑ Section 401, CWA
☑ Section 7, Endangered Species Act
☑ Section 305 of the Magnuson-Stevens Act
☑ Fish and Wildlife Coordination Act
☑ Section 103, Marine Protection, Research and Sanctuaries Act
☐ Comprehensive Environmental Response, Compensation, and Liability Act

Project Description: Table 2 summarizes the O&M dredging program details for the LCR FNC project. Dredging is needed to provide reliable commercial and recreational navigation.

Table 2. Project Details

Waterbody / river miles (RMs)	Columbia River / +3.0 to +106.5
Dredged volume	~6.7 million cubic yards annually
Deep-draft channel dimensions	600 ft. wide + 100 ft. over-dredge width, 103 miles long
Max. proposed dredging depth	-48 ft. (43 ft. + 5 ft. advanced maintenance depth, MLLW/CRD)
Dredging method	Pipeline, Hopper Dredge
Dredged material transport	Pipeline, Hopper Dredge
Placement locations	Ocean, in-river, shoreline, upland
Dredging dates	Typically April through October

Sampling and Analysis Description: The Corps' sampling and analytical program for the LCR FNC is summarized in Table 3. Dredge prism surface grab (power grab sampler) samples were collected from 22 through 31 March 2016. Sample station locations are shown in Figures 2 through 6 of the SQER.

Table 3. LCR FNC Sampling and Analysis Description

Sampling Description		
Sample collection methods		Power grab sampler
Dredged material management unit (DMMU)		N/A
Averaged DMMU volume (cy)		On average, each sample represents ~114,000 cy
Subsamples (SS)/DMMU		
DP	Depth range (ft. MLLW/CRD)	-22.6 to -74.5
	Composite (Y/N)	N
	SS archive (Y/N) Composite archive (Y/N)	N N
PDS	Not Proposed	--
Sediment Physical and Chemical Analysis (no. analyses/decision unit)		
Decision unit (DMMU ID)		59 discrete stations
Station ID(s)		CR-2 to CR-299
ASTM Dredge Analyses		--
Grain size		1
Bulk Density		1
Total volatile solids		--
Total organic carbon		1
Sulfides		--
Ammonia		--
Metals		--

Semi volatile organic compounds (polynuclear aromatic hydrocarbons, chlorinated hydrocarbons, phthalates, phenols, misc. extractables)	--
Pesticides	--
Polychlorinated biphenyls (Aroclors)	--
Butyltins	--
Total petroleum hydrocarbons	--
Dioxins/furans	--
Biological Testing Description	
Bioassays planned (Y/N)	N

Deviations from the SAP: Five (5) deviations from the PSET-approved SAP occurred.

1. The Corps simplified the sample ID by removing the date of collection from the sample ID and relied on the station ID because each station was discretely analyzed.
2. No fine-grained sediments were visually observed in the FNC grab samples. Therefore, no chemical analyses were necessary.
3. The Corps sampled 59 stations within the LCR FNC, 4 more than proposed in the PSET-approved SAP.
4. To achieve cost efficiencies, the Corps proposed the LCR FNC survey in conjunction with a larger regional sediment management survey. This combined survey effort and unpredictable shoaling resulted in only 44% (26) of samples representing dredge prism material and 56% (33) of the stations were below the advanced maintenance depth of – 48 feet. For 6.7 MCY of dredging, a minimum of 22 stations are needed in very low ranked project (300,000 CY per DMMU) per the 2016 SEF. The 26 samples the Corps collected within the dredge prism meets the sampling density for a very low ranked project.
5. Even though approximately half of the stations were below maintenance depth (-48', AMD included), the majority of dredged material in the FNC consists of coarse-grained bedload material instead of fine-grained suspended sediment load. Bedload material typically form the sand waves that shoal (each typically less than 50,000 CY) within the FNC and trigger localized dredging. Sand waves move downstream as bedload sediment erodes from the upstream face, deposits in the downstream trough and is then buried by additional material eroded from the upstream face. This movement occurs in a layer only a few sand grains thick. Through this mechanism, all the individual grains in a sand wave are exposed to flow, eroded, transported, deposited, buried, and then eventually exposed again as the sand wave migrates downstream. The height of sand waves is dependent on higher river flows (spring freshets) that shapes the bedload material into taller sand waves. The suspended sediment load stays suspended by high flows and does not interact with the bedload materials that form sand waves. Therefore, even the bedload sediments sampled below -48' have the potential to form sandwave shoals that require dredging and are represented of dredged materials in LCR FNC.

Results and Discussion: Analytical results for the Corps' sampling event are summarized in Table 4. The analytical results from the SQER were compared to the 2016 SEF SLs.

Table 4. LCR FNC Sediment Analytical Summary

Sediment Physical Results	
DMMU ID and Sample ID(s):	59 discrete sampling stations
Sample type (dredge prism, adv. main. depth)	dredge prism + advanced maintenance depth*
Grain size, minimum % gravel and sand / maximum % silt and clay	>97 / 2.6
Bulk density, range (g/cm^3)	1.27 to 2.15
Total organic carbon, range (%)	0.1 to 0.29
* 33 of the 59 stations (56%) were sampled below the maximum depth of -48' due the location of the regional sediment management transects every ~two river miles. This broader survey effort dictated where LCR FNC stations were placed.	

There have been no substantive changes in the complex hydrologic (riverine, tidal) regimes of the lower Columbia River, hydropower operations within the Columbia River Basin, or the LCR federal navigation channel since the completion of the Columbia River Channel Improvement Project that deepened the LCR FNC to -43+5 feet in 2010. The grain size, bulk density, and total organic carbon results from the March 2016 sampling event are representative of the bedload sediments within the LCR FNC regardless of the sampling surface elevation relative to the project depth. The 2016 physical results confirm the LCR FNC sediments are very similar to previous testing results (2008).

Dredge Prism: The LCR deep-draft FNC is assigned a "very low" rank because the project is dominated by coarse sands, low total organic carbon content (<0.5%), and strong river and tidal currents. Per the Section 3.5.3 of the 2016 SEF, chemical testing is not required. Therefore, the LCR deep-draft FNC dredge prism material is suitable for unconfined, aquatic placement per the SEF guidance through March 2026.

Post-Dredge Surface: The dredge prism materials were determined to be suitable and the LCR deep-draft FNC is assigned a "very low" rank. As such, the PSET assumes that the LCR deep-draft FNC post-dredge surface is suitable for unconfined, aquatic exposure per the SEF guidance through March 2026.

Contact: This memorandum was prepared by Bridgette Lohrman (PSET Co-Lead) and reviewed by the participating PSET agencies, identified above. Questions regarding this memorandum should be directed to Bridgette Lohrman at (503) 326-4006 or e-mail to: lohrman.bridgette@epa.gov.

Stokke, Jessica B CIV USARMY CENWP (USA)

From: Lohrman, Bridgette <lohrman.bridgette@epa.gov>
Sent: Friday, July 8, 2022 2:28 PM
To: Stokke, Jessica B CIV USARMY CENWP (USA)
Cc: Holm, James A CIV USARMY CENWP (USA); Yballe, Dominic P CIV USARMY CENWP (USA); Pete Anderson; Inouye, Laura (ECY); Jeremy_Buck@fws.gov; Tom Hausmann - NOAA Federal (tom.hausmann@noaa.gov)
Subject: [Non-DoD Source] PSET - LCR FNC Transfer Sites - suitability
Attachments: 20220707 LCR DM Transfer Sites Lvl 1_Plates.pdf

Hello Jessica,

This email correspondence constitutes the Portland Sediment Evaluation Team's (PSET's) determination regarding the June 2022 No Test request for the U.S. Army Corps of Engineers – Portland District (Corps) transfer sites for the Lower Columbia River (LCR) deep-draft federal navigation channel (FNC). The LCR FNC is located in the Columbia River from river mile (RM 3 to 106.5) along the boundary between the states of Oregon and Washington. This determination was made in accordance with the May 2018 Sediment Evaluation Framework for the Pacific Northwest (SEF) and after reviewing the Corps 28 June 2022 "MEMORANDUM FOR THE RECORD – Re: SEF Level 1 No-Test Request for the Lower Columbia River Federal Navigation Project – In-Water Dredged Material Transfer Sites" (Level 1 memo), prepared by the Corps' Sediment Quality Team. The scope of the PSET's sediment evaluation includes placement of previously determined suitable LCR FNC dredged material in the aquatic transfer sites and the subsequent dredging for shoreline or upland placement, including minimal over-dredging of the transfer sites when removing LCR FNC sediments. This email documents the PSET's decision to not require sediment testing per Subpart G of the Clean Water Act section 404(b)(1) guidelines (see 40 CFR 230.60-230.61).

PROJECT DESCRIPTION: The Corps dredges 6 to 8 million cubic yards of sand from the LCR FNC each year. The eight LCR FNC transfer sites are in-water holding areas for temporary storage of suitable dredged materials. The Corps proposes to modify one existing site and add seven new sites. Transfer sites are necessary when shoaling forms beyond the reach of the pipeline DREDGE Oregon that is used to place sediments along shorelines or in upland sites. Dredged materials would typically be placed by a hopper dredge. Transfer sites are located in water deeper than 20 feet and in locations which have been previously used by the Corps for placement of dredged material. The Corps anticipates placing and removing the material into/from these eight sites annually.

SOURCES OF CONTAMINATION: In 2017, the PSET evaluated potential sources of contamination for the LCR FNC sediments and issued a suitability determination memo (SDM) stating the dredged materials are suitable for unconfined aquatic placement without chemical testing. The PSET confirmed a "very low" management area ranking for these sediments.

Once the material is within the transfer sites, the potential for contamination is very low given the 8 sites are subject to high river flows which transport large bed loads of material. Based on the Corps' LCR FNC sediment sampling in 2017, an analysis of stations in close proximity to the transfer sites indicates that any material that may be transported into the transfer sites by the riverine processes is predominately sand and gravel (>95%) with less than 5% fines. Thus, the potential for the sediments to be carriers of contamination is very low. Also, the 8 transfer sites are not in close proximity to known land-based sources of contamination that could cause contamination while the sediments are "stored" at the transfer sites.

MANAGEMENT AREA RANK: The PSET assigns a "very low" management area ranking to these 8 transfer sites due to the previous review of the LCR FNC, and no reason to believe that the project sediments have chemicals of concerns at concentrations above SEF SLs.

REGULATORY REQUIREMENTS FOR SEDIMENT EVALUATION: In accordance with the CWA section 404(b)(1) guidelines (40 CFR 230.60), when provided information indicates the material is sufficiently removed from sources of contamination, with reasonable assurances that the dredged material is not a carrier of contaminants, then testing is unnecessary. Project sediments are most likely not a carrier of contaminants because they are composed primarily of sand, gravel, or other naturally occurring inert material and if dredged materials are found in areas of high current or wave energy. Less than 5% of the material is fine-grained sediment.

NO TEST DETERMINATION: Based on the information provided, the PSET has determined that the transfer sites project areas do not require additional sediment physical or chemical evaluation per the CWA section 404(b)(1) guidelines. If the project changes or if additional information is available, then this “no test” determination must be re-evaluated, and sediment testing may be required. The PSET has assigned a “very low” site management area ranking to this project with this analysis being valid until March 2026, which aligns with the recency of the data collected by the Corps for the LCR FNC in 2016. If there are project changes or new information regarding sources of contamination are available, PSET would re-evaluate the suitability determination.

REVIEWING PSET AGENCIES: U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, Oregon Department of Environmental Quality, Washington Department of Ecology, U.S. Fish and Wildlife Service, National Marine Fisheries Service.

CONTACT: If you have questions regarding this PSET determination, please email or call me.

Take care,
-Bridgette
~~~~~~

Bridgette Lohrman | Ecologist | U.S. Environmental Protection Agency
Ocean Dumping Program | Oregon Operations Office | 805 SW Broadway, Suite 500 | Portland, OR 97205 | 503.326.4006 | lohrman.bridgette@epa.gov
~~~~~~

EPA-Region 10 Water Division, Wetlands and Oceans Section 08 May 2023

Memorandum for: U.S. Army Corps of Engineers – Portland District, Operations Division, Channels and Harbors, Waterways Maintenance Section (CENWP-ODN-W, Stokke), Oregon Slough Downstream Deep Draft Federal Navigation Channel (entrance to mile 1.5) in Portland, Multnomah County, Oregon.

Subject: Portland Sediment Evaluation Team (PSET) Level 2A dredged material suitability determination for the U.S. Army Corps of Engineers - Portland District's (USACE) operations and maintenance (O&M) dredging for the Oregon Slough Downstream (OSD) Deep Draft Federal Navigation Channel (FNC) in the Columbia River at river mile (RM) 102 to 104 (project mile entrance to 1.5).

Introduction: Per the May 2018 *Sediment Evaluation Framework for the Pacific Northwest* (SEF)[1], this suitability memorandum (SDM) documents the consensus of the PSET agencies regarding the suitability of the OSD deep draft FNC dredged material for unconfined, aquatic disposal and suitability of the post-dredge surface for unconfined, aquatic exposure. The PSET reviewed the April 2023 "*Sediment Characterization: Oregon Slough Downstream Deep-Draft Draft Channel, Columbia River Mile 102.5, Multnomah County, Oregon*" (SQER)[2] prepared by ANAMAR for the USACE's Sediment Quality Team (SQT). Sediment chemical testing results are summarized in the SQER; chemical analytical results were compared to the freshwater benthic toxicity screening levels (SEF SLs) published in the 2018 SEF. The PSET also used Oregon DEQ's sediment screening level value (SLV) for freshwater fish to evaluate PCBs[3].

Suitability Summary:

Dredge Prism (DP) Sediments: ☒Suitable ☐Unsuitable
Post-Dredge Surface (PDS): ☒Suitable ☐Unsuitable

[1] U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, Washington Department of Ecology, Washington Department of Natural Resources, Oregon Department of Environmental Quality, Idaho Department of Environmental Quality, National Marine Fisheries Service, and U.S. Fish and Wildlife Service. 2018. *Sediment Evaluation Framework for the Pacific Northwest*. Published May 2018, by the U.S. Army Corps of Engineers, Northwestern Division, 183 pp with Appendices.

[2] U.S. Army Corps of Engineers (USACE) – Portland District. 2023. *Sediment Characterization: Oregon Slough Downstream Deep-Draft Channel, Columbia River Mile 102.5, Multnomah County, Oregon*. Prepared by ANAMAR, April 2023. 25 pp with Maps, Tables, and Appendices.

[3] Oregon Department of Environmental Quality. 2007. *Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment*. Updated April 3, 2007 by ODEQ Environmental Cleanup Program, 18 pp with Appendices.

Reviewers: The PSET agencies include the USACE, U.S. Environmental Protection Agency – Region 10 (EPA), National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife (USFWS), Washington Department of Ecology (Ecology), and Oregon Department of Environmental Quality (ODEQ). Table 1 lists the PSET's review timeline for this project. Reviewers included:

☒ James Holm (USACE, Lead)
☒ Bridgette Lohrman (EPA, Co-Lead)
☒ Pete Anderson (ODEQ)
☒ Laura Inouye (Ecology)
☒ Dominic Yballe (USACE)
☒ Tom Hausmann (NMFS)
☒ Jeremy Buck (USFWS)
☒ Samantha Lynch (USACE)

PSET/SEF Conditions:

☒ Data Recency Expiration – Based on a "**Low**" rank, the data recency for sediments in the Oregon Slough Downstream Deep Draft Federal Navigation Channel expires in **November 2029**.

Table 1. Review Timeline

Draft Sampling and analysis plan (SAP) submitted to PSET	30 August 2022
SAP revisions requested by PSET	31 August 2022
Revised SAP submitted to PSET	31 August 2022
Revised SAP revisions requested by PSET	7 September 2022
Final SAP[4] submitted to PSET	13 September 2022
Final SAP approved by PSET[5]	19 September 2022
Sampling date(s)	14 November 2022
Draft SQER submitted to PSET	4 April 2023
Draft SQER edits requested by PSET	18 April 2023
Final SQER submitted to PSET	25 April 2023
Suitability Determination Memorandum (SDM) issued by PSET	08 May 2023
Management area ranking	Low
Recency of data	November 2029 (7 years)

Federal Regulatory Authorities:

☒ Section 10, Rivers and Harbors Act
☒ Section 404, Clean Water Act (CWA)
☒ Section 401, CWA
☒ Section 7, Endangered Species Act
☒ Section 305 of the Magnuson-Stevens Act
☒ Fish and Wildlife Coordination Act
☐ Section 103, Marine Protection, Research and Sanctuaries Act
☐ Comprehensive Environmental Response, Compensation, and Liability Act

[4] USACE – Portland District. 2022. *Oregon Slough Downstream Deep-Draft Channel, Columbia River Mile 102.5, Multnomah County, Oregon, Sediment Sampling and Analyses Plan.* Prepared by SQT, 13 September 2022. 16 pp with Attachments.

[5] Portland Sediment Evaluation Team (PSET). 2022. *PSET - Oregon Slough SAP Approval.* Email issued by B. Lohrman (EPA) for PSET, 19 September 2022. 2 pp with Attachment.

Project Description: Table 2 provides a summary of the dredging project details for the OSD deep draft FNC. Maintenance dredging is needed to provide navigation access.

Table 2. Project Details

Waterbody/river mile (RM)	Columbia River, 102 to 104
Total proposed dredging volume (cy)	~100,000 to 250,000
Max. proposed dredging depth (includes overdepth allowance)	-48 feet CRD (43+5 ft overdredge)
Dredging area (acres, approx.)	~125
Dredge dimensions	Triangular turning basin: ~1,000 ft. wide by 3,000 ft long; Deep draft channel: 400 ft wide by 1.5 miles
Dredging method	Pipeline, clamshell or hopper dredge
Dredged material transport	Barge, hopper
Proposed disposal location(s)	Columbia River flowlane
Proposed dredging date(s)	August 1 through December 15
Dredged material mgmt. units (DMMUs)	3

Sampling and Analysis Description: The USACE sampling and analytical program for the OSD deep draft FNC is summarized in Table 3. Actual grab sample station locations are shown in SQER Table 1 and Map 1 (SDM Figure 1).

Deviations from the SAP: One lab deviation from the PSET-approved SAP was identified in SQER Section 4.3.5, regarding the SVOCs.

In all three composite samples, bis(2-ethylhexyl) phthalate was L-qualified (QC recovery was off scale high and the concentration exceeded the linear range) and V-qualified (detected in the sample and blank). Benzoic acid was HP-qualified (the time between prep and analysis was outside the method specified hold time) and V-qualified. Di-n-butyl phthalate and phenol were V-qualified. Therefore, the USACE had frozen archive samples analyzed at ARI for bis(2-ethylhexyl) phthalate and benzoic acid. The ARI results were below SEF SLs for both analytes.

Table 3. Sampling and Analysis Description

Sample collection method		Standard Ponar		
DMMU IDs (location)		OSDS-1 (triangular turning basin)	OSDS-2 (mile 0+05 to 0+48)	OSDS-3 (mile 0+48 to 1+26)
DMMU Rank		Low		
Station/Sample ID		OSDS-1A, OSDS-1B, OSDS-1C, OSDS-1D	OSDS-2A, OSDS-2B, OSDS-2C, OSDS-2D	OSDS-3A, OSDS-3B, OSDS-3C, OSDS-3D
Composite Sample ID		1122-OSDS-1-COMP	1122-OSDS-2-COMP	1122-OSDS-3-COMP
DMMU volume (cy)		~100,000 to 250,000		
Dredge Prism	Mudline range (ft CRD)	-40.8 to -45.7	-36.2 to -45.5	-31.8 to -41.6
	Composite (Y/N)	Y	Y	Y
	Subsample /DMMU	4	4	4
	Subsample Archive (Y/N)	Y	Y	Y
PDS Layer	Depth range (ft CRD)	N/A	N/A	N/A
	Composite (Y/N)			
	Subsample /PDS			
	Subsample Archive (Y/N)			
Sediment Physical and Chemical Analysis (No. DP samples / No. PDS samples analyzed)				
Grain size		1/-	1/-	1/-
Total organic carbon		1/-	1/-	1/-
Total solids		1/-	1/-	1/-
Ammonia		1/-	1/-	1/-
Total sulfides		1/-	1/-	1/-
Metals, freshwater		1/-	1/-	1/-
PAHs		1/-	1/-	1/-
SVOCs (phthalates, phenols, misc. extractables)		1/-	1/-	1/-
Pesticides		1/-	1/-	1/-
PCBs (Total Aroclors)		1/-	1/-	1/-
Butyltins		1/-	1/-	1/-
TPH (diesel [dx], residual [rx] range)		1/-	1/-	1/-
Dioxin/Furans		-/-	-/-	-/-
Biological Analysis (No. DP samples / No. PDS samples analyzed)				
Freshwater Bioassays		-/-	-/-	-/-

Results and Discussion: Analytical results for the USACE sampling event are summarized in Table 4. The chemical analytical results were compared to the 2018 SEF freshwater SLs and to ODEQ’s fish based freshwater SLV (22 ug/kg) to evaluate PCBs (total Aroclors). There were no exceedances of ODEQ’s fish-based, freshwater bioaccumulative SLV (22 ug/kg) for total PCB Aroclors because all samples were between 5.75 and 8.81 ug/kg.

All analytes were detected below SEF freshwater SLs or were non-detections (U) with method reporting limits (MRLs) below SLs. The composite samples consisted of 73 to 82% sand and 18 to 27% fines with trace gravel (<0.4%). The total organic carbon (TOC) ranged from 0.62 to 1.27%. Total solids ranged from 60.7 to 63.8%.

Site Ranking: Based on the results, the PSET confirms a “low” rank to the Oregon Slough Downstream deep draft sediments.

PSET Suitability Determination:
Dredge Prism – Chemical concentrations in OSD dredge prisms are below the SEF freshwater SLs and ODEQ SLV as discussed above. As such, the **OSD deep draft FNC dredged prism material** is **suitable for unconfined, aquatic disposal** per the 2018 SEF guidance without additional testing.

Post-Dredge Surface – Based on a “Low” rank and multiple rounds of suitable sediments, the post-dredge surfaces are expected to be of similar quality to the dredge prisms. As such, the **OSD deep draft FNC post-dredge surfaces** are **suitable for unconfined, aquatic exposure** per the 2018 SEF guidance without additional testing.

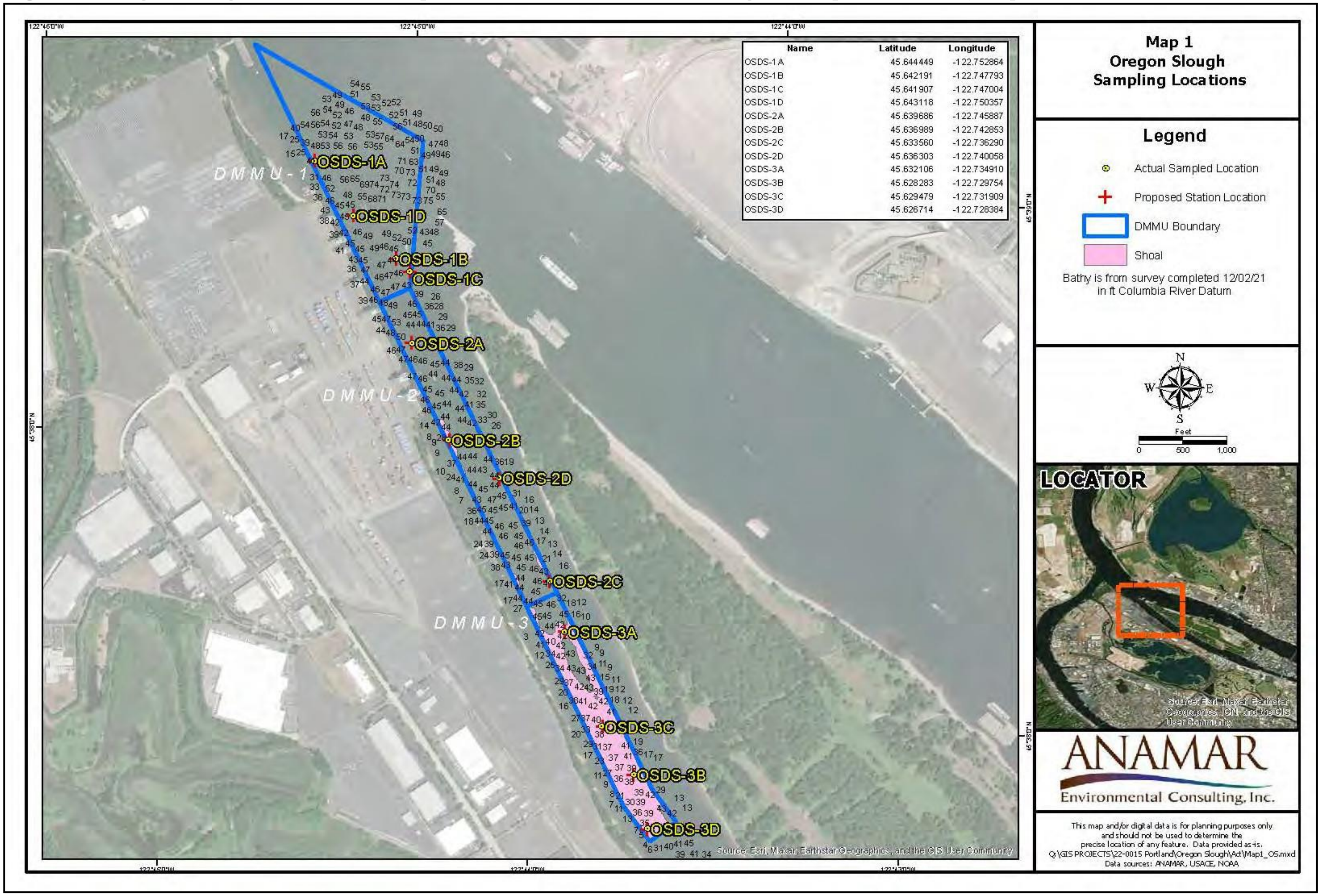
Contact: This memorandum was prepared by Bridgette Lohrman (PSET co-lead) and James Holm (PSET Lead, USACE) and reviewed by the participating PSET agencies, identified above. Questions regarding this memorandum should be directed to Bridgette Lohrman at (503) 326-4006 or e-mail to: lohrman.bridgette@epa.gov.

Table 4. Project Sediment Analytical Summary – Dredge Prism (sampled November 2022)

Sediment Physical and Chemical Results				
Composite Sample ID: Parameter	1122-OSDS-1-COMP	1122-OSDS-2-COMP	1122-OSDS-3-COMP	SEF SL1, freshwater (SLV†)
Grain size: gravel, sand, silt + clay (%)	0.4, 81.4, 18.2	0.2, 72.8, 26.9	0.1, 81.8, 18.0	--
Total Solids (%)	60.7	61.9	63.8	--
Total Organic Carbon (%)	1.27	0.98	0.62	--
Ammonia (mg/kg)	72.8	78.8	51.5	230
Total Sulfides (mg/kg)	0.54 U	0.68 U	0.37 U	39
Metals (mg/kg)	Non-detect, Detect <SLs U, J, V	Non-detect, Detect <SLs U, J, V	Non-detect, Detect <SLs U, J, V	Varies
Total PAHs (ug/kg)	31.7 J	27.8 J	17.6 J	17,000
SVOCs (ug/kg) (phenols, phthalates, misc. extractables)	Non-detect, Detect <SLs U, J, V, C+	Non-detect, Detect <SLs U, J, V, C+	Non-detect, Detect <SLs U, J, V, C+	Varies
Pesticides (ug/kg)	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	Varies
2,4’+4,4’-DDD	1.65 HP, U	1.62 HP, U	1.57 HP, U	310
2,4’+4,4’-DDE	1.05 J	0.60 J, P	1.57 HP, U	21
2,4’+4,4’-DDT	1.65 HP, U	1.62 HP, U	1.57 HP, U	100
PCBs, Total Aroclors (ug/kg)	5.75 C	8.81 C	7.23 C	110 (22†)
Butyltins (ug/kg)	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	Varies
TPH (dx/rx) (ug/kg)	25 U / 15.8 J	25 U / 21.7 J	25 U / 25 U	340 / 3,600

U = Non-detection (ND) at the method reporting limit (MRL) or method detection limit (MDL), MRL reported (MDL in parenthesis); J = Estimated value between MDL and MRL; V = analyte detected is sample and blank; HP = time between prep and analysis was outside the method holding time; P = difference between GC column results greater than method requirement - higher result reported; C = associated calibration QC is outside the established QC criteria for accuracy; C+ = associated calibration QC is outside the established QC criteria for accuracy - no hit in sample - data not affected and acceptable to report; † = ODEQ (2007) freshwater fish-based bioaccumulation screening level value.

Figure 1. Oregon Slough Downstream deep draft FNC DMMUs and actual grab sample locations (sampled 14 November 2022).



Name	Latitude	Longitude
OSDS-1A	45.644449	-122.752864
OSDS-1B	45.642191	-122.747793
OSDS-1C	45.641907	-122.747004
OSDS-1D	45.643118	-122.750357
OSDS-2A	45.639686	-122.745887
OSDS-2B	45.636989	-122.742853
OSDS-2C	45.633560	-122.736290
OSDS-2D	45.636303	-122.740058
OSDS-3A	45.632106	-122.734910
OSDS-3B	45.628283	-122.729754
OSDS-3C	45.629479	-122.731909
OSDS-3D	45.626714	-122.728384

EPA-Region 10 Water Division, Wetlands and Oceans Section 17 April 2019

Memorandum for: U.S. Army Corps of Engineers – Portland District, Operations Division, Channels and Harbors, Waterways Maintenance Section (CENWP-ODN-W, Stokke), Vancouver to The Dalles Federal Navigation Channel

Subject: Portland Sediment Evaluation Team (PSET) Level 2A dredged material suitability determination for the U.S. Army Corps of Engineers - Portland District's (Corps) operations and maintenance (O&M) dredging for the Vancouver to The Dalles Federal Navigation Channel (VTD FNC) in the Columbia River from river mile (RM) 106 to 192.5.

Introduction: Per the *Sediment Evaluation Framework for the Pacific Northwest* (SEF)[1], this suitability memorandum (SDM) documents the consensus of the PSET agencies regarding the suitability of the dredged material for unconfined, aquatic disposal. The PSET reviewed the Corps' 20 March 2019 "Sediment Quality Evaluation Report: Vancouver to The Dalles Federal Navigation Channel" (SQER)[2], prepared by Corps' Sediment Quality Team (SQT). Sediment testing consisted of physical analysis of sediments to confirm very low rank. If the sediment testing did not confirm a "very low rank", additional testing would be pursued.

Suitability Summary:

Surface Sediments:	☒Suitable	☐Unsuitable
Post-Dredge Surface (PDS):	☒Suitable	☐Unsuitable

Reviewers: The PSET agencies include the Corps, U.S. Environmental Protection Agency – Region 10 (EPA), National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife (USFWS), Washington Department of Ecology (Ecology), and Oregon Department of Environmental Quality (ODEQ). Table 1 lists the PSET's review timeline for this project. Reviewers included:

☒James Holm (Corps, Lead) ☒ Bridgette Lohrman (EPA, Co-Lead)
☒Pete Anderson (ODEQ) ☒Laura Inouye (Ecology) ☒ Dominic Yballe (Corps)
☒Tom Hausmann (NMFS) ☒ Jeremy Buck (USFWS)

PSET/SEF Condition:

☒ Data Recency Expiration – The data recency of this SDM expires for the VTD FNC in January 2029.

---

[1] U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, Washington Department of Ecology, Washington Department of Natural Resources, Oregon Department of Environmental Quality, Idaho Department of Environmental Quality, National Marine Fisheries Service, and U.S. Fish and Wildlife Service. 2018. *Sediment Evaluation Framework for the Pacific Northwest*. Published May 2018, by the U.S. Army Corps of Engineers, Northwestern Division, 278 pp with Appendices.

[2] U.S. Army Corps of Engineers – Portland District. 2019. Sediment Quality Evaluation Report – Vancouver to the Dalles Federal Navigation Channel. Prepared by the Portland District Sediment Quality Team, 20 March 2019. 22 pp

Table 1. PSET Review Timeline

Sampling and analysis plan (SAP) received	18 December 2018
SAP Approval	27 December 2018[3]
Sampling date(s)	10 January 2019
SQER received by PSET	25 March 2019
Suitability Determination Memo issued	17 April 2019
Management area ranking	Very Low
Recency of data*	January 2029 (10 years)

* If site conditions or the proposed project change, or if new information related contaminants of concerns are discovered, additional project coordination with PSET may be required to determine the validity of this SDM.

Federal Regulatory Authorities:

☒ Section 10, Rivers and Harbors Act
☒ Section 404, Clean Water Act (CWA)
☒ Section 401, CWA
☒ Section 7, Endangered Species Act
☒ Section 305 of the Magnuson-Stevens Act
☒ Fish and Wildlife Coordination Act
☐ Section 103, Marine Protection, Research and Sanctuaries Act
☐ Comprehensive Environmental Response, Compensation, and Liability Act

Project Description: Table 2 summarizes the O&M dredging program details for the VTD FNC project. Dredging is needed to provide reliable commercial and recreational navigation.

Table 2. Project Details

Waterbody / river miles (RMs)	Columbia River (106-192.5)
Dredged volume (cy)	~406,960 (2019 volume for RM 106-136; dredged annually)
Channel dimensions	300 ft wide by 84.5 miles long
Dredge area	~1,090 acres
Max. proposed dredging depth + advanced maintenance depth	-27 ft Columbia River Datum (CRD) (authorized); Maintained to -19 ft CRD (-17+2)
Dredging method	Hopper dredge
Dredged material transport	Hopper dredge
Disposal locations	In-water placement in off-channel areas
Dredging dates	Typically June through December
Dredged material management units (DMMUs): No. of stations	DMMU 1: 4 grabs, 1 composite sample DMMU 2: 5 grabs, 1 composite sample DMMU 3: 2 grabs, 1 composite sample

Sampling and Analysis Description: The Corps' sampling and analytical program for the VTD FNC is summarized in Table 3. Actual sample station locations are shown in SQER Table 3 and Figures 2, 3, and 4.

[3] Portland Sediment Evaluation Team (PSET). 2018. [E-mail correspondence] PSET – SAP Approval for LCR FNC and RSM Dredging. *Bridgette Lohrman*. 27 December 2018. 2 pages.

Table 3. Project Sampling and Analysis Description

Sampling Description				
Sample collection methods		Double van Veen grab sampler		
DMMU ID		VTD-01	VTD-02	VTD-03
Proposed DMMU volume (cy)		~122,467	~258,049	~26,444
Subsamples per DMMU		4	5	2
Dredge Prism	Depth range (ft. CRD)	-5.8 to -21.7	-13.4 to -20.5	-13.8 to -18.7
	Composite (Y/N)	Y	Y	Y
	SS archive (Y/N)	N	N	N
	Composite archive (Y/N)	N	N	N
PDS		Not proposed		
Sediment Analytical Parameters (No. Analyses by DMMU)				
Grain Size		1 (triplicate analysis)	1	1
Total Solids		1	1	1
Total Organic Carbon		1	1	1

Deviations from the SAP: There were two minor deviations from the sampling and analysis plan. These minor deviations do not affect the sediment suitability.

- Samples were collected using a double van Veen grab sampler provided by the contractor instead of the Grey-O'hara box corer.
- Five of the 11 stations were deeper than the proposed dredge prism (-19 ft. CRD) as listed in SQER Table 3; however, at least two samples in each DMMU are representative of the dredge prism. Surficial sediments within the VTD FNC are consistently dominated by coarse-grain particles.

Results and Discussion: Analytical results for the Corps' sampling event are summarized in Table 4. Sediment testing consisted of physical analysis of sediments to confirm a very low rank (minimum 80% sand, less than 0.5% total organic carbon (TOC)). As expected, the sampling results confirmed a "very low rank", therefore, analytical chemistry testing was not triggered.

Table 4. Sediment Analytical Summary

<table>
<tr><td colspan="4">Sediment Physical and Conventional Results – Dredge Prism</td></tr>
<tr><td>Sample ID:</td><td>011019VTD-COMP01</td><td>011019VTD-COMP02</td><td>011019VTD-COMP03</td></tr>
<tr><td>DMMU ID:
Parameter</td><td>DMMU 1
(triplicate analysis)</td><td>DMMU 2</td><td>DMMU 3</td></tr>
<tr><td>Total Organic Carbon (%)</td><td>0.04</td><td>0.16</td><td>0.03</td></tr>
<tr><td rowspan="3">Total Solids (%)</td><td>85.3</td><td rowspan="3">73.2</td><td rowspan="3">74.2</td></tr>
<tr><td>85.4</td></tr>
<tr><td>76.7</td></tr>
<tr><td rowspan="3">Gravel (%)</td><td>17.7</td><td rowspan="3">0.1</td><td rowspan="3">0.2</td></tr>
<tr><td>17.4</td></tr>
<tr><td>20.8</td></tr>
<tr><td rowspan="3">Sand (%)</td><td>81.2</td><td rowspan="3">98.0</td><td rowspan="3">99.6</td></tr>
<tr><td>81.2</td></tr>
<tr><td>76.7</td></tr>
<tr><td rowspan="3">Fines (%), silt + clays</td><td>1.1</td><td rowspan="3">1.9</td><td rowspan="3">0.1</td></tr>
<tr><td>1.4</td></tr>
<tr><td>2.5</td></tr>
</table>

PSET Suitability Determination:

Dredge Prism

The VTD FNC maintains a “very low” management area rank because the project sediments are still dominated by coarse sands and gravels (>98%) with low total organic carbon content (<0.2%) in strong river and tidal currents. The **VTD FNC dredge prism material** is **suitable** for **unconfined, aquatic disposal** without further testing per the 2018 SEF guidance.

Post-Dredge Surface

Based on a “very low” management area rank and confirmed coarse grain size with low total organic carbon for the dredge prism, chemical testing of the post-dredge surface sediments is not required. The **VTD FNC post-dredge surface** is **suitable** for **unconfined, aquatic exposure** without further testing per the 2018 SEF guidance.

Contact: This memorandum was prepared by Bridgette Lohrman (EPA, PSET Co-Lead), James Holm (USACE, PSET Lead) and reviewed by the participating PSET agencies, identified above. Questions regarding this memorandum should be directed to Bridgette Lohrman at (503) 326-4006 or e-mail to: lohrman.bridgette@epa.gov.

EPA-Region 10 Water Division, Wetlands and Oceans Section 17 March 2021

Memorandum for: U.S. Army Corps of Engineers – Portland District, Operations Division, Channels and Harbors, Waterways Maintenance Section (CENWP-ODN-W, Groth), Skipanon River Federal Navigation Channel (Mile 0.0 to 2.0), near Warrenton, Clatsop County, Oregon.

Subject: Portland Sediment Evaluation Team (PSET) Level 2A dredged material suitability determination for the U.S. Army Corps of Engineers - Portland District's (Corps) operations and maintenance (O&M) dredging for the Skipanon River (SKIP) Federal Navigation Channel (FNC) at river mile (RM) 10.7 of the Columbia River.

Introduction: Per the May 2018 *Sediment Evaluation Framework for the Pacific Northwest* (SEF)[1], this suitability memorandum (SDM) documents the consensus of the PSET agencies regarding the suitability of the SKIP FNC dredged material for unconfined, aquatic disposal and suitability of the post-dredge surface for unconfined, aquatic exposure. The PSET reviewed the February 2021 "*Sediment Characterization: Skipanon Channel Federal Navigation Project, Skipanon River Miles 0.0 to 2.0, Clatsop County, Oregon*" (SQER)[2], prepared by ANAMAR for the Corps' Sediment Quality Team (SQT). Sediment chemical testing results are summarized in the SQER; chemical analytical results were compared to the marine benthic toxicity screening levels (SEF SLs) published in the 2018 SEF. The PSET also used Oregon DEQ's sediment screening level value (SLV) for marine fish to evaluate PCBs[3].

Suitability Summary:
Dredge Prism (DP) Sediments:
☒Suitable ☐Unsuitable
Post-Dredge Surface (PDS):
☒Suitable ☒Unsuitable (DMMU SKIP-04-Z, -17 to -19 ft MLLW)

Reviewers: The PSET agencies include the Corps, U.S. Environmental Protection Agency – Region 10 (EPA), National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife (USFWS), Washington Department of Ecology (Ecology), and Oregon Department of Environmental Quality (ODEQ). Table 1 lists the PSET's review timeline for this project. Reviewers included:

☒ James Holm (Corps, Lead) ☒ Bridgette Lohrman (EPA, Co-Lead)
☒ Pete Anderson (ODEQ) ☒ Laura Inouye (Ecology) ☒ Dominic Yballe (Corps)
☒ Tom Hausmann (NMFS) ☒ Jeremy Buck (USFWS)

---

[1] U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, Washington Department of Ecology, Washington Department of Natural Resources, Oregon Department of Environmental Quality, Idaho Department of Environmental Quality, National Marine Fisheries Service, and U.S. Fish and Wildlife Service. 2018. *Sediment Evaluation Framework for the Pacific Northwest*. Published May 2018, by the U.S. Army Corps of Engineers, Northwestern Division, 183 pp with Appendices.

[2] U.S. Army Corps of Engineers – Portland District. 2021. *Sediment Characterization: Skipanon Channel Federal Navigation Project, Skipanon River Miles 0.0 to 2.0, Clatsop County, Oregon*. Prepared by ANAMAR, February 2021. 23 pp with Maps, Tables, and Appendices.

[3] Oregon Department of Environmental Quality. 2007. *Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment*. Updated April 3, 2007 by ODEQ Environmental Cleanup Program, 18 pp with Appendices.

PSET/SEF Conditions:

☒ Data Recency Expiration:

- Based on a "**Moderate**" rank, the data recency for **DMMUs 2, 3, 4, and 5** in the **Skipanon FNC** expires in **September 2025**.
- Based on a "**Low**" rank, the data recency for **DMMUs 1 and 6789** in the **Skipanon FNC** expires in **September 2027**.

☒ **Biological testing** per the 2018 SEF is required for the **post-dredge surface in DMMU 4** to assess the suitability of these sediments for unconfined, aquatic exposure. If biological testing is not performed or if biological tests fail, then the following is required:

- **Upland disposal** of post-dredge surface sediments (-17 to -19 feet MLLW) from **DMMU 4** with full characterization of underlying sediments and/or placement of 12 inches of sand; or
- **Post-dredge surface management** in **DMMU 4** in coordination with PSET. Post-dredge surface management may include one or more of the following:
  - Under dredging to -15 feet MLLW or shallower;
  - Post-dredge sampling for pesticides;
  - Placement of 12 inches of sand; and/or
  - Monitored natural recovery.

Table 1. Review Timeline

Draft Sampling and analysis plan (SAP)[4] submitted to PSET	24 August 2020
SAP approved by PSET[5]	4 September 2020
Sampling date(s)	8 and 9 September 2020
Draft SQER submitted to PSET	11 December 2020
SQER revisions requested by PSET	14, 16 December 2020
Core correction discussion	23 December 2020
SQER revisions requested by PSET	6 January 2021
Corps submits re-analysis results	9 February 2021
Final SQER submitted to PSET	25 February 2021
Suitability Determination Memorandum (SDM) issued by PSET	17 March 2021
Management area ranking	Moderate – DMMUs 2-5 Low – DMMUs 1 & 6789*
Recency of data	DMMUs 2-5 – September 2025 DMMUs 1 & 6789* – September 2027

* - Naming convention for DMMU "6789" represents DMMUs 6 through 9 sampled in 2014.

Federal Regulatory Authorities:

☒ Section 10, Rivers and Harbors Act

☒ Section 404, Clean Water Act (CWA)

☒ Section 401, CWA

---

[4] U.S. Army Corps of Engineers. 2020. *Skipanon Channel Federal Navigation Project, Skipanon River, Miles 0.0 to 2.0, Clatsop County, Oregon, Sediment Sampling and Analysis Plan.* Prepared by Corps SQT, 24 August 2020. 21 pp with Attachments.

[5] Portland Sediment Evaluation Team (PSET). 2020. [E-mail correspondence] *PSET – Skipanon FNC SAP Approval*. Bridgette Lohrman, EPA, sent 4 September 2021. 3 pp.

☒ Section 7, Endangered Species Act
☒ Section 305 of the Magnuson-Stevens Act
☒ Fish and Wildlife Coordination Act
☐ Section 103, Marine Protection, Research and Sanctuaries Act
☐ Comprehensive Environmental Response, Compensation, and Liability Act

Project Description: Table 2 provides a summary of the dredging project details for the SKIP FNC. Maintenance dredging is needed to provide reliable navigation access.

Table 2. Project Details

Waterbody/river mile (RM)	Skipanon River / 0.0 to 2.0 (Enters the Columbia River at RM 10.7)
Total proposed dredging volume (cy)	~160,000 (range: 65,000 to 355,000)
Max. proposed dredging depth (includes overdepth allowance)	-17 feet MLLW (-16 + 1 ft)
Dredge dimensions	Channel: 2.0 miles long by 200 feet wide with a turning basin from RM 1.5 to 1.8 that is 220 to 480 feet wide
Dredging method	Pipeline, clamshell, or hopper
Dredged material transport	Barge, hopper, or pipeline
Proposed disposal location(s)	Columbia River flowlane
Proposed dredging date(s)	Typically August through December
Dredged material mgmt. units (DMMUs) / stations	6 / 2 per DMMU

Sampling and Analysis Description: The Corps' sampling and analytical program for the SKIP FNC is summarized in Table 3. Actual sample station locations are shown in the SQER Table 1 and Map 1 (SDM Figure 1) with full delineation of all DMMUs in Figures 3 and 4 of SAP.

Deviations from the SAP: Deviations from the PSET-approved SAP are listed in SQER section 3.1 and noted in SQER Tables 1 (core summary). Deviations included the following:

1. Core station VC-04 for DMMU SKIP-02 was relocated to avoid rocks (potentially rip rap) that caused shallow refusal. The Corps was only able to penetrate to -18 feet MLLW, one foot short of the full Z-layer interval (-17 to -19 ft MLLW).
2. Seven cores (VC-06 to VC-12) were over-penetrated by 1 to 4 feet to improve retention of the soft silty surface layer and minimize sample loss from the bottom of the core sampler. Consolidated sediments at depth prevented sample loss. The over-penetrated section of the core was discarded after completing the linear core compaction correction. See SQER section 2.2.2 (Vibracore Sampling Methods) and SQER Exhibit 2-3.
3. Low percent core recovery (<75%) occurred on multiple core attempts at core stations VC-02, VC-04, VC-05, VC-06, VC-07, VC-08, VC-09, VC-11, and VC-12 as shown in SQER Table 1. The field team processed the core with highest recovery.

Table 3. Sampling and Analysis Description

Sample collection method		Vibracore					
DMMU ID		SKIP-01	SKIP-02	SKIP-03	SKIP-04	SKIP-05	SKIP-6789
Project mile		1+50 to 2+00	1+40 to 1+50	1+37 to 1+40	1+32 to 1+37	1+30 to 1+32	0+00 to 1+30
DMMMU volume (CY)		~50,000	~20,000	~17,000	~22,000	~14,000	~37,000
DMMU rank		Low	Moderate	Moderate	Moderate	Moderate	Low
DP composite sample ID (mudline to -17 ft MLLW)		SKIP-01-COMP	SKIP-02-COMP	SKIP-03-COMP	SKIP-04-COMP	SKIP-05-COMP	SKIP-6789-COMP
PDS composite sample ID (-17 to -19 ft MLLW)		SKIP-01-COMP-Z	SKIP-02-COMP-Z	SKIP-03-COMP-Z	SKIP-04-COMP-Z	SKIP-05-COMP-Z	SKIP-6789-COMP-Z
Dredge Prism	Depth range (ft MLLW)	-6.4, -7.2 to -17	-7.4, -8.5 to -17	-12.3, -13.0 to -17	-12.0, -12.6 to -17	-12.1, -15.3 to -17	-14.6, -15.0 to -17
	Composite (Y/N)	Y	Y	Y	Y	Y	Y
	Subsamples /DMMU	2	2	2	2	2	2
	Subsample Archive (Y/N)	Y	Y	Y	Y	Y	Y
PDS Layer	Depth range (ft MLLW)	-17 to -19	-17 to -19, -17 to -18^	-17 to -19	-17 to -19	-17 to -19	-17 to -19
	Composite (Y/N)	Y	Y	Y	Y	Y	Y
	Subsample /PDS-layer	2	2	2	2	2	2
	Subsample Archive (Y/N)	Y	Y	Y	Y	Y	Y
Sediment Physical and Chemical Analysis per DMMU (No. DP/ No. PDS)							
Grain size		1/1	1/1	1/1	1/1	1/1	1/1
Total organic carbon		1/1	1/1	1/1	1/1	1/1	1/1
Total solids		1/1	1/1	1/1	1/1	1/1	1/1
Ammonia		1/1	1/1	1/1	1/1	1/1	1/1
Total sulfides		1/1	1/1	1/1	1/1	1/1	1/1
Metals, marine		1/1	1/1	1/1	1/1	1/1	1/1
PAHs		1/1	1/1	1/1	1/1	1/1	1/1
SVOCs (chlorinated hydrocarbons, phthalates, phenols, misc. extractables)		1/1	1/1	1/1	1/1	1/1	1/1
Pesticides		1/1	1/1	1/1	1/1	1/1	1/1
PCBs (Total Aroclors)		1/1	1/1	1/1	1/1	1/1	1/1
Tributyltin		1/1	1/1	1/1	1/1	1/1	1/1
Dioxin/Furans		-/-	-/-	-/-	-/-	-/-	-/-

^ = refusal meet, 1-ft Z-layer sample collected

Results and Discussion: Dredge prism analytical results for the Corps' sampling event are summarized in Table 4. Post-dredge surface analytical results for the Corps' sampling event are summarized in Table 5. The chemical analytical results from the SQER were compared to the 2018 SEF marine SLs and to ODEQ's SLV for marine fish (47 ug/kg) to evaluate PCBs.

The dredge prism sediments are predominantly silt (77-86%) with some clay (12-20%) and minor amounts of sand and gravels (<3%). Total organic carbon (TOC) in the dredge prism sediments ranged from 2.14 to 2.79%. Total solids in the dredge prism sediments ranged from 35 to 42%.

In all dredge prism composite samples, no parameters had detections, estimated concentrations (J) or non-detections (U) with elevated detections or reporting limits above SEF marine SLs or the ODEQ SLV for PCB Aroclors.

The post-dredge surface sediments are predominantly silt (56-79%) with clay (15-42%) and lesser amounts of sand and gravels (2 to 29%). Total organic carbon (TOC) in the post-dredge surface sediments ranged from 1.66 to 3.13%. Total solids in the dredge prism sediments ranged from 44 to 52%.

In the post-dredge surface composite sample for DMMU 4 (SKIP-04-COMP-Z), 4,4'-DDD was detected at a concentration of 48.2 ug/kg which exceeds the SEF marine SL of 16 ug/kg. In the 2014 dredged material evaluation, 4,4'-DDD was also detected at a concentration of 19 ug/kg in the post-dredge surface layer of DMMU 4. Based on the continued presence of elevated DDD concentrations, the post-dredge surface is not suitable for unconfined aquatic exposure without further testing. If testing is not conducted or fails, management of the post-dredge surface in DMMU 4 is required. The Corps may choose upland disposal of the post-dredge surface sediments and conduct post-dredge sampling for pesticides to inform placement of a 12-inch sand layer. The Corps shall prepare a dredging and disposal quality control plan for the project and coordinate with PSET for implementation prior to dredging DMMU 4.

N-nitrosodiphenylamine was detected in 3 PDS samples (1Z, 3Z, and 4Z). However, the concentration only minimally exceeded the SEF marine SL (28 ug/kg) in the 1Z (29 ug/kg) and 4Z (30 ug/kg) samples. The sample 3Z concentration of 17 ug/kg is below the SEF SL. To confirm the concentration in the post-dredge surface of DMMU 1, the Corps re-analyzed the initial composite sample twice and an archived jar of the composite sample. All three re-analyses were non-detections for n-nitrosodiphenylamine with a sufficiently low MRL (5.0 ug/kg) below the SEF SL. There is "no reason to believe" that n-nitrosodiphenylamine is present in the post-dredge surface sediments in DMMU 1 at concentrations exceeding the SEF SL.

No other parameters had detections, estimated concentrations (J) or non-detections (U) with elevated detections limits above SEF marine SLs or ODEQ SLV for PCB Aroclors.

PSET Suitability Determination:
Dredge Prism – Chemical concentrations in all dredge prism samples were below the SEF marine SLs and ODEQ SLV as discussed above. As such, the **Skipanon FNC dredged prism**

material is **suitable for unconfined, aquatic disposal** per the 2018 SEF guidance without additional testing.

<u>Post-Dredge Surface</u> – Chemical concentrations in five of the six post-dredge surface samples were below the SEF marine SLs and ODEQ SLV as discussed above. As such, the **Skipanon FNC post-dredge surfaces**, **excluding DMMU 4**, are **suitable for unconfined, aquatic exposure** per the 2018 SEF guidance without additional testing.

The post-dredge surface (-17 to -19 ft MLLW) in DMMU 4 has elevated n-nitrosodiphenylamine and 4,4'-DDD above SEF marine SLs. Therefore, the **DMMU 4 post-dredge surface** is **not suitable** for **unconfined, aquatic exposure** without biological testing per the 2018 SEF. If additional testing is not completed or fails, management of the post-dredge surface is required in coordination with the PSET.

Contact: This memorandum was prepared by Bridgette Lohrman (PSET co-lead) and James Holm (PSET Lead, Corps) and reviewed by the participating PSET agencies, identified above. Questions regarding this memorandum should be directed to Bridgette Lohrman at (503) 326-4006 or e-mail to: lohrman.bridgette@epa.gov.

Table 4. Project Sediment Analytical Summary – Dredge Prism

Dredge Prism Sediment Physical and Chemical Results							
Decision unit/Sample ID: **Parameter**	Mile 1+50 to 2+00 / **SKIP-01-COMP**	Mile 1+40 to 1+50 / **SKIP-02-COMP**	Mile 1+37 to 1+40 / **SKIP-03-COMP**	Mile 1+32 to 1+37 / **SKIP-04-COMP**	Mile 1+30 to 1+32 / **SKIP-05-COMP**	Mile 0+00 to 1+30 / **SKIP-6789-COMP**	**SEF SL1 marine (SLV)**
Grain size: gravel, sand, silt, clay (%)	0.3, 1.5, 86.0, 12.5	0.3, 2.3, 84.8, 12.9	0.3, 2.0, 82.4, 15.5	0.3, 1.6, 79.8, 18.6	0.3, 2.2, 79.2, 18.7	0.5, 3.1, 76.9, 19.8	--
Total Solids (%)	39.41	42.42	35.09	39.59	38.8	40.01	--
Total Organic Carbon (%)	2.76	2.14	2.79	2.5	2.53	2.22	--
Ammonia (mg/kg)	344	281	278	300	255	205	--
Total Sulfides (mg/kg)	2,940	2,710	2,720	2,610	2,030	2,080	--
Metals (mg/kg)	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	varies
PAHs (ug/kg)	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	varies
LPAHs (ug/kg)	13 J	32 J	7.7 J	22 J	8.6 J	20 U	5,200
HPAHs (ug/kg)	248 J	329 J	129 J	200 J	152 J	89 J	12,000
SVOCs (ug/kg) (phenols, chlorinated hydrocarbons, misc. extractables)	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	varies
N-nitrosodiphenylamine	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	28
Pesticides (ug/kg)	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	varies
4,4’-DDD	4.20	2.86	2.69	4.00	3.91	2.12 J	16
4,4’-DDE	2.99	2.22	3.31	1.75	1.81	1.43	9
4,4’-DDT	0.99 U	1.0 U	1.0 U	1.0 U	1.02 U	1.0 U	12
PCBs, Total Aroclors (ug/kg)	27.8 J	16.7	17.9	20.5	12.9 J	11.2 J	130 (47†)
Tributyltin (ug/kg)	1.5 J	1.8 J	1.6 J	1.8 J	0.83 J	0.85 J	73

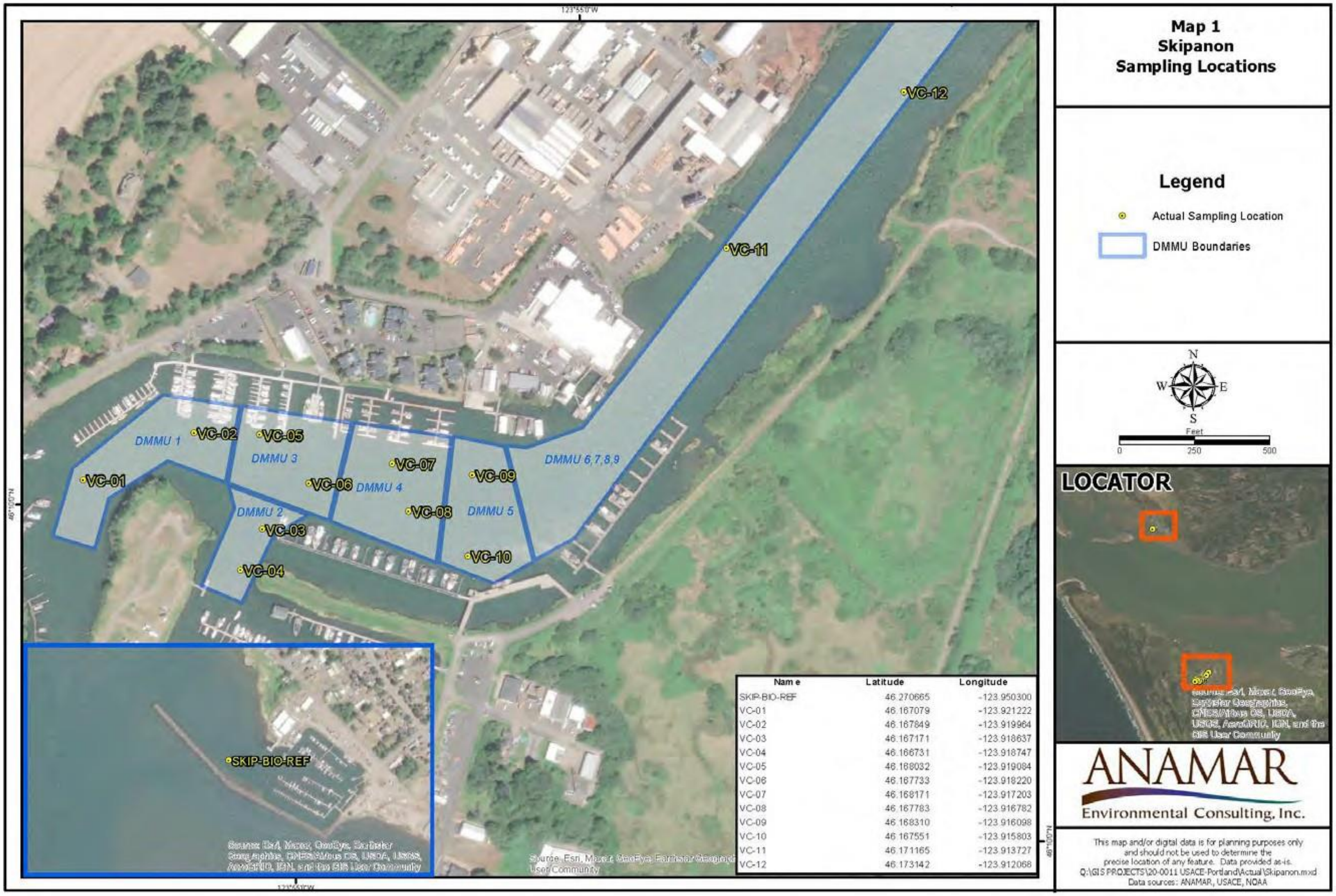
BOLD = Detection exceeds SEF marine screening level (SL); U = Non-detection (ND) at the method reporting limit (MRL) or method detection limit (MDL), MRL reported; J = Estimated value between MDL and MRL; † = ODEQ (2007) Marine fish-based bioaccumulation screening level value.

Table 5. Project Sediment Analytical Summary – Post-Dredge Surface

Post-Dredge Surface Sediment Physical and Chemical Results							
Decision unit/Sample ID: **Parameter**	Mile 1+50 to 2+00 / **SKIP-01-COMP-Z**	Mile 1+40 to 1+50 / **SKIP-02-COMP-Z**	Mile 1+37 to 1+40 / **SKIP-03-COMP-Z**	Mile 1+32 to 1+37 / **SKIP-04-COMP-Z**	Mile 1+30 to 1+32 / **SKIP-05-COMP-Z**	Mile 0+00 to 1+30 / **SKIP-6789-COMP-Z**	**SEF SL1 marine (SLV)**
Grain size: gravel, sand, silt, clay (%)	0.3, 1.3, 57.0, 41.8	0.7, 28.0, 56.3, 15.0	0.9, 1.3, 79.1, 19.2	0.3, 1.4, 74.8, 24.0	0.3, 3.3, 78.0, 18.7	0.3, 2.9, 77.0, 20.0	--
Total Solids (%)	48.05	52.33	45.12	44.96	44.35	44.17	--
Total Organic Carbon (%)	3.13	1.66	2.62	2.73	2.36	2.22	--
Ammonia (mg/kg)	707	257	463	630	457	409	--
Total Sulfides (mg/kg)	1,150	1,660	2,830	2,080	2,060	1,930	--
Metals (mg/kg)	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	varies
PAHs (ug/kg)	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	varies
LPAHs (ug/kg)	151 J	159 J	102 J	107 J	16 J	9.5 J	5,200
HPAHs (ug/kg)	1,271 J	485 J	532 J	700 J	258 J	147 J	12,000
SVOCs (ug/kg) (phenols, chlorinated hydrocarbons, misc. extractables)	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	varies
N-nitrosodiphenylamine Re-analysis in triplicate	**29** 5.0 U	5.0 U	17	**30**	5.0 U	5.0 U	28
Pesticides (ug/kg)	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	varies
4,4'-DDD	15.8	3.32	15.3	**48.2**	11.6	2.32 J	16
4,4'-DDE	2.11	1.64	3.38	3.37	2.71	1.73	9
4,4'-DDT	1.0 U	1.0 U	1.0 U	0.99 U	1.0 U	0.99 U	12
PCBs, Total Aroclors (ug/kg)	23.8	24.8	33.3 J	28.9 J	37.1 J	11.3 J	130 (47†)
Tributyltin (ug/kg)	3.8 U	1.2 J	1.2 J	0.49 J	0.78 J	0.76 J	73

BOLD = Detection exceeds SEF marine screening level (SL); U = Non-detection (ND) at the method reporting limit (MRL) or method detection limit (MDL), MRL reported; J = Estimated value between MDL and MRL; † = ODEQ (2007) Marine fish-based bioaccumulation screening level value.

Figure 1. Skipanon River Federal Navigation Channel, actual sample locations and DMMUs (sampled 8-9 September 2020).



Name	Latitude	Longitude
SKIP-BIO-REF	46.270665	-123.950300
VC-01	46.167079	-123.921222
VC-02	46.167849	-123.919964
VC-03	46.167171	-123.918637
VC-04	46.166731	-123.918747
VC-05	46.168032	-123.919084
VC-06	46.167733	-123.918220
VC-07	46.168171	-123.917203
VC-08	46.167783	-123.916782
VC-09	46.168310	-123.916098
VC-10	46.167551	-123.915803
VC-11	46.171165	-123.913727
VC-12	46.173142	-123.912068

EPA-Region 10 Water Division, Wetlands and Oceans Section 11 January 2021

Memorandum for: U.S. Army Corps of Engineers – Portland District, Operations Division, Channels and Harbors, Waterways Maintenance Section (CENWP-ODN-W, Stokke), Cathlamet Bay (Tongue Point) Federal Navigation Channel (Station 0+00 to 1+24), near Astoria, Clatsop County, Oregon.

Subject: Portland Sediment Evaluation Team (PSET) Level 2B dredged material suitability determination for the U.S. Army Corps of Engineers - Portland District's (Corps) operations and maintenance (O&M) dredging for the Cathlamet Bay (CBY) Federal Navigation Channel (FNC) in the Columbia River at river mile (RM) 18.5.

Introduction: Per the May 2018 *Sediment Evaluation Framework for the Pacific Northwest* (SEF)[1], this Level 2B suitability determination memorandum (SDM) documents the consensus of the PSET agencies regarding the suitability of the CBY FNC dredged material from DMMUs CBY-54-B and CBY-67-A for unconfined, aquatic disposal. The PSET reviewed the December 2020 "*Sediment Characterization and Bioassays of Cathlamet Bay Federal Side Channel (Tongue Point), Lower Columbia River, Clatsop County, Oregon*" (2B SQER)[2], prepared by ANAMAR for the Corps' Sediment Quality Team (SQT). Sediment chemical and bioassay testing results are summarized in the 2B SQER; chemical analytical results were compared to the marine benthic toxicity screening levels (SLs) published in the 2018 SEF; bioassay results were compared to the SEF interpretive criteria for dispersive sites (SEF Table 7-1). The PSET also used Oregon DEQ's sediment screening level value (SLV) for marine fish to evaluate PCBs[3].

Suitability Summary:

Dredge Prism (DP) Sediments:

- ☒ Suitable (DMMUs CBY 54-B and 67-A)
- ☐ Unsuitable

Post-Dredge Surface (PDS):

Previously determined suitable.

Reviewers: The PSET agencies include the Corps, U.S. Environmental Protection Agency – Region 10 (EPA), National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife (USFWS), Washington Department of Ecology (Ecology), and Oregon Department of Environmental Quality (ODEQ). Table 1 lists the PSET's review timeline for this project. Reviewers included:

☒ James Holm (Corps, Lead) ☒ Bridgette Lohrman (EPA, Co-Lead)

[1] U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, Washington Department of Ecology, Washington Department of Natural Resources, Oregon Department of Environmental Quality, Idaho Department of Environmental Quality, National Marine Fisheries Service, and U.S. Fish and Wildlife Service. 2018. *Sediment Evaluation Framework for the Pacific Northwest*. Published May 2018, by the U.S. Army Corps of Engineers, Northwestern Division, 183 pp with Appendices.

[2] U.S. Army Corps of Engineers – Portland District (Corps). 2020. *Sediment Characterization and Bioassays of the Cathlamet Bay Federal Side Channel (Tongue Point), Lower Columbia River, Clatsop County, Oregon*. Prepared by ANAMAR, December 2020. 24 pp with Maps, Tables, and Appendices.

[3] Oregon Department of Environmental Quality. 2007. *Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment*. Updated April 3, 2007 by ODEQ Environmental Cleanup Program, 18 pp with Appendices.

☒ Pete Anderson (ODEQ) ☒ Laura Inouye (Ecology) ☒ Dominic Yballe (Corps)
☒ Tom Hausmann (NMFS) ☒ Jeremy Buck (USFWS)

PSET/SEF Condition:

☒ Data Recency Expiration: Based on a "**Moderate**" rank, the data recency for **DMMUs 54-B** and **67-A** in **Shoal B** of the Cathlamet Bay Federal Navigation Channel expires concurrent with the rest of Shoal B in **November 2024**.

Table 1. Review Timeline – CBY FNC

LEVEL 2A	
Draft Sampling and analysis plan (SAP) submitted to PSET	1 October 2019
SAP revisions requested by PSET	2 October 2019
Revised Draft SAP submitted	8 October 2019
Revised SAP revisions requested by PSET	11 October 2019
Final SAP submitted	15 October 2019
Final SAP approved by PSET	31 October 2019
Sampling date(s)	11 to 19 November 2019
Draft SQER submitted to PSET	10 March 2020
SQER revisions requested by PSET	11 March 2020
Final SQER submitted to PSET	22 April 2020
Level 2A SDM issued by PSET	31 July 2020
LEVEL 2B	
Draft Supplement SAP (SSAP) submitted to PSET	20 August 2020
SSAP comments given during PSET call	26 August 2020
Revised SSAP[4] submitted to PSET	1 September 2020
SSAP approved by PSET[5]	2 September 2020
Sampling date(s)	10 September 2020
Level 2B SQER submitted to PSET	8 December 2020
Level 2B SDM issued by PSET	11 January 2021
Management area ranking	Shoal A – Very Low Shoal B – Moderate
Recency of data	Shoal A – November 2029 (10 years) Shoal B – November 2024 (5 years)

Federal Regulatory Authorities:

☒ Section 10, Rivers and Harbors Act
☒ Section 404, Clean Water Act (CWA)
☒ Section 401, CWA
☒ Section 7, Endangered Species Act
☒ Section 305 of the Magnuson-Stevens Act
☒ Fish and Wildlife Coordination Act
☒ Section 103, Marine Protection, Research and Sanctuaries Act

[4] Corps. 2020. *Supplemental Sediment Sampling and Analysis Plan (SSAP) for the Cathlamet Bay Federal Navigation Side Channel.* Prepared by Corps SQT, 1 September 2020. 6 pp.

[5] Portland Sediment Evaluation Team (PSET). 2020. [E-mail correspondence] *PSET – Cathlamet Bay – Bioassay SAP Approval*. Bridgette Lohrman, EPA, sent 2 September 2020. 3 pp with attachment.

☐ Comprehensive Environmental Response, Compensation, and Liability Act

Project Description: Table 2 provides a summary of the Corps' dredging project details for the CBY FNC. Maintenance dredging is needed to provide navigation access. The CBY turning basin (Station 1+24 to 1+40) will not be dredged, was not characterized in the Level 2A or 2B SQER and is not evaluated in this 2B SDM.

Table 2. Project Details – CBY FNC

Waterbody/river mile (RM)	Columbia River, 18.5
Total proposed dredging volume (cy)	~585,000 (Shoal A = ~80,000, Shoal B = ~465,000, Shoal B side slopes = ~40,000)
Max. proposed dredging depth (includes overdepth allowance)	-36 feet MLLW (34 + 2 ft overdredge)
Dredging area (acres, approx.)	~120
Dredge dimensions	~2,200 ft. wide narrowing to 350 ft. wide for ~3,000 ft., then 350 ft. wide for 1 mi. (turning basin excluded)
Dredging method	Pipeline, clamshell or hopper dredge
Dredged material transport	Barge, hopper, or pipeline
Proposed disposal location(s)	Columbia River flowlane
Proposed dredging date(s)	Typically August through December
Dredged material mgmt. units (DMMUs)	Level 2A: 94 + 16 side slope stations Level 2B: 2 (CBY-54-B, CBY-67-A)

Sampling and Analysis Description: The Corps' Level 2B sampling and analytical program for DMMUs CBY-54-B and CBY-67-A and the reference site sediments are summarized in Table 3. Actual sample station locations are shown in the 2B SQER Table 1 and Map 1 (Level 2B SDM Figure 1).

Deviations from the SSAP: One deviation from the PSET-approved SSAP was necessary. The reference site was relocated from outside the Chinook Channel breakwater to within the breakwater to collect reference sediments with grain size similar to the Cathlamet Bay FNC test sediments.

Table 3. Sampling and Analysis Description – Level 2B, CBY FNC

<table>
<tr><th colspan="5">Sampling Description</th></tr>
<tr><td colspan="2">Sample collection method</td><td colspan="2">Vibracore</td><td>PONAR</td></tr>
<tr><td colspan="2">Shoal ID</td><td>B</td><td>B</td><td>Reference Site</td></tr>
<tr><td colspan="2">DMMU ID</td><td>CBY-54-B</td><td>CBY-67-A</td><td>N/A</td></tr>
<tr><td colspan="2">DMMU Rank</td><td>Moderate</td><td>Moderate</td><td>N/A</td></tr>
<tr><td colspan="2">Proposed DMMU volume (cy)</td><td>~5,000</td><td>~5,000</td><td>N/A</td></tr>
<tr><td colspan="2">Sample ID
(planned interval, ft MLLW)</td><td>200910-CBY-54-B-BIO-COMP
(-32 to -36)</td><td>200910-CBY-67-A-BIO-COMP
(mudline to -32)</td><td>200910-CBY-REF-COMP
(mudline)</td></tr>
<tr><td rowspan="4">Dredge Prism</td><td>Depth range (ft MLLW)</td><td>-32 to -36</td><td>Mudline (-27.1) to -32</td><td>Mudline at -6</td></tr>
<tr><td>Composite (Y/N)</td><td>Y</td><td>Y</td><td>N</td></tr>
<tr><td>Subsamples /DMMU</td><td>2</td><td>2</td><td>1</td></tr>
<tr><td>Subsample Archive (Y/N)</td><td>Y</td><td>Y</td><td>N</td></tr>
<tr><td rowspan="4">PDS Layer</td><td>Depth range (ft MLLW)</td><td rowspan="4">N/A</td><td rowspan="4">N/A</td><td rowspan="4">N/A</td></tr>
<tr><td>Composite (Y/N)</td></tr>
<tr><td>Subsample /PDS-layer</td></tr>
<tr><td>Subsample Archive (Y/N)</td></tr>
<tr><th colspan="5">Sediment Physical, Chemical and Biological Analyses per DMMU (No. DP/ No. PDS)</th></tr>
<tr><td colspan="2">Grain size</td><td>1/--</td><td>1/--</td><td>1/--</td></tr>
<tr><td colspan="2">Total organic carbon</td><td>1/--</td><td>1/--</td><td>1/--</td></tr>
<tr><td colspan="2">Total solids</td><td>1/--</td><td>1/--</td><td>1/--</td></tr>
<tr><td colspan="2">Ammonia</td><td>1/--</td><td>1/--</td><td>1/--</td></tr>
<tr><td colspan="2">Total sulfides</td><td>1/--</td><td>1/--</td><td>1/--</td></tr>
<tr><td colspan="2">Metals, marine</td><td>1/--</td><td>1/--</td><td>1/--</td></tr>
<tr><td colspan="2">PAHs</td><td>1/--</td><td>1/--</td><td>1/--</td></tr>
<tr><td colspan="2">SVOCs (chlorinated hydrocarbons, phthalates, phenols, misc. extractables)</td><td>1/--</td><td>1/--</td><td>1/--</td></tr>
<tr><td colspan="2">Pesticides</td><td>1/--</td><td>1/--</td><td>1/--</td></tr>
<tr><td colspan="2">PCBs (Total Aroclors)</td><td>1/--</td><td>1/--</td><td>1/--</td></tr>
<tr><td colspan="2">Tributyltin</td><td>1/--</td><td>1/--</td><td>1/--</td></tr>
<tr><td colspan="2">Bioassays, marine</td><td>3/--</td><td>3/--</td><td>3/--</td></tr>
</table>

Results and Discussion: Analytical results for the Corps' Level 2B sampling event are summarized in Table 4. The chemical analytical results were compared to the 2018 SEF marine SLs and to ODEQ's SLV for marine fish to evaluate PCBs (47 ug/kg). The marine bioassay results were compared to the 2018 SEF performance standards and interpretive criteria for dispersive disposal sites as shown in Tables 5, 6, 7, and 8.

The initial November 2019 concentrations of diethyl phthalate detected in DMMUs CBY-54-B (254 ug/kg) and CBY-67-A (223 ug/kg) were not replicated in the Level 2B test sediments (19 ug/kg J, 15 ug/kg J). No other parameters had detections, estimated concentrations (J) or non-detections (U) with elevated detections limits above SEF marine SLs or ODEQ SLV for PCBs.

Table 4. DMMUs CBY-54-B and CBY-67-A and Reference Site Analytical Summary

Sediment Physical and Chemical Results				
Decision unit/Sample ID: Parameter	200910-CBY-54-B-BIO-COMP	200910-CBY-67-A-BIO-COMP	200910-CBY-REF-COMP	SEF SL1 marine (SLV)
Grain size: gravel, sand, silt, clay (%)	0.7, 8.9, 80.8, 9.8	0.3, 31.5, 59.7, 8.7	0.3, 19, 61.7, 19	--
Total Solids (%)	47.5	58.7	61.3	--
Total Organic Carbon (%)	2.12	1.54	1.18	--
Ammonia (mg/kg)	5.27	187	46.1	--
Total Sulfides (mg/kg)	599	646	514	--
Metals (mg/kg)	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Detect <SLs J	varies
PAHs (ug/kg)	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	varies
LPAHs (ug/kg)	103 J	65 J	307 J	5,200
HPAHs (ug/kg)	331 J	314 J	1,149 J	12,000
SVOCs (ug/kg) (phenols, phthalates, chlorinated hydrocarbons, misc. extractables)	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	varies
Pesticides (ug/kg)	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	varies
4,4'-DDD	1.4	0.52 J	0.87 J	16
4,4'-DDE	0.84 J	0.42 J	0.85 J	9
4,4'-DDT	1.0 U	1.0 U	0.50 U	12
PCBs, Total Aroclors (ug/kg)	10.2 J	1.2 J	6.6 J	130 (47†)
Tributyltin (ug/kg)	7.0	0.83 J	3.8 U	73

U = Non-detection at the method reporting limit (MRL) or method detection limit (MDL), MRL reported; J = Estimated value between MDL and MRL; † = ODEQ (2007) Marine fish-based bioaccumulation screening level value for PCBs.

Table 5. DMMUs CBY-54-B and CBY-67-A Bioassay Summary

Treatment	1-Hit Rule			2-Hit Rule		
	Amphipod	Polychaete	Larval	Amphipod	Polychaete	Larval
200910-CBY-54-B-BIO-Comp	Pass	Pass	Pass	Pass	Pass	Pass
200910-CBY-67-A-BIO-Comp	Pass	Pass	Pass	Pass	Pass	Pass

Table 6. 10-day Amphipod Mortality Comparison for *Eohaustorius estuarius*

Treatment	Mean Mortality (%)	Statistically Different than Reference? (P=0.05)	Mortality Comparison to Control M_T-M_C (%)	Mortality Comparison to Reference M_T-M_R (%)	Fails 2-Hit?[1]	Fails 1-Hit?[2]
Control	2					
200910-CBY-REF-Comp	18					
200910-CBY-54-B-BIO-Comp	5	No	3	-13	No	No
200910-CBY-67-A-BIO-Comp	10	No	8	-8	No	No

[1]2-Hit Rule: Statistical Significance and M_T-M_C >20%; [2]1-Hit Rule: Statistical Significance and M_T-M_C >20% and M_T-M_R >10% (dispersive); M_T = Treatment Mortality; M_R = Reference Mortality; M_C = Control Mortality

Table 7. 20-day Polychaete Mortality and Growth Comparison for *Neanthes arenaceodentata*

Treatment	MIG (mg/ind/day) AFDW	Statistically Less than Reference? (p=0.05)	MIG Relative to Control MIG_T/MIG_C	MIG Relative to Reference MIG_T/MIG_R	Fails 2-Hit?[1]	Fails 1-Hit?[2]
Control	0.552					
200910-CBY-REF-Comp	0.445					
200910-CBY-54-B-BIO-Comp	0.543	No	0.98	1.22	No	No
200910-CBY-67-A-BIO-Comp	0.623	No	1.13	1.40	No	No

[1]2-Hit Rule: Statistical Significance and MIG_T/MIG_C <0.80; [2]1-Hit Rule: Statistical Significance and MIG_T/MIG_C <0.80 and MIG_T/MIG_R <0.70; MIG_T = Treatment Mean Individual Growth; MIG_R = Reference Mean Individual Growth; MIG_C = Control Mean Individual Growth

Table 8. Larval Development Comparison for *Mytilus galloprovincialis*

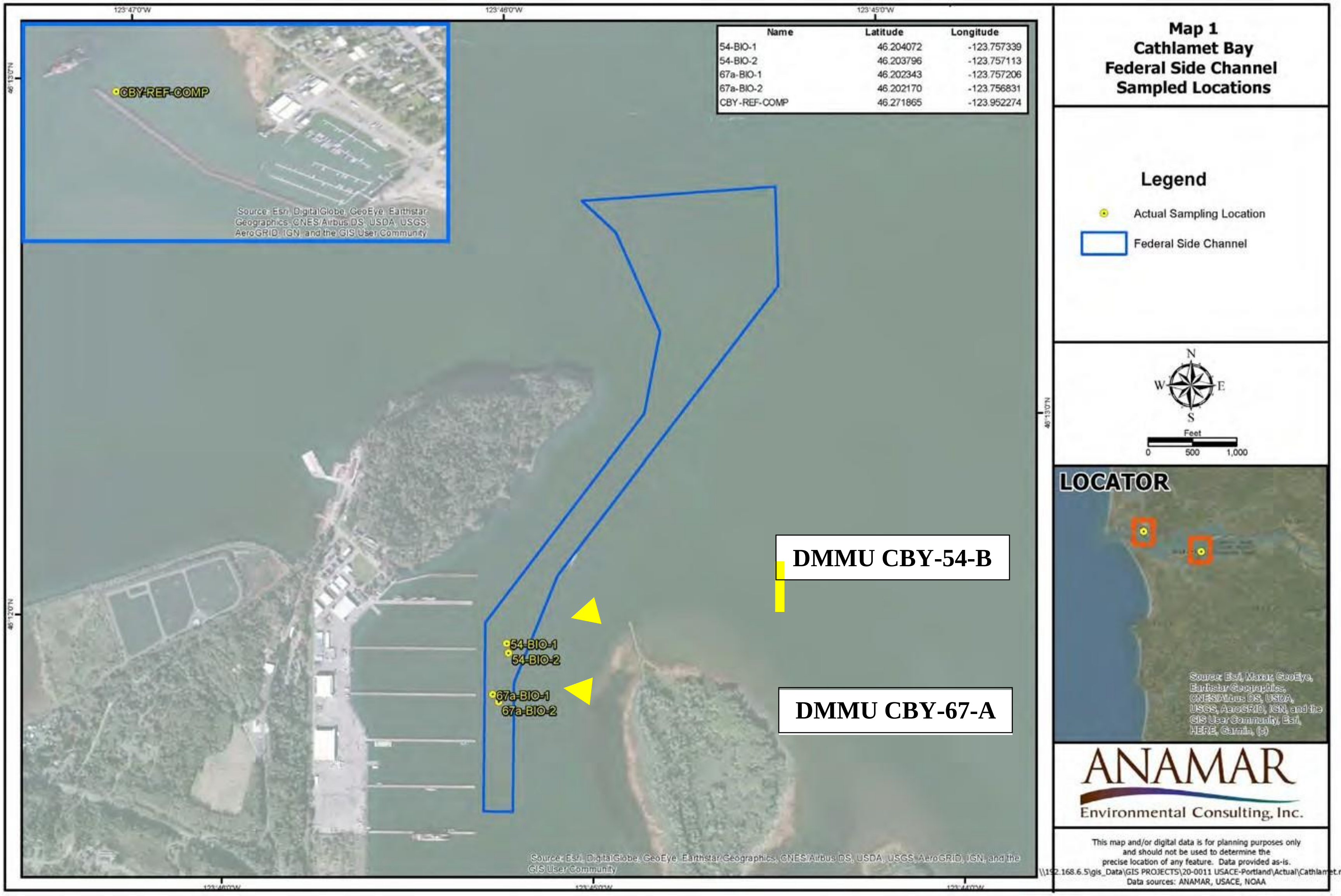
Treatment	Mean Number Normal	Statistically Less than Reference? (p=0.10)	Normal Survival to Seawater Control N_T/N_C	$N_R/N_C - N_T/N_C$	Fails 2-Hit?[1]	Fails 1-Hit?[2]
Seawater Control	244.6					
Sediment Control	252.0					
200910-CBY-REF-Comp	252.6					
200910-CBY-54-B-BIO-Comp	235.0	Yes	0.96	0.07	No	No
200910-CBY-67-A-BIO-Comp	226.0	Yes	0.92	0.11	No	No

[1]2-Hit Rule: Statistical Significance and (N_T/N_C) <0.80; [2]1-Hit Rule: Statistical Significance and (N_T/N_C) <0.80 and $N_R/N_C - N_T/N_C > 0.15$; N_T =Treatment Mean Number Normal; N_R =Reference Mean Number Normal; N_C =Control Mean Number Normal

PSET Suitability Determination:
Based on both 1-hit and 2-hit rules for dispersive disposal site criteria, both DMMU CBY-54-B and DMMU CBY-67-A pass all marine bioassay tests. Therefore, **dredged materials** from **DMMUs CBY-54-B** and **CBY-67-A** are **suitable for unconfined, aquatic disposal** per the 2018 SEF.

Contact: This memorandum was prepared by Bridgette Lohrman (PSET co-lead) and James Holm (PSET Lead, Corps) and reviewed by the participating PSET agencies, identified above. Questions regarding this memorandum should be directed to Bridgette Lohrman at (503) 326-4006 or e-mail to: lohrman.bridgette@epa.gov.

Figure 1. Cathlamet Bay Federal Navigation Channel, actual core sampling stations for DMMUs CBY-54-B and CBY-67-A (near Astoria, OR) and grab sampling stations for the reference site (near Chinook, WA).



CENWP-EC-HR March 5, 2014

Memorandum for: Portland District, Waterways Maintenance, (CENWP-OD-NW, Stokke)

Subject: Portland Sediment Evaluation Team (PSET) Level 2 dredged material suitability determination for maintenance dredging at the Wahkiakum Ferry and Westport Slough side channel projects.

Reviewers: The PSET includes the U.S. Army Corps of Engineers (Corps), Environmental Protection Agency (EPA), National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife (USFWS), Washington Department of Ecology (Ecology), and Oregon Department of Environmental Quality (ODEQ). The reviewers for this project included James McMillan and James Holm (Corps), Laura Inouye (Ecology), Jeff Lockwood (NMFS), Jeremy Buck (USFWS), Pete Anderson (ODEQ), and Jonathan Freedman and Bridgette Lohrman (EPA).

The PSET reviewed the Portland District (District) Sediment Quality Team's February 3, 2014 "Wahkiakum Ferry Channel Realignment – Westport Slough Dredging Project, Sediment Quality Evaluation Report" (SQER). This technical memorandum documents the consensus of the reviewing agencies regarding the suitability of sediments at the Wahkiakum Ferry and Westport Slough side channels for unconfined, aquatic placement. Sediment quality data collected from these side channel projects was evaluated using guidance found in the 2009 *Sediment Evaluation Framework for the Pacific Northwest* (SEF).

Applicable Authorities Governing the Project: Congressional authorization under the Rivers and Harbors Act of 1937; sections 401 and 404 of the Clean Water Act; section 7 of the Endangered Species Act; section 305 of the Magnuson-Stevens Act; et al.

Project Description: The Lower Columbia River (LCR) deep draft navigation channel bisects the Wahkiakum Ferry channel into two side channel projects: the Westport Slough side channel (Oregon) and Wahkiakum Ferry side channel (Washington). These side channel projects are located at Columbia River mile (RM) 43.5. Side channel project figures appear in the SQER.

<u>Wahkiakum Ferry Side Channel.</u> The existing Wahkiakum Ferry side channel project is currently maintained for ferry traffic only, and provides for a channel 9 ft. deep, 200 ft. wide, and 1,900 ft. long, with a 100-ft. over-width on each side of the channel. The Corps performs advanced maintenance dredging on the project to -11 ft. Columbia River Datum (CRD); the project was last dredged in 2010 and the sediment was placed in the Columbia River flow lane. The Corps proposes to widen and realign the Puget Island segment of the ferry channel; the channel centerline would be shifted upstream and the channel will be widened from 200 to 300 ft. and shifted upstream. The downstream channel boundary would shift upstream approximately 70 ft. while the upstream channel boundary would shift upstream approximately 170 ft. The 100-ft. over-width will shift upstream as well. The Wahkiakum Ferry side channel depth would remain the same (-11 ft. CRD). The new area to be dredged is approximately 300 ft. by 400 ft., and the

total volume of sediment to be dredged is estimated between 22,000 and 33,000 cubic yards (CY).

Westport Slough Side Channel. The Westport Slough side channel project was authorized by Congress for a channel 28 ft. deep, 200 ft. wide, and 1,600 ft. long, with a 100-ft. over-width on each side of the channel. A single user may ultimately need the channel maintained to -22 ft. CRD, but funding has not been available for the Corps to maintain the channel to that depth. However, the Corps currently maintains the Westport Slough side channel to -11 ft. CRD for the ferry. The project was last maintained to -11 ft. CRD in 2010 and the sediment was placed in the Columbia River flow lane. The area to be dredged (to -11 ft. CRD) is approximately 200 ft. by 500 ft., and the total volume to be dredged is estimated between 30,000 and 40,000 CY. The estimated volume of sediment to be dredged for the -22 ft. CRD project would be 75,000 to 100,000 CY.

Dredging Methods: Both side channel projects will be dredged with a clamshell dredge.

Dredged Material Transport and Placement: A tug and bottom dumping scow are typically used to transport the dredged material. Dredged material will be placed near the Wahkiakum Ferry channel in the Columbia River flow lane.

Site History and Management Area Ranking: Based on prior sediment characterization, sediment grades from coarse-grained material in the LCR federal navigation channel to fine-grained material in the Westport Slough side channel. The Wahkiakum Ferry side channel is composed of coarse-grained material. There are no known sources of contamination in the project area or immediately upstream of the ferry. Georgia Pacific (formerly James River paper mill) is located at Wauna, Clatsop County, Oregon, approximately 2 miles downstream. Sediments in both side channel projects have been characterized multiple times. Sediment concentrations of metals, semi-volatile organic compounds (SVOCs), pesticides, and polychlorinated biphenyls (PCBs) have never exceeded the SEF freshwater benthic toxicity screening levels (SLs). Based on the previous testing, SVOC analysis was not included in the CoC list for this round of testing.

Management Area Ranking: The PSET has assigned a “very low” management area ranking to the Wahkiakum Ferry side channel. The Wahkiakum Ferry side channel sediments must be re-characterized 10 years from the sampling date, by September 2023. A “low” management area ranking is assigned to the Westport Slough side channel project. The Westport Slough side channel sediments must be re-characterized 7 years from the sampling date, by September 2020.

Sampling and Analysis Description: The Wahkiakum Ferry federal project was sampled on September 26, 2013; samples were collected with a petite ponar grab sampler. Sample stations appear in Figures 3 and 4 of the SQER; the grab sample log form appears in Attachment A of the SQER. The laboratory chain of custody form appears in Attachment B of the SQER.

<u>Wahkiakum Ferry Side Channel.</u> Three dredge prism subsamples were collected at the Wahkiakum Ferry dredged material management unit (DMMU) to form one composite sample (092613CRWF-COMP-1). Although metals were not originally proposed for analysis, the District instructed the contract laboratory to analyze the Wahkiakum Ferry composite sample for total solids, total organic carbon, grain size, and metals.

<u>Westport Slough Side Channel.</u> The Westport Slough side channel was split into two DMMUs that were defined by depth. Sample 092613CRWS-COMP-1 was composited from four grabs to characterize material above -11 ft. CRD (the typical maintenance depth). Sample 092613CRWS-COMP-2 was composited from four grabs to characterize material from -11 ft. to -22 ft. CRD (the depth that would be required for ocean-going barges that could potentially use the channel in the future). The District instructed the contract laboratory to analyze the Westport Slough composite samples for total solids, total organic carbon (TOC), grain size, metals, pesticides, PCBs, and total petroleum hydrocarbons.

Results: Sediment chemical results appear in Table 2 of the SQER. The District compared bulk sediment concentrations to the 2006 SEF freshwater SLs.

<u>Wahkiakum Ferry Side Channel.</u> The Wahkiakum Ferry shoal is composed of 96.2% sand and 3.5% fines (silt + clay); the TOC content of the shoal material is 0.768%. Antimony, mercury, and silver were not detected in sample 092613CRWF-COMP-1. Concentrations of detected metals were below the respective SLs.

<u>Westport Slough Side Channel.</u> The Westport Slough material is composed of an average of 83.1% sand and 15.2% fines; the TOC content is 0.698%. Antimony, mercury, and silver were not detected in either of the composite samples (092613CRWS-COMP-1, 092613CRWS-COMP-2). Concentrations of detected metals were below the respective SLs in both samples. Pesticides and PCBs were not detected in either sample. Diesel-range organics ranged from 7.8 to 35 mg/kg. Lube oil was only detected in the deep composite sample (092613CRWS-COMP-2; -11 to -22 ft. CRD) at 130 mg/kg; it was not detected in 092613CRWS-COMP-1.

Suitability Determination: The PSET's suitability determination is based on comparison of the District's sediment quality data to the 2006 SEF freshwater SLs.

<u>Wahkiakum Ferry Side Channel.</u> Material in the current and realigned Wahkiakum Ferry side channel configurations is suitable for unconfined, aquatic placement. The PSET assumes that the quality of sediments exposed after dredging will be similar to the dredge prism material.

<u>Westport Slough Side Channel.</u> Material in the Westport Slough side channel project is suitable for unconfined, aquatic placement. Materials from the mudline to -11 ft. CRD and from -11 ft. to -22 ft. CRD may be placed in the Columbia River flow lane. The PSET assumes that the quality of sediments exposed after dredging will be similar to the dredge prism material.

Contact: This memorandum was prepared by James McMillan, and reviewed by the participating PSET agencies, identified above. Questions regarding this memorandum should be directed to James McMillan (Lead – Portland Sediment Evaluation Team) at (503) 808-4376 or e-mail to: james.m.mcmillan@usace.army.mil.

References:

U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, Washington Department of Ecology, Washington Department of Natural Resources, Oregon Department of Environmental Quality, Idaho Department of Environmental Quality, National Marine Fisheries Service, and U.S. Fish and Wildlife Service. 2009. *Sediment Evaluation Framework for the Pacific Northwest*. Published May 2009, by the U.S. Army Corps of Engineers, Northwestern Division, 128 p. plus Appendices.

U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, Washington Department of Ecology, Washington Department of Natural Resources, Oregon Department of Environmental Quality, Idaho Department of Environmental Quality, National Marine Fisheries Service, and U.S. Fish and Wildlife Service. 2006. Interim Final *Sediment Evaluation Framework for the Pacific Northwest*. Published May 2009, by the U.S. Army Corps of Engineers, Northwestern Division, 194 p. plus Appendices.

U. S. Army Corps of Engineers. 2014. Wahkiakum Ferry Channel Realignment – Westport Slough Dredging Project, Sediment Quality Evaluation Report. February 3, 2014; *prepared by* Portland District – Sediment Quality Team; 12 p. plus figures and attachments.

EPA-Region 10 Water Division, Wetlands and Oceans Section 08 September 2021

Memorandum for: U.S. Army Corps of Engineers – Portland District, Operations Division, Channels and Harbors, Waterways Maintenance Section (CENWP-ODN-W, Stokke), Oregon Slough Downstream Shallow Draft Federal Navigation Channel (miles 1.5 to 3.8) in Portland, Multnomah County, Oregon.

Subject: Portland Sediment Evaluation Team (PSET) Level 2A dredged material suitability determination for the U.S. Army Corps of Engineers - Portland District's (USACE) operations and maintenance (O&M) dredging for the Oregon Slough Downstream (OSD) Shallow Draft Federal Navigation Channel (FNC) in the Columbia River at river mile (RM) 101.4 to 104.6 (project mile 1.5 to 3.8).

Introduction: Per the May 2018 *Sediment Evaluation Framework for the Pacific Northwest* (SEF)[1], this suitability memorandum (SDM) documents the consensus of the PSET agencies regarding the suitability of the OSD shallow draft FNC dredged material for unconfined, aquatic disposal and suitability of the post-dredge surface for unconfined, aquatic exposure. The PSET reviewed the December 2020 "*Sediment Characterization: Oregon Slough Downstream Shallow Draft Channel (Miles 1.5 to 3.8), Multnomah County, Oregon*" (2020 SQER)[2] and the August 2021 "*Supplemental Sediment Characterization: Oregon Slough Downstream Shallow Draft Channel (Miles 1.5 to 3.8), Multnomah County, Oregon*" (2021 SQER)[3], prepared by ANAMAR for the USACE's Sediment Quality Team (SQT). Sediment chemical testing results are summarized in the SQER; chemical analytical results were compared to the freshwater benthic toxicity screening levels (SEF SLs) published in the 2018 SEF. The PSET also used Oregon DEQ's sediment screening level value (SLV) for freshwater fish to evaluate PCBs and dioxins and furans[4].

Suitability Summary:

Dredge Prism (DP) Sediments: ☒Suitable ☐Unsuitable
Post-Dredge Surface (PDS): ☒Suitable ☐Unsuitable

Reviewers: The PSET agencies include the USACE, U.S. Environmental Protection Agency – Region 10 (EPA), National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife (USFWS), Washington Department of Ecology (Ecology), and Oregon Department of Environmental Quality (ODEQ). Table 1 lists the PSET's review timeline for this project. Reviewers included:

---

[1] U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, Washington Department of Ecology, Washington Department of Natural Resources, Oregon Department of Environmental Quality, Idaho Department of Environmental Quality, National Marine Fisheries Service, and U.S. Fish and Wildlife Service. 2018. *Sediment Evaluation Framework for the Pacific Northwest*. Published May 2018, by the U.S. Army Corps of Engineers, Northwestern Division, 183 pp with Appendices.

[2] U.S. Army Corps of Engineers (USACE) – Portland District. 2020. *Sediment Characterization Oregon Slough Downstream Shallow Draft Channel (Miles 1.5 to 3.8), Multnomah County, Oregon*. Prepared by ANAMAR, December 2020. 25 pp with Maps, Tables, and Appendices.

[3] USACE – Portland District. 2021. *Supplemental Sediment Characterization Oregon Slough Downstream Shallow Draft Channel (Miles 1.5 to 3.8), Multnomah County, Oregon*. Prepared by ANAMAR, August 2021. 27 pp with Maps, Tables, and Appendices

[4] Oregon Department of Environmental Quality. 2007. *Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment*. Updated April 3, 2007 by ODEQ Environmental Cleanup Program, 18 pp with Appendices.

☒ James Holm (USACE, Lead)
☒ Bridgette Lohrman (EPA, Co-Lead)
☒ Pete Anderson (ODEQ)
☒ Laura Inouye (Ecology)
☒ Dominic Yballe (USACE)
☒ Tom Hausmann (NMFS)
☒ Jeremy Buck (USFWS)

PSET/SEF Conditions:

☒ Data Recency Expiration – Based on a "Low" rank, the data recency for sediments in the Oregon Slough Downstream Shallow Draft Federal Navigation Channel expires in May 2028.

Table 1. Review Timeline

Draft Sampling and analysis plan (SAP) submitted to PSET	1 September 2020
SAP revisions requested by PSET	4 September 2020
Revised SAP[5] submitted	5 September 2020
Revised SAP approved by PSET[6]	10 September 2020
Sampling date(s)	11-13 September 2020
Draft SQER submitted to PSET	11 December 2020
Sonic drill sampling concept submitted to PSET	19 January 2021
Supplemental SAP submitted to PSET[7]	29 January 2021
Supplemental SAP approved by PSET[8]	25 February 2021
Sonic drill sampling date(s)	10-12 May 2021
Supplemental SQER submitted to PSET	24 August 2021
Suitability Determination Memorandum (SDM) issued by PSET	08 September 2021
Management area ranking	Low
Recency of data	May 2028 (7 years)

Federal Regulatory Authorities:

☒ Section 10, Rivers and Harbors Act
☒ Section 404, Clean Water Act (CWA)
☒ Section 401, CWA
☒ Section 7, Endangered Species Act
☒ Section 305 of the Magnuson-Stevens Act
☒ Fish and Wildlife Coordination Act
☐ Section 103, Marine Protection, Research and Sanctuaries Act
☐ Comprehensive Environmental Response, Compensation, and Liability Act

Project Description: Table 2 provides a summary of the dredging project details for the OSD shallow draft FNC. Maintenance dredging is needed to provide navigation access.

[5] USACE – Portland District. 2020. *Oregon Slough Downstream Shallow Draft Channel (mile 1.5 to 3.8) Multnomah County, Oregon, Sediment Sampling and Analysis Plan (v2.1).* Prepared by SQT, 5 September 2020. 29 pp with Attachment.

[6] Portland Sediment Evaluation Team (PSET). 2020. *Oregon Slough Downstream FNC – SAP Approval.* Email issued by B. Lohrman (EPA) for PSET, 10 September 2020. 3 pp with Attachment.

[7] USACE – Portland District. 2021. *Supplemental Sampling and Analysis Plan (SSAP) for Level 2A and contingency sediment characterization and sampling with a sonic drill at the Oregon Slough Downstream, Shallow Draft Federal Navigation Channel.* Prepared by SQT, 29 January 2021. 6 pp.

[8] PSET. 2021. *PSET - Oregon Slough Downstream FNC (SSAP Approval).* Email issued by B. Lohrman (EPA) for PSET, 25 February 2021. 2 pp with Attachment.

Table 2. Project Details

Waterbody/river mile (RM)	Columbia River, 101.4 to 104.6
Total proposed dredging volume (cy)	~425,000
Max. proposed dredging depth (includes overdepth allowance)	-22 feet CRD (20+2 ft overdredge)
Dredging area (acres, approx.)	~55
Dredge dimensions	~200 ft. wide for 2.3 miles
Dredging method	Pipeline, clamshell or hopper dredge
Dredged material transport	Barge, hopper
Proposed disposal location(s)	Columbia River flowlane
Proposed dredging date(s)	August 1 through December 15
Dredged material mgmt. units (DMMUs)	11

Sampling and Analysis Description: The USACE sampling and analytical program for the OSD FNC is summarized in Table 3. Actual grab sample station locations are shown in the 2020 SQER Table 1A and Map 1 (SDM Figure 1). Based on the inability to collect deeper-dredge prism material, a SSAP was prepared, approved by PSET, and implemented by the USACE. The USACE' significantly modified their sampling approach by using a sonic core sample to penetrate deeper through the dredge prism and into the post-dredge surface. The PSET agreed to the USACE' approach of considering the grab samples to represent the top 4-feet of dredge prism material because of the likelihood of those materials being more recently deposited coarse Columbia River sand. Actual sonic core sample station locations are shown in the 2021 SQER Table 1C and Map 1 (SDM Figure 2). The conceptual DMMU layout is shown in Figure 2 of the PSET-approved SSAP (SDM Figure 3).

Deviations from the SAP: Deviations from the PSET-approved SAP are identified in the 2020 SQER sections 2.1.1, 2.2.2, and 2.2.3 and are noted in SQER Tables 1A (grab sample summary) and 1B (core sample summary).

1. Core sampling with a standard vibracore sample and core catcher was not possible due to the presence of unconsolidated, coarse sand and gravel in the upper 6 to 9 feet of the dredge prism. Coarse sediments resulted in core refusals above project depth (-24 ft CRD) or core recoveries of 0 to 16%. After many coring attempts across the project and coordinating with Ecology staff from the field, the USACE switched to a standard Ponar grab sampler to characterize the surface layer DMMUs (OSD-01, OSD-02, OSD-03, OSD-06, OSD-09 and OSD-11) of the project.
2. Due to the coarse character of the surface sediments, the reference site for the contingency bioassays was relocated from Elk Rock Island in the Willamette River (~RM 16) to sandy sediments along Sauvie Island in the Columbia River (~RM 100).

Deviations from the SSAP: Deviations from the PSET-approved SSAP are listed in the 2021 SQER Table 1C for stations OSD-06D, OSD-06E, OSD-09D, and OSD-09E. The deviations included the inability to collect surface material from DMMUs 6 and 9 because the mudline elevation encountered in the field during sampling was deeper than what was encountered in 2020. This deviation did not result in a lack of data collection because the 2020 sampling collected sediment from the shallower depths.

Table 3. Sampling and Analysis Description

Sample collection method		Standard Ponar (†) or Sonic Drill (‡)					
DP sample IDs / DMMU IDs (DP interval in ft CRD)		OSD-01† (mudline to -22 ft)	OSD-02† (mudline to -22 ft)	OSD-03† (mudline to -14 ft)	OSD-06† (mudline to -14 ft)	OSD-09† (mudline to -18 ft)	OSD-11† (mudline to -22 ft)
				OSD-04r‡ (-14 to -18 ft)	OSD-07r‡ (-14 to -18 ft)		
				OSD-05r‡ (-18 to -22 ft)	OSD-08r‡ (-18 to -22 ft)	OSD-10r‡ (-18 to -22 ft)	
PDS sample IDs (-22 to -24 ft CRD)		OSD-01Z‡	OSD-02Z‡	OSD-03Z‡	OSD-06Z‡	OSD-09Z‡	OSD-11Z‡
DMMU volume (CY)		~45,000	~45,000	~35,000 to ~40,000	~35,000 to ~40,000	~40,000	~25,000
Dredge Prism	Mudline range (ft CRD)	-15.5 to -17.3†	-14.5 to -18.3†	-11.0 to -12.5†	-7.8 to -9.8†	-10.9 to -14.4†	-19.1 to -21.4†
	Composite (Y/N)	Y	Y	Y	Y	Y	Y
	Subsample /DMMU	3	3	3 / 2r	3 / 2r	3 / 2r	3
	Subsample Archive (Y/N)	Y	Y	Y	Y	Y	Y
PDS Layer	Depth range (ft CRD)	-22 to -24‡	-22 to -24‡	-22 to -24‡	-22 to -24‡	-22 to -24‡	-22 to -24‡
	Composite (Y/N)	Y	Y	Y	Y	Y	Y
	Subsample /PDS-layer	2r	2r	2r	2r	2r	2r
	Subsample Archive (Y/N)	Y	Y	Y	Y	Y	Y
Sediment Physical and Chemical Analysis (No. DP samples / No. PDS samples analyzed)							
Grain size		1/1	1/1	3/1	3/1	2/1	1/1
Total organic carbon		1/1	1/1	3/1	3/1	2/1	1/1
Total solids		1/1	1/1	3/1	3/1	2/1	1/1
Ammonia		1/1	1/1	3/1	3/1	2/1	1/1
Total sulfides		1/1^	1/1^	3/1^	3/1^	2/1^	1/1^
Metals, freshwater		1/1	1/1	3/1	3/1	2/1	1/1
PAHs		1/1	1/1	3/1	3/1	2/1	1/1
SVOCs (phthalates, phenols, misc. extractables)		1/1	1/1	3/1	3/1	2/1	1/1
Pesticides		1/1	1/1	3/1	3/1	2/1	1/1
PCBs (Total Aroclors)		1/1	1/1	3/1	3/1	2/1	1/1
Butyltins		1/1	1/1	3/1	3/1	2/1	1/1
TPH (diesel [dx] and residual [rx] range)		1/1	1/1	3/1	3/1	2/1	1/1
Dioxin/Furans		1/1	1/1	3/1	3/1	2/1	1/1
Contingency Biological Analysis – dredge prism only, three DMMUs maximum							
Freshwater Bioassays		1*	1*	3*	3*	2*	1*

† = Ponar grab samples; ‡ = sonic drill core samples; ^ = sulfides analysis removed by USACE since no biological test are needed on the PDS; * = contingency bioassays not required based on sediment chemistry.

Total sulfides were removed from analysis by the USACE on the six Z-layer composite samples because biological tests are not necessary on the post-dredge surface and the overlying DMMUs were analyzed for sulfides. Only one of the 11 overlying DMMUs detected elevated sulfides (39.1 mg/kg, DMMU OSD-5r) above the SEF freshwater SL (39 mg/kg).

Results and Discussion: Analytical results for the USACE sampling event are summarized in Tables 5a (dredge prism) and 5b (post-dredge surface). The chemical analytical results from both SQERs were compared to the 2018 SEF freshwater SLs and to ODEQ's freshwater fish-based SLV (22 ug/kg) to evaluate PCBs (total aroclors) and SLV (5.6 ng/kg) for dioxins and furans.

Total sulfides in DMMU OSD-05r (39.1 mg/kg) was the only DMMU or post-dredge surface sample with an analyte detected above an SEF SL (39 mg/kg). All other analytes were detected below SEF freshwater SLs or were non-detections (U) with method reporting limits (MRLs) below SLs. Sulfides are generally used to inform bioassay testing for potential non-treatment effects. When total sulfides are the sole parameter detected above an SEF SL, the PSET may determine sediments are suitable for unconfined, aquatic disposal and exposure.

Except for DMMU OSD-05r, all dredge prism samples (Table 5a) consisted of at least 91% sand with a total organic carbon (TOC) of 0.1% or less. DMMU OSD-05r was 67% sand, 26% silt, and 6% clay with a TOC of 0.3%.

Except for samples OSD-03Z and OSD-09Z, all post-dredge surface samples (Table 5b) consisted of at least 80% sand with a TOC of less than 0.19%. OSD-03Z consisted of 38% sand, 51% silt, and 11% clay with a TOC of 0.89%. OSD-09Z consisted of 3% gravel, 72% sand, 22% silt, and 3% clay with a TOC of 0.9%. DMMU OSD-05r is directly on top of OSD-3Z layer.

There were no exceedances of ODEQ's bioaccumulative SLV for PCBs because all samples were non-detections (U) with an MRL (4.0 ug/kg) below the SLV (22 ug/kg). There were no exceedances of ODEQ's bioaccumulative SLV for dioxins and furans because all samples had 2,3,7,8 TCDD TEQ results below the SLV (5.6 ng/kg).

No other parameters had detections, estimated concentrations (J) or non-detections (U) with elevated MRLs above an SEF freshwater SLs or an ODEQ SLVs.

Site Ranking: The sampling design was based upon a "moderate" rank due to the lack of dredging and agency concerns about CoCs at depth. Based on the dredge prism and post-dredge surface results and similar physical characteristics to surrounding projects, the PSET has assigned a "low" rank to the OSD shallow-draft sediments.

PSET Suitability Determination:
Dredge Prism – Chemical concentrations in OSD dredge prisms are below the SEF freshwater SLs and ODEQ SLVs as discussed above. As such, the **OSD shallow draft FNC dredged prism material** is **suitable for unconfined, aquatic disposal** per the 2018 SEF guidance without additional testing.

Post-Dredge Surface – Chemical concentrations in OSD post-dredge surface samples are below the SEF freshwater SLs and ODEQ SLVs as discussed above. As such, the **OSD shallow draft FNC post-dredge surfaces** are **suitable for unconfined, aquatic exposure** per the 2018 SEF guidance without additional testing.

Contact: This memorandum was prepared by Bridgette Lohrman (PSET co-lead) and James Holm (PSET Lead, USACE) and reviewed by the participating PSET agencies, identified above. Questions regarding this memorandum should be directed to Bridgette Lohrman at (503) 326-4006 or e-mail to: lohrman.bridgette@epa.gov.

Table 5a. Project Sediment Analytical Summary – Dredge Prism (sampled September 2020 and May 2021)

Sediment Physical and Chemical Results							
Sample Location (sample year)	Surface (2020)	Subsurface (2021)					**SEF SL1, freshwater (SLV†)**
DMMU ID / Sample ID: Parameter	OSD-01, OSD-02, OSD-03, OSD-06, OSD-09, OSD-11	OSD-04r	OSD-05r	OSD-07r	OSD-08r	OSD-10r	
Grain size: gravel, sand, silt, clay (%)	Range: 2.8 to 8.2, 91.4 to 94.2, 0.6 to 4.5, 0.3 to 0.4	1.0, 95.7, 3.5, 0.3	0.5, 67.0, 26.3, 6.2	3.1, 95.1, 1.7, 0.1	1.5, 95.3, 3.0, 0.2	6.6, 92.7, 0.8, 0.1	--
Total Solids (%)	Range: 76.1 to 88.2	79.0	74.55	80.62	84.30	79.78	--
Total Organic Carbon (%)	Range: 0.04 to 0.1	0.05	0.30	0.06	0.05	0.05	--
Ammonia (mg/kg)	Range: 0.45 U to 0.52 U	22.0	52.5	8.58	7.01	3.19	230
Total Sulfides (mg/kg)	Range: 1.13 U to 1.26 U	Range: 1.16 U to 1.26 U	Range: 1.21 U to **39.1**	Range: 1.21 U to 1.24 U	Range: 1.23 U to 1.25 U	Range: 1.17 U to 1.20 U	39
Metals (mg/kg)	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Detect <SLs J	Non-detect, Detect <SLs U, J	Detect <SLs J	Non-detect, Detect <SLs U, J	Varies
Total PAHs (ug/kg)	Range: 4.8 J to 39.8 U Non-detect, Detect <SL	39.9 U	62.7	39.9 U	40.0 U	40.0 U	17,000
SVOCs (ug/kg) (phenols, phthalates, misc. extractables)	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Varies
Pesticides (ug/kg)	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	Varies
4,4'-DDD							310
4,4'-DDE	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	21
4,4'-DDT							100
PCBs, Total Aroclors (ug/kg)	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	110 (22†)
Butyltins (ug/kg)	3.69 U to 5.73 U Non-detect <SLs U	3.84 U to 5.74 U Non-detect <SLs U	3.83 U to 5.74 U Non-detect <SLs U	3.83 U to 5.73 U Non-detect <SLs U	3.86 U to 5.78 U Non-detect <SLs U	3.86 U to 5.78 U Non-detect <SLs U	Varies
TPH (dx/rx) (ug/kg)	Range: 5.55 U to 6.9 / 11.1 U to 37.8	6.05 U / 12.1 U	6.47 U / 17.3	6.10 U / 12.2 U	5.94 U / 11.9 U	6.08 U / 12.2 U	340 / 3,600
Dioxins/Furans, 2,3,7,8 TCDD TEQ (ng/kg) ND=0 / ND = ½ EDL	Range: 0.0056 to 0.0268 / 0.0666 to 0.1030	0.0183 / 0.1620	0.0118 / 0.1470	0.0593 / 0.1840	0.0240 / 0.1920	0.0154 / 0.1620	(5.6†)

BOLD = Detection exceeds SEF freshwater screening level; U = Non-detection (ND) at the method reporting limit (MRL) or method detection limit (MDL), MRL reported (MDL in parenthesis); J = Estimated value between MDL and MRL; † = ODEQ (2007) freshwater fish-based bioaccumulation screening level value.

Table 5b. Project Sediment Analytical Summary – Post-Dredge Surface (sampled May 2021)

PDS Sample ID: Parameter	OSD-01Z	OSD-02Z	OSD-03Z	OSD-06Z	OSD-09Z	OSD-11Z	**SEF SL1, freshwater (SLV†)**
Sediment Physical and Chemical Results							
Grain size: gravel, sand, silt, clay (%)	0.4, 95.6, 4.0, 0.1	0.5, 92.5, 7.0, 0.1	0.3, 38.1, 50.8, 10.6	1.0, 86.6, 11.0, 1.5	3.2, 71.9, 21.8, 3.1	2.4, 80.0, 16.1, 1.5	--
Total Solids (%)	76.1	75.4	68.7	82.0	74.5	74.7	--
Total Organic Carbon (%)	0.06	0.06	0.89	0.08	0.90	0.19	--
Ammonia (mg/kg)	28.4	20.6	169	31.5	29.5	18.6	230
Total Sulfides (mg/kg)	--	--	--	--	--	--	39
Metals (mg/kg)	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Detect <SLs J	Detect <SLs J	Detect <SLs J	Detect <SLs J	Varies
Total PAHs (ug/kg)	40.0 U	39.9 U	39.9 U	20.4	66.6 J	39.8 U	17,000
SVOCs (ug/kg) (phenols, phthalates, misc. extractables)	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Non-detect, Detect <SLs U, J	Varies
Pesticides (ug/kg)	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	Varies
4,4'-DDD					1.15 J		310
4,4'-DDE	1.0 U	1.0 U	1.0 U	1.0 U	0.36 J	1.0 U	21
4,4'-DDT					1.0 U		100
PCBs, Total Aroclors (ug/kg)	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	110 (22†)
Butyltins (ug/kg)	Non-detect <SLs U	Non-detect <SLs U	Non-detect <SLs U	Non-detect, Detect <SLs U	Non-detect, Detect <SLs U	Non-detect <SLs U	Varies
TPH (dx/rx) (ug/kg)	6.71 U / 13.4 U	6.68 U / 13.4 U	11.9 / 40.5	6.09 U / 12.2 U	6.92 U / 20.8	6.82 U / 13.6 U	340 / 3,600
Dioxins/Furans, 2,3,7,8 TCDD TEQ (ng/kg) ND=0 / ND = ½ EDL	0.0304 / 0.1790	0.0124 / 0.1240	0.0289 / 0.1510	0.0304 / 0.1980	2.68 / 2.78	0.0216 / 0.1850	(5.6†)

BOLD = Detection exceeds SEF freshwater screening level; U = Non-detection (ND) at the method reporting limit (MRL) or method detection limit (MDL), MRL reported (MDL in parenthesis); J = Estimated value between MDL and MRL; † = ODEQ (2007) freshwater fish-based bioaccumulation screening level value.

Figure 1. Oregon Slough Downstream shallow draft Federal Navigation Channel, actual grab sample locations (sampled 11-13 September 2020).

Name	Latitude	Longitude
CR-REF-COMP	45.674389	-122.775161
OSD-01A	45.617666	-122.709782
OSD-01B	45.617185	-122.708884
OSD-01C	45.616704	-122.707848
OSD-02A	45.616208	-122.706895
OSD-02B	45.615660	-122.705833
OSD-02C	45.615191	-122.704927
OSD-03A	45.613777	-122.702033
OSD-03B	45.613298	-122.701086
OSD-03C	45.612890	-122.700105
OSD-06A	45.612444	-122.698321
OSD-06B	45.612198	-122.696932
OSD-06C	45.611830	-122.695645
OSD-09A	45.611440	-122.694373
OSD-09B	45.611037	-122.693297
OSD-09C	45.610613	-122.692029
OSD-11A	45.610181	-122.690562
OSD-11B	45.609738	-122.689157
OSD-11C	45.609159	-122.688125

Figure 2. Oregon Slough Downstream shallow draft Federal Navigation Channel, actual sonic drill sample locations (sampled 10-12 May 2021).

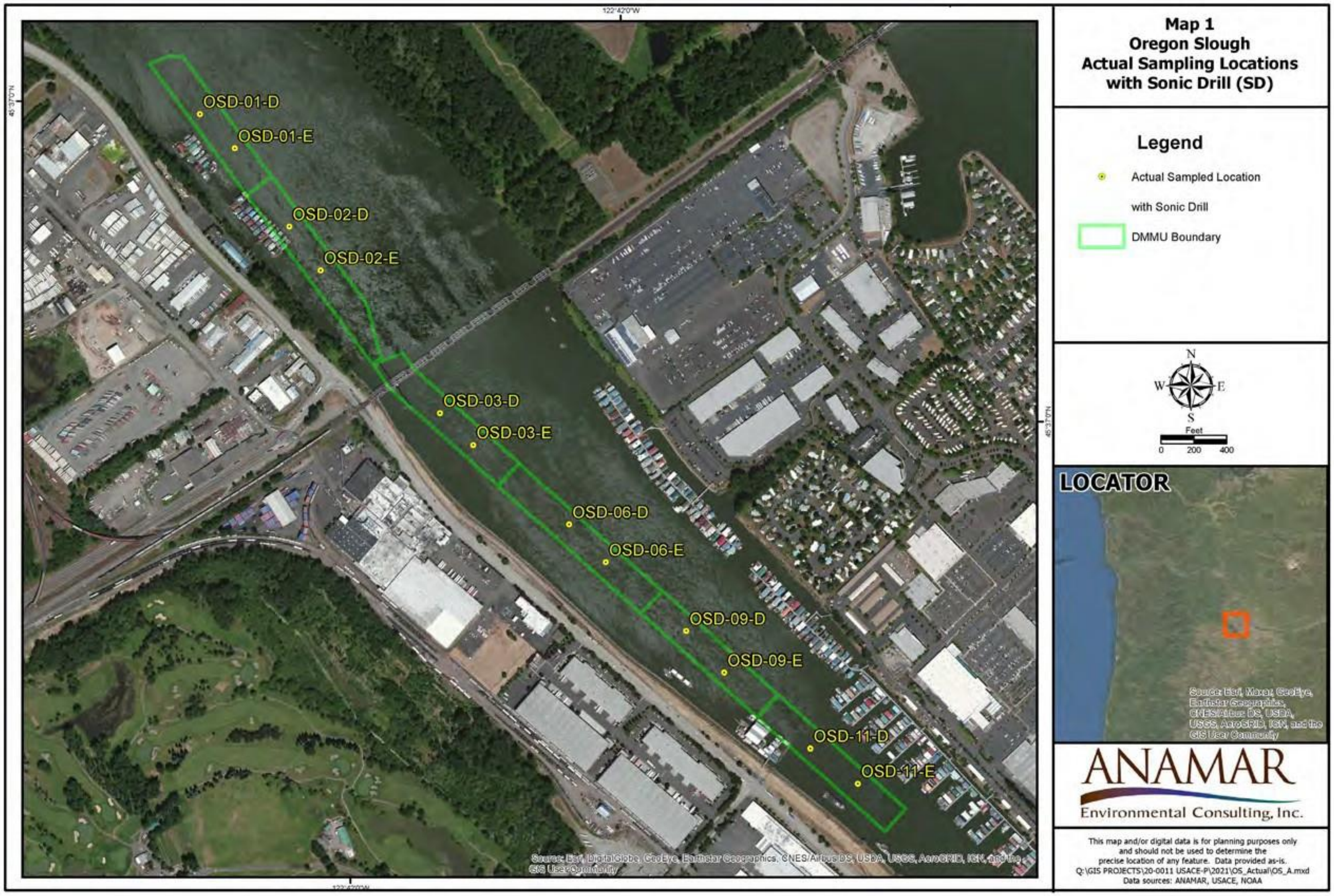
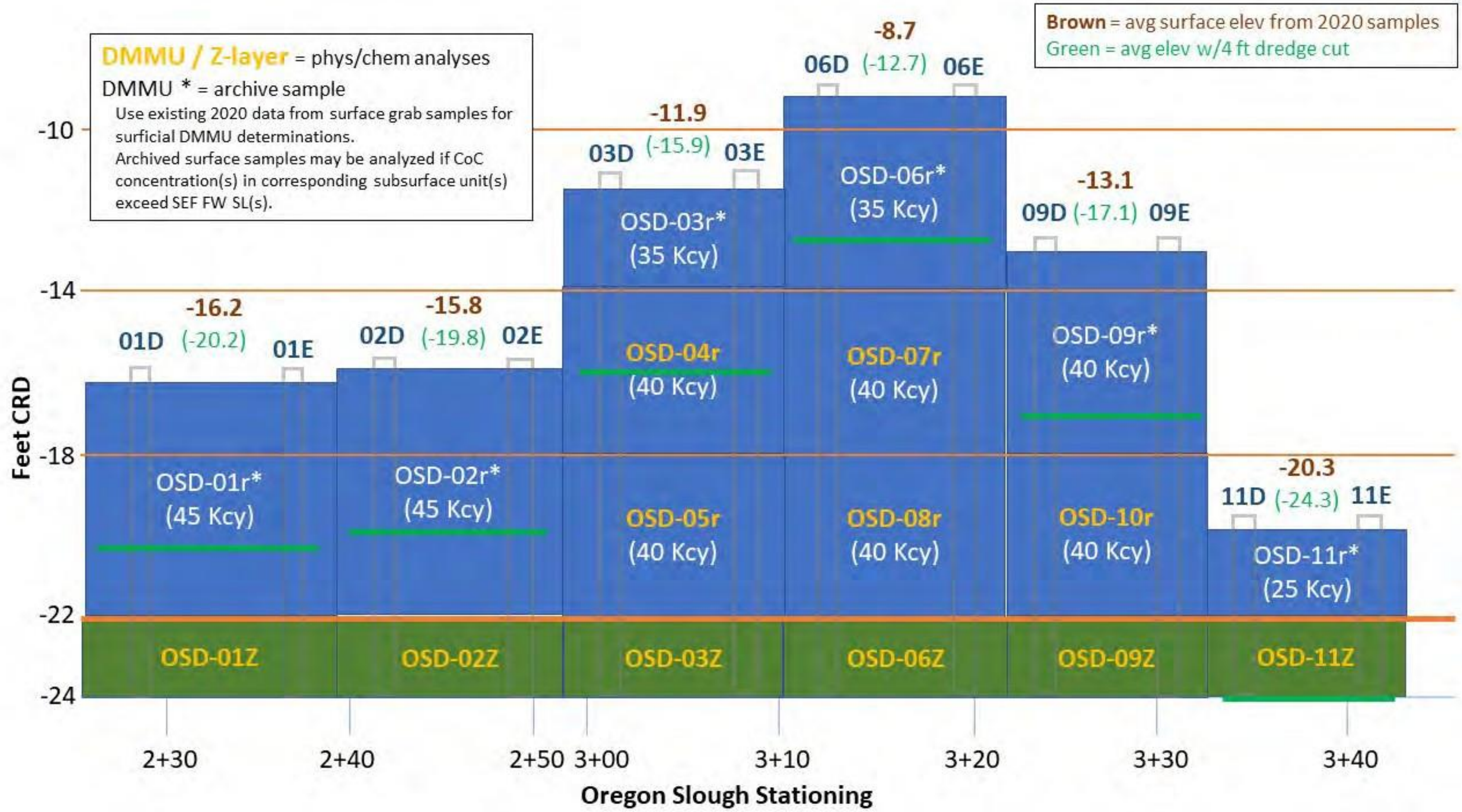


Figure 3. Oregon Slough Downstream shallow draft conceptual DMMU and Z-layer diagram (USACE SSAP, 2021).



EPA-Region 10 Water Division, Wetlands and Oceans Section 1 August 2019

Memorandum for: U.S. Army Corps of Engineers – Portland District, Operations Division, Channels and Harbors, Waterways Maintenance Section (CENWP-ODN-W, Stokke), Oregon Slough Federal Navigation Side Channel, Upstream Entrance.

Subject: Portland Sediment Evaluation Team (PSET) Level 2A dredged material suitability determination for the U.S. Army Corps of Engineers - Portland District's (Corps) operations and maintenance (O&M) dredging for the Oregon Slough Federal Navigation Side Channel, Upstream Entrance (OSU FNC) in the Columbia River at river mile (RM) 108.

Introduction: Per the May 2018 *Sediment Evaluation Framework for the Pacific Northwest* (SEF)[1], this suitability memorandum (SDM) documents the consensus of the PSET agencies regarding the suitability of the dredged material for unconfined, aquatic disposal. The PSET reviewed the Corps' 18 July 2019 "*Oregon Slough Upstream Federal Navigation Side Channel, Sediment Quality Evaluation Report*" (SQER)[2], prepared by Corps' Sediment Quality Team (SQT). Sediment chemical testing results are summarized in the SQER; chemical analytical results were compared to the freshwater benthic toxicity screening levels (SEF SLs) published in the 2018 SEF. The PSET also used Oregon DEQ's sediment screening level value (SLV) for freshwater fish to evaluate PCBs[3].

Suitability Summary:

Surface Sediments:	☒Suitable	☐Unsuitable
Post-Dredge Surface (PDS):	☒Suitable	☐Unsuitable

Reviewers: The PSET agencies include the Corps, U.S. Environmental Protection Agency – Region 10 (EPA), National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife (USFWS), Washington Department of Ecology (Ecology), and Oregon Department of Environmental Quality (ODEQ). Table 1 lists the PSET's review timeline for this project. Reviewers included:

☒ James Holm (Corps, Lead)	☒ Bridgette Lohrman (EPA, Co-Lead)	
☒ Pete Anderson (ODEQ)	☒ Laura Inouye (Ecology)	☒ Dominic Yballe (Corps)
☒ Tom Hausmann (NMFS)	☒ Jeremy Buck (USFWS)	

PSET/SEF Conditions:

☒ Data Recency Expiration – The data recency of this SDM for the OSU FNC expires in April 2026.

[1] U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, Washington Department of Ecology, Washington Department of Natural Resources, Oregon Department of Environmental Quality, Idaho Department of Environmental Quality, National Marine Fisheries Service, and U.S. Fish and Wildlife Service. 2018. *Sediment Evaluation Framework for the Pacific Northwest*. Published May 2018, by the U.S. Army Corps of Engineers, Northwestern Division, 183 pp with Appendices.

[2] U.S. Army Corps of Engineers – Portland District. 2019. *Oregon Slough Upstream Federal Navigation Side Channel; Multnomah County, Oregon; Columbia River (River Mile 108); Sediment Quality Evaluation Report*. Prepared by the Corps SQT, 18 July 2019. 14 pp plus Attachments.

[3] Oregon Department of Environmental Quality. 2007. *Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment*. Updated April 3, 2007 by ODEQ Environmental Cleanup Program, 18 pp with Appendices.

Table 1. Review Timeline

Sampling and analysis plan (SAP) submitted to PSET	12 February 2019
SAP revisions requested by PSET (verbal)	13 February 2019
Revised SAP submitted	22 February 2019
Final SAP[4] submitted	11 March 2019
Final SAP approved by PSET	26 March 2019[5]
Sampling date(s)	5 April 2019
Draft SQER submitted to PSET	18 July 2019
Final SQER	18 July 2019
Suitability Determination Memorandum (SDM) issued by PSET	01 August 2019
Management area ranking	Low
Recency of data*	April 2026 (7 years)

Federal Regulatory Authorities:

☒ Section 10, Rivers and Harbors Act
☒ Section 404, Clean Water Act (CWA)
☒ Section 401, CWA
☒ Section 7, Endangered Species Act
☒ Section 305 of the Magnuson-Stevens Act
☒ Fish and Wildlife Coordination Act
☐ Section 103, Marine Protection, Research and Sanctuaries Act
☐ Comprehensive Environmental Response, Compensation, and Liability Act

Project Description: Table 2 provides a summary of the dredging project details for the OSU FNC. Maintenance dredging is needed to provide navigation access.

Table 2. Project Details

Waterbody/river mile (RM)	Columbia River, 108
Total proposed dredging volume (cy)	~133,000
Max. proposed dredging depth (includes overdepth allowance)	-12 ft. CRD
Dredging area (acres, approx.)	~40
Dredge dimensions	300 ft. wide by 5,800 ft. long
Dredging method	Pipeline, clamshell or hopper dredge
Dredged material transport	Barge, hopper, or pipeline
Proposed disposal location(s)	Columbia River flowlane
Proposed dredging date(s)	Typically August through December
Dredged material mgmt. units (DMMU)	2 (3-station composite samples)

[4] US Army Corps of Engineers. 2019. *Oregon Slough Federal Navigation Channel – Upstream Entrance (Columbia River, River Miles 108-109); Multnomah County, Oregon; Sediment Sampling and Analysis Plan.* Prepared by Corps SQT 11 March 2019. 14 pp with Attachments.

[5] Portland Sediment Evaluation Team (PSET). 2019. [E-mail correspondence] *PSET – Oregon Slough Federal Project (SAP Approval)*. Bridgette Lohrman, EPA, sent 26 March 2019. 2 pp.

Sampling and Analysis Description: The Corps' sampling and analytical program for the OSU FNC is summarized in Table 3. Actual sample station locations are shown in the SQER Table 3 and Figure 1, and SDM Figure 1.

Table 3. Sampling and Analysis Description

Sample collection method		Standard PONAR Grab		
DMMU ID		OSU-01	OSU-02	BOTH
DMMU Rank		Low	Low	Low
DP sample ID		040519-OSU-01-COMP	040519-OSU-02-COMP	040519-OSU-COMP-TIN
PDS sample ID		NA	NA	NA
Proposed DMMU volume (cy)		70,000	63,000	133,000
Dredge Prism	Depth range (ft CRD)	-6.42 to -6.81	-4.75 to -8.23	-4.75 to -8.23
	Composite (Y/N)	Y	Y	Y
	Subsamples (SS)/DMMU	3	3	6
	SS Archive (Y/N)	Y	Y	Y
PDS Layer	Depth range (ft CRD)	N/A		
	Composite (Y/N)			
	SS/PDS-layer			
	SS Archive (Y/N)			
Sediment Physical and Chemical Analysis (No. DP/ No. PDS)				
Grain size		1/-	1/-	-/-
Total organic carbon		1/-	1/-	-/-
Total solids		1/-	1/-	-/-
Total volatile solids		1/-	1/-	-/-
Metals, freshwater		1/-	1/-	-/-
Total PAHs		1/-	1/-	-/-
SVOCs (phthalates, phenols, misc. extractables)		1/-	1/-	-/-
Pesticides		1/-	1/-	-/-
PCBs (Total Aroclors)		1/-	1/-	-/-
Butyltins		-/-	-/-	1/-
Total petroleum hydrocarbons (dx, rx)		1/-	1/-	-/-

Deviations from the SAP: There were no deviations from the PSET-approved SAP.

Results and Discussion: Analytical results for the Corps' sampling event are summarized in Table 4. The chemical analytical results from the SQER were compared to the 2018 SEF freshwater SLs and ODEQ's SLV for freshwater fish to evaluate PCBs. There were no detections or non-detection exceedances (U) of freshwater SEF SLs or applicable ODEQ SLV.

Table 4. Project Sediment Analytical summary

Decision unit (Sample ID): Parameters	040519-OSU-01-COMP	040519-OSU-02-COMP	040519-OSU-COMP-TIN	SEF freshwater SL1
Grain size (%)				
Gravel	1.0	0.0	--	--
Sand	96.8	78.6	--	--
Silt and clay	2.0	21.3	--	--
Total organic carbon (%)	0.03	0.47	--	--
Total solids (%)	99.97	71.8	--	--
Metals (mg/kg)	<SLs J, U	<SLs J, U	--	Varies
Total PAHs (ug/kg)	93.9 J	39.7 U	--	17,000
SVOCs (ug/kg) (phthalates, phenols, misc. extractables)	<SLs J, U	<SLs U	--	Varies
Pesticides (ug/kg)				
DDDs	0.99 U	0.98 U	--	310
DDEs	0.99 U	0.98 U	--	21
DDTs	0.99 U	0.98 U	--	100
Other pesticides	<SLs U	<SLs U	--	Varies
Total Aroclors – PCBs (ug/kg)	4.0 U	3.9 U	--	110 (22†)
Butyltins (ug/kg)				
Monobutyltin	--	--	3.85 U	540
Dibutyltin	--	--	5.45 U	910
Tributyltin	--	--	3.64 U	47
Tetrabutyltin	--	--	4.71 U	97
Total Petroleum Hydrocarbons (mg/kg)				
Diesel range	6.1 U	27.7	--	340
Residual range	12.2 U	55.7	--	3,600

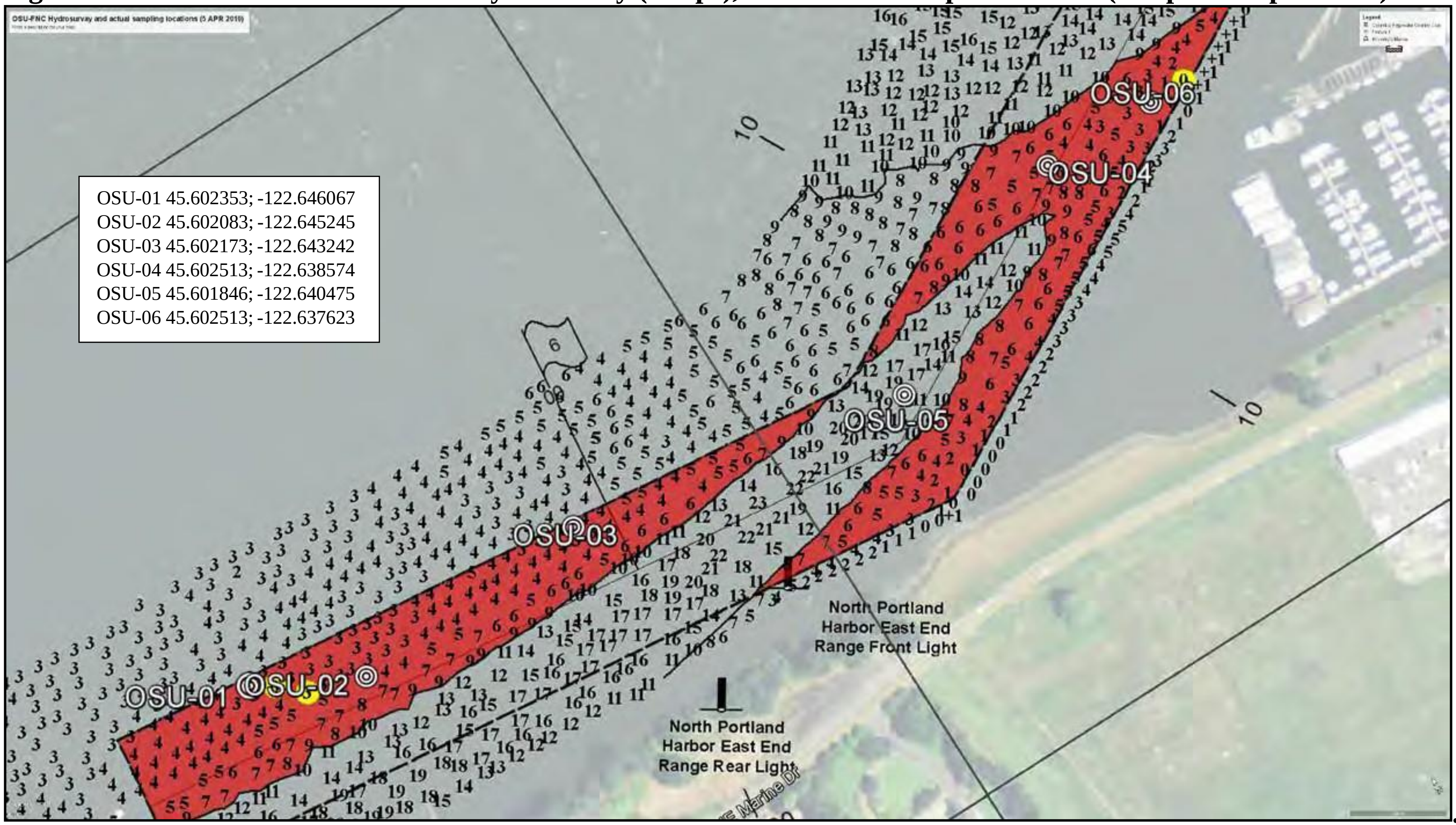
U = Non-detection at the method reporting limit (MRL) or method detection limit (MDL), MRL reported;
J = Estimated value between MDL and MRL; † = ODEQ (2007) freshwater fish-based SLV

PSET Suitability Determination:
Dredge Prism – Chemical concentrations in both dredge prism composite samples were below the SEF freshwater SLs as discussed above. As such, the **OSU FNC dredged prism material** is **suitable for unconfined, aquatic disposal** per the 2018 SEF guidance.

Post-Dredge Surface – The dredge prism materials were determined to be suitable and the Oregon Slough Upstream Entrance has a “low” management area rank. As such, the PSET assumes that the **OSU FNC post-dredge surface** is **suitable for unconfined, aquatic exposure** per the 2018 SEF guidance.

Contact: This memorandum was prepared by Bridgette Lohrman (PSET co-lead) and James Holm (PSET Lead, Corps) and reviewed by the participating PSET agencies, identified above. Questions regarding this memorandum should be directed to Bridgette Lohrman at (503) 326-4006 or e-mail to: lohrman.bridgette@epa.gov.

Figure 1. OSU FNC – December 2018 hydrosurvey (Corps), 2019 actual sample locations (sampled 5 April 2019)



Water Quality Sampling and Monitoring Plan

For Federally authorized Columbia River Navigation Channel (RM 3 to 145),
Columbia River Side Channels and Portland-Vancouver Anchorages

This plan is prepared in accordance with the following environmental clearances:

A) 401 Water Quality Certificates:

Columbia River (RM 3 to 145) & Side Channels
State of Oregon Department of Environmental Quality, application for certificate renewal
State of Washington Department of Ecology, certificate dated September 10, 2020, as amended

B) Biological Opinions:

Mouth of the Columbia River, Columbia River & Side Channels (except as listed separately)
National Marine Fisheries Service, consultation number 2011/02095 dated July 11, 2012

Tongue Point, Elochoman Slough, Lake River and Oregon Slough Side Channels
National Marine Fisheries Service, consultation number WCRO-2020-02918 dated June 16, 2021

The work procedures described herein have been coordinated with the States of Oregon and Washington and the National Marine Fisheries Service to ensure compliance with all applicable Water Quality Certificates and Biological Opinions. All requirements of the state Water Quality Certificates and Biological Opinions apply.

If there is a discrepancy between this Sampling Plan and the Water Quality Certificates or Biological Opinions, the more restrictive requirement applies.

Sampling Procedures

1. **Instrument Sampling and Visual Observations**. It is expected that instrument samples for turbidity and dissolved oxygen will be taken from a water quality monitoring boat. All sample measurements by instrument will be taken at a water depth of 15 feet (± 2 feet) or the midpoint of the water column (± 2 feet) if the water depth is less than 20 feet. It is expected that visual turbidity observations for dredging activities will be observed from the dredge and turbidity observations for in-water placement will be observed from the hopper dredge or tugboat or end scow, as applicable. Visual observations shall include notation of whether the water is clear (no visible turbidity) or cloudy (yes visible turbidity) at the observation point.

2. **Background Sampling**. Background samples/observations must be taken immediately prior to conducting each compliance test. Background samples/observations will be taken up current of dredging and placement operations, within the authorized navigation channel if possible, and well outside the influence of the dredging operation. Obtaining a sample/observation outside the influence of the dredging or placement operation is critical to ensuring valid compliance tests, and is the primary consideration when selecting a location. Background sampling does not apply to dissolved oxygen compliance.

3. **Dredging Compliance Sampling**. Compliance samples/observations must be taken during daylight hours, during active dredging, and in the turbidity plume if visible. Sampling/observation frequencies, locations, and types are listed below by Federal channel.

Turbidity

Dredge Area	Frequency of Testing	Compliance Test Location	Type of Sample
Columbia River Navigation Channel RM 3 to 145	twice/day (ebb & flood)	900 feet downcurrent from point of discharge and no more than 150 feet lateral	Visual
State of Washington Side Channels: Baker Bay, Chinook, Skamokawa Creek, Elochoman Slough, Wahkiakum Ferry Channel, Old Mouth Cowlitz, Lake River	twice/day (ebb & flood)	900 feet downcurrent from point of discharge and no more than 150 feet lateral	Visual
State of Oregon Side Channels: Hammond Boat Basin, Skipanon, Tongue Point, Westport Slough, Oregon Slough RM 1.5-3.8, Upstream Entrance to Oregon Slough	twice/day (ebb & flood)	900 feet downcurrent from point of discharge and no more than 150 feet lateral	Instrument (Turbidimeter)
State of Oregon: Portland-Vancouver Anchorages	twice/day (ebb & flood)	900 feet downcurrent from point of discharge and no more than 150 feet lateral	Instrument (Turbidimeter)

Dissolved Oxygen

Dredge Area	Frequency of Testing	Compliance Test Location	Type of Sample
Columbia River Navigation Channel RM 3 to 145	Not required		
All Side Channels and Portland-Vancouver Anchorages	Prior to start of project, then twice/day (ebb & flood)	300 feet downcurrent from point of discharge and no more than 150 feet lateral	Instrument (Dissolved Oxygen meter)

4. **Placement Compliance Sampling**. Compliance samples must be taken during daylight hours, during active placement and/or placement site dewatering, and in the turbidity plume if possible. Sampling frequencies, locations, and types are organized below by operation.

Turbidity

Operation	Frequency of Testing	Compliance Test Location	Type of Sample
In-Water Placement	twice/day (ebb & flood)	900 feet downcurrent from point of discharge and no more than 150 feet lateral	Visual
Shoreline Placement	twice/day (ebb & flood)	900 feet downcurrent from point of discharge and no more than 150 feet lateral	Visual
Upland Placement return water outfall	every 4 hours	300 feet downcurrent from point of discharge	Visual

Notes:

1. Upcurrent & downcurrent locations for selecting sampling points are determined by surface currents, not by tidal state.

2. Tidal state will be reported as the tide at the sample location as determined by the automatic tide gauge on the dredge, or by a published tide program specific to the area being tested.

3. Daylight hours are determined by the published times for sunrise and sunset. These will be noted on the water quality monitoring report.

4. Monitoring will generally be conducted mid-way through the dredging cycle or placement event, or after a sufficient amount of time has elapsed to ensure that the turbidity plume has had sufficient time to reach the compliance sampling location. This would generally be several minutes after a cycle or event commences.

5. Water quality monitoring will not be done under any unsafe conditions as determined by the boat operator, captain or other individual. A monitoring interval may be omitted during unsafe conditions for the monitoring boat. As long as monitoring can be done during the tide cycle, third party verification will not be made. However, if conditions do not improve by the end of the tide cycle and monitoring cannot be done on the tide cycle as required, a third party verification will be required. Should the boat operator or dredge captain determine that conditions are unsafe for the monitoring boat; this must be verified via an independent third party such as the Coast Guard Watch Stander, National Weather Service, Columbia River Pilots, Columbia River Bar Pilots, or other credible third party. This verification must be done in writing by preparing a written record of the telephone conversation (worksheet attached). This third party verification must be obtained prior to the end of the tide cycle.

6. A positive means of determining relative position of the monitoring boat to the dredge, such as an electronic distance measurer (range finder) will be kept on the monitoring boat and used to periodically check positioning.

7. The testing depth will be automatically logged by the YSI instrument and reported on the Water Quality Monitoring Report.

8. Coordinates will be automatically logged by the YSI instrument for all test locations by a differential GPS unit (using the Coast Guard beacon or a WASS-enabled GPS unit). This coordinate data will be reported in NAD 83 (State Plane Oregon North) on the Water Quality Monitoring Report.

9. The instrument will be lowered to the testing depth (background and compliance); the reading will be taken shortly after reaching the testing depth. The only exception is if the readings are rapidly going up, which indicates that the instrument display has not had time to increment up to the correct reading. The reading will not be recorded until the display number has stabilized.

Equipment (for non-visual monitoring)

1. Instrumentation. The YSI Meter will be used, with the following features (or equivalent):

    a. Turbidity Probe, Model 6136
    b. Dissolved Oxygen Probe, Model 6562 or 6150
    c. Logger 650 MDS
    d. Sonde: Multiparameter 6600 EDS-M or 6820
    e. Temperature and Depth Probe 6560

2. Calibrations:

    a. The turbidity probe will be calibrated once a week, or more if data is suspect. A two-point calibration method will be used and calibrations will be in accordance with the manufacturer's instructions.
    b. The YSI data logger clock will be checked against the dredge clock (or tug if a scow is used for disposal) daily.
    c. The Dissolved Oxygen probe and all other instrument features will be calibrated in accordance with the manufacturer's recommendations.
    d. The results of the calibrations (including measurement value against a standard) will be recorded in the Daily Water Quality Monitoring Report.

3. Instrument Parameters. The YSI instrument will be set to take discrete readings every 0.5 seconds.

4. Downrigger System. The YSI instrument will be mounted on an automatically operated downrigger with a 15-pound minimum weight. Downrigger stops will be installed at the testing depth so it can be rapidly reached quickly while the boat is in position for testing. A manual downrigger will be stored on each monitoring boat in a readily accessible location. This manual downrigger will be used in the event that the automatic downrigger malfunctions. All necessary mounting hardware for the manual downrigger will be installed on the boat so that the manual downrigger can be quickly put in place.

5. The Operations Manual Supplied by YSI. A copy of this manual will be kept with all instruments.

6. Instrument Accuracy. For the YSI meter specified, the manufacturer's stated accuracies are as follows:

    a. Turbidity: ± 2 NTU or 5% of the reading, whichever is greater.
    b. Dissolved Oxygen: ± 0.2 mg/l or 2% of the reading (in the range of 0 to 20 mg/l), whichever is greater.

    All measurements should be considered to be a range of values based on the stated accuracy. For example, a measurement of 8 NTU would be considered to be a range of 6 NTU to 10 NTU.

    Turbidity will be reported to the nearest 1 NTU. Conventional rounding will be used. For example 0.5 or greater, should be rounded to 1 when reporting whole numbers.

    Dissolved oxygen will be reported to the nearest 0.1 mg/l. Conventional rounding will be used.

Compliance

1. Turbidity

Turbidity must be measured/observed and recorded as described above. All samples/observations must be recorded. Results must be compared to the background sample/observation taken during that monitoring event.

For visual observations: the observation of the turbidity plume at the compliance location is considered an exceedance.

For instrument sampling: Determination of compliance must take into account the accuracy of the instrument (compliance range calculation examples attached). Turbidity is considered to be in exceedance when the lower range value of the compliance measurement (considering instrument accuracy) is greater than the upper range value of the sum of the background measurement and acceptable compliance range (defined in table below).

Turbidity is considered to have returned to background when the lower range value of the compliance measurement is at or below the upper range value of the background measurement.

If an exceedance is measured, a re-test will be taken immediately. If the value of the re-test is also an exceedance, the exceedance is confirmed for that monitoring interval and action must be taken according to the table below. If the re-test value is within acceptable levels, the initial exceedance is not confirmed so there is no exceedance for that monitoring interval.

If a confirmed exceedance occurs at two consecutive monitoring intervals, the activity must stop until the turbidity levels return to background (as confirmed by another sample or observation). At that time, activity may resume with the minimum frequency of monitoring while maintaining compliance.

Turbidity Level		Action Required at 1st Monitoring Interval	Action Required at 2nd Monitoring Interval
Background <50 NTU	Background ≥ 50 NTU		
0 to 5 NTU above background	10% or less over background	Continue to monitor at next interval	Continue to monitor at next interval
Greater than 5 NTU above background	Greater than 10% over background	Modify activity and continue to monitor at next interval	Stop activity until levels return to background and then continue to monitor at next interval

During re-sampling/observations to determine when levels return to background, a new background sample/observation for turbidity will be obtained if it appears that conditions have changed such that the background sample/observation may be invalid, or if up to two hours have passed. If a new background sample/observation is obtained, the reason therefore must be clearly annotated on the water quality monitoring report.

2. Dissolved Oxygen

Dissolved oxygen must be measured and recorded as described above. All samples must be recorded. If the concentration measured is below 8 mg/l, a re-test will be taken immediately. If the value of the re-test is also measured below 8 mg/l, the reduced level is confirmed and action must be taken according to the table below.

If a confirmed level (test and re-test) below 6.5 mg/l is measured (or if distressed or dead fish are observed in or beside the dredge), the activity must stop until the dissolved oxygen level returns above 6.5 mg/l (as measured by another sample). At that time, activity may resume with monitoring at the appropriate frequency interval based on the level of dissolved oxygen measured. Dredging may not begin if dissolved oxygen concentration at the dredge site is less than 6.5mg/l.

Dissolved Oxygen Level	Action Required
8 mg/l or greater	Continue to monitor at next interval
6.5 mg/l up to 8 mg/l	Increase monitoring frequency to every 4 hours during daylight hours and active dredging
Less than 6.5 mg/l	Stop activity until levels return to above 6.5 mg/l and then continue to monitor at appropriate interval based on level of dissolved oxygen measured

Activity Modifications and Stopping Activity

Dredging

1. Hopper Dredging Activity:
    a. Modification of the hopper dredging activity means that the dredge cannot pass back over the point where the exceedance occurred while completing the dredging load. Dredging may continue while moving away from the area, but no dredging can occur in the area where the exceedance was observed (or measured and confirmed) until the water quality parameter(s) have returned to acceptable levels. The mate's screen will be marked with the position of the dredge when the exceedance was measured to ensure that the dredge does not pass back over this point while filling the hopper. This may necessitate frequent moves or additional transit time, especially during clean-up operations.
    b. Stopping the hopper dredging activity could be any of the following actions:
        i. Stop dredging and transit to the disposal site.
        ii. Stop dredging and move to a different dredging location well away from the area where an exceedance was measured.
        iii. Stop dredging and stand by.

    Dredging may not resume at the same dredging location where the exceedance occurred until an additional observation (or sampling) indicates that the water quality parameter(s) have returned to acceptable levels.

2. Pipeline Dredging Activity: The Corps is not aware of any acceptable "modifications" for pipeline dredging activities. Once an exceedance has been observed or measured and confirmed, all further dredging operations must be stopped until additional sampling indicates that the water quality parameter(s) have returned to acceptable levels.

3. Clamshell Dredging Activity: Currently the Corps is not aware of any acceptable "modifications" for clamshell dredging activities. Because of the stationary nature of a clamshell operation, once an exceedance has been observed or measured and confirmed, all further dredging operations must be stopped until additional observations or sampling indicate that the water quality parameter(s) have returned to acceptable levels.

In-Water Placement

1. Hopper Dredge and Dump Scow Placement: In-water placement by a hopper dredge or dump scow is anticipated to be a short term discrete event. Because of the short term nature of the placement event, the dredge or scow will not be expected to stop placing the current load if an exceedance is observed during placement. However, once an exceedance has been observed, all further placement operations at that placement site must be stopped until an additional observation indicates turbidity has returned to acceptable levels. It is anticipated that turbidity levels will return to background before the next scheduled placement event.

2. Pipeline Dredge Placement: In-water placement by a pipeline dredge is anticipated to be a continuous event. The Corps is not aware of any acceptable "modifications" for pipeline dredge in-water placement operations. Once an exceedance has been observed, placement operations at that site must be stopped until an additional observation indicates that turbidity has returned to acceptable levels.

Shoreline Placement

1. Activity modifications include: adjusting site berms to slow water discharge and any other action intended to further minimize turbidity.

2. If exceedances occur at two consecutive monitoring intervals, placement operations at that site must be stopped until an additional observation indicates turbidity has returned to acceptable levels.

Upland Placement

1. Return water from upland placement site: Activity modifications include: adjusting weirs (boards and outfall discharge ends), adjusting internal site berms to slow water discharge, and any other action intended to further minimize turbidity.

2. If exceedances occur at two consecutive monitoring intervals, all water discharge to the river must be stopped until an additional observation indicates turbidity has returned to acceptable levels. The drainage system for return water to the river must contain a means to shut off the discharge.

Reporting

Daily Water Quality Monitoring Report. There must be a water quality monitoring report completed for each day that there is scheduled activity. If no activity actually occurs during a monitoring interval (for example, the dredge is down for repairs), a report is submitted with an explanation in the Remarks column. Example reporting forms for visual turbidity observations turbidity/dissolved oxygen sampling with an instrument are attached. Electronic copies are provided to the dredge. The following data will be included:

1. Date
2. Published times for sunrise and sunset
3. Test (Background, compliance, confirmation of exceedance (if applicable), return to background)
4. Location (Channel Dredge Area or Placement site name)
5. Contract Name (if applicable)
6. Contract Number (if applicable)
7. Placement Site
8. For instrument sampling: Position in NAD 83 (State Plane Oregon North)
9. For instrument sampling: Depth as logged by the YSI instrument
10. Tidal State (ebb/flood/slack), at the testing location
11. Load Number
12. Time
13. Remarks column will contain any statements necessary to explain the data including the following:
    a. Delays in the testing cycle and the reason therefore (for example if the dredge was down for repairs, or if the dredging cycle was longer than the required testing frequency)
    b. Delays in monitoring due to restricted visibility
    c. Locations where water quality criteria were exceeded, along with actions taken (i.e. was the operation modified or stopped)
    d. Additional samples performed to confirm exceedance or return to background, this must be noted
    e. If operation is modified or stopped as a result of the exceedance, what time the modification or stoppage began, how long it lasted, and what time operations resumed
    f. Best Management Practices used to bring the levels back into compliance
    g. Observation of a visible plume (yes/no) if present when measurement exceeds water quality criteria
14. Results of calibrations

Water Quality Monitoring Report - Visual Observations

Date (mm/dd/yy):		**Contract #:**		**Dredge Name:**		**Sunrise/Sunset (hh:mm):**	
Contract Name:		**Dredge Type:**		**Captain:**			

Load #	**Activity (Dredging or Placement)**	**Tidal State**	**Time**	**Channel Name (Dredging)**	**Channel Station (Dredging)**	**Placement Area (Placement)**	**Background Point** upcurrent and outside the area of influence (dredging or placement) Visible Turbidity (yes/no)	**Compliance Point** 900 feet down current, less than 150 feet laterally from dredging or placement Visible Plume (yes/no)	**Exceedance:** no visible turbidity at Background Point and yes visible turbidity plume at Compliance Point (yes/no)	**Remarks If in Exceedance: Action Taken, time activity stopped, resumed and duration of stoppage**

Form dated 27-Jun-2014

Attachment D

Water Quality Monitoring Report - Sampling with an Instrument

Date (mm/dd/yy):		Contract #:		Dredge Type:		Clock Validated (hh:mm):		Calibration Date (mm/dd/yy):		Calibration Standard Value:		
Contract Name:				Dredge Name:		Captain:		Sunrise/Sunset (hh:mm):		Calibration Measured Value:		

Test No.	Test Type	Load No.	Tidal State	Channel Name	Dredging RM From	Dredging RM To	Test Time hh:mm:ss	Test Coordinates (NAD83) (x)	Test Coordinates (NAD83) (y)	NTU Meter Display	Adjusted NTU	Depth (ft)	NTU Limit	NTU Compliance	DO (mg/L)	Adjusted DO Compliance	In/Out Of Plume	Stopped (hh:mm)	Resumed (hh:mm)	Duration of Stoppage (hh:mm)	Exceedance Action Taken	Remarks
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						
											-		-	-		-						

Form dated 05-Apr-2018

Unsafe Water Quality Monitoring Conditions Worksheet

Project Information

Date & Time	
Monitoring Vessel	
Location(s) & action(s)	
Tide (ebb and/or flood)	

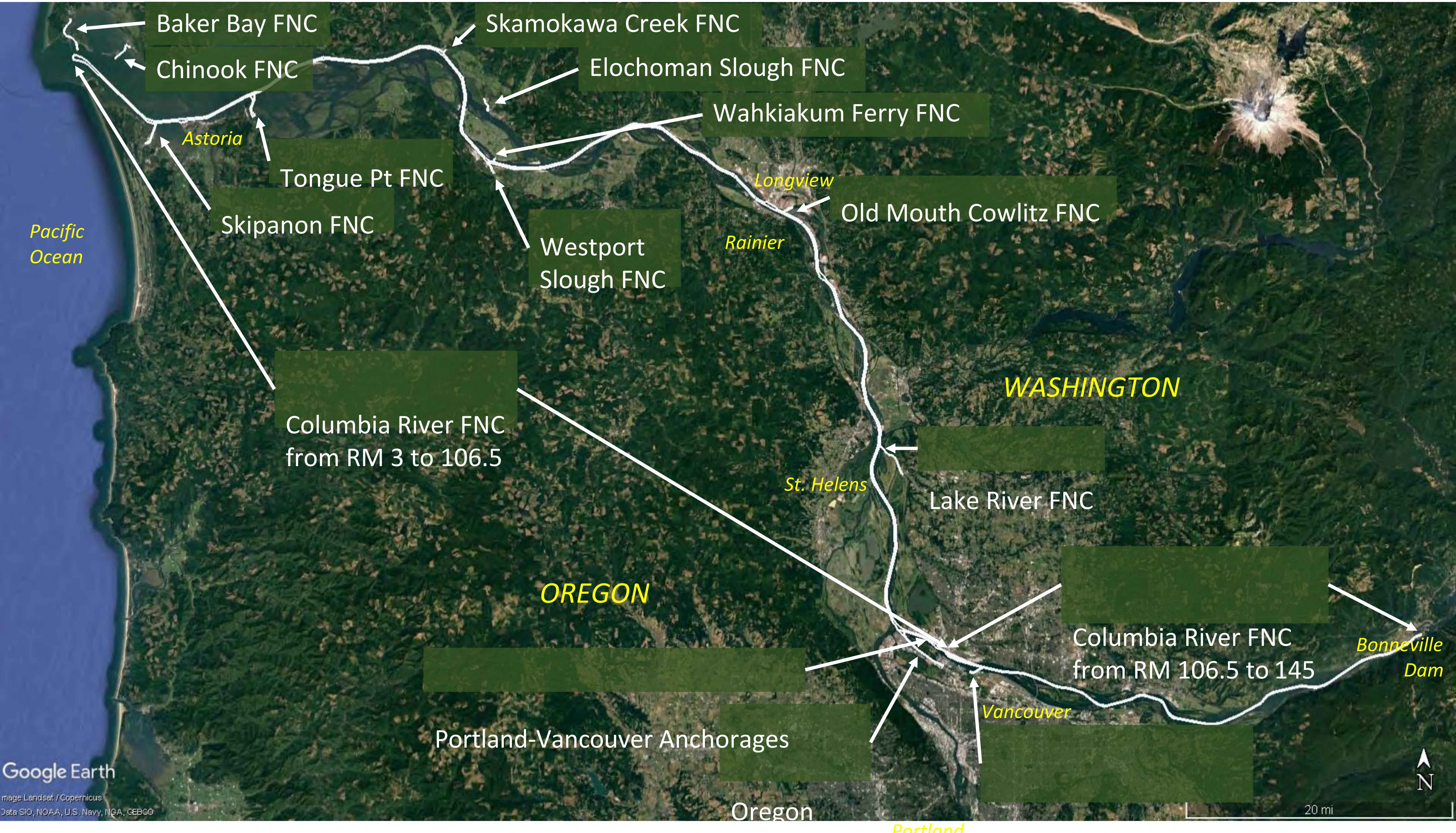
Third Party Contacted (check one)		Contact Info
	MCR Recorded Message	(360) 642-3565
	USCG Watch Stander	(360) 642-2382 or Marine Radio Channel 13
	Columbia River Bar Pilot (Bar to Astoria)	(503) 325-2641 or Marine Radio Channel 13
	Columbia River Pilot (Astoria to Portland)	(503) 289-9922 or Marine Radio Channel 13

Criteria in Question

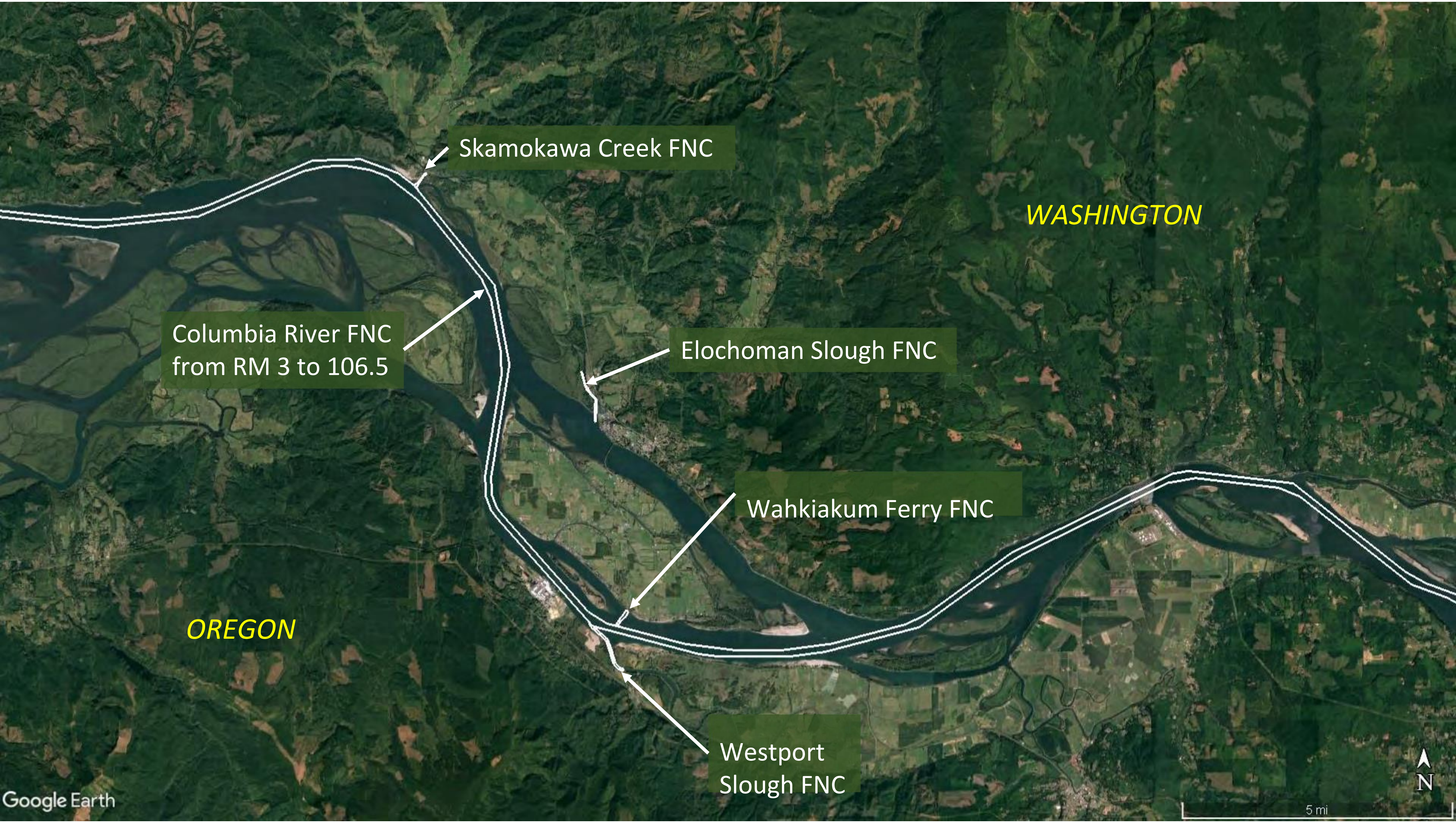
Visibility (miles)	
Wind (kts, steady and gusts)	
Wave Height (feet)	
Current (kts)	
Precipitation (type)	

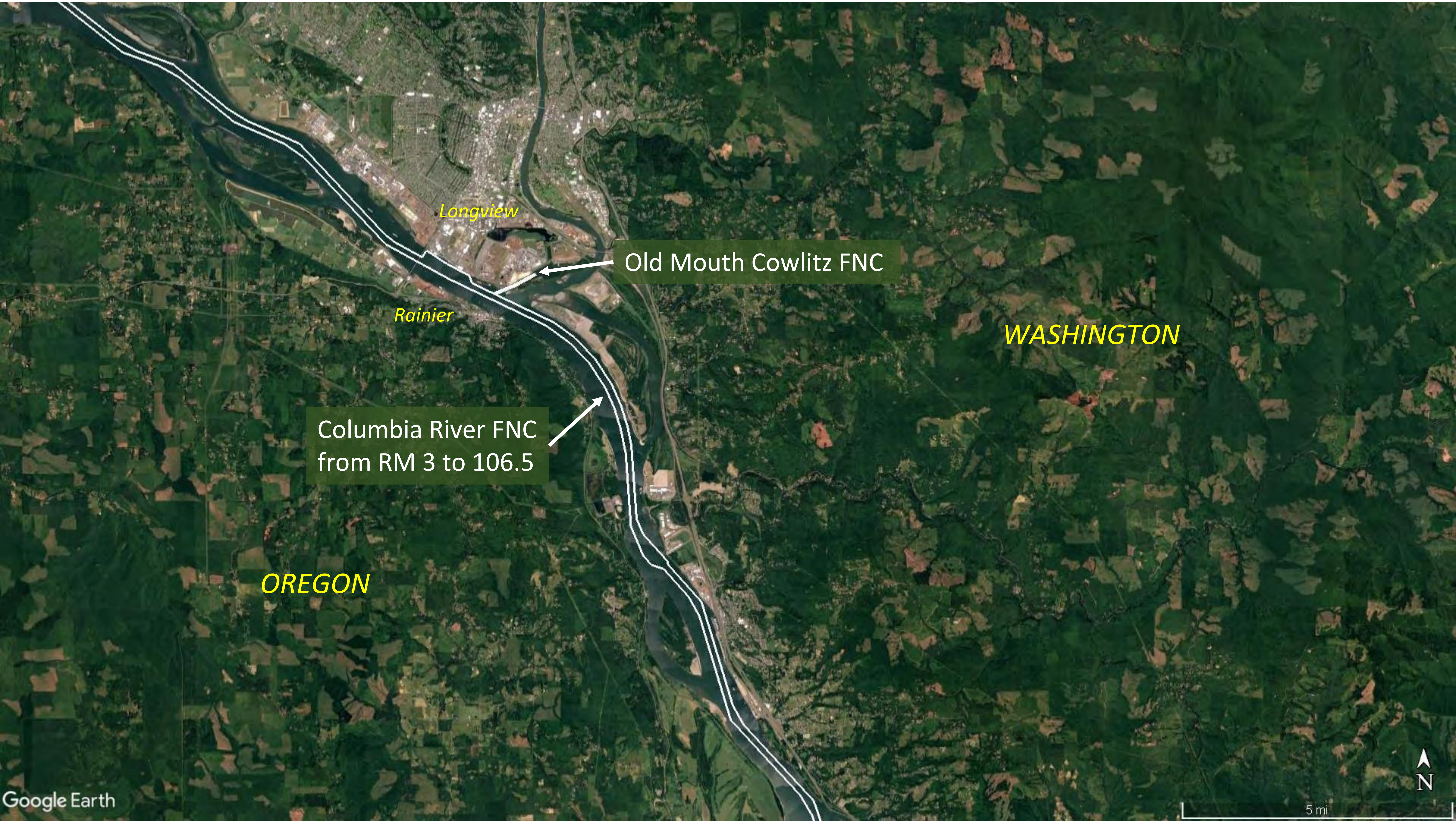
Title	Name	Decision (Monitoring is Safe or Unsafe)
Dredge Captain		
Launch Operator		
Third Party		

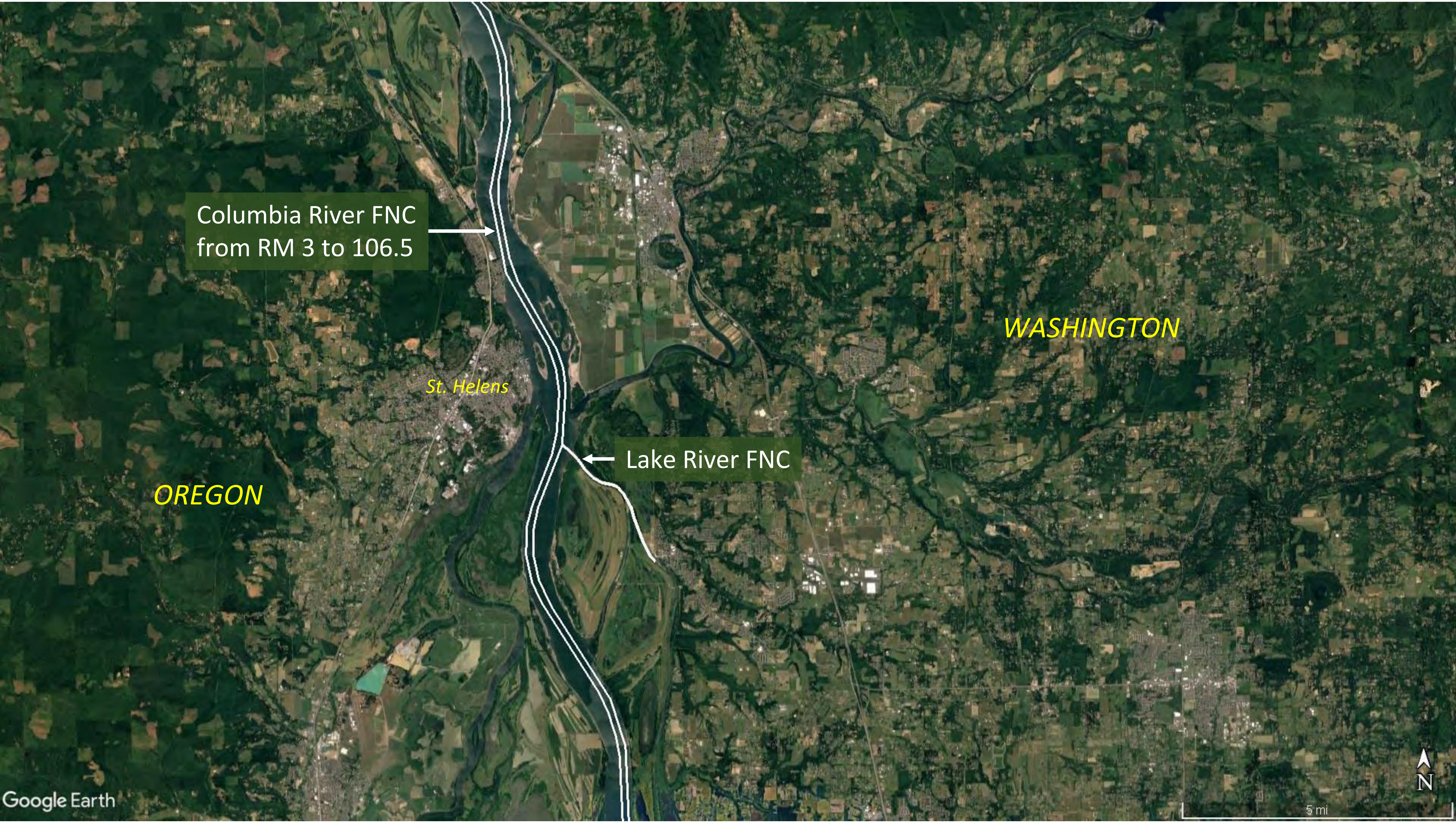
Notes

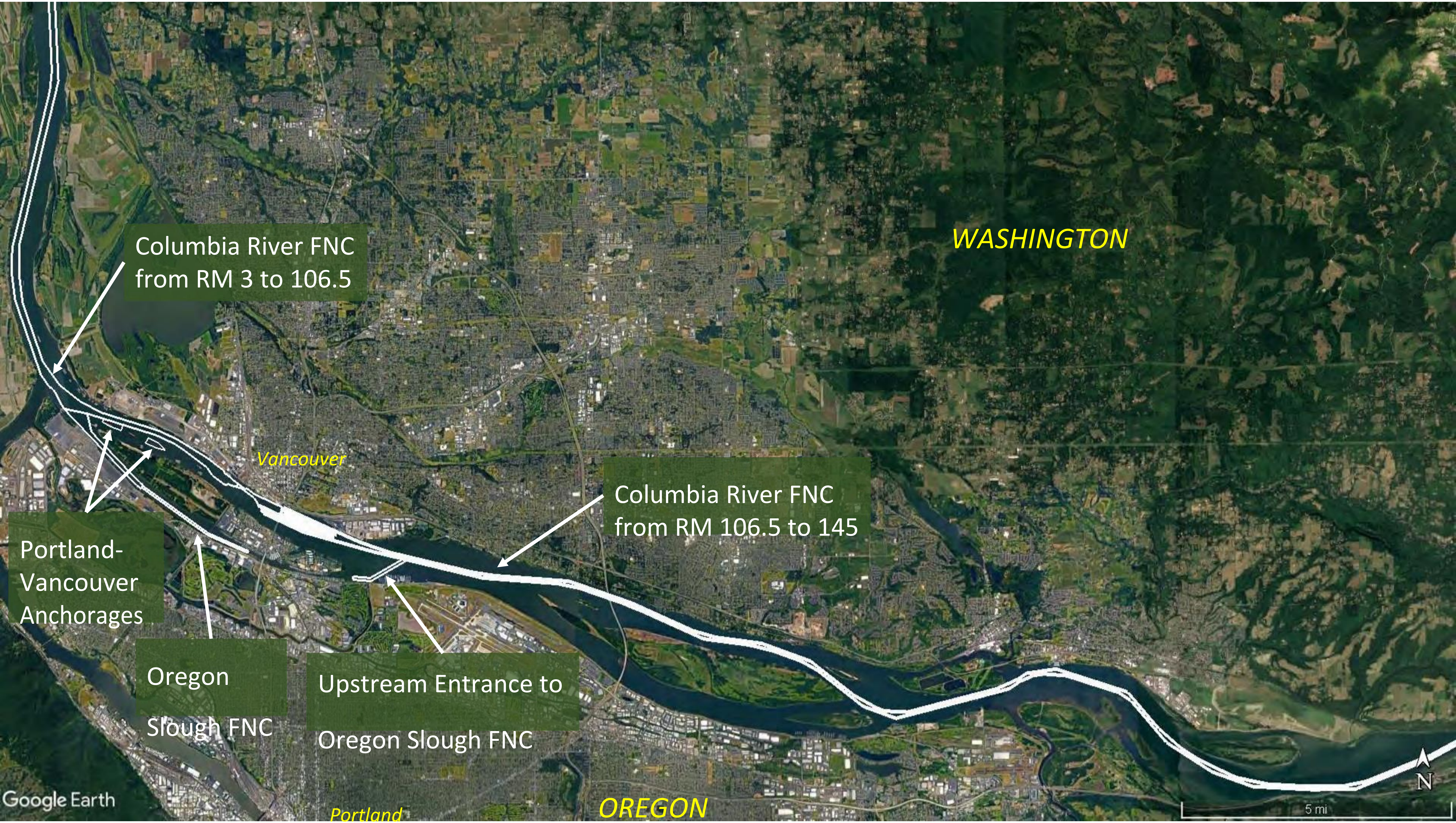

Baker Bay FNC
Skamokawa Creek FNC
Chinook FNC
Elochoman Slough FNC
Wahkiakum Ferry FNC
Astoria
Tongue Pt FNC
Longview
Old Mouth Cowlitz FNC
Skipanon FNC
Pacific Ocean
Rainier
Westport Slough FNC
WASHINGTON
Columbia River FNC from RM 3 to 106.5
St. Helens
Lake River FNC
OREGON
Columbia River FNC from RM 106.5 to 145
Bonneville Dam
Vancouver
Portland-Vancouver Anchorages
Google Earth
Oregon
Portland
20 mi
N

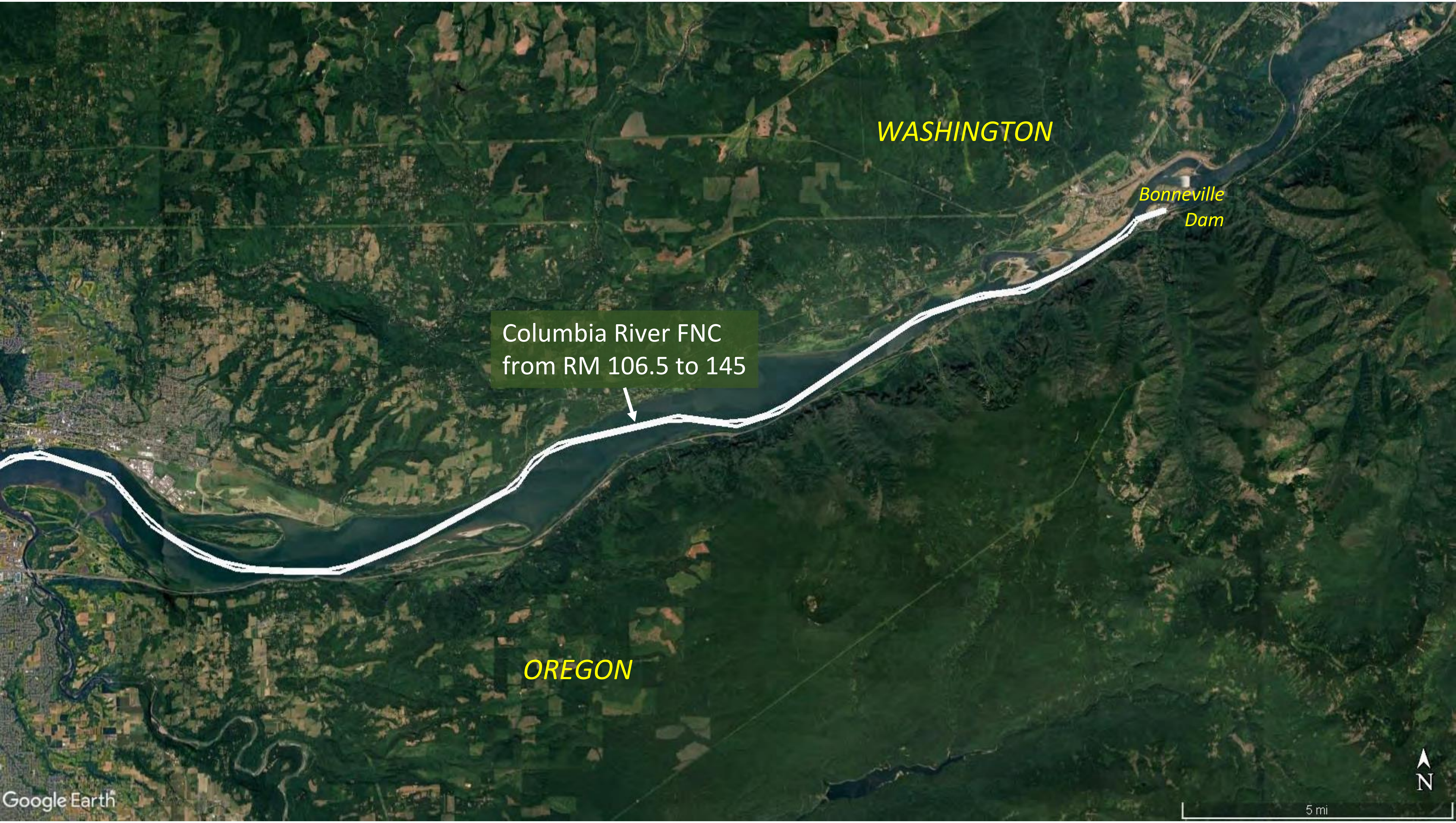

WASHINGTON
Baker Bay FNC
Chinook FNC
Columbia River FNC
from RM 3 to 106.5
Pacific
Ocean
Tongue Pt FNC
Astoria
Skipanon FNC
OREGON
Google Earth
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
5 mi
N

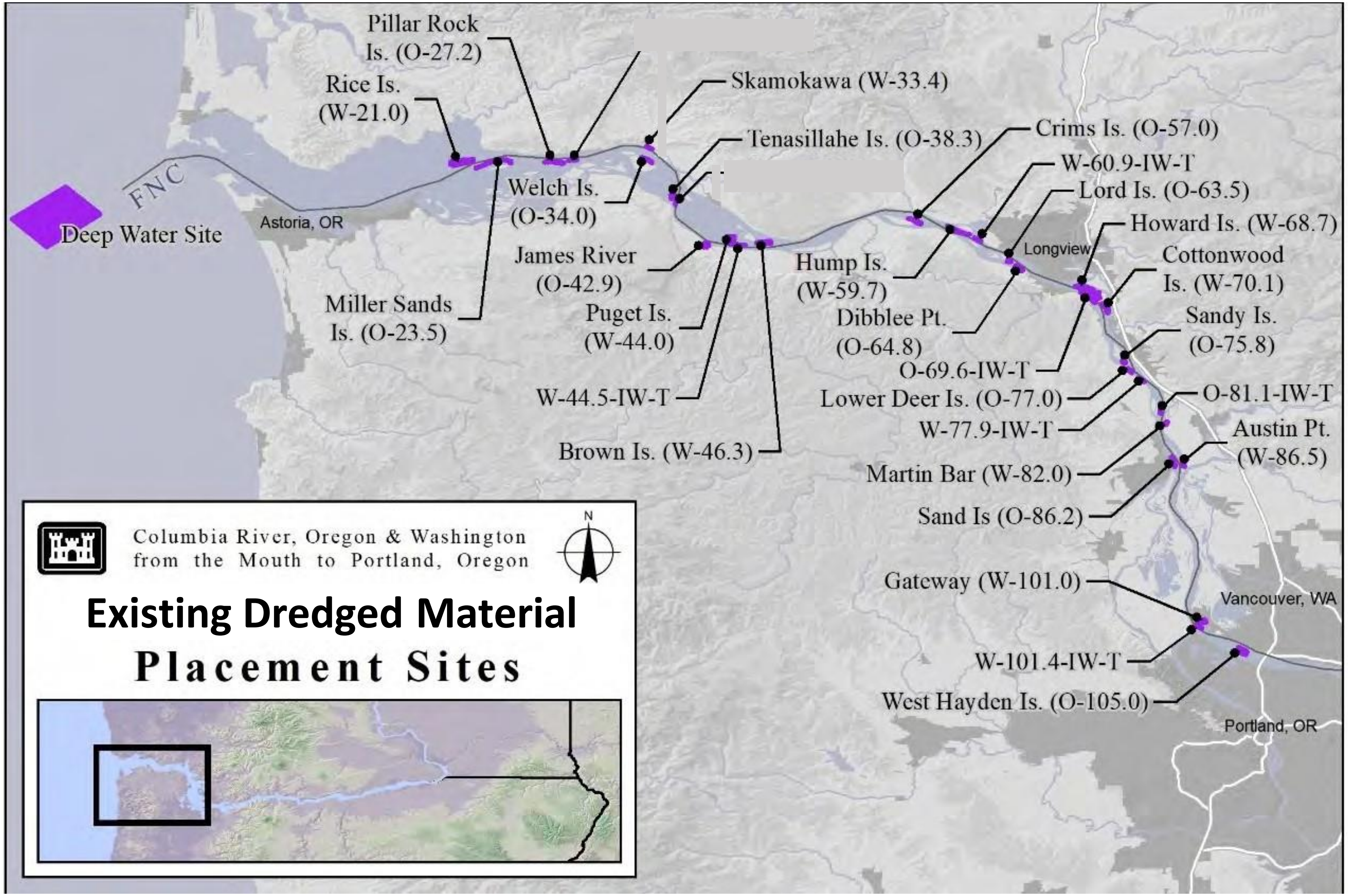

Skamokawa Creek FNC
WASHINGTON
Columbia River FNC
from RM 3 to 106.5
Elochoman Slough FNC
Wahkiakum Ferry FNC
OREGON
Westport
Slough FNC
Google Earth
N
5 mi


Longview
Old Mouth Cowlitz FNC
Rainier
WASHINGTON
Columbia River FNC
from RM 3 to 106.5
OREGON
Google Earth
N
5 mi


Columbia River FNC
from RM 3 to 106.5
Lake River FNC
St. Helens
OREGON
WASHINGTON
Google Earth
5 mi
N


Columbia River FNC from RM 3 to 106.5
WASHINGTON
Vancouver
Columbia River FNC from RM 106.5 to 145
Portland-Vancouver Anchorages
Oregon Slough FNC
Upstream Entrance to Oregon Slough FNC
Google Earth
Portland
OREGON
5 mi
N


WASHINGTON
Bonneville Dam
Columbia River FNC
from RM 106.5 to 145
OREGON
Google Earth
N
5 mi



LCR FNC Upland, Shoreline, Transfer, and Ocean Dredged Material Placement Sites. In-water placement of material dredged from federal navigation projects in Oregon and Washington occurs in depths greater than 20 feet within or outside the navigation channel throughout the mainstem Columbia River from RM 3 to RM 145.

BIOLOGICAL ASSESSMENT FOR THE CONTINUED OPERATIONS AND MAINTENANCE DREDGING PROGRAM FOR THE COLUMBIA RIVER FEDERAL NAVIGATION CHANNEL

Upland placement of dredged materials on Rice Island, September 2013

Photos courtesy of USFWS: streaked horned lark, bull trout, Columbian white-tailed deer, marbled murrelet

MARCH 2014

U.S. Army Corps of Engineers
Portland District

Table of Contents

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

ACRONYMS AND ABBREVIATIONS

ATV	All-terrain vehicle
BA	Biological Assessment
BiOp	Biological Opinion
CFR	Code of Federal Regulations
CH	Critical Habitat
Corps	U.S. Army Corps of Engineers, Portland District
CRCIP	Columbia River Channel Improvement Project
CR FNC	Columbia River Federal Navigation Channel
CWA	Clean Water Act
CY	cubic yards
DMEF	Dredge Material Evaluation Framework, 1998
DPS	Distinct Population Segment
DSL	Department of State Lands
EIS	Environmental Impact Statement
ESA	Endangered Species Act of 1973, as amended
kCY	Thousand cubic yards
MCR	Mouth of the Columbia River
MHHW	Mean Higher High Water
MPRSA	Marine Protection, Research, and Sanctuaries Act, 1972
NDVI	Normalized Difference Vegetation Index
NMFS	National Marine Fisheries Service
O&M	Operations and Maintenance
ODFW	Oregon Department of Fish and Wildlife
OHV	Off-highway vehicle
OHW	Ordinary High Water
PCE	Primary Constituent Elements
RM	River Mile
SEF	Sediment Evaluation Framework for the Pacific Northwest, 2009
SHLA	streaked horned lark
T&Cs	Terms and Conditions
USGCRP	United States Global Change Research Program
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife

INTRODUCTION

The U.S. Army Corps of Engineers, Portland District (Corps) prepared this Biological Assessment (BA) for the purpose of re-initiating consultation under Section 7 of the Endangered Species Act (ESA) of 1973, as amended. This document evaluates the effects on federally listed species and their designated critical habitats for the Columbia River Federal Navigation Channel (CR FNC), Operations and Maintenance (O&M) Program through 2018. This BA specifically describes the biological effects to streaked horned larks (SHLA) (*Eremophila alpestris strigata*) that may occur from the placement of material dredged from the Columbia River. Dredging the Columbia River maintains the CR FNC from the River Mouth to Bonneville Dam (River Mile (RM) -3.0 to 145), including the Mouth of the Columbia River (MCR) project, nine side channel projects (Baker Bay, Chinook Channel, Hammond Boat Basin, Skipanon Channel, Skamokawa Creek, Wahkiakum Ferry Channel, Westport Slough, Old Mouth Cowlitz River, and Upstream Entrance to Oregon Slough), and the Portland-Vancouver Anchorages.

Section 7 of the ESA states that Federal agencies shall ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in destruction or adverse modification to designated critical habitat (CH). Therefore, Federal agencies consult with the U.S. Fish and Wildlife Service (USFWS) and/or the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS), depending on the species that may be affected. Section 7 (a)(1) further directs federal agencies to use their existing authorities to further the purposes of the Act, aid in recovering listed species, and to address existing and potential conservation issues with regards to preserving, enhancing, and restoring important habitat types (USFWS 1998).

The proposed action, as described in this BA, entails upgrading the existing placement network and operations to meet current and projected dredged material placement needs for the next five years (2014 through the 2018 dredging season). This BA describes the potential adverse and beneficial effects to SHLA and its critical habitat in the lower Columbia River. The SHLA was listed as threatened and had critical habitat designated under the ESA on 3 October 2013.

BACKGROUND AND HISTORY

In support of the regional and national economy, the Corps operates and maintains the CR FNC to provide reliable navigation throughout the lower river between the Mouth of the Columbia River and Bonneville Dam (RM -3 to 145). The CR FNC includes nine side channels and the Portland/Vancouver anchorages (referred to as auxiliary channels). The Columbia River is the gateway for global imports and exports from the Columbia-Snake River navigation system, where the CR FNC is used by commercial, industrial, agricultural, and recreational interests. The CR FNC is the number one gateway on the West Coast for the export of wheat, wood products, and bulk minerals, totaling 42 million tons in 2010 and $20 billion worth of U.S. products bound for world markets. Approximately 55 million tons of incoming cargo pass through the Columbia River annually, supporting more than 40,000 regional jobs directly linked to the seaport and import/export activities on the river (PNWA 2010).

The deep draft channel from the ocean to Vancouver, WA was originally authorized for full construction in 1878 with a 20-foot minimum depth. Over the years, the depth has increased in order to accommodate larger ocean-going vessels transporting goods into and out of the region. Most recently completed in 2010, the channel from RM 3 to 106.5 was deepened from 40 to 43 feet. The Supplemental Environmental Impact Statement (EIS) for this action identified dredge placement sites suitable for a period of 20 years (USACE 2003). However, since the channel deepening was completed, some placement sites have reached or are nearing maximum capacity.

The Corps annually dredges shoals from the CR FNC from RM -3 to 3 and RM 3 to 106.5 to maintain the congressionally-authorized depths of 48/55 feet and 43 feet, respectively, to accommodate deep-draft vessels. The Corps also dredges shoals annually from the CR FNC from RM 106.5 to 145 to maintain a depth of 17 feet for current users. The auxiliary channels are dredged annually or less often to their various full authorized depths or as adjusted for current user traffic. Inherent to the dredging is placement of the dredged materials immediately following or simultaneous to active dredging. To maintain the navigation channels in the complex river system, the Corps uses a balance of dredged material placement at in-water, shoreline, and upland (including island) sites, which is referred to as the Columbia River Dredged Material Placement Network (Network). The Network is a complex combination of sites distributed throughout the lower river, and includes federal, state and locally managed lands, and some private lands and shorelines.

As part of the NMFS' 2012 Biological Opinion (BiOp), *Reinitiation of Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Columbia River Navigation Channel Operations and Maintenance, Mouth of the Columbia River to Bonneville Dam, Oregon and Washington (HUCs 1708000605, 1708000307, 1708000108),* the Corps was directed to implement Terms and Conditions (T&Cs) to minimize take of ESA-listed species (namely salmonids) (NMFS 2012). In the NMFS BiOp, the T&Cs include specific mandates for the timing of dredging and placement activities, water quality sampling and monitoring, operational constraints, dissuasion practices for avian species that consume juvenile salmonids, and construction requirements for in-water, upland, and shoreline dredged material placement sites.

PROJECT AUTHORITY

Since 1824, the Corps has been the governmental agency responsible for maintaining navigable waters. The Commerce Clause in the U.S. Constitution and subsequent Supreme Court decisions have established the Federal right and obligation to regulate navigation and commercial activity, and also to make any necessary improvements to the river for this purpose. Congress has strengthened this authority through several Rivers and Harbor Acts, the earliest one enacted in 1872. The Rivers and Harbors Acts gave way to the Water Resources Development Acts in 1973. Subsequently, the Courts have determined the Corps has paramount rights to work in all navigable waters of the U.S. below the ordinary high water mark (mean higher high water in the estuary). Appendix A provides a complete history of Congressional authorizations for the Columbia River dredging program.

Maintenance dredging and in-water placement of dredged sediments to maintain these authorized navigation channels is conducted under the provisions of Sections 102 and 103 of the Marine Protection Reserve and Sanctuaries Act (MPRSA) of 1972, Sections 401 and 404 of the Clean Water Act (CWA) of 1977, and in accordance with Regulations 33 Code of Federal Regulations (CFR) parts 335 through 338 ("Operation and Maintenance of Army Corps of Engineers Civil Works Projects Involving Discharge of Dredged or Fill Material into Waters of the U.S. or Ocean Waters" and affiliated procedures, etc).

The Corps does not own or have exclusive use of the dredged material placement sites, and therefore cannot manage or regulate use of the sites prior to or following dredged material placement. Some sites may be leased by the landowner (states of Washington or Oregon, private entities, or Ports) to outside parties for the purpose of extracting the placed dredged materials for off-site uses. Other sites have public and private users for recreation, agriculture, grazing, storage, or training.

CONSULTATION HISTORY

The Corps has previously consulted with the USFWS on the CR O&M navigation program addressing effects to several ESA-listed species. Table 1 lists current ESA-listed species in the action area that are within the USFWS' jurisdiction.

Table 1: USFWS ESA-listed species in the proposed action area.

Species		Federal Status	Critical Habitat	Protective Regulations
Marbled murrelet	*Brachyramphus marmoratus*	Threatened	Designated	75 FR 3424 76 FR 61599
Northern spotted owl	*Strix occidentalis caurina*	Threatened	Designated	77 FR 71875
Short-tailed albatross	*Phoebastria albatrus*	Endangered	(none)	65 FR 46643
Western snowy (coastal) plover	*Charadrius nivosus*	Threatened	Designated	53 FR 45788 77 FR 36727
Streaked horned lark	*Eremophila alpestris strigata*	Threatened	Designated	78 FR 61452 78 FR 61506
Yellow-billed cuckoo	*Coccyzus americanus*	Proposed Threatened	(none)	78 FR 61621 78 FR 78322
Bull trout	*Salvelinus confluentus*	Threatened	Designated	63 FR 31647 75 FR 63897
Oregon silverspot butterfly	*Speyeria zerene hippolyta*	Threatened	Designated	45 FR 44935
Columbian white-tailed deer	*Odocoileus virginianus leucurus*	Endangered	(none)	35 FR 16047 68 FR 43647
Water howellia	*Howellia aquatilis*	Threatened	(none)	59 FR 35860

Several species have been delisted and no longer require ESA consultation, which include the bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), brown pelican (*Pelecanus occidentalis*), and the Aleutian Canada goose (*Branta canadensis leucopareia*). These consultations are incorporated herein, and include:

- On June 14, 1991, the USFWS issued a Biological Opinion which stated the placement of dredged material on Rice Island is *"not likely to jeopardize"* the continued existence of bald eagles (USFWS reference #1-7-91-F-280).
- On July 9, 1991, the Corps determined that the interim disposal site at RM 5.5-6.5 would have *"no effect"* on bald eagle, peregrine falcon, Columbian white-tailed deer, marbled murrelet, and western snowy plover (USFWS reference # 1-7-91-I-398).
- On November 19, 1992, the Corps determined that ocean dredged material disposal sites would have *"no effect"* on marbled murrelet (USFWS reference # 1-7-93-I-57).

- On June 28, 1994, the USFWS concurred the Baker Bay West Channel Maintenance Dredging project *"may affect, not likely to adversely affect"* bald eagle, peregrine falcon, brown pelican, and marbled murrelet (USFWS reference # 1-7-94-I-328).
- On February 19, 1998, the Corps determined the O&M of the Columbia River federal navigation channel from RM 3 to 106.5 would have *"no effect"* on peregrine falcon, Aleutian Canada goose, Oregon silverspot butterfly, water howellia, golden paintbrush, Nelson's checker-mallow, Bradshaw's lomatium, brown pelican, marbled murrelet, and western snowy plover (USFWS reference # 1-7-97-I-127).
- On February 24, 1998, the USFWS concurred that O&M of the Columbia River federal navigation channel from RM 3 to 106.5, *"may affect, not likely adversely affect"* Columbian white-tailed deer and bald eagle (USFWS reference # 1-7-97-I-127).
- On August 14, 1998, the Corps determined that the MCR North Jetty Dredged Material Placement would have *"no effect"* on Aleutian Canada goose, bull trout, bald eagle, peregrine falcon, marbled murrelet, and brown pelican (USFWS reference # 1-3-98-I-0385).
- On December 6, 1999, the USFWS issued a Biological Opinion (1-7-99-F-280, 1-7-99-TA-374, 1-7-98-I-342, 1-7-98-I-138) on the Columbia River Channel Deepening project. The Corps determined that the channel deepening project would have *"no effect"* on Aleutian Canada goose, brown pelican, marbled murrelet, western snowy plover, Oregon silverspot butterfly, Bradshaw's lomatium, golden paintbrush, Nelson's checker-mallow, and water howellia. The USFWS concurred that the action *"may affect, not likely adversely affect"* peregrine falcon. The USFWS determined the channel deepening project *"may affect, likely to adversely affect"* bald eagle and Columbian white-tailed deer. On April 24, 2002, the USFWS concurred the MCR dredging and disposal project *"may affect, not likely adversely affect"* bald eagle, brown pelican, and marbled murrelet (USFWS reference # 02-4212).
- On May 20, 2002, the USFWS issued a Biological and Conference Opinion on the Columbia River Channel Improvement Project (CRCIP), from RM 3-106.5. The Opinion stated the project *"may effect, likely to adversely affect"* proposed Southwestern Washington/Columbia River distinct population segment (DPS) of coastal cutthroat trout, bald eagle, Columbia River DPS of bull trout, and Columbian white-tailed deer. The USFWS provided an updated incidental take statement for Columbian white-tailed deer and bald eagle to the December 6, 1999 Opinion, (USFWS reference #02-4212).
- On September 13, 2004, the USFWS concurred that the MCR jetty rehabilitation project *"may affect, not likely adversely affect"* bald eagle, marbled murrelet, and brown pelican (USFWS reference # 04-3736).
- On December 14, 2004, the Corps determined that continued O&M of the CR navigation channel, from RM -3.0 to 145, would have *"no effect"* on western snowy plover, northern spotted owl, short-tailed albatross, Oregon silverspot butterfly, and water howellia. The USFWS concurred that the O&M of the project *"may affect, not likely adversely affect"* bull trout, bald eagle, brown pelican, marbled murrelet, and Columbian white-tailed deer (USFWS reference # 1-7-04-I-0090).
- On December 27, 2004, the USFWS concurred that de-designation and designation of the dredged material disposal sites offshore of the MCR, in Oregon and Washington, *"may affect, not likely adversely affect"* short-tailed albatross, marbled murrelet, and brown pelican (USFWS reference # 1-7-04-I-489).
- On May 23, 2008, the USFWS concurred that the Benson Beach sand berm restoration project *"may affect, not likely adversely affect"* brown pelican and western snowy plover (USFWS reference # 13420-2008-I-0063).

- On September 29, 2010, the Corps determined that O&M of the Columbia River federal navigation channel, from RM -3.0 to 145, will have *"no effect"* to western snowy plover, northern spotted owl, short-tailed albatross, Oregon silverspot butterfly, and water howellia. The USFWS concurred that O&M of the project *"may affect, not likely adversely affect"* bull trout, marbled murrelet, and Columbian white-tailed deer (USFWS reference # 13420-2010-I-0165).
- On February 23, 2011, the USFWS concurred that the major rehabilitation of the MCR Jetty System *"may affect, not likely adversely affect"* bull trout, marbled murrelet, and western snowy plover (USFWS reference # 13420-2011-I-0082).
- On January 24, 2012, the USFWS concurred that the minor 2012 updates to the North Jetty dredged material placement site has the same effects as the 2010 consultation (USFWS reference # 13420-2010-I-0165) on the O&M of the Columbia River federal navigation channel. The USFWS concurred that the action *"may affect, not likely adversely affect"* bull trout, marbled murrelet, and Columbian white-tailed deer (USFWS reference # 13420-2010-I-0165).

The Corps' 2010 BA for the Columbia River dredging and dredged material placement program, for which the dredging and placement action and range of effects is very similar to the proposed action described herein, received USFWS concurrence on September 29, 2010, as listed above. Therefore, the potential effects for bull trout, marbled murrelet, and Columbian white-tailed deer ***are consistent with previous determinations*** and the species are not further evaluated in this BA. In addition, the Corps determined the proposed action will have ***"no effect"*** to western snowy plover, northern spotted owl, short-tailed albatross, Oregon silverspot butterfly, and water howellia. Therefore, these species are also not further evaluated in this BA.

Beginning in April 2013, the Corps sought active participation from USFWS on ways to avoid and minimize potential adverse effects to SHLA and its habitats. Placement activities can facilitate the creation and/or maintenance of suitable SHLA habitat and the Corps has worked with USFWS and its partners to minimize potentially adverse effects and maximize the beneficial effects of dredged material placement actions throughout the lower Columbia River for SHLA. Specific meetings and phone conversations include the following:

- The Corps met with staff from USFWS and the Center for National Lands Management on 26 April 2013 to discuss the dredging program and processes involved in coordinating dredging and placement at uplands sites.
- In addition, the Corps met with the USFWS on 25 June 2013 to discuss the dredged material placement sites and define the project area to include all placement sites within the Network.
- In August 2013, the Corps participated in a workshop with USFWS personnel from both the Washington and Oregon offices and the ports to discuss ESA coverage, Section 7 consultation, the Corps' proposed action and consequential management needs – specifically the development of Habitat Conservation Plans.
- Staff from the USFWS participated in a site visit to Rice and Miller Sands Islands on 16 September 2013 to observe active dredged material placement by the Dredge OREGON.
- Following this site visit, the Corps and USFWS (both ESA consultation specialists and migratory bird specialists) met on 25 September 2013 to discuss the Corps' actions in the lower Columbia River and potential impacts to Caspian terns and double-crested cormorants in the lower estuary.

- On 19 December 2013, the Corps met with USFWS staff to discuss the proposed action, specifically dissuasion of terns and cormorants and monitoring of streaked horned larks, as well as how to address western yellow-billed cuckoos (discussed below).
- The Corps presented the USFWS with an initial draft of the proposed action on 10 January 2014 and further discussed the proposed action in a follow-up meeting on 21 January 2014.
- The Corps organized a meeting on 3 February 2014 to discuss the proposed monitoring strategy for streaked horned larks, including USFWS staff and regional experts from the Washington Department of Fish and Wildlife, the Center for Natural Lands Management.
- On 26 February 2014, the Corps discussed dissuasion of terns and cormorants, and possible areas of overlap with staff from the USFWS.
- Finally, on 3 March 2014, the Corps initiated formal consultation with USFWS and delivered this biological assessment to the Service for review.

WESTERN YELLOW-BILLED CUCKOO

The USFWS announced the proposed listing of the western distinct population of yellow-billed cuckoos (*Coccyzus americanus occidentalis*) as *threatened* under the ESA on October 3, 2013 (FR 78 61622). This proposal applies to the western yellow-billed cuckoo throughout its entire breeding range. The cuckoo became a candidate for ESA-listing in 2001 and since this time, the USFWS has annually evaluated the species' status and identified threats to its continued existence. The available information concludes that the western yellow-billed cuckoo has declined by several orders of magnitude over the past 100 years, and that the decline is continuing, isolating birds into smaller populations at core breeding areas. The decline of the western yellow-billed cuckoo is primarily the result of habitat loss and degradation. While much of this habitat loss occurred historically, many of the impacts have subsequent ramifications that are on-going and affect the size, extent, connectivity, and quality of riparian vegetation within the range of the cuckoo. The USFWS found that no critical habitat was present in Oregon or Washington and as a result, no critical habitat was proposed for designation in this region.

The western yellow-billed cuckoo is a riparian obligate species, historically found in parts of 12 states west of the Continental Divide, including: Oregon, Washington, Idaho, Montana, Wyoming, Colorado, Nevada, Utah, California, Arizona, New Mexico, and Texas. Approximately 350-500 pairs are estimated to breed north of the Mexican border where habitat requirements include extensive riparian forests dominated by mature, structurally diverse trees and a vegetative understory consisting of shrubs and smaller trees. The last confirmed breeding records in Oregon are from the 1940s and observations of individual birds in 2009, 2010, and 2012 near the Sandy River Delta and its confluence with the Columbia River were the first confirmed sightings west of the Cascade Mountains since 1977. Historically, the western yellow-billed cuckoo was considered rare in the Pacific Northwest and the available data suggests that if yellow-billed cuckoos still breed in Oregon and Washington, the numbers are extremely low with pairs numbering in the single digits.

The USFWS concluded that the curtailment and decline in riparian habitat is primarily the result of long-lasting effects from manmade features that alter watercourse hydrology such that the natural processes that sustain riparian habitats are diminished or non-functional. In addition, the encroachment and establishment of non-native species has further degraded the quality of remaining riparian areas. Climate change was also recognized as a critical issue with potentially wide-ranging effects on the species and its habitat; it was suggested that the effects of climate change will exacerbate habitat loss and degradation, invasive species, and wildlife/drought resulting in smaller patch sizes and more isolated breeding areas. Nesting yellow-billed cuckoos are sensitive to patch size and seldom use riparian areas smaller than 100m x 300m. For this reason, the USFWS concluded that smaller patch sizes and isolated breeding areas may compound juvenile dispersal and re-occupation of breeding adults. Furthermore, where riparian areas are located in proximity to urban and agricultural areas, the potential for pesticide and herbicide to affect habitat, prey availability, and cuckoos themselves is increasingly high.

Based on the information provided above, it is assumed that very few western yellow-billed cuckoos are present in the region, and if any birds are present they would likely occupy intact and extensive riparian forests found outside of the Network. The placement sites (described in more detail below) are largely composed of open, sandy areas and if riparian vegetation is present, it does not consist of large, extensive riparian forests preferred by the cuckoo (greater than 100 x 300m). For this reason, the proposed placement activities are highly unlikely to affect individual cuckoos or their preferred habitats because these conditions are not present in the action area. As a result, the Corps has determined the proposed action will have **"*no effect*"** to the western yellow-billed cuckoo and therefore the species is not further discussed in this assessment.

CHANGES FROM PREVIOUS ACTION

The Corps is proposing to practice shoreline placement at Pillar Rock Island (RM 27.2), which is currently an upland placement site within the existing Network and is owned by Oregon Department of State Lands. Shoreline placement will facilitate use of the upland placement site, which is currently too narrow for placement to occur. Once the site reaches upland placement capacity, shoreline placement would be conducted periodically to protect the integrity of the upland site.

The Corps is also modifying the Wahkiakum Ferry Channel side channel project (RM 43) that connects the ferry landing on Puget Island to an area of deep water in the Columbia River for the purpose of supporting improvements to the ferry dock and a new, larger ferry. The modification increases channel width from 200 to 300 feet and shifts the channel centerline approximately 120 feet upstream. There is no change to dredging or placement methods or best management practices, and construction and future maintenance volumes associated with the channel widening are within the previously considered range of effects. Figure 1 shows the revised channel alignment and shoaling to be dredged within the existing and new footprints.

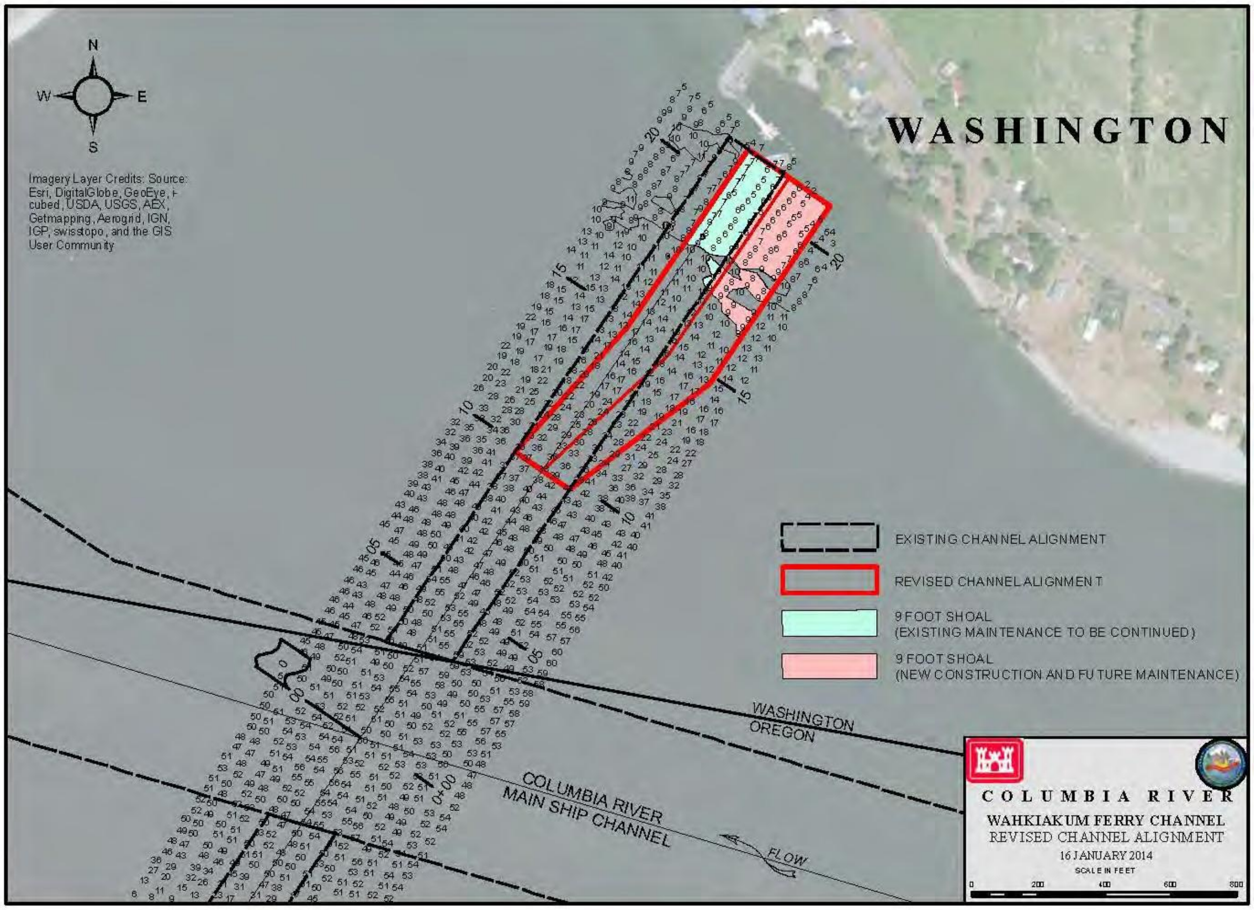


Figure 1: Modification to the Wahkiakum Ferry Channel

As detailed above, the Corps has previously consulted on the range of effects from shoreline placement in the lower Columbia River and dredging the Wahkiakum Ferry Channel and associated in-water placement on bull trout, marbled murrelet, Columbian white-tailed deer, and determined there would be ***"no effect"*** to western snowy plover, northern spotted owl, short-tailed albatross, Oregon silverspot butterfly, and water howellia. As a result of these evaluations, the addition of shoreline placement at Pillar Rock Island and modifications to the Wahkiakum Ferry Channel ***will not result in new or additional effects*** that were not previously considered. For this reason, the effects to these species from shoreline placement at Pillar Rock Island and modifications to the Wahkiakum Ferry Channel will not be evaluated further.

ACTION AREA

The Action Area includes all areas to be affected directly or indirectly by the Federal action and not merely the immediate are involved in the action (50 CFR § 402.02). The Columbia River is the largest river in the Pacific Northwest, starting high in the Rocky Mountains of British Columbia. The river flows northwest before turning south into Washington State and then west toward the Pacific Ocean, forming the border between Oregon and Washington. The river is approximately 1,240 miles in length and, by volume, is the fourth largest river in the United States.

For the purposes of this BA, the Action Area is defined as the Columbia River Federal Navigation Channel from the mouth (RM -3), upstream to Bonneville Dam (RM 145), including the Portland-

Vancouver Anchorages and the nine federally authorized side channel projects in this reach. The side channels include Baker Bay, Chinook Channel, Hammond Boat Basin, Skipanon Channel, Skamokawa Creek, Wahkiakum Ferry Channel, Westport Slough, Old Mouth Cowlitz River, and Upstream Entrance to Oregon Slough. The lateral extension of the Action Area extends 300 feet shoreward of the mean higher high water (MHHW) or ordinary high water (OHW) line to include direct and indirect effects from dredging and in-water placement of dredged materials in the lower Columbia River. The Action Area also extends 200 feet landward from the boundaries of the upland and shoreline dredged material placement sites.

The upland and shoreline dredged material placement network, as shown in Table 2 and Figure 2 below, includes 25 sites in the Columbia River between RM 3 to 105 and the Benson Beach intertidal site on the Pacific Ocean. Detailed information, figures, and current environmental baseline conditions on the upland and shoreline placement sites is provided in Appendix B. The Action Area includes the ocean disposal sites, which are described in Appendix B.

Table 2: Upland and Shoreline Dredged Material Placement Network

Site	State – River Mile	Site Type
Benson Beach	W-Pacific Ocean	Shoreline (intertidal)
West Sand Island	O-3.1	Upland
Rice Island	O/W-21.0	Upland, Sump
Miller Sands	O-23.5	Shoreline
Pillar Rock Island	O-27.2	Upland, Shoreline
Skamokawa - Vista Park	W-33.4	Upland, Shoreline
Welch Island	O-34.0	Upland
Tenasillahe Island	O-38.3	Upland
James River	O-42.9	Upland
Puget Island	W-44.0	Upland, Sump
Brown Island	W-46.3	Upland
Crims Island	O-57.0	Upland
Hump Island	W-59.7	Upland
Lord Island (Upstream)	O-63.5	Upland
Dibblee Point	O-64.8	Upland
Howard Island	W-68.7	Upland
Cottonwood Island	W-70.1	Upland
Northport	W-71.9	Upland
Sandy Island	O-75.8	Upland
Lower Deer Island	O-77.0	Upland
Martin Bar	W-82.0	Upland
Sand Island	O-86.2	Shoreline
Austin Point	W-86.5	Upland
Fazio Sand & Gravel	W-97.1	Upland, In-water
Gateway	W-101.0	Upland
West Hayden Island	O-105.0	Upland

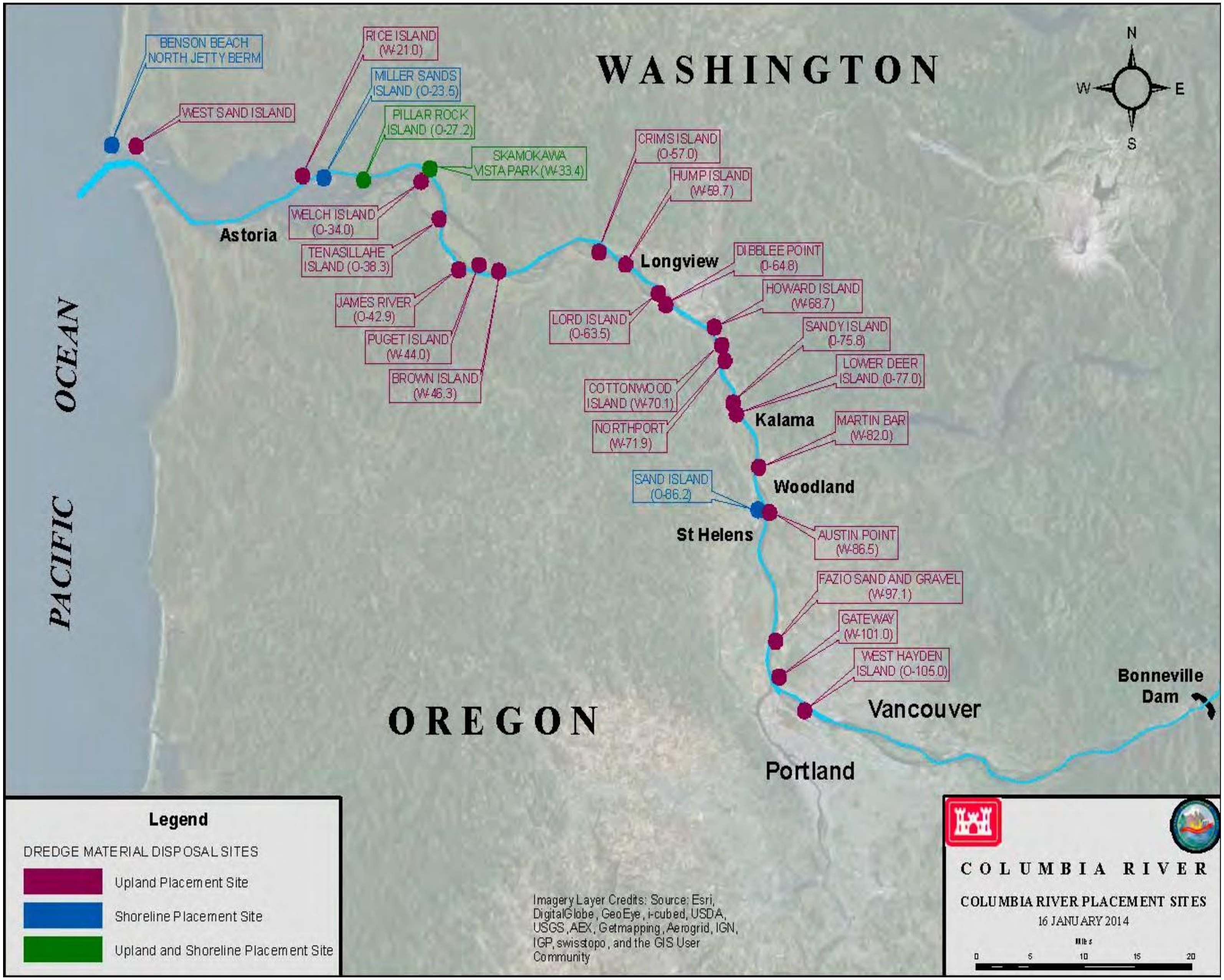


Figure 2: Upland and shoreline Dredged Material Placement Network in the Columbia River

Streaked horned larks are not distributed evenly throughout the Columbia River or across all placement sites, where some sites host a large proportion of the local population (Rice and Brown Islands) and other sites have very few, if any, birds. For the purpose of this document, placement sites were grouped together to describe changes to habitat within specific sections of the river. Six groups were identified as biologically relevant and within operational flexibility for the O&M program, and include the following placement sites:

- Group 1: Benson Beach intertidal site and West Sand Island
- Group 2: Rice, Miller Sands, and Pillar Rock Islands
- Group 3: Skamokawa – Vista Park, Welch and Tenasillahe Islands, James River, Puget and Brown Islands
- Group 4: Crims and Hump Islands, Lord Island (upstream), Dibblee Point, Howard and Cottonwood Islands, and Northport
- Group 5: Sandy and Lower Deer Islands, Martin Bar, Sand Island, and Austin Point
- Group 6: Fazio Sand & Gravel, Gateway, and West Hayden Island

DESCRIPTION OF THE PROPOSED ACTION

The proposed action entails the continued operation and maintenance of the CR FNC and upgrading the existing placement network and operations to meet current and projected dredged material placement needs for the next five years. As part of the proposed management of material placement, the maintenance of the placement network includes pre-placement conservation measures to minimize potential impacts of placement, post-placement redistribution of sediment, and routine dissuasion of colonial nesting birds to preclude nesting on active placement sites in order to minimize adverse effects. Additionally, the placement of dredged materials on previously unsuitable habitat will be beneficial by creating denuded areas, which will transition into suitable breeding habitat for SHLA.

Appendix B provides a general description by which the Portland District Corps conducts dredging and placement activities in the Columbia River. The appendix briefly describes the different types of dredges (hopper, pipeline, clamshell, and backhoe), placement sites (in-water, ocean, upland, and shoreline), and best management practices performed during dredging, as well as site descriptions for the upland and shoreline dredged material placement network.

There are seven individual features of the proposed action discussed at length below, including:

- Pre-placement site preparations and modifications
- Dissuasion of avian species
- Dredging and in-water placement
- Upland and shoreline placement: 5-year placement plan
- Post-placement site modifications
- SHLA monitoring
- Communication and Coordination

All actions will necessarily be specific to each dredged material placement location, but would generally include site preparations prior to placement, avian dissuasion actions (if necessary), followed by active dredged material placement and post-dredged material placement modifications, monitoring, and regular stakeholder meetings.

SITE PREPARATIONS

Prior to placement of dredged sediments, upland and shoreline sites may need preparation and/or modification to facilitate placement and minimize adverse impacts to sensitive species and habitat. There are two phases to site preparations: those that occur prior to the breeding season and those that occur immediately prior to placement of dredged material. In all cases, site preparations begin with delineation of the dredged material placement footprint by a Corps technical channel maintenance representative, dredge manager, and a Corps biologist.

The dredging season typically begins in June after the spring freshet has subsided. This coincides with the breeding season for nesting and migratory songbirds, whereupon nesting begins at upland locations in the early spring in March and April. If vegetation (trees, shrubs, forbs) is present in the dredged material placement footprint and is used for nesting, nestlings and juvenile songbirds could be directly impacted from dredged material placement later in the summer (June through September). To minimize adverse impacts to songbirds in the dredged material placement footprint, vegetation would be mechanically removed via a bulldozer or similar equipment, piled on the site, and if possible, buried in the dikes or berms in the late winter/early spring prior to the onset of the breeding season. Only vegetation within that year's dredged material placement footprint, and any staging/stockpile areas, or access routes would be removed during site preparations.

Depending on the dredged material placement schedule (presented and discussed later), each site will need to be evaluated prior to placement to assess the suitability of the area for SHLA and document the presence/absence of any birds. A protocol will be based on established survey methods or the most recent site information. If upland or shoreline sites have high site use by SHLA, early site preparations would occur in the winter/spring prior to the lark nesting season and may include site grading by earth-moving equipment, and trenching or mounding of sands for dissuasive purposes. As a ground dwelling bird, SHLA prefer open space with a clear view of their surroundings. Mounding or trenching of dredged materials throughout a placement site substantially reduces the line-of-sight available to birds from the ground, resulting in an area that may be less appealing for nesting and foraging than nearby areas which provide better visibility. If a dredged material placement site is scheduled for use in any particular year, making a site unsuitable by trenching or mounding sands could minimize adverse affects associated with dredged material placement during the breeding season.

For example, if Tenasillahe Island is used for dredged material placement in June, site preparations would clear and remove vegetation in February or March before songbirds have an opportunity to initiate nesting in the dredged material placement footprint. Similarly, off-loading, staging, stockpile areas and all access roads used during material placement will be evaluated prior to placement. If these secondary use areas are not contained within the dredged material placement footprint, these areas will be evaluated and prepared in the same manner as the dredged material placement area to minimize adverse effects to SHLA and nesting songbirds.

As a preventative measure to preclude site use by terns and cormorants, sands were mounded and trenched following placement activities in 2011, 2012, and 2013 at Miller Sands Island and Rice Island (see Figure 3). While neither site was regularly monitored following mounding/trenching, it is hypothesized that the reduced visibility decreased site nesting by larks and other birds, including Caspian terns, double-crested cormorants, and American white pelicans. Where mounding or trenching occurs during the five-year implementation plan, a monitoring plan (presented and discussed later) will evaluate the efficacy of these actions in precluding site use and minimizing direct adverse effects to avian species during the nesting season.

Figure 3: Trenches on Rice Island (left) and mounding on Miller Sands Island (right)

It should be noted that it is not the intent of the dredging program to make all dredged material placement sites unsuitable in every year. Rather, only those portions of sites that are suitable in any given year *and* are proposed for use during the breeding season will be modified to preclude active SHLA use during the breeding season. Ideally, a shifting mosaic of suitable nesting habitat on a particular site and across the Network would be available for SHLA use while only a portion of some sites are actively prepared for dredged material placement (and therefore unsuitable) in any given year. At sites with high human activity (sand mining/borrow sites, public recreation, agriculture, heavy machines, storage, etc.) where there are no avian species concerns, early site preparations may not be necessary to preclude effects to larks during placement activities because nesting birds are highly unlikely to be present in these areas.

Where site preparations are deemed necessary, earth-moving equipment (bulldozers, tractors, etc.) is used to construct berms and dikes around the perimeter of upland dredged material placement areas to contain the slurry mixture as it is discharged from the incoming dredged material pipe (see Figure 4). In addition, the site is graded to maximize the capacity of the dredged material placement footprint (see) and provide space for the settling ponds.

Figure 4: Site preparations and dike building for placement of dredged materials (at Northport).

If there is not sufficient water depth for the equipment barge to land at an existing shoreline, a landing ramp and access road would be constructed from material on the placement site to gain access to the island (see Figure 5). Some shoreline grading at the landing location may also be necessary to facilitate equipment access to other portions of the island. Typical site preparations at upland sites include grading a slope for the incoming dredged material pipe (see Figure 6).

Figure 5: Typical build-out of a barge landing (Rice Island)

Figure 6: Grading slope for incoming dredged material pipe

Site preparations may take anywhere from several days to several weeks to complete, depending on the existing condition of the site. If a site has little-to-no vegetation, was used recently where some berms or dikes remain in place, the necessary site preparations would be minimal and could be completed within 1-3 days. Conversely, if a site has substantial vegetation and/or has not been used recently, preparations could take several weeks to clear vegetation, construct dikes and re-grade the area for dredged material placement.

Prior to placement of sediments in the summer/fall, additional site preparations at all sites would include the staging, stockpiling and placement of pipes and valves for sediment discharge. When pipes and other material are not stockpiled on the landing barge, they are stockpiled in the staging area within or near the placement footprint. Unless there are permanent weirs (i.e. Gateway and West Hayden Island) and outfall pipes on site, temporary weirs and outfall pipes are re-used as the dredge moves from site to site (see Figure 7 and Figure 8). At upland sites requiring the installation of temporary weirs and outfall pipes, these actions will occur immediately prior to placement and disassembly would occur immediately after placement.

Figure 7: Weir and berm structure, in operation on Rice Island

The combination of riverine processes, river flows, waves, and tidal effects naturally erodes material from shorelines. As described in Appendix B, beach nourishment is a method of replenishing material that has eroded away from shorelines and is conducted as needed. Beach nourishment or shoreline placement occurs at the sand/water interface, not in open water. Shoreline placement operations differ from beach nourishment operations in that the premise of placement is also used to directly protect a Corps asset. For example, shoreline placement is conducted when the integrity of an upland placement site is compromised by rapidly eroding shorelines. However, for the purposes of this document, shoreline placement and beach nourishment are used interchangeably with regards to placement methodology.

Shoreline sites (listed in Table 2: Upland and Shoreline Dredged Material Placement Network) typically experience substantial erosion between dredged material placement events. Each shoreline site experiences varying rates of erosion and replenishment needs range from annual for areas with high erosion to periodic (every 3 to 5 years) for sites with less erosion. Because shoreline sites are used at higher frequencies for placement and are exposed to erosion, little vegetation typically becomes established between dredged material placement events. However, because SHLA and other ground-dwelling songbirds prefer habitats with minimal vegetation, these areas could provide suitable breeding and foraging habitat in the interim.

Figure 8: Outfall pipes returning water back to river after dredged material has settled out, Rice Island

Furthermore, equipment, vehicles and pipes are staged above the scarp of the existing dredged material placement footprint at shoreline placement sites prior to actual sediment placement (see Figure 9). These staging areas are typically 50 feet by 90 feet (~0.10 acre) and are located as close to the shoreline as safely feasible. During placement inspections, the exact location of the 0.10-acre staging area can be located to avoid or minimize impacts to SHLA. Similar to site preparations at upland sites, early preparations may be necessary in the upland areas at shoreline sites to accommodate the staging area. The remaining activities occur during active placement (discussed later).

Figure 9: Staging equipment on top of the bank at Sand Island Shoreline Placement Site

Dissuasion

It is anticipated that in some instances dissuasion will be necessary to preclude use of the site by larks, Caspian terns (*Hydroprogne caspia*, formerly *Sterna caspia*), and/or double-crested cormorants (*Phalacrocorax auritus*) during the breeding season when it overlaps with dredged material placement (larks) or when required by NMFS 2012 BiOp T&C (Caspian terns and double-crested cormorants). Management activities can be categorized into three actions: hazing; physical barriers or obstructions; and habitat modification to discourage nesting, roosting, and/or foraging behavior. All management actions will comply with local, state, and federal regulations. As necessary, multiple management measures will be used in conjunction to increase the effectiveness of dissuasion in order to minimize adverse effects to birds during placement activities.

Cormorants and Terns

The Pacific Flyway Council has outlined a management strategy for double-crested cormorants to be implemented at the local, regional, and flyway scale (Pacific Flyway Plan 2012). The localized strategies are relevant and appropriate for implementation with the dredging program in the Columbia River estuary for cormorants, as well as Caspian terns and other piscivorous species. The peak nesting season for these species begins in mid-April and culminates in June, though nestlings may be present through August and September. Hazing will be conducted, where necessary, to prevent terns and cormorants from establishing nest colonies on islands in the Network (as described below). Hazing activities, including the use of frightening devices, decoys, scarecrows, visual and/or auditory deterrents, human disturbance, dogs, lights, and/or water cannons are best used in combination with other methods to ensure lasting effects.

Caspian terns formerly had a nest colony on the west (downstream) portion of Rice Island which was later moved downstream to East Sand Island in 1999 and 2000. Following the move to East Sand Island, dissuasion activities on upland placement sites in the Network are implemented regularly to prevent nesting by terns and cormorants as required by the NMFS 2012 BiOp, specifically T&C 1(k) that states, "monitor upland disposal sites during the nesting season. Discourage any avian predators that are found nesting at an upland disposal site, consistent with the Migratory Bird Act." Dissuasion activities occurred (as necessary) at the placement sites on Rice, Miller Sands, and Pillar Rock Islands, as these are the locations where terns have exhibited nesting behavior in recent years.

Between 2001 and 2003, terns were occasionally observed roosting, loafing, and displaying courtship/breeding behaviors on upland portions of Rice, Miller Sands and Pillar Rock Islands. Dissuasion materials (fencing, flagging, eagle silhouettes) were installed at Miller Sands and Pillar Rock Islands in 2004, 2005, and 2006, effectively discouraging terns from roosting or nesting in these areas. No birds were observed at Rice, Miller Sands, or Pillar Rock Islands in 2007 or 2008, but terns did initiate nesting at Rice Island in 2009, and the eggs were collect using a depredation permit from the USFWS; no further nesting attempts were made in 2009 following egg collection.

In all previous years, dissuasion materials were installed at the former colony site at the west end of Rice Island prior to the beginning of the nesting season to discourage terns from nesting. In 2010, this area became completely vegetated and consequently unsuitable for nesting terns. However, terns were observed in an upland area east of the former colony site in 2010, whereupon stakes and flagging were installed which effectively deterred nesting at Rice Island; no terns were observed at Miller Sands or Pillar Rock Islands in 2010. There was no suitable habitat for tern nesting at Miller Sands or Pillar Rock Island in 2011, 2012, or 2013, and terns were only observed in upland areas at Rice Island, from which they were subsequently hazed.

With regards to the proposed 5-year placement plan, if dissuasion is needed in the dredge placement network, physical barriers could be employed to preclude site use when regular human presence is not feasible. Following successful dissuasion, these materials (nets, ropes, silt fencing, etc.) may be dismantled and reused in other areas as needed. Only non-lethal dissuasion practices will be implemented for adult terns and cormorants. These dissuasion activities could occur and overlap spatially and temporally with SHLA nesting. Currently, Rice Island has habitat conditions which are suitable for tern nesting, but these areas do not overlap spatially with suitable habitat areas for SHLA. Pillar Rock Island has some habitat areas that are marginally suitable for tern nesting, and these areas overlap with the suitable habitat that is available for SHLA.

Where tern nests are discovered before egg-laying has been initiated, nests would be manually brushed over to eliminate the nest. Where tern egg laying has occurred, the Corps has a contract to collect tern eggs under a USFWS Migratory Bird Permit (permit # MB209988-0) from Rice, Miller Sands, and Pillar Rock Islands. Studies have shown that birds disperse to other nearby nesting areas when nests and eggs are repeatedly destroyed and birds are continually harassed early in the breeding season (Pacific Flyway Council 2012).

If birds are present and exhibit nesting or breeding behavior, the person monitoring would haze the birds from the area, destroying nest scrapes, collecting eggs (as permitted), and would follow these actions by immediately installing dissuasive materials. Wooden stakes at least three feet would be installed with flagging secured to the stakes to scare birds from the area. Flagging would be a minimum of two feet in length, and stakes shall be placed 10 feet apart. Polyester roping may be used in conjunction with the flagging to further preclude the habitat available to birds. All survey and monitoring efforts will be standardized to the extent possible to ensure consistency of information and detections. A proposed monitoring plan is presented and described later in this document, and includes monitoring the effectiveness of dissuasion actions on deterring terns and cormorants, as well as precluding site use by SHLA where it is deemed necessary.

LARKS

Recent observations have shown that some areas become suitable for SHLA less than 12 months following dredged material placement if sufficient organic materials are present in the dredged sediments to support vegetation growth (Anderson 2013). Similarly, it is anticipated that areas where dense vegetation currently makes an area unsuitable for larks could become suitable within the breeding season immediately following vegetation removal during site preparations in the spring. These same areas may also be or could become suitable for nesting or roosting by Caspian terns and double-crested cormorants.

To prevent larks from using areas that are prepared in the spring (prior to mid-April) for dredged material placement during the active breeding season (mid-April – mid-August), habitat modifications and/or physical barriers may be used to dissuade larks. Habitat modifications could be implemented to reduce the availability of nesting habitat, as well alter a site's suitability. It is proposed that trenching or mounding, as described above, effectively alters the suitability of a site for birds preferring habitats with minimal vegetation and expansive open habitat. Tree and vegetation removal, altering the density of vegetation, and modifying the topography of a site are all methods that could passively dissuade use of a placement site between dredged material placement events. Both vegetation removal and modifications to site topography would involve mechanical methods (bulldozers). Ropes and flagging may be installed at a site immediately following vegetation removal. Physical barriers and visual deterrents (nets, fencing, ropes, flagging, screens, etc.) can minimize the area available for nesting and roosting, effectively dissuading nesting behavior through passive means.

Dredging And In-Water Placement

The CR FNC projects are maintained by regular O&M dredging to provide reliable deep-draft navigation. Each year, the Corps dredges 3-5 million cubic yards (CY) of sediment at the Mouth of the Columbia River to maintain the inlet's 6-mile long deep-draft navigation entrance channel and approximately 6 to 9 million cubic yards of material from the lower Columbia River with placement at in-water, ocean, upland, and shoreline dredged material placement sites. The annual dredging plan is based on up-to-date survey data collected regularly and frequently throughout the year.

Unusually high and sustained spring flows occurred in 2011 and 2012 and it is unknown where "typical" shoaling will occur with the deepened channel from RM 3 to 106.5. In addition, it is also unknown what potential volumes of sediment will need to be removed from the deeper channel and placed in upland or shoreline areas. The proposed action forecasts dredging and placement need based on the best available information.

A general description of dredging and placement activities is described in detail in Appendix B.

Dredged Material Sediment Quality

Sediments from the federal navigation channels are evaluated to determine if they are acceptable for in-water unconfined placement according to the requirements of the Clean Water Act and the Marine Protection, Research, and Sanctuaries Act. The Corps has characterized sediments to be dredged in accordance with the regional and national dredge material testing manual protocols, Ocean Testing Manual, Inland Testing Manual, 2009 Northwest Regional Sediment Evaluation Framework (SEF), and previously under the 1998 Dredge Material Evaluation Framework (DMEF).

Project sediment testing is typically performed on the mainstem Columbia River on a 10-year rotational cycle unless an event occurs that would warrant more frequent sampling. The 10-year rotation allows for the continued, even management of both budget and labor while providing sediment quality information to allow dredging to proceed unobstructed. Projects dredged less frequently, such as the auxiliary side channel projects, are evaluated, sampled, and tested as required by the SEF. A brief description of recent sediment quality sampling results is provided below for the Action Area.

- Mouth of the Columbia River (MCR) FNC (RM -3 to RM 3) – The sediments tested in 2008 at the MCR averaged 98.5% sands and 1.5% fines.
- Columbia River FNC, deep draft channel and associated turning basins (RM 3 to RM 106.5) – The 2008 analyses indicated a mean grain-size of 92% sand. Total organic carbon averaged 0.25%. The Oregon Slough reach of the deep-draft channel was tested in 2005. Mean grain size for all the samples is 0.40 mm, with .037% gravel, 48.15% sand, 41.925% silt, and 9.875% clay.
- Columbia River FNC, Vancouver, Washington to Bonneville Dam (RM 106.5 to RM 145) – The 2009 analyses indicated a mean grain-size of 99.9% sand and gravel.
- Portland/Vancouver Anchorage Project – There is currently no shoaling in the anchorages to test. If shoaling develops, the site will be evaluated under the SEF prior to dredging.
- Columbia River FNC, side channels:
  - Baker Bay (tested in 2009) – Materials are primarily fine-grained that have settled out of the Columbia River.
  - Chinook Channel (tested in 2008) – The material is less than 25% sand, with the outer channel averaging 19.3% sand and 81.0% fine-grained material. The inner channel averaged 1.5% sand and 98.1% fine-grained material.

- Hammond Boat Basin (tested in 1994) – The samples were sandy, clayey, silts. They averaged 10% sand, 18% clay and 72% silt. The median grain size for the samples varied from medium to coarse silt.
- Skipanon (tested in 2003 and 2013) – The post dredge sampling materials from 2013 are predominately fine-grained, with approximately 83.6% fines. The 2003 physical analyses indicated mean values of 23.9% sand and 76.1% silt/clay.
- Skamokawa Creek (tested in 1992) – Sediments are primarily sandy silt with concentrations of silt and clay, up to 22%.
- Wahkiakum Ferry (tested in 2006 and 2013) – This channel is part of the main Columbia River channel and in 2006 it was predominately sand, with 1.2 % fines. Sampling results from 2013 for the channel re-alignment are in preparation and review under the SEF.
- Westport Slough (tested in 2006 and 2013) – The 2006 analysis indicates the material is 66.4% sand and 33.8% silt and clay. Sampling results from 2013 are in preparation and review under the SEF.
- Old Mouth Cowlitz (tested in 2006) – The material is mostly silty sand of 96% fines.
- Upstream Entrance to Oregon Slough (tested in 2005) – Analysis indicate the material ranges from poorly graded sand to silty sand with an average of 94.28 % sand and 5.67 % fines.

The detailed results of the characterizations highlighted above are available upon request. Based on these results, the dredged materials have been determined suitable for unconfined aquatic placement without further testing.

UPLAND AND SHORELINE DREDGED MATERIAL PLACEMENT

OVERVIEW

The Columbia River has not yet stabilized following the completion of channel improvements in 2010, and by necessity, the Network needs to be fully utilized to accommodate the increased volumes of dredged material removed from shoals in the Columbia River. To meet this need, the Corps is proposing to continue placing dredged materials on the existing dredged material placement network, including the addition of shoreline placement at Pillar Rock as described previously. This allows for strategic management of dredged material for conservation and operational purposes. The careful management of the Network will allow for greater flexibility for the CR O&M program, as well as create suitable habitat for larks.

SHORELINE PLACEMENT

Shoreline placement involves pumping dredged material through a floating discharge pipe from the pipeline or hopper dredge (see Figure 10). The material is pumped to an existing shoreline where placement occurs at the sand/water interface (not in open-water). As described in the site preparations, the dredge first pumps a landing area on the shoreline to establish a point from which further material placement occurs. Dredged material is then pumped out in sand and water slurry (about 20% sand) and as it exits the shore pipe, sand settles out along the shoreline while water returns to the river (see Figure 11). A temporary sand berm is constructed to retain sand on the beach during pump-out, otherwise, much of the sand would immediately be lost to the river. Settling rates of Columbia River sands are very quick and turbidity from the operation is minimal.

Figure 10: Active shoreline placement at Sand Island (looking upstream)

Figure 11: Active shoreline placement at Sand Island (looking downstream)

The temporary berms are typically 5 feet high and 12 feet wide at the base. The berms are built gradually by earth-moving equipment as pump-out continues and are created from existing beach sand, pumped sand, or both. After sufficient sand has settled out and begins to increase in height, the settled sand is moved by bulldozers to match the elevation and profile of the existing shoreline at approximately the high water line. This process continues by adding to the shore pipe and proceeding longitudinally along the shoreline.

A typical beach/shoreline placement operation lasts from 5 to 15 days and the typical width of the created shoreline is approximately 100 to 150 ft, but may vary slightly depending on site and river conditions. The length of shoreline replaced is dependent on the quantity of material to be dredged from the shoal in the channel and the available capacity within the placement footprint. After shoreline placement has completed, the slope of the shoreline is groomed by mechanical equipment (bulldozers) to a steepness of 10% to 15% to prevent the possibility of creating areas where juvenile fish could be stranded from vessel wakes on the new shoreline.

UPLAND PLACEMENT

Upland placement of dredged material is conducted via clamshell, hopper, and pipeline dredges, and earth-moving equipment (bulldozers, backhoes, etc.) to manage sediment placement. Regardless of type of dredge used, the earth-moving equipment may be barged in or driven in, depending on site accessibility. When equipment is barged in, the barge(s) is maneuvered to the shoreline where it is anchored for the duration of the operation. As discussed in site preparation, a wide sand berm is constructed from the barge to the placement site for movement and transfer of equipment.

While the method of discharge is similar to shoreline placement, upland placement requires extension of a pipeline from the dredge to a location in the placement site that is higher in elevation (see Figure 12). To maintain the stability and integrity of the pipeline, it is placed to rest against the berms that were constructed during site preparations. The sand-water slurry flows downhill from the discharge point toward the settling pond and weirs, which are lower in elevation than the discharge pipe (see Figure 13). There may be several discharge points (controlled by a valve) to better manage the incoming dredged material and use multiple settling pond configurations to ensure sufficient time for sediments to settle out before the water returns to the river.

Figure 12: Active dredged material placement at Martin Bar Upland Site

Figure 13: Active discharge of sand and water dredged material slurry at Rice Island Upland Site

If a clamshell dredge places material on a barge for upland placement, the material is off-loaded at a transfer point for placement at an upland site. Hopper and pipeline dredges pump dredged material in sand-and-water slurry directly into the diked, upland site. Discharge of water from upland sites back into the river is controlled by the use of weirs. The landward end of the pipe is moved by a bulldozer at regular intervals to minimize unintentional mounding on the site. In addition, sediment is maneuvered regularly during placement to facilitate flow and drainage of the slurry mixture across the site, maximizing settling and sediment accretion.

Five-year Dredged Material Placement Plan

Recent surveys of the placement sites indicate site capacity varies by site and placement activities may fill a site to capacity. The pipeline dredge will likely be capable of pumping material farther and higher on upland placement sites due to a planned engine overhaul, increasing the Corps' ability to place dredged material on sites that were not previously viable or feasible. Table 3 below provides the estimated placement volumes in thousands of cubic yards (kCY) and estimated acres of each placement in the next five years, from 2014 through 2018.

The estimated volumes and acreages take into consideration the maximum feasible amount of placement based on equipment limitations, anticipated shoaling, site-use logistics based on past and future placements, and anticipated funding. Actual placement volumes and areas may be less due to limited annual funding and shoal development. In total, approximately 17,270,000 CY of dredged material will be placed at 20 of 26 sites over the next five years. Of that total volume, approximately 3,750,000 CY will be placed across four shoreline sites (Miller Sands, Pillar Rock Island, Skamokawa – Vista Park, Sand Island) over the next five years. The six sites not planned for use by the Corps for placement in the next five years (Benson Beach, Dibblee Point, Northport, Sandy Island, Austin Point, and Fazio Sand & Gravel) will remain in the Corps' planning for long-term placement.

Appendix B provides information on site history, existing site conditions, recent placements of dredged materials, and known SHLA use for each site within the Corps' Network. Figures for each site's placement plan over the next five years relative to suitable SHLA nesting conditions are located in Appendix C. Placements of dredged material and availability of suitable SHLA nesting habitat on each designated critical habitat subunit in the Network are displayed on figures located in Appendix D.

Table 3: Five-year Dredged Material Placement Plan (2014 – 2018)

SITE (acres)	State River Mile	2014		2015		2016		2017		2018	
		kCY	Acres	kCY	Acres	kCY	Acres	kCY	Acres	kCY	Acres
Benson Beach (27)	*W-n/a*	0	0	0	0	0	0	0	0	0	0
West Sand Island (83)	O-3.1	0	0	0	0	0	0	0	0	20	83
Rice Island (264) # +	O/W-21.0	650	53	250	3	0	0	650	104	600	23
Miller Sands (117) # +	O-23.5	*200	*6	*200	*14	*450	11	*200	*9	*200	*9
Pillar Rock Island (52) # +	O-27.2	*500	*26	*500	*26	*500	26	500	26	500	26
Skamokawa - Vista Park (15)	W-33.4	0	0	0	0	0	0	*200	*15	0	0
Welch Island (41) # +	O-34.0	0	0	400	41	0	0	200	23	0	0
Tenasillahe Island (41) # +	O-38.3	400	14	0	0	400	27	0	0	200	14
James River (53)	O-42.9	0	0	0	0	400	53	450	53	0	0
Puget Island (96)	W-44.0	0	0	400	96	0	0	0	0	1,000	96
Brown Island (102) # +	W-46.3	500	68	0	0	400	50	0	0	0	0
Crims Island (59) # +	O-57.0	0	0	500	22	0	0	0	0	0	0
Hump Island (65)	W-59.7	300	65	0	0	250	48	0	0	0	0
Lord Island Upstream (24)	O-63.5	0	0	0	0	0	0	200	20	0	0
Dibblee Point (52)	*O-64.8*	0	0	0	0	0	0	0	0	0	0
Howard Island (315)	W-68.7	0	0	400	173	0	0	400	108	400	34
Cottonwood Island (62)	W-70.1	350	26	0	0	300	13	0	0	0	0
Northport (31) +	*W-71.9*	0	0	0	0	0	0	0	0	0	0
Sandy Island (32) # +	*O-75.8*	0	0	0	0	0	0	0	0	0	0
Lower Deer Island (24)	O-77.0	0	0	400	11	300	12	0	0	0	0
Martin Bar (40)	W-82.0	250	23	0	0	0	0	0	0	300	40
Sand Island (28)	O-86.2	0	0	*400	*14	0	0	*400	*14	0	0
Austin Point (30)	*W-86.5*	0	0	0	0	0	0	0	0	0	0
Fazio Sand & Gravel (17)	*W-97.1*	0	0	0	0	0	0	0	0	0	0
Gateway (40)	W-101.0	0	0	0	0	0	0	0	0	900	40
W. Hayden Island (116)	O-105.0	0	0	0	0	350	84	0	0	0	0
Yearly Totals		**3,150**	**281**	**3,450**	**400**	**3,350**	**324**	**3,200**	**372**	**4,120**	**365**
5 Year Total		**17,270**	**1,741**								

*Denotes shoreline placement; # denotes designated SHLA critical habitat; *Italics indicate no placement activities*; + denotes recent breeding pairs recorded

The following narrative summarizes the proposed dredged material placement activities across the Network by year.

Eight (8) sites will be used in 2014, totaling approximately 3,150,000 CY over 281 acres. Approximately 700,000 CY will be shoreline placement at the Miller Sands and Pillar Rock Island sites, combined. Table 4 provides the Corps' estimated sequence and timing of placement during the 2014 dredging season. The placement sequence assumes 25,000 CY will be placed daily, working five to seven days a week, and requiring three days to move between work areas. The sequence for each subsequent dredging year will be estimated during each year's annual coordination meeting with the USFWS.

Table 4: Estimated 2014 Dredged Material Placement Sequence

Site	Volume (CY)	Area (acres)	Timing	Notes
Tenasillahe Island	400,000	14	During SHLA nesting	Need early season site prep to remove vegetation and install SHLA dissuasion
Pillar Rock Island	500,000 (Shoreline)	26	During SHLA nesting	Shoreline placement with 0.10-acre staging site
Hump Island	300,000	65	During SHLA nesting	Need early season site prep to remove vegetation and install SHLA dissuasion
Martin Bar	250,000	23	During SHLA nesting	South parcel only, no SHLA or migratory bird nesting at borrow site
Miller Sands	200,000 (Shoreline)	6	During SHLA nesting	Shoreline placement with 0.10-acre staging site
Rice Island	650,000	53	After SHLA nesting	Site prep on west end to remove vegetation with tern dissuasion
Brown Island	500,000	68	After SHLA nesting	Site prep to remove vegetation, no dissuasion
Cottonwood Island	350,000	26	After SHLA nesting	Site prep to remove vegetation, no dissuasion
2014 TOTAL	3,150,00	281		

In 2015, nine (9) sites will be used, totaling approximately 3,450,000 CY over 400 acres. Approximately 1,100,000 CY will be shoreline placement at the Miller Sands, Pillar Rock Island, and Sand Island sites, combined.

In 2016, nine (9) sites will also be used, totaling approximately 3,350,000 CY over 324 acres. Approximately 950,000 CY will be shoreline placement at the Miller Sands and Pillar Rock Island sites, combined.

In 2017, nine (9) sites will be used, totaling approximately 3,200,000 CY over 372 acres. Approximately 800,000 CY will be shoreline placement at the Miller Sands, Skamokawa-Vista Park, and Sand Island sites, combined.

In 2018, nine (9) sites will be used, totaling approximately 4,120,000 CY over 365 acres. Approximately 200,000 CY will be shoreline placement at the Miller Sands site.

The availability of SHLA breeding habitat during the next five years is affected by specific site characteristics and landscape context, recent site modifications, vegetation succession, other human site uses, and planned site preparation and placement actions. Each placement site is evaluated annually to assess the amount of habitat available for nesting, the amount of habitat that is unsuitable, and the amount of habitat yet-to-be suitable for nesting in any given year[1]. Finally, SHLA are not likely to completely use a site because they require a buffer of open space between the habitat edge and actual nest sites. This buffer to the river's edge, taller vegetation, or a riparian edge is approximately 25 meters (Anderson 2013).

As described above, site preparations and placement of dredged materials removes or buries all vegetation in the placement footprint. Habitat in the placement footprint is then considered yet-to-be suitable because the area is devoid of all vegetation (>90% bare sand). If left undisturbed, these areas are assumed to transition into suitable SHLA nesting habitat conditions after sufficient time has elapsed for vegetation to become established following placement. Once areas have developed into suitable habitat, it is further assumed they will remain suitable for a given number of years, based on the amount of time it takes for vegetation to grow and exceed 50% cover. It should also be noted that without placement of dredged materials, many areas would transition into unsuitable SHLA nesting habitat and these areas would remain unavailable to SHLAs until habitat conditions change through other disturbance mechanisms. The Corps' placement of dredged materials is therefore a crucial disturbance event for maintaining suitable breeding habitat for SHLA on upland placement sites.

Upland placement events at Rice Island, Skamokawa-Vista Park, James River, Puget Island, Howard Island, and Sand Island typically occur late in the summer, after the SHLA nesting season ends in mid-August/early-September. Therefore, placement events at these sites are not expected to interfere with active SHLA nesting during the breeding season. All other sites are assumed to have placement occur during the breeding season, which may affect SHLAs if they move into the placement footprint and initiate nesting after the Corps has conducted site preparations and dissuasion activities.

It should also be reiterated that habitat conditions on Rice, Miller Sands, and Pillar Rock Islands transition slower than on the other islands farther upstream. It is assumed that vegetation succession takes three growing seasons following placement to transition into suitable nesting habitat, such that the placement area is suitable at the beginning of the fourth year after placement. Since vegetation establishment and growth is reduced in the lower river due to high winds and harsh growing conditions, suitable nesting habitat is assumed to remain viable for a duration of 12 years at Rice, Miller Sands, and Pillar Rock Islands.

For all other sites (Skamokawa – Vista Park upstream to West Hayden Island), it is assumed that vegetation only takes one full growing season to develop into suitable nesting habitat. Placement areas would then be available as suitable nesting habitat at the beginning of the breeding season in second year following placement if no additional disturbance occurs. This suitable habitat is assumed to remain viable for a duration of 6 years (Anderson 2013).

To maintain consistency with recent information and observations about SHLA in the Columbia River, the Corps used Normalized Difference Vegetation Index (NDVI) data that was collected and classified as part of an analysis to identify suitable nesting habitat throughout the lower river for the USFWS (Anderson 2013). The Corps has taken into account additional Corps' placement actions in 2011, 2012, and 2013 to establish the 2014 suitable SHLA nesting habitat baseline across the network. Since this consultation covers five years and baseline conditions for suitable habitat are

[1] Unsuitable areas are assumed to be those areas not affected by the placement of dredged materials, but which are also not suitable for nesting SHLA. This includes areas with dense vegetation (trees, shrubs, grasses, forbs), rocks, wetlands, beach and shorelines that are tidally-influenced daily, etc.

based on NDVI data collected in 2011, some areas may transition beyond suitability if placement activities do not occur to restart vegetation succession that benefits SHLA.

The following narrative and Table 5 details the acreages of currently available suitable SHLA nesting habitat, placements of dredged material, regrading events, and the shifting mosaic of yet-to-be suitable to suitable to unsuitable SHLA nesting habitats on each of the Network sites from 2014 through 2018. Sites without planned placements are included because a few sites provide suitable SHLA nesting habitat during the next five years. Figures for each site's placement plan over the next five years relative to suitable SHLA nesting conditions are located in Appendix C.

Table 5: Availability of Suitable Streaked Horned Lark Nesting Habitat within the Dredged Material Placement Network (2014-2018)

2014

Placement Site	Placement Area Acres	Placement Area Timing	Baseline Suitable[1] Acres	Baseline Suitable[1] %	Placement (acres)	Suitable Lost[2] Acres	Suitable Lost[2] %	Yet-to-be Suitable Acres	Yet-to-be Suitable %	Suitable Remaining Acres	Suitable Remaining %	Unsuitable Acres	Unsuitable %
Benson Beach	27	During breeding	0	0%	0	0	0%	0	0%	0	0%	27	100%
West Sand Island	83	During breeding	0	0%	0	0	0%	0	0%	0	0%	83	100%
Group I Total	**110**		**0**	**0%**	**0**	**0**	**0%**	**0**	**0%**	**0**	**0%**	**110**	**100%**
Rice Island*	264	Post-breeding	150	57%	53	28	19%	0	0%	150	57%	114	43%
Miller Sands*	117	During breeding	0	0%	6	0	0%	0	0%	0	0%	117	100%
Pillar Rock Island*	52	During breeding	4	8%	26	0	0%	0	0%	4	8%	48	92%
Group II Total	**433**		**154**	**36%**	**85**	**28**	**18%**	**0**	**0%**	**154**	**36%**	**279**	**64%**
Skamokawa - Vista Park	15	Post-breeding	0	0%	0	0	0%	0	0%	0	0%	15	100%
Welch Island*	41	During breeding	10	24%	0	0	0%	0	0%	10	24%	31	76%
Tenasillahe Island*	41	During breeding	3	7%	14	1	33%	21	51%	2	5%	18	44%
James River	53	Post-breeding	0	0%	0	0	0%	0	0%	0	0%	53	100%
Puget Island	96	Post-breeding	0	0%	0	0	0%	0	0%	0	0%	96	100%
Brown Island*[4]	102	Post-breeding	72	0%	68	51	71%	0	0%	72	71%	30	29%
Group III Total	**348**		**85**	**24%**	**82**	**52**	**61%**	**21**	**6%**	**84**	**24%**	**243**	**70%**
Crims Island*	59	During breeding	25	3%	0	0	0%	0	0%	25	42%	34	58%
Hump Island	65	During breeding	0	0%	65	0	0%	0	0%	0	0%	65	100%
Lord Island (upstream)	24	During breeding	10	42%	0	0	0%	0	0%	10	42%	14	58%
Dibblee Point	52	n/a	0	0%	0	0	0%	0	0%	0	0%	52	100%
Howard Island	315	Post-breeding	5	2%	0	0	0%	0	0%	5	2%	310	98%
Cottonwood Island	62	During breeding	0	0%	26	0	0%	0	0%	0	0%	62	100%
Northport	31	n/a	3	10%	0	0	0%	0	0%	3	10%	28	90%
Group IV Total	**608**		**43**	**7%**	**91**	**0**	**0%**	**0**	**0%**	**43**	**7%**	**565**	**93%**
Sandy Island*	32	n/a	32	0%	0	0	0%	0	0%	32	0%	0	0%
Lower Deer Island	24	During breeding	0	0%	0	0	0%	0	0%	0	0%	24	100%
Martin Bar	40	During breeding	0	0%	23	0	0%	0	0%	0	0%	40	100%
Sand Island	28	Post-breeding	1	4%	0	0	0%	0	0%	1	4%	27	96%
Austin Point	30	n/a	0	0%	0	0	0%	0	0%	0	0%	30	100%
Group V Total	**154**		**33**	**21%**	**23**	**0**	**0%**	**0**	**0%**	**33**	**21%**	**121**	**79%**
Fazio Sand & Gravel	17	n/a	0	0%	0	0	0%	0	0%	0	0%	17	100%
Gateway	40	During breeding	0	0%	0	0	0%	0	0%	0	0%	40	100%
West Hayden Island	116	During breeding	0	0%	0	0	0%	0	0%	0	0%	116	100%
Group VI Total	**173**		**0**	**0%**	**0**	**0**	**0%**	**0**	**0%**	**0**	**0%**	**173**	**100%**
Total Network Acres	***1826***		***315***	***17%***	***281***	***80***	***4%***	***21***	***1%***	***314***	***17%***	***1491***	***82%***

2015

Placement Site	Baseline Suitable[3] Acres	Baseline Suitable[3] %	Placement (acres)	Suitable Lost[2] Acres	Suitable Lost[2] %	Yet-to-be Suitable Acres	Yet-to-be Suitable %	Suitable Remaining Acres	Suitable Remaining %	Unsuitable Acres	Unsuitable %
Benson Beach	0	0%	0	0	0%	0	0%	0	0%	27	100%
West Sand Island	0	0%	0	0	0%	0	0%	0	0%	83	100%
Group I Total	**0**	**0%**	**0**	**0**	**0%**	**0**	**0%**	**0**	**0%**	**110**	**100%**
Rice Island*	122	46%	3	0	0%	76	29%	122	46%	66	25%
Miller Sands*	0	0%	14	0	0%	34	29%	0	0%	83	71%
Pillar Rock Island*	4	8%	26	0	0%	0	0%	4	8%	48	92%
Group II Total	**126**	**29%**	**43**	**0**	**0%**	**110**	**25%**	**126**	**29%**	**197**	**45%**
Skamokawa - Vista Park	0	0%	0	0	0%	0	0%	0	0%	15	100%
Welch Island*	10	24%	41	10	100%	0	0%	0	0%	41	100%
Tenasillahe Island*	23	56%	0	0	0%	14	34%	23	56%	4	10%
James River	0	0%	0	0	0%	0	0%	0	0%	53	100%
Puget Island	0	0%	96	0	0%	0	0%	0	0%	96	100%
Brown Island*[4]	21	21%	0	0	0%	68	67%	21	21%	13	13%
Group III Total	**54**	**16%**	**137**	**10**	**19%**	**82**	**24%**	**44**	**13%**	**222**	**64%**
Crims Island*	25	42%	22	5	20%	0	0%	20	34%	39	66%
Hump Island	0	0%	0	0	0%	65	100%	0	0%	0	0%
Lord Island (upstream)	10	42%	0	0	0%	0	0%	10	42%	14	58%
Dibblee Point	0	0%	0	0	0%	0	0%	0	0%	52	100%
Howard Island	5	2%	173	5	100%	0	0%	5	2%	310	98%
Cottonwood Island	0	0%	0	0	0%	0	0%	0	0%	62	100%
Northport	3	10%	0	0	0%	0	0%	3	10%	28	90%
Group IV Total	**43**	**7%**	**195**	**10**	**23%**	**65**	**11%**	**38**	**6%**	**505**	**83%**
Sandy Island*	32	100%	0	0	0%	0	0%	32	100%	0	0%
Lower Deer Island	0	0%	11	0	0%	0	0%	0	0%	24	100%
Martin Bar	0	0%	0	0	0%	0	0%	0	0%	40	100%
Sand Island	1	4%	14	0	0%	0	0%	1	4%	27	96%
Austin Point	0	0%	0	0	0%	0	0%	0	0%	30	100%
Group V Total	**33**	**21%**	**25**	**0**	**0%**	**0**	**0%**	**33**	**21%**	**121**	**79%**
Fazio Sand & Gravel	0	0%	0	0	0%	0	0%	0	0%	17	100%
Gateway	0	0%	0	0	0%	0	0%	0	0%	40	100%
West Hayden Island	0	0%	0	0	0%	0	0%	0	0%	116	100%
Group VI Total	**0**	**0%**	**0**	**0**	**0%**	**0**	**0%**	**0**	**0%**	**173**	**100%**
Total Network Acres	***256***	***14%***	***400***	***20***	***1%***	***257***	***14%***	***241***	***13%***	***1328***	***73%***

2016

Placement Site	Baseline Conditions[3] Acres	Baseline Conditions[3] %	Placement (acres)	Suitable Lost[2] Acres	Suitable Lost[2] %	Yet-to-be Suitable Acres	Yet-to-be Suitable %	Suitable Remaining Acres	Suitable Remaining %	Unsuitable Acres	Unsuitable %
Benson Beach	0	0%	0	0	0%	0	0%	0	0%	27	100%
West Sand Island	0	0%	0	0	0%	0	0%	0	0%	83	100%
Group I Total	**0**	**0%**	**0**	**0**	**0%**	**0**	**0%**	**0**	**0%**	**110**	**100%**
Rice Island*	122	46%	0	0	0%	79	30%	122	46%	63	24%
Miller Sands*	0	0%	11	0	0%	34	29%	0	0%	83	71%
Pillar Rock Island*	4	8%	26	0	0%	0	0%	4	8%	48	92%
Group II Total	**126**	**29%**	**37**	**0**	**0%**	**113**	**26%**	**126**	**29%**	**194**	**45%**
Skamokawa - Vista Park	0	0%	0	0	0%	0	0%	0	0%	15	100%
Welch Island*	0	0%	0	0	0%	41	100%	0	0%	0	0%
Tenasillahe Island*	37	90%	27	12	32%	0	0%	10	24%	31	76%
James River	0	0%	53	0	0%	0	0%	0	0%	53	100%
Puget Island	0	0%	0	0	0%	0	0%	0	0%	96	100%
Brown Island*[4]	89	87%	50	50	56%	0	0%	49	48%	53	52%
Group III Total	**126**	**36%**	**130**	**62**	**49%**	**41**	**12%**	**59**	**17%**	**248**	**71%**
Crims Island*	20	34%	0	0	0%	22	37%	20	34%	17	29%
Hump Island	65	100%	48	48	74%	0	0%	17	26%	48	74%
Lord Island (upstream)	10	42%	0	0	0%	0	0%	10	42%	14	58%
Dibblee Point	0	0%	0	0	0%	0	0%	0	0%	52	100%
Howard Island	0	0%	0	0	0%	173	55%	0	0%	142	45%
Cottonwood Island	0	0%	13	0	0%	0	0%	0	0%	62	100%
Northport	0	0%	0	0	0%	0	0%	0	0%	31	100%
Group IV Total	**95**	**16%**	**61**	**48**	**51%**	**195**	**32%**	**47**	**8%**	**366**	**60%**
Sandy Island*	32	100%	0	0	0%	0	0%	32	100%	0	0%
Lower Deer Island	0	0%	12	0	0%	11	46%	0	0%	13	54%
Martin Bar	0	0%	0	0	0%	0	0%	0	0%	40	100%
Sand Island	1	4%	0	0	0%	0	0%	1	4%	27	96%
Austin Point	0	0%	0	0	0%	0	0%	0	0%	30	100%
Group V Total	**33**	**21%**	**12**	**0**	**0%**	**11**	**7%**	**33**	**21%**	**110**	**71%**
Fazio Sand & Gravel	0	0%	0	0	0%	0	0%	0	0%	17	100%
Gateway	0	0%	0	0	0%	0	0%	0	0%	40	100%
West Hayden Island	0	0%	84	0	0%	0	0%	0	0%	116	100%
Group VI Total	**0**	**0%**	**84**	**0**	**0%**	**0**	**0%**	**0**	**0%**	**173**	**100%**
Total Network Acres	***380***	***21%***	***324***	***110***	***6%***	***360***	***20%***	***265***	***15%***	***1201***	***66%***

2017

Placement Site	Baseline Conditions[3] Acres	Baseline Conditions[3] %	Placement (acres)	Suitable Lost[2] Acres	Suitable Lost[2] %	Yet-to-be Suitable Acres	Yet-to-be Suitable %	Suitable Remaining Acres	Suitable Remaining %	Unsuitable Acres	Unsuitable %
Benson Beach	0	0%	0	0	0%	0	0%	0	0%	27	100%
West Sand Island	0	0%	0	0	0%	0	0%	0	0%	83	100%
Group I Total	**0**	**0%**	**0**	**0**	**0%**	**0**	**0%**	**0**	**0%**	**110**	**100%**
Rice Island*	122	46%	104	64	52%	79	30%	122	46%	63	24%
Miller Sands*	0	0%	9	0	0%	34	29%	0	0%	83	71%
Pillar Rock Island*	0	0%	26	0	0%	0	0%	0	0%	52	100%
Group II Total	**122**	**28%**	**139**	**64**	**52%**	**113**	**26%**	**122**	**28%**	**198**	**46%**
Skamokawa - Vista Park	0	0%	15	0	0%	0	0%	0	0%	15	100%
Welch Island*	41	100%	23	23	56%	0	0%	18	44%	23	56%
Tenasillahe Island*	10	24%	0	0	0%	27	66%	10	24%	4	10%
James River	0	0%	53	0	0%	0	0%	0	0%	53	100%
Puget Island	0	0%	0	0	0%	0	0%	0	0%	96	100%
Brown Island*[4]	49	48%	0	0	0%	50	49%	49	48%	3	3%
Group III Total	**100**	**29%**	**91**	**23**	**23%**	**77**	**22%**	**77**	**22%**	**194**	**56%**
Crims Island*	42	71%	0	0	0%	0	0%	42	71%	17	29%
Hump Island	17	26%	0	0	0%	48	74%	17	26%	0	0%
Lord Island (upstream)	10	42%	20	10	100%	0	0%	0	0%	24	100%
Dibblee Point	0	0%	0	0	0%	0	0%	0	0%	52	100%
Howard Island	173	55%	108	0	0%	0	0%	173	55%	142	45%
Cottonwood Island	0	0%	0	0	0%	0	0%	0	0%	62	100%
Northport	0	0%	0	0	0%	0	0%	0	0%	31	100%
Group IV Total	**242**	**40%**	**128**	**10**	**4%**	**48**	**8%**	**232**	**38%**	**328**	**54%**
Sandy Island*	32	100%	0	0	0%	0	0%	32	100%	0	0%
Lower Deer Island	11	46%	0	0	0%	12	50%	11	46%	1	4%
Martin Bar	0	0%	0	0	0%	0	0%	0	0%	40	100%
Sand Island	0	0%	14	0	0%	0	0%	0	0%	28	100%
Austin Point	0	0%	0	0	0%	0	0%	0	0%	30	100%
Group V Total	**43**	**28%**	**14**	**0**	**0%**	**12**	**8%**	**43**	**28%**	**99**	**64%**
Fazio Sand & Gravel	0	0%	0	0	0%	0	0%	0	0%	17	100%
Gateway	0	0%	0	0	0%	0	0%	0	0%	40	100%
West Hayden Island	0	0%	0	0	0%	0	0%	0	0%	116	100%
Group VI Total	**0**	**0%**	**0**	**0**	**0%**	**0**	**0%**	**0**	**0%**	**173**	**100%**
Total Network Acres	***507***	***28%***	***372***	***97***	***5%***	***250***	***14%***	***474***	***26%***	***1102***	***60%***

2018

Placement Site	Baseline Conditions[3] Acres	Baseline Conditions[3] %	Placement (acres)	Suitable Lost[2] Acres	Suitable Lost[2] %	Yet-to-be Suitable Acres	Yet-to-be Suitable %	Suitable Remaining Acres	Suitable Remaining %	Unsuitable Acres	Unsuitable %
Benson Beach	0	0%	0	0	0%	0	0%	0	0%	27	100%
West Sand Island	0	0%	83	0	0%	0	0%	0	0%	83	100%
Group I Total	**0**	**0%**	**83**	**0**	**0%**	**0**	**0%**	**0**	**0%**	**110**	**100%**
Rice Island*	134	51%	23	23	17%	107	41%	134	51%	23	9%
Miller Sands*	34	29%	9	0	0%	0	0%	34	29%	83	71%
Pillar Rock Island*	0	0%	26	0	0%	13	25%	0	0%	39	75%
Group II Total	**168**	**39%**	**58**	**23**	**14%**	**120**	**28%**	**168**	**39%**	**145**	**33%**
Skamokawa - Vista Park	0	0%	0	0	0%	0	0%	0	0%	15	100%
Welch Island*	18	44%	0	0	0%	23	56%	18	44%	0	0%
Tenasillahe Island*	37	90%	14	14	38%	0	0%	23	56%	18	44%
James River	0	0%	0	0	0%	0	0%	0	0%	53	100%
Puget Island	0	0%	96	0	0%	0	0%	0	0%	96	100%
Brown Island*[4]	99	97%	0	0	0%	0	0%	99	97%	3	3%
Group III Total	**154**	**44%**	**110**	**14**	**9%**	**23**	**7%**	**140**	**40%**	**185**	**53%**
Crims Island*	42	71%	0	0	0%	0	0%	42	71%	17	29%
Hump Island	65	100%	0	0	0%	0	0%	65	100%	0	0%
Lord Island (upstream)	0	0%	0	0	0%	20	83%	0	0%	4	17%
Dibblee Point	0	0%	0	0	0%	0	0%	0	0%	52	100%
Howard Island	173	55%	34	0	0%	108	34%	173	55%	34	11%
Cottonwood Island	0	0%	0	0	0%	0	0%	0	0%	62	100%
Northport	0	0%	0	0	0%	0	0%	0	0%	31	100%
Group IV Total	**280**	**46%**	**34**	**0**	**0%**	**128**	**21%**	**280**	**46%**	**200**	**33%**
Sandy Island*	32	100%	0	0	0%	0	0%	32	100%	0	0%
Lower Deer Island	23	96%	0	0	0%	0	0%	23	96%	1	4%
Martin Bar	0	0%	40	0	0%	0	0%	0	0%	40	100%
Sand Island	0	0%	0	0	0%	0	0%	0	0%	28	100%
Austin Point	0	0%	0	0	0%	0	0%	0	0%	30	100%
Group V Total	**55**	**36%**	**40**	**0**	**0%**	**0**	**0%**	**55**	**36%**	**99**	**64%**
Fazio Sand & Gravel	0	0%	0	0	0%	0	0%	0	0%	17	100%
Gateway	0	0%	40	0	0%	0	0%	0	0%	40	100%
West Hayden Island	0	0%	0	0	0%	0	0%	0	0%	116	100%
Group VI Total	**0**	**0%**	**40**	**0**	**0%**	**0**	**0%**	**0**	**0%**	**173**	**100%**
Total Network Acres	***657***	***36%***	***365***	***37***	***2%***	***271***	***15%***	***643***	***35%***	***912***	***50%***

* Denotes placement areas/islands designated as critical habitat.

[1] Baseline suitable in 2014 equal the extent of habitat which is suitable for SHLA at the beginning of the breeding season based on the best scientific information available (Anderson 2013). In addition, the area is calculated by subtracting a 25m buffer from the edge of shorelines, unsuitable vegetation (trees, shrubs). While larks are known to forage in these areas, they are not known to nest and breed in these areas.

[2] Suitable habitat loss is defined as those areas where placement or pre-season site-preparation activities affect suitable habitat, thereby making these areas unsuitable during the given breeding season.

[3] Baseline suitable for 2015, 2016, 2017, and 2018 are estimates of suitable habitat at the beginning of the breeding season. These values are assumed to equal the quantity of suitable habitat remaining from the preceding year plus any areas that become suitable from previous placement events. Where placement occurs after the breeding season, any loss of suitable habitat acres are not realized until the beginning of the following breeding season, and thus reflected in the baseline suitable conditions.

[4] 2016 placement on Brown Island will occur during the nesting season, thereby reducing available suitable nesting habitat during the 2016 nesting season

NETWORK SCALE

Figure 14 below summarizes how SHLA nesting habitat changes throughout the Network due to the 5-year placement plan as detailed in Table 5. The entire Network totals 1,826 acres that are categorized as suitable habitat, yet-to-be suitable habitat, or unsuitable habitat based on the assumptions discussed above. The 2011 NDVI habitat data, Corps placement events in 2011, 2012, 2013, and placement events during the 2014 nesting season are included in the baseline information for the analysis. Of the 1,826 acres in the Network, only 315 acres (17% of total upland placement area) are considered suitable SHLA nesting habitat at the time of its listing under the ESA in October 2013.

Following the placements in 2014, the suitable habitat acreage of the Network will initially experience a reduction (-0.3%) of suitable habitat during the 2014 breeding season, for a total of 314 acres available in 2014. Dredged material placement and/or habitat succession results in an initial decrease of 73 acres (-23%) o suitable habitat during the 2015 breeding season as compared to 2014, for a total of 241 acres available in 2015.

Following placement activities in 2015, the acreage of suitable habitat available increases in 2016, 2017, and 2018 across the Network. Dredged material placement and/or habitat succession results in an increase of 24 acres (+10%) of suitable nesting habitat during the 2016 breeding season as compared to 2015, for a total of 265 acres available in 2016. Dredged material placement and/or habitat succession results in an increase of 209 acres (+79%) of suitable habitat during the 2017 breeding season, as compared to 2016, for a total of 474 acres in 2017. Dredged material placement and/or habitat succession results in an increase of 169 acres (+36%) of suitable habitat during the 2018 breeding season, for a total of 643 acres of suitable habitat available across the Network in 2018.

Overall, suitable SHLA nesting habitat will increase by 328 acres (+104%) from 315 acres in 2014 to 643 acres in 2018. Additionally, the acreage of yet-to-be suitable nesting habitat increases by 250 acres, from 21 acres in 2014 to 271 acres in 2018 (+1,190%) across the Network. Unsuitable habitat will decrease by 579 acres from 1,491 to 912 acres, a reduction of -39%. Therefore, at the Network scale, the upland placement of dredged materials is essential for suitable SHLA nesting habitat in the lower Columbia River, which will aid in the recovery of the species.

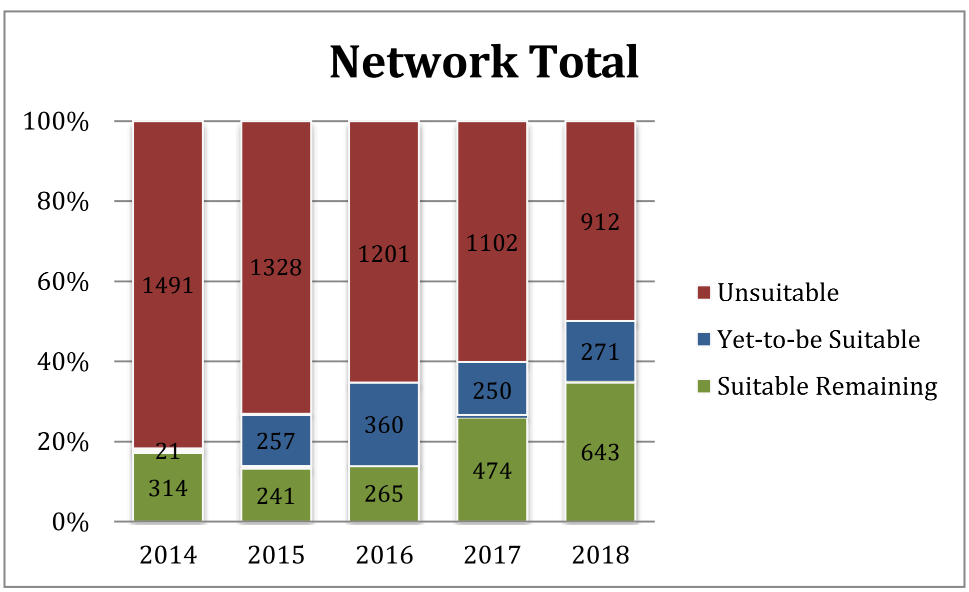


Figure 14: Transition of Suitable SHLA Nesting Habitat throughout Network, 2014-2018

INDIVIDUAL PLACEMENT SITE SCALE

BENSON BEACH (PACIFIC OCEAN)

No placement is planned on the 27-acre Benson Beach intertidal site on the Pacific Ocean during the 5-year placement plan. No suitable SHLA nesting habitat is known or expected to develop over the course of this consultation, as shown in Figure 15 below.

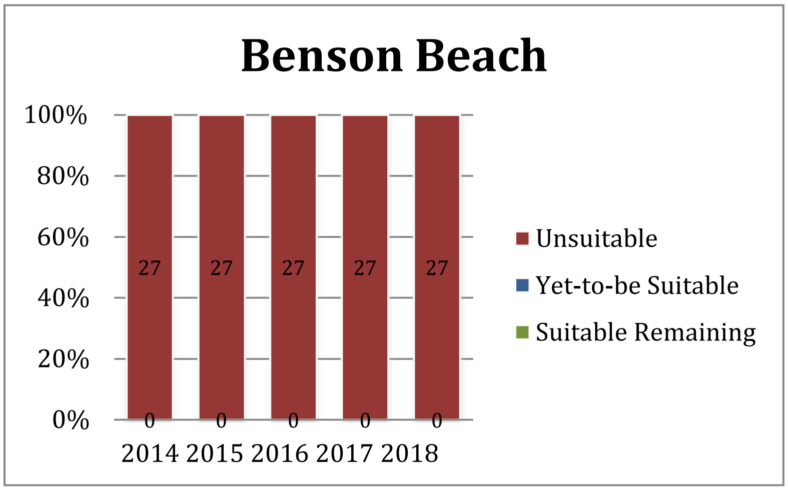


Figure 15: Availability of SHLA Nesting Habitat on Benson Beach, 2014-2018

WEST SAND ISLAND (RM 3.1)

This site is 83 acres and has no suitable SHLA breeding habitat currently available due to extensive site vegetation. Placement would occur during the summer in-water work window. In 2018, or earlier if needed, dredged material will be placed on the entire 83-acre site using a pipeline dredge. This will require early spring removal of existing vegetation and installation of SHLA dissuasion measures. If practicable, following placement the site will be replanted with native vegetation that will not affect the native dune-grass community south of the placement site. No suitable SHLA nesting habitat is available or is expected to develop over the course of this consultation at West Sand Island, as shown in Figure 16.

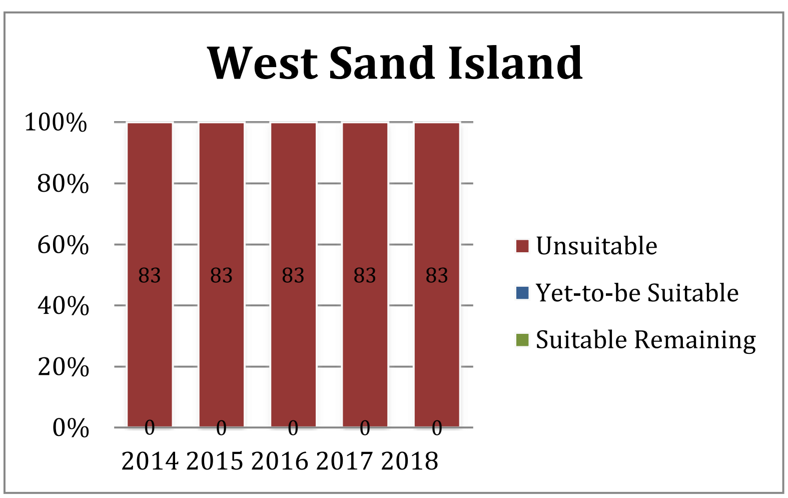


Figure 16: Availability of SHLA Nesting Habitat on West Sand Island, 2014-2018

GROUP I

Group I consists of two placement sites located at the mouth of the Columbia River: the Benson Beach intertidal site on the Pacific Ocean and the West Sand Island upland placement area. No suitable SHLA nesting is currently available within the 110 acres of Group I. The 83-acre placement on West Sand Island in 2018 will not result in a loss of suitable habitat or create suitable habitat because the site is revegetated with native plants. Group I will be unsuitable over the 5-year placement plan. No suitable SHLA nesting habitat is available or is expected to develop over the course of this consultation in Group I, as shown in Figure 17.

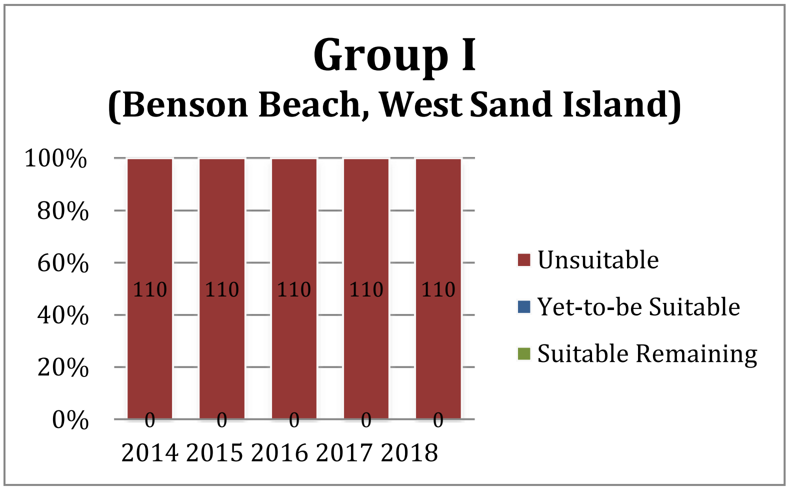


Figure 17: Availability of SHLA Nesting Habitat on Group I Sites, 2014-2018

RICE ISLAND (RM 21.0)

Placement events on the 264-acre Rice Island occur late in the summer, after the SHLA nesting season ends in mid-August/early-September. Therefore, placement actions on Rice Island are not expected to interfere with active SHLA nesting during the year of dredged material placement. Habitat conditions on Rice Island transition slower than on other islands farther upstream and it is assumed that vegetation succession takes three growing seasons following placement to transition into suitable breeding habitat in the fourth year after placement. In addition, because vegetation establishment and subsequent growth on dredged materials is reduced in the estuary, suitable SHLA nesting habitat conditions are assumed to remain viable for 12 years at Rice Island. The total succession cycle from placement to unsuitable is 15 years.

In 2014, the baseline of suitable breeding habitat is 150 acres with the remaining 114 acres of the site as unsuitable. The 2014 placement events will occur after the breeding season has ended and will cover a total of 53 acres of habitat currently classified as a mixture of suitable and unsuitable conditions, where 28 acres of suitable habitat will be covered. The placement events will occur in two locations on the island: (1) on the downstream end of the island which is currently covered by short vegetation, and (2) along a strip of low-ground in the interior portion of the island. In addition to the placement of dredged materials, 23 acres on the upstream end of the island, which was trenched following placement activities in September 2013, will be smoothed out after the 2014 breeding season. This regraded area will develop into suitable breeding habitat in 2018.

Approximately 122 acres will remain in suitable nesting conditions for the beginning of the SHLA breeding season in 2015. The 53-acre area covered by the 2014 placements and the 23-acre trenched/regraded area are expected to be mostly bare sand for the duration of 2015, and this yet-to-be suitable acreage (76 acres) is assumed to be unavailable for nesting SHLA. All remaining areas (66 acres) are considered unsuitable as breeding habitat in 2015. A small placement event will occur in 2015 in an area that is not currently suitable for SHLA, covering approximately three acres at the upper-most end of the island after the nesting season.

No placement will occur in 2016 at Rice Island, and therefore no suitable breeding habitat will be lost. The areas covered by the 2014 and 2015 placement events (79 acres total) will be yet-to-be suitable habitat, and it is assumed to be unavailable for nesting. It is assumed all areas suitable at the beginning of the 2016 breeding season will remain in suitable condition throughout the breeding season, such that 122 acres are available SHLA nesting habitat and the remaining 63 acres are unsuitable for nesting.

Approximately 122 acres will be available as suitable nesting habitat in the 2017 breeding season. The 76 acres from the 2014 re-grading and placement activities will be in the third year of vegetation succession, but still considered yet-to-be suitable habitat, along with the three acres from the 2015 placement event, resulting in a total of 79 acres of yet-to-be suitable habitat in 2017 nesting season. The placement event in 2017 will cover approximately 104 acres in the center of the island after the breeding season, whereupon 64 acres of suitable habitat would be lost to nesting SHLA in the following breeding season. The 2017 placement event will cover areas where the most SHLA activity has been recorded in the recent years (Anderson 2013). The remaining 63 acres of the site are still expected to be unsuitable nesting habitat.

Approximately 134 acres will be available as suitable nesting habitat in the 2018 breeding season due to the loss of 64 acres of suitable habitat by the placement event in 2017 and the addition of 76 acres from the 2014 placement and regrading areas that were yet-to-be suitable becoming suitable in 2018. The 104-acre placement event in 2017, combined with the 3-acre placement event in 2015 at the upstream tip, will total 107 acres of yet-to-be suitable habitat for the 2018 breeding season. The remaining 23 acres are expected to remain unsuitable. A 2018 placement event will cover approximately 23 acres at the upstream end of the site after the breeding season, resulting in a loss of 23 acres of suitable breeding habitat in subsequent years. These 23 acres had recently transitioned into viable nesting habitat from the 2014 re-grading event. The 23-acre placement event will increase the acreage of yet-to-be suitable habitat following in subsequent years.

Figure 18 displays the percentage and acreage of suitable, yet-to-be suitable, and unsuitable SHLA nesting habitat over the next five years on Rice Island.

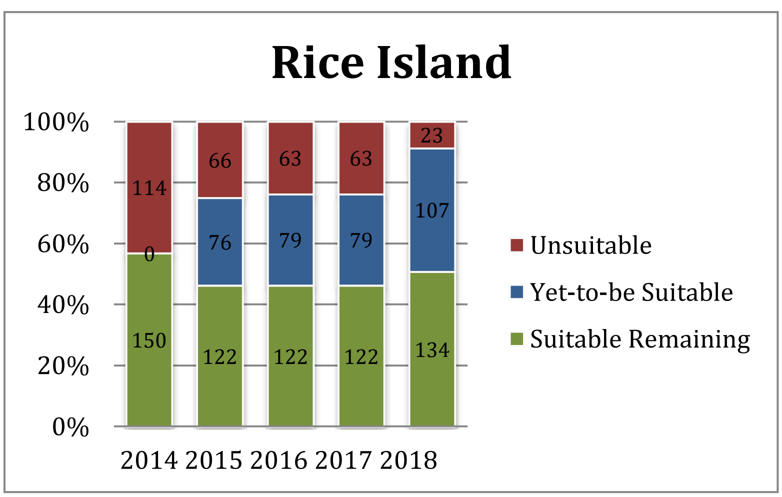


Figure 18: Availability of SHLA Nesting Habitat on Rice Island, 2014-2018

MILLER SANDS (RM 23.5)

Placement events on the 117-acre Miller Sands site occur during the SHLA nesting season. However, this site is only used for shoreline placements and the 0.10-acre upland staging area can be placed to avoid any nesting larks, if any are identified. Therefore, shoreline placement actions on Miller Sands are not expected to interfere with active SHLA nesting. Shoreline placements on Miller Sands are also not expected to typically develop into suitable SHLA nesting habitat because the dredged material is expected to erode away in subsequent years. Habitat conditions on Miller Sands transition slower than on other islands farther upstream and it is assumed that vegetation succession takes three growing seasons following placement to transition into suitable breeding habitat in the four year after upland placement. In addition, because vegetation establishment and subsequent growth on dredged materials are reduced in the estuary, suitable SHLA nesting habitat conditions are assumed to remain viable for 12 years at Miller Sands. The total succession cycle from placement to unsuitable is 15 years.

In 2014, the baseline of suitable breeding habitat is zero (0) acres due to the succession of vegetation on Miller Sands and the entire 117 acres are considered unsuitable for SHLA nesting. In 2014, a six-acre shoreline placement will occur on the upstream tip of the site during the breeding season. In addition to the shoreline placement, 34 acres in the middle of the island will be smoothed during the 2014 breeding season to offset future impacts to suitable habitat in Group II following an extensive placement event at Rice Island in 2017. Regrading in 2014 allows this area to transition into suitable habitat at the beginning of 2018 for the purpose of avoiding substantial impacts to SHLA at the population scale in 2018. This area was previously mounded to dissuade tern and cormorant use.

No suitable SHLA nesting conditions will be present on Miller Sands in 2015. The 34-acre re-graded mound area is expected to be yet-to-be suitable habitat. All remaining areas (83 acres), including the prior shoreline placement, are considered unsuitable as breeding habitat in 2015. A 14-acre shoreline placement will occur on the mid-downstream portion of the site, during the 2015 breeding season.

No suitable SHLA nesting conditions will be present on Miller Sands in 2016. The 34-acre re-graded mound area is expected to be in its second year of yet-to-be suitable habitat. All remaining areas (83 acres), including the prior shoreline placements, are considered unsuitable as breeding habitat in 2016. An 11-acre shoreline placement will occur on two downstream portions of the site, during the 2016 breeding season.

No suitable SHLA nesting conditions will be present on Miller Sands in 2017. The 34-acre re-graded mound area is expected to be in its third year of yet-to-be suitable habitat. All remaining areas (83 acres), including the prior shoreline placements, are considered unsuitable as breeding habitat in 2017. A nine-acre shoreline placement will occur where necessary to repair site erosion, during the 2017 breeding season.

The 34 acres of mounded area that was regarded in 2014 will be available as suitable SHLA nesting habitat in the 2018 breeding season. All remaining areas (83 acres), including the prior shoreline placements, are considered unsuitable as breeding habitat in 2018. A nine-acre shoreline placement will occur where necessary to repair site erosion, during the 2018 breeding season.

Figure 19 displays the percentage and acreage of suitable, yet-to-be suitable, and unsuitable SHLA nesting habitat over the next five years on Miller Sands.

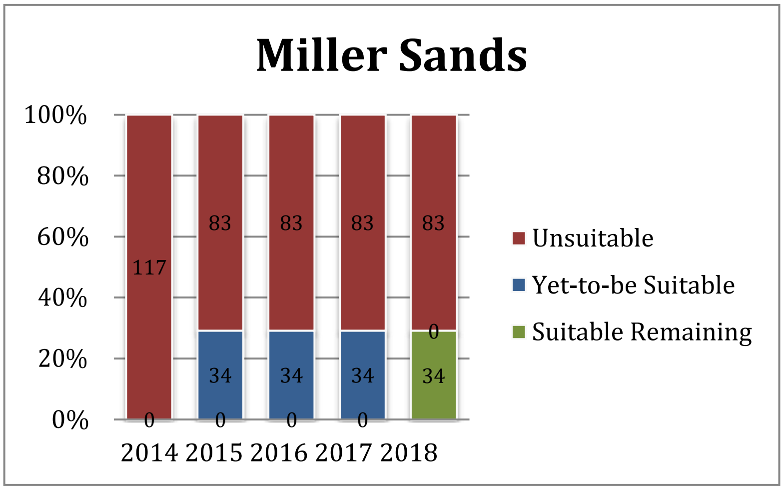


Figure 19: Availability of SHLA Nesting Habitat on Miller Sands, 2014-2018

PILLAR ROCK ISLAND (RM 27.2)

Both shoreline and upland placement events on the 52-acre Pillar Rock Island site occur during the SHLA nesting season. Shoreline placements require a 0.10-acre upland staging area which can be placed to avoid any nesting larks, if any are identified. Therefore, shoreline placement actions on Pillar Rock Island are not expected to interfere with active SHLA nesting. Shoreline placements on Pillar Rock Island are not expected to typically develop into suitable SHLA nesting habitat because the placements are expected to erode away in subsequent years. Early season site preparation activities for upland placement will include vegetation removal and dissuasion techniques to preclude SHLA nesting in proposed upland placement locations. Habitat conditions on Pillar Rock Island transition slower than on other islands farther upstream to and it is assumed that vegetation succession takes three growing seasons following upland placement to transition into suitable breeding habitat in the four year after placement. In addition, because vegetation establishment and subsequent growth on dredged materials are reduced in the estuary, suitable SHLA nesting habitat conditions are assumed to remain viable for 12 years at Pillar Rock Island. The total succession cycle from placement to unsuitable is 15 years.

In 2014, the baseline of suitable SHLA breeding habitat is four acres due to the succession of vegetation and active erosion of Pillar Rock Island. The remaining 48 acres of the site are considered unsuitable for SHLA nesting. In 2014, a 26-acre shoreline placement will occur on the northern portion to rebuild the site. The 2014 shoreline placement event will occur during the breeding season on the shoreline.

In 2015, the baseline of suitable SHLA breeding habitat is four acres. The remaining 48 acres of the site are considered unsuitable for SHLA nesting. In 2015, a 26-acre shoreline placement will occur on the northern portion to rebuild the site. The 2015 shoreline placement event will occur during the breeding season on the shoreline.

In 2016, the baseline of suitable SHLA breeding habitat is four acres. The remaining 48 acres of the site are considered unsuitable for SHLA nesting. In 2016, a 26-acre shoreline placement will occur on the northern portion to rebuild the site. The 2016 shoreline placement event will occur during the breeding season on the shoreline.

No suitable SHLA nesting conditions will be present on Pillar Rock Island in 2017 due to the succession of vegetation since placement last occurred in 2001, 15 years prior. A 26-acre placement will occur during the breeding season in 2017 on Pillar Rock Island. Approximately half of the acreage will be shoreline placement to maintain the site and the other 13 acres will be placed in uplands that had vegetation removed and SHLA dissuasion techniques installed in the early spring. The entire 52-acre site is considered unsuitable for SHLA nesting in 2017.

No suitable SHLA nesting conditions will be present on Pillar Rock Island in 2018. Approximately 13 acres of yet-to-be suitable habitat is expected from the 2017 upland placement. The remaining 43 acres of the site are considered unsuitable for SHLA nesting in 2018. A 26-acre placement will occur during the breeding season in 2018 on Pillar Rock Island. Approximately half of the acreage will be shoreline placement to maintain the site and the other 13 acres will be placed in uplands that had vegetation removed and SHLA dissuasion techniques installed in the early spring. The 13-acre upland placement in 2018 will not overlap with the 2017 upland placement.

Figure 20 displays the percentage and acreage of suitable, yet-to-be suitable, and unsuitable SHLA nesting habitat over the next five years on Pillar Rock Island.

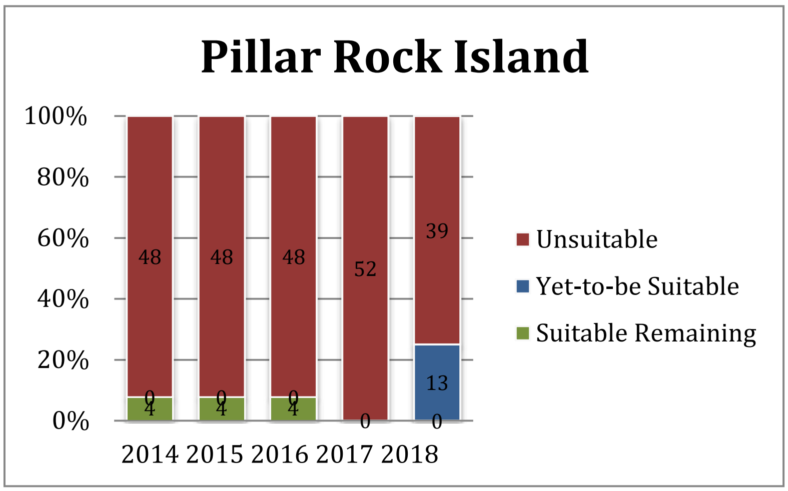


Figure 20: Availability of SHLA Nesting Habitat on Pillar Rock Island, 2014-2018

GROUP II

Group II consists of three placement sites located in the lower Columbia River estuary: Rice Island, Miller Sands, and Pillar Rock Island. Of the 433 acres in Group II, only 154 acres (36% of total upland placement area) are baseline suitable SHLA nesting habitat at the time of its listing under the ESA in October 2013 and all 154 acres are available during the 2014 breeding season. Dredged material placement and/or habitat succession results in a decrease of 28 acres (-18%) of suitable habitat during the 2015 breeding season as compared to 2014, for a total of 126 acres available in 2015. There is no change in the acreage of suitable habitat between 2015 and 2016 breeding seasons. Increased vegetation at Pillar Rock Island results in a decrease of 4 acres (-3%) of suitable nesting habitat during the 2017 breeding season as compared to 2016, for a total of 122 acres available in 2017. Dredged material placement and/or habitat succession results in an increase of 46 acres (+38%) of suitable nesting habitat available during the 2018 breeding season as compared to 2017, for a total of 168 acres available in 2018. Overall, suitable nesting habitat is expected to increase by 14 acres from 154 acres available as baseline habitat during the 2014 breeding season to 168 acres available during the 2018 breeding season (+9%). Additionally, yet-to-be suitable nesting habitat is expected to increase from zero acres in 2014 to 120 acres in 2018. Figure 21 shows the percentage and acreage of suitable, yet-to-be suitable, and unsuitable SHLA nesting habitat over the next five years in Group II.

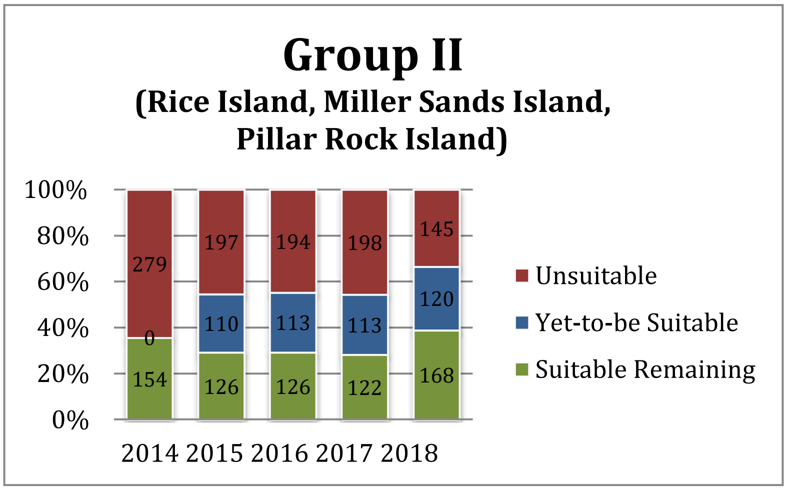


Figure 21: Availability of SHLA Nesting Habitat on Group II Sites, 2014-2018

<u>*Skamokawa – Vista Park (RM 33.4)*</u>

The CNLM estimated that approximately five acres of suitable lark breeding habitat existed on the site in 2011 using NDVI habitat analysis. A placement event in 2012 covered the entire 15 acre upland site, eliminating all habitat identified as suitable in the 2011 analysis. The site was surveyed for larks in 2013 by CNLM, but no individuals were observed. Despite the NDVI analysis results, high levels of human use and regular disturbance from recreation and commercial sand extraction likely preclude SHLA use of the site. Therefore, the Corps assumes that no suitable nesting habitat is currently available for SHLA, and no suitable SHLA nesting habitat is expected to develop over the course of this consultation, as shown in Figure 22.

In 2017, the entire site 15-acre site is planned for placement after the breeding season across the uplands and shoreline. The Corps does not anticipate this area would transition into yet-to-be suitable nesting habitat in 2018 due to high levels of human use at the site and the site is unsuitable in all years. No placements are planned to occur in 2014, 2015, 2016, or 2018.

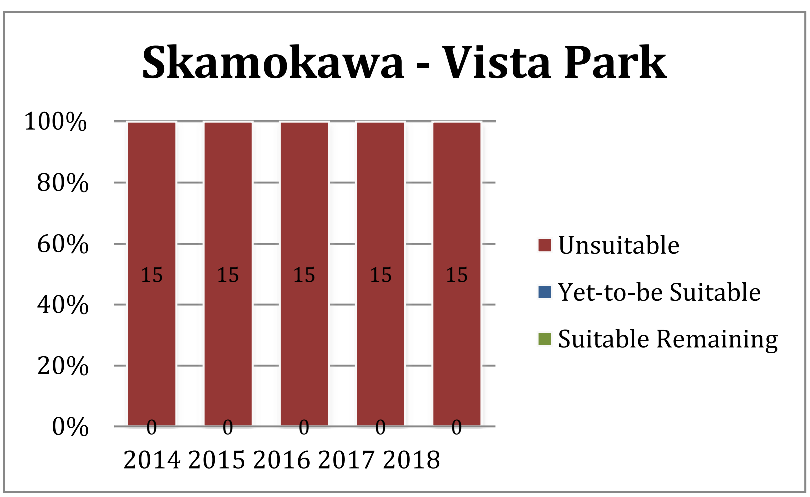


Figure 22: Availability of Nesting Habitat at Skamokawa-Vista Park, 2014-2018

WELCH ISLAND (RM 34.0)

Placement events on the 41-acre Welch Island occur in the summer, during the SHLA nesting season. Early season site preparation activities for upland placement will include vegetation removal and dissuasion techniques to preclude SHLA nesting in proposed upland placement locations. Habitat conditions on Welch Island assume vegetation succession takes one growing season following placement to transition into suitable breeding habitat in the second year after placement. Suitable SHLA nesting habitat conditions are assumed to remain viable for six years on Welch Island (Anderson 2013). The total succession cycle from placement to unsuitable is seven years.

In 2014, the baseline of suitable SHLA breeding habitat is 10 acres with the remaining 31 acres of the site as unsuitable habitat. No placements are planned in 2014.

In 2015, the baseline of suitable SHLA breeding habitat is 10 acres. However, the entire 41-acre site will used for upland placement during the breeding season. Therefore, the entire 41-acre site would be unsuitable for SHLA nesting in 2015.

In 2016, no suitable SHLA breeding habitat will be available on the site. The entire 41-acre site is classified as yet-to-be suitable due the 2015 placement event. No placement is planned in 2016.

In 2017, the 41 acres of yet-to-be suitable habitat is expected to transition into suitable SHLA nesting habitat. However, a 23-acre placement is planned during the breeding season on the upstream portion of the site making it unsuitable for nesting. Therefore, the baseline of suitable SHLA nesting habitat is 18 acres in 2017.

In 2018, the baseline of suitable SHLA nesting habitat is 18 acres with the remaining 23 acres as yet-to-be suitable due to the 2017 upland placement. No placement is planned in 2018.

Figure 23 displays the percentage and acreage of suitable, yet-to-be suitable, and unsuitable SHLA nesting habitat over the next five years on Welch Island.

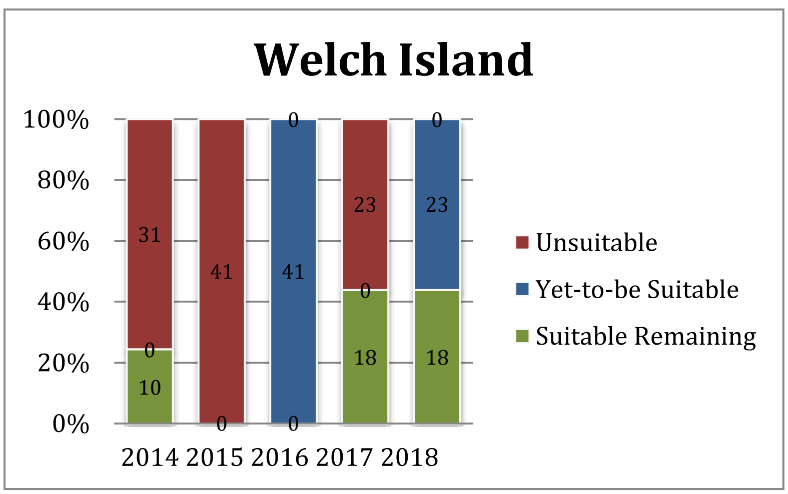


Figure 23: Availability of SHLA Nesting Habitat on Welch Island, 2014-2018

TENASILLAHE ISLAND (RM 38.3)

Placement events on the 41-acre Tenasillahe Island occur in the summer, during the SHLA nesting season. Early season site preparation activities for upland placement will include vegetation removal and dissuasion techniques to preclude SHLA nesting in proposed upland placement locations. Habitat conditions on Tenasillahe Island assume vegetation succession takes one growing season following placement to transition into suitable breeding habitat in the second year after placement. Suitable SHLA nesting habitat conditions are assumed to remain viable for six years on Tenasillahe Island (Anderson 2013). The total succession cycle from placement to unsuitable is seven years.

The baseline of suitable SHLA breeding habitat is two acres at the time of its listing under the ESA in October 2013. In 2014, a 14-acre placement is planned during the breeding season on the downstream third of the site, resulting in a loss of one acre of suitable SHLA nesting habitat. Therefore, the baseline of suitable SHLA breeding habitat in 2014 is two acres. Approximately 21 acres of yet-to-be suitable habitat are anticipated due to placements in 2012 and 2013. Approximately 18 acres on the site is unsuitable for SHLA nesting habitat.

In 2015, the baseline of suitable SHLA breeding habitat is 23 acres because the 21 acres of placement in 2013 have become suitable habitat. The 14-acre placement in 2014 is classified as yet-to-be suitable in 2015 with the remaining four acres as unsuitable. No placement is planned in 2015.

In 2016, a 27-acre placement is planned during the breeding season on the downstream two thirds of the site, resulting in a loss of approximately 12 acres of suitable nesting habitat and 14 acres of yet-to-be suitable habitat. Therefore, there are an estimated 10 acres of suitable SHLA nesting habitat in 2016. The remaining 31 acres are unsuitable.

In 2017, the baseline of suitable SHLA breeding habitat is 10 acres. The 27-acre placement area from 2016 is yet-to-be suitable habitat and the remaining four acres of the site is unsuitable. No placement is planned in 2017.

In 2018, a 14-acre placement is planned during the breeding season on the downstream third of the site, resulting is a loss of 14 acres of suitable SHLA nesting habitat. However, the 27-acre placement event from 2016 will transition into suitability, thereby creating a net gain of 13 acres of suitable habitat. As a result, 23 acres are estimated to be suitable for SHLA nesting in 2018 and the remaining 18 acres are considered unsuitable for nesting.

Figure 24 displays the percentage and acreage of suitable, yet-to-be suitable, and unsuitable SHLA nesting habitat over the next five years on Tenasillahe Island.

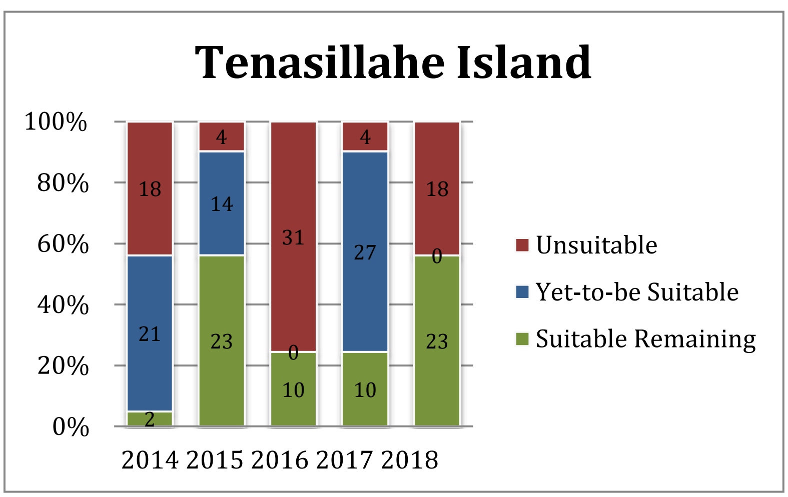


Figure 24: Availability of SHLA Nesting Habitat on Tenasillahe Island, 2014-2018

JAMES RIVER (RM 42.9)

The CNLM estimated that approximately 14 acres of suitable lark breeding habitat existed on the James River site in 2011 using NDVI analysis. James River has not been surveyed due to expected low habitat value. Despite the NDVI analysis, high levels of human use and regular disturbance from recreation and commercial sand extraction likely preclude SHLA use of the site. Therefore, the Corps assumes that no suitable nesting habitat is currently available for SHLA and no suitable SHLA nesting habitat is expected to develop at James River over the course of this consultation.

No placements are planned in 2014 or 2015. The entire 53-acre site is planned for placement after the 2016 and 2017 SHLA breeding seasons, but the Corps assumes this site would not develop into suitable SHLA nesting habitat between 2014 and 2018 due to regular site disturbance, as shown in Figure 25, and the entire site would be unsuitable in all years.

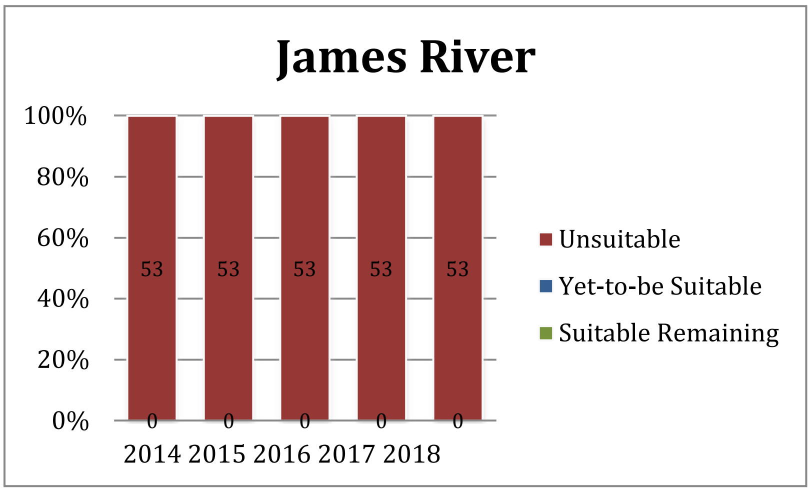


Figure 25: Availability of SHLA Nesting Habitat on James River Site, 2014-2018

PUGET ISLAND (RM 44.0)

Placements on the 96-acre Puget Island site occur late in the summer, after the SHLA nesting season ends in mid-August/early-September. As part of required site maintenance after each placement event, the Corps will establish a healthy vegetative cover by grass seeding, fertilization, and/or irrigation to prevent wind erosion of placed sand onto adjacent agricultural lands. Additionally, trees may be planted along the perimeter of the site for the same purpose. Maintenance mowing and invasive vegetation control measures may be taken. Therefore, no suitable SHLA nesting is expected to develop on Puget Island between 2014 and 2018, as shown in Figure 26, and the site will be unsuitable in all years.

In 2014, no suitable SHLA nesting habitat is available on the site and the 96-acre site is unsuitable habitat. No placement is planned in 2014.

In 2015, no suitable SHLA nesting habitat is available on the site and the 96-acre site is unsuitable habitat. A full 96-acre site placement is planned after the SHLA nesting season in 2015.

In 2016, no suitable SHLA nesting habitat is available on the site due to reseeding the site with grass and the 96-acre site is unsuitable habitat. No placement is planned in 2016.

In 2017, no suitable SHLA nesting habitat is available on the site and the 96-acre site is unsuitable habitat. No placement is planned in 2017.

In 2018, no suitable SHLA nesting habitat is available on the site due to reseeding the site with grass and the 96-acre site is unsuitable habitat. A full 96-acre site placement is planned after the SHLA nesting season in 2018.

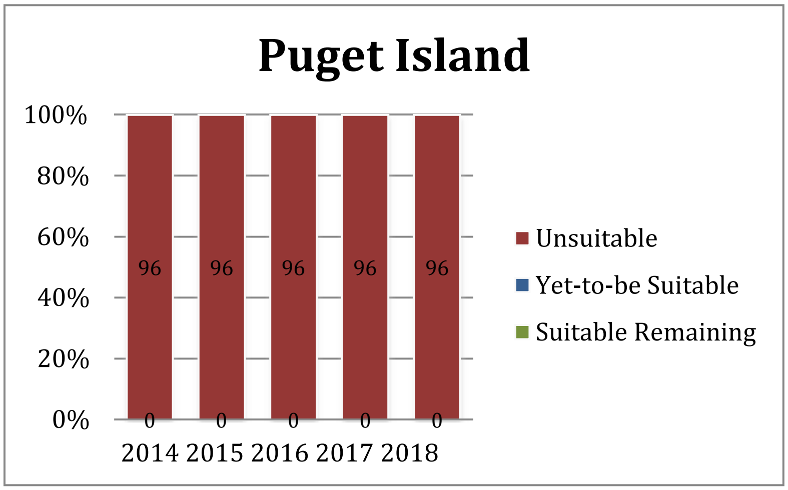


Figure 26: Availability of SHLA Nesting Habitat on Puget Island Site, 2014-2018

BROWN ISLAND (RM 46.3)

Placement events on the 102-acre Brown Island typically occur in the summer, during the SHLA nesting season. Early season site preparation activities for upland placement will include vegetation removal and dissuasion techniques to preclude SHLA nesting in proposed upland placement locations. Placement actions after the breeding season are not expected to interfere with active SHLA nesting during the year of dredged material placement. Habitat conditions on Brown Island assume vegetation succession takes one growing season following placement to transition into suitable breeding habitat in the second year after placement. Suitable SHLA nesting habitat conditions are assumed to remain viable for six years on Brown Island. The total succession cycle from placement to unsuitable is seven years.

In 2014, the baseline of suitable breeding habitat is 72 acres due to placement activities in 2011. The remaining 30 acres of the site are unsuitable during the nesting season. A 68-acre placement is planned after the nesting season, resulting is a loss of 51 acres of suitable nesting habitat in the following year. The placement will occur adjacent the shoreline and downstream end of the site.

In 2015, the baseline of suitable breeding habitat is 21 acres with approximately 68 acres of yet-to-be suitable habitat and 13 acres of unsuitable habitat. No placement is planned in 2015 on Brown Island.

In 2016, a 50-acre placement on the north side and downstream end of the site will occur during the breeding season, resulting is a loss of 50 acres of suitable nesting habitat. The 68-acre placement event in 2014 will become suitable nesting habitat. Therefore, 49 acres of suitable SHLA nesting habitat will be available during 2016 breeding season. The remaining 53 acres will be unsuitable habitat.

In 2017, the baseline of suitable breeding habitat on Brown Island will be 49 acres. The 50-acre placement event in 2016 will be yet-to-be suitable habitat with three acres of unsuitable habitat. No placement is planned in 2017 on Brown Island.

In 2018, the 50-acre placement event from 2016 will become suitable. Therefore, the baseline of suitable SHLA nesting habitat in 2018 on Brown Island is approximately 99 acres. The remaining three acres will be unsuitable. No placement is planned in 2018 on Brown Island.

Figure 27 displays the percentage and acreage of suitable, yet-to-be suitable, and unsuitable SHLA nesting habitat over the next five years s on Brown Island.

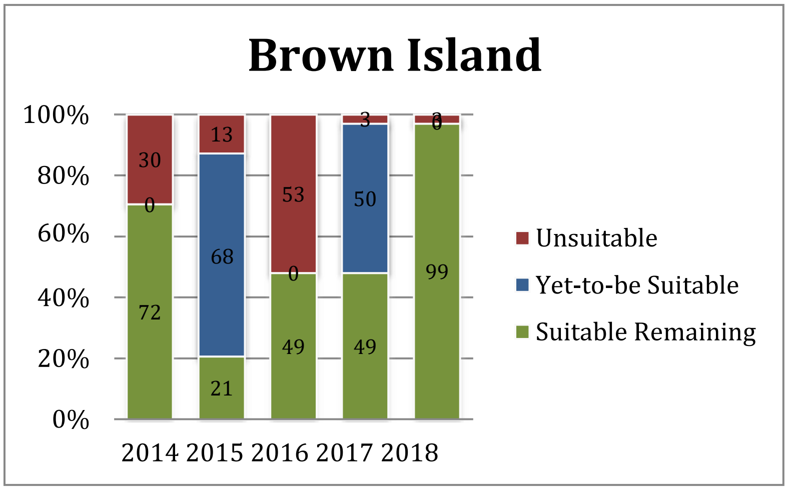


Figure 27: Availability of SHLA Nesting Habitat on Brown Island, 2014-2018

<u>GROUP III</u>

Group III consists of six placement sites located in the lower Columbia River: Skamokawa-Vista Park, Welch Island, Tenasillahe Island, James River, Puget Island, and Brown Island. Of the 348 acres in Group III, only 85 acres (24% of total upland placement area) are baseline suitable SHLA nesting habitat at the time of its listing under the ESA in October 2013. Dredged material placement results in a decrease of one acre (-1%) of suitable habitat during the 2014 breeding season, for a total of 84 acres available in 2014. Dredged material placement and/or habitat succession results in a decrease of 40 acres (-48%) of suitable habitat during the 2015 breeding season as compared to 2014, for a total of 44 acres available in 2015. Dredged material placement and/or habitat succession results in an increase of 15 acres (+34%) of suitable nesting habitat during the 2016 breeding season as compared to 2015, for a total of 59 acres available in 2016. Dredged material placement and/or habitat succession results in an increase of 18 acres (+31%) of suitable nesting habitat during the 2017 breeding season as compared to 2016, for a total of 77 acres available in 2017. Dredged material placement and/or habitat succession results in an increase of 63 acres (+82%) of suitable nesting habitat available during the 2018 breeding season as compared to 2017, for a total of 140 acres available in 2018. Overall, suitable nesting habitat is expected to increase by 55 acres from 85 acres available as baseline habitat during the 2014 breeding season to 140 acres available during the 2018 breeding season (+65%). Additionally, yet-to-be suitable nesting habitat is expected to increase by 2 acres from 21 acres in 2014 to 23 acres in 2018 (+10%). Figure 28 shows the percentage and acreage of suitable, yet-to-be suitable, and unsuitable SHLA nesting habitat over the next five years Group III.

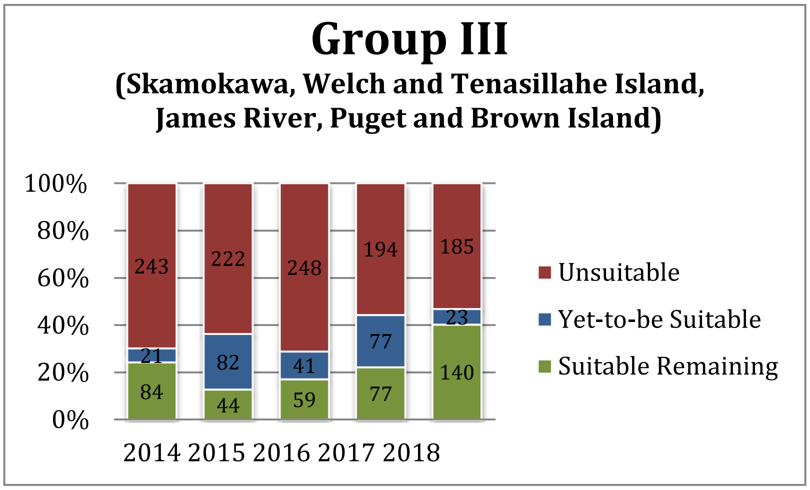


Figure 28: Availability of SHLA Nesting Habitat on Group III Sites, 2014-2018

CRIMS ISLAND (RM 57.0)

Placement events on the 59-acre Crims Island occur in the summer, during the SHLA nesting season. Early season site preparation activities for upland placement will include vegetation removal and dissuasion techniques to preclude SHLA nesting in proposed upland placement locations. Habitat conditions on Crims Island assume vegetation succession takes one growing season following placement to transition into suitable breeding habitat in the second year after placement. Suitable SHLA nesting habitat conditions are assumed to remain viable for six years on Crims Island. The total succession cycle from placement to unsuitable is seven years.

In 2014, the baseline of suitable SHLA breeding habitat is 25 acres with the remaining 34 acres of the site as unsuitable habitat. No placements are planned in 2014.

In 2015, a 22-acre placement on the downstream end of the site during the breeding season will result in a loss of five acres of suitable SHLA nesting habitat. Therefore, there will be an estimated 20 acres of suitable SHLA nesting habitat in 2015. The remaining 39 acres will be unsuitable habitat.

In 2016, the baseline of suitable SHLA nesting habitat is 20 acres. The 22-acre placement event in 2015 will be yet-to-be suitable habitat. The remaining 17 acres will be unsuitable habitat. No placement is planned in 2016 on Crims Island.

In 2017, the 22-acre placement event in 2015 will transition to suitable habitat. Therefore, the baseline of suitable SHLA nesting habitat in 2017 will be 42 acres. The remaining 17 acres will be unsuitable habitat. No placement is planned in 2017 on Crims Island.

In 2018, the baseline of suitable SHLA nesting habitat is 42 acres. The remaining 17 acres will be unsuitable habitat. No placement is planned in 2018 on Crims Island.

Figure 29 displays the percentage and acreage of suitable, yet-to-be suitable, and unsuitable SHLA nesting habitat over the next five years on Crims Island.

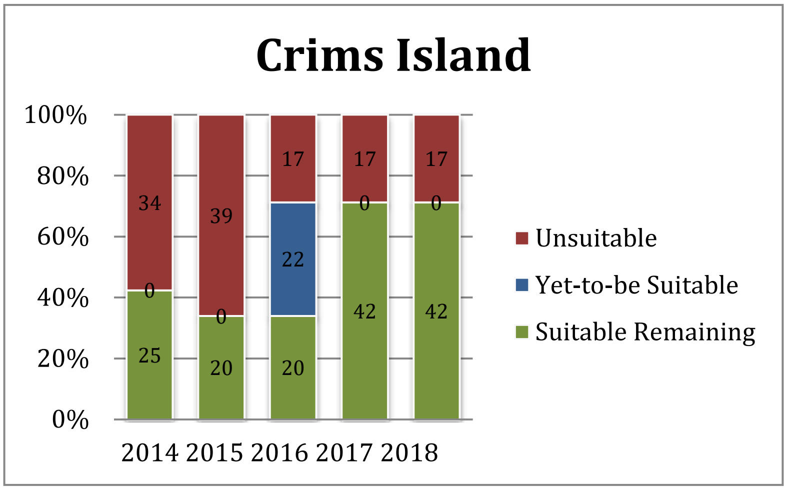


Figure 29: Availability of SHLA Nesting Habitat on Crims Island, 2014-2018

<u>HUMP ISLAND (RM 59.7)</u>

Placement events on the 65-acre Hump Island occur in the summer, during the SHLA nesting season. Early season site preparation activities for upland placement will include vegetation removal and dissuasion techniques to preclude SHLA nesting in proposed upland placement locations. Habitat conditions on Hump Island assume vegetation succession takes one growing season following placement to transition into suitable breeding habitat in the second year after placement. Suitable SHLA nesting habitat conditions are assumed to remain viable for six years on Hump Island. The total succession cycle from placement to unsuitable is seven years.

In 2014, no suitable SHLA nesting habitat is available on the site due to extensive vegetation since the last placement prior to 2000. A full-site placement is planned during the nesting season on Hump Island. The 65-acre Hump Island site is unsuitable habitat.

In 2015, no suitable SHLA nesting habitat is available on the site due to the previous year's placement event. The entire 65-acre site is yet-to-be suitable habitat. No placement is planned in 2015 on Hump Island.

In 2016, the 65-acre site would transition into suitable habitat. However, a 48-acre placement in the upper three quarters of the site during the breeding season will prevent 48 acres from becoming suitable. Therefore, there will be an estimated 17 acres of suitable SHLA nesting habitat in 2016. The remaining 48 acres will be unsuitable habitat.

In 2017, the baseline of suitable SHLA nesting habitat is 17 acres. The remaining 48 acres will be yet-to-be suitable habitat from the placement event in 2016. No placement is planned in 2017 on Hump Island.

In 2018, the baseline of suitable SHLA nesting habitat will be 65 acres due to the 48-acre placement in 2016 transitioning to suitable habitat. No placement is planned in 2018 on Hump Island.

Figure 30 displays the percentage and acreage of suitable, yet-to-be suitable, and unsuitable SHLA nesting habitat over the next five years on Hump Island.

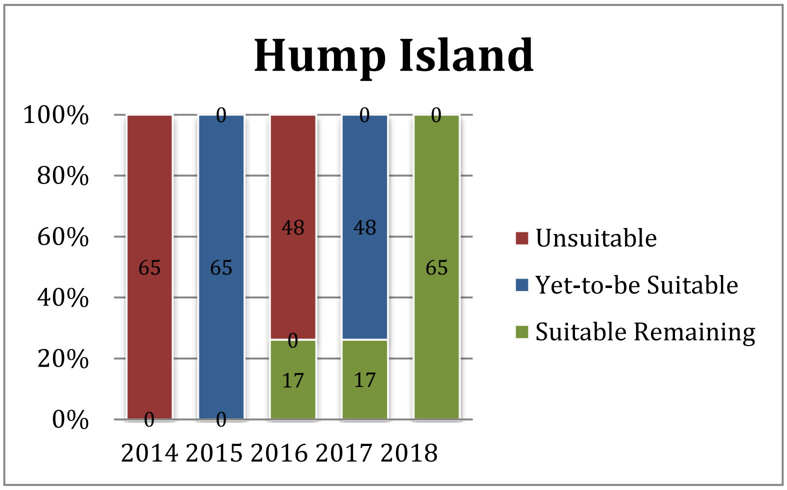


Figure 30: Availability of SHLA Nesting Habitat on Hump Island, 2014-2018

<u>*LORD ISLAND – UPSTREAM (RM 63.5)*</u>

Placement events on the 24-acre Lord Island Upstream site occur in the summer, during the SHLA nesting season. Early season site preparation activities for upland placement will include vegetation removal and dissuasion techniques to preclude SHLA nesting in proposed upland placement locations. Habitat conditions on Lord Island assume vegetation succession takes one growing season following placement to transition into suitable breeding habitat in the second year after placement. Suitable SHLA nesting habitat conditions are assumed to remain viable for six years on Lord Island. The total succession cycle from placement to unsuitable is seven years.

In 2014, the baseline of suitable SHLA breeding habitat is 10 acres with the remaining 14 acres of the site as unsuitable habitat. No placements are planned in 2014.

In 2015, the baseline of suitable SHLA breeding habitat is 10 acres with the remaining 14 acres of the site as unsuitable habitat. No placements are planned in 2015.

In 2016, the baseline of suitable SHLA breeding habitat is 10 acres with the remaining 14 acres of the site as unsuitable habitat. No placements are planned in 2016.

In 2017, no suitable SHLA nesting habitat is available on the site because it will have been seven years since the site was last used in 2009. A 20-acre placement over the majority of the site will occur during the breeding season. The entire 24-acre site will be unsuitable habitat in 2017.

In 2018, no suitable SHLA nesting habitat is available on the site. However, the 20-acre placement from 2017 will be yet-to-be suitable habitat. The remaining four acres of the site will be unsuitable. No placements are planned in 2018.

Figure 31 displays the percentage and acreage of suitable, yet-to-be suitable, and unsuitable SHLA nesting habitat over the next five years on the Lord Island (upstream) site.

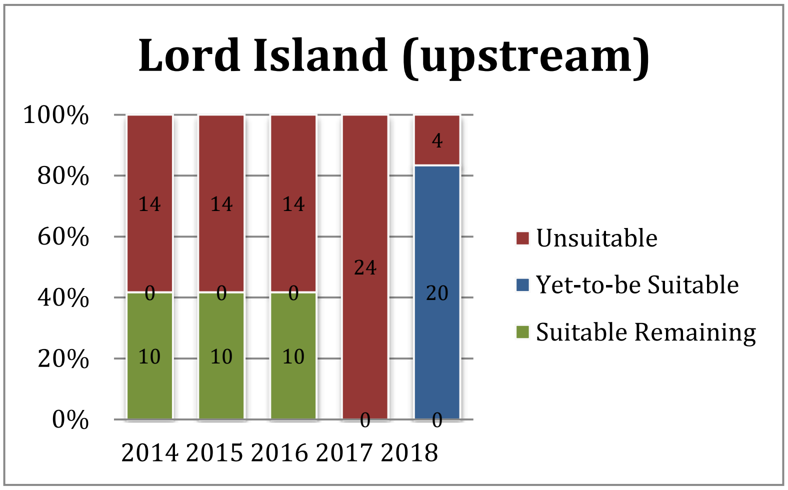


Figure 31: Availability of SHLA Nesting Habitat on Lord Island (upstream), 2014-2018

DIBBLEE POINT (RM 64.8)

No placements are planned on the 52-acre Dibblee Point upland placement site between 2014 and 2018. One acre of suitable habitat was identified as suitable habitat based on NDVI analysis in 2011. In 2013, Dibblee Point was surveyed for larks by CNLM and none were detected. It is assumed that commercial sand removal activities likely exclude SHLA from nesting or occupying the habitat. Therefore, the Corps has determined that even though the NDVI analysis indicates suitable habitat conditions exist, no suitable habitat is available or is expected to develop over the course of this consultation, as shown in Figure 32, and the site is unsuitable in all years.

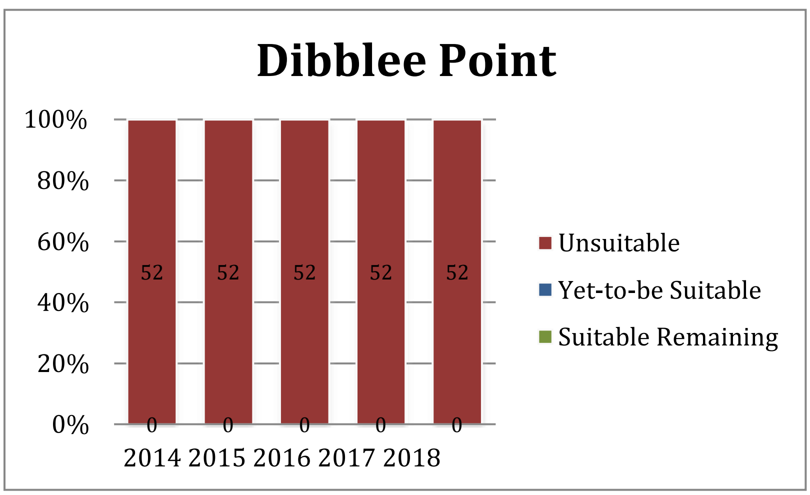


Figure 32: Availability of SHLA Nesting Habitat on Dibblee Point, 2014-2018

HOWARD ISLAND (RM 68.7)

Placements on the 315-acre Howard Island site occur late in the summer, after the SHLA nesting season ends in mid-August/early-September. Therefore, placement actions on Howard Island are not expected to interfere with active SHLA nesting during the year of dredged material placement. Habitat conditions on site assume vegetation succession takes one growing season following placement to transition into suitable breeding habitat in the second year after placement. Suitable

SHLA nesting habitat conditions are assumed to remain viable for six years at Howard Island. The total succession cycle from placement to unsuitable is seven years.

In 2014, the baseline of suitable SHLA breeding habitat is five acres with the remaining 310 acres of the site as unsuitable habitat. No placements are planned in 2014.

In 2015, the baseline of suitable SHLA breeding habitat is five acres with the remaining 310 acres of the site as unsuitable habitat. A 173-acre placement on the upstream half of the site will occur after the SHLA nesting season, resulting is a loss of five acres of suitable SHLA nesting habitat in the following year.

In 2016, no suitable SHLA nesting habitat is available on the site. The 173-acre placement event in 2015 will be yet-to-be suitable habitat in 2016. The remaining 142 acres of the site are unsuitable habitat. No placements are planned in 2016.

In 2017, the baseline of suitable SHLA breeding habitat will be 173 acres due to the 2015 placement event being suitable habitat. The remaining 142 acres of the site are unsuitable habitat. A 108-acre placement on a downstream portion of the site will occur after the SHLA nesting season. No suitable SHLA nesting habitat will be lost to the 108-acre placement.

In 2018, the baseline of suitable SHLA breeding habitat is 173 acres on Howard Island. The 108-acre placement area in 2017 will transition into yet-to-be suitable habitat. The remaining 34 acres of the site will be unsuitable habitat during the nesting season. A 34-acre placement is planned on the downstream tip of the after the SHLA nesting season. No suitable SHLA nesting habitat will be lost to the 34-acre placement.

Figure 33 displays the percentage and acreage of suitable, yet-to-be suitable, and unsuitable SHLA nesting habitat over the next five years on Howard Island.

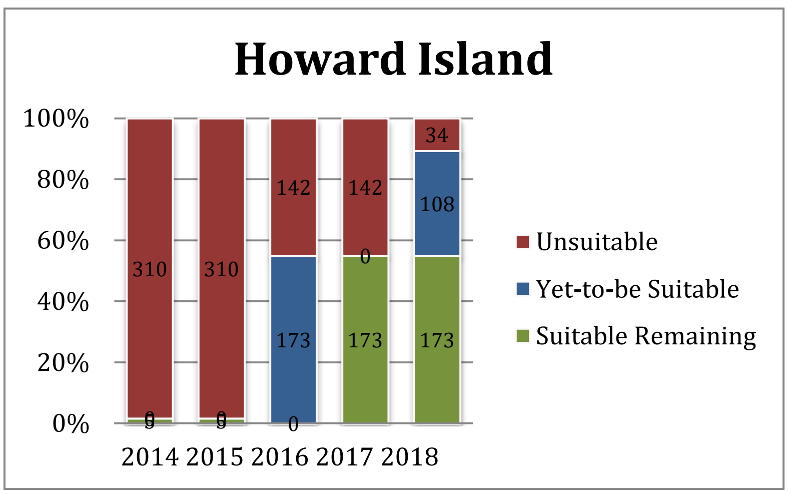


Figure 33: Availability of SHLA Nesting Habitat on Howard Island, 2014-2018

Cottonwood Island (RM 70.1)

Placements on the 62-acre Cottonwood Island site occur in the summer, during the SHLA nesting season. Suitable SHLA nesting habitat is not expected to be available on Cottonwood Island because the site is bordered by trees that preclude lark nesting. Cottonwood Island is managed for Columbian white-tailed deer and the removal of trees and shrubs adjacent to the site is unlikely. No suitable SHLA nesting habitat is available or is expected to develop over the course of this consultation at Cottonwood Island, as shown in Figure 34, and the site is unsuitable in all years.

A 26-acre placement is planned on the downstream portion of the site during the 2014 nesting season. A 13-acre placement is planned on the downstream portion of the site during the 2016 nesting season. No placement is planned in 2015, 2017, or 2018. Despite these placements, the entire site is assumed to be unsuitable for nesting all years because the site lacks an open landscape preferred by SHLA.

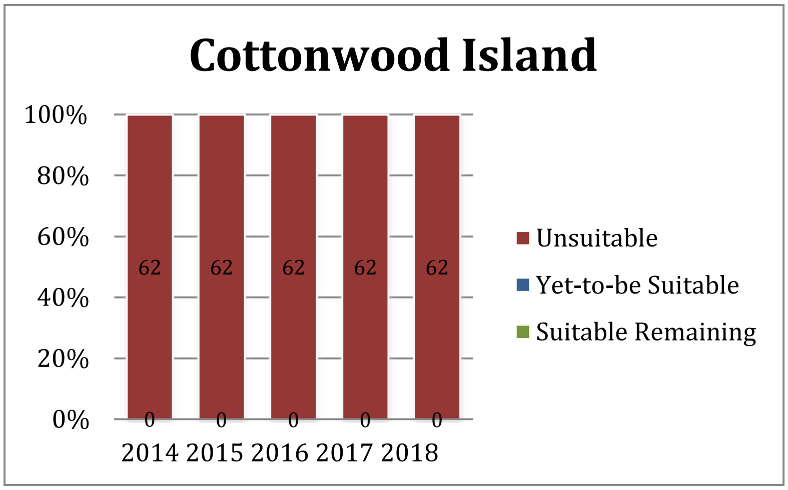


Figure 34: Availability of SHLA Nesting Habitat on Cottonwood Island, 2014-2018

NORTHPORT (RM 71.9)

No placements are planned on the 31-acre Northport upland placement site. Three acres of suitable habitat were identified in the 2011 NDVI habitat analysis. Currently, no borrow activities occur at Northport because three pair of SHLA were detected in 2013 during annual surveys by CNLM (Anderson 2013). However, since dredged materials were last placed in 2008, the site is expected to become unsuitable after the 2015 nesting season due to vegetation succession, as shown in Figure 35.

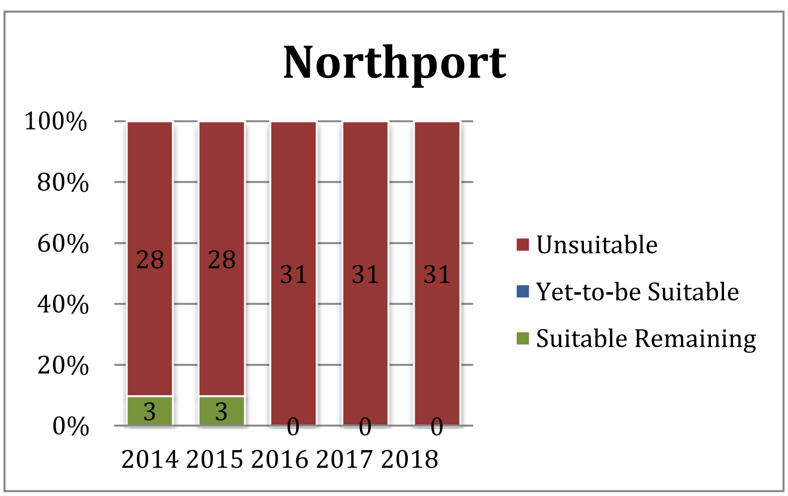


Figure 35: Availability of SHLA Nesting Habitat at Northport, 2014-2018

Group IV

Group IV consists of seven placement sites located in the lower Columbia River: Crims Island, Hump Island, Lord Island Upstream, Dibblee Point, Howard Island, Cottonwood Island, and Northport. Of the 608 acres in Group IV, only 43 acres (7% of total upland placement area) are baseline suitable SHLA nesting habitat at the time of its listing under the ESA in October 2013 and all 43 acres are available during the 2014 breeding season. Dredged material placement and/or habitat succession results in a decrease of five acres (-12%) of suitable habitat during the 2015 breeding season as compared to 2014, for a total of 38 acres available in 2015. Dredged material placement and/or habitat succession results in an increase of nine acres (+24%) of suitable nesting habitat during the 2016 breeding season as compared to 2015, for a total of 47 acres available in 2016. Dredged material placement and/or habitat succession results in an increase of 185 acres (+394%) of suitable nesting habitat during the 2017 breeding season as compared to 2016, for a total of 232 acres available in 2017. Dredged material placement and/or habitat succession results in an increase of 48 acres (+21%) of suitable nesting habitat available during the 2018 breeding season as compared to 2017, for a total of 280 acres available in 2018. Overall, suitable nesting habitat is expected to increase by 237 acres from 43 acres available as baseline habitat during the 2014 breeding season to 280 acres available during the 2018 breeding season (+551%). Additionally, yet-to-be suitable nesting habitat is expected to increase from no acres in 2014 to 128 acres in 2018. Figure 36 shows the percentage and acreage of suitable, yet-to-be suitable, and unsuitable SHLA nesting habitat over the next five years in Group IV.

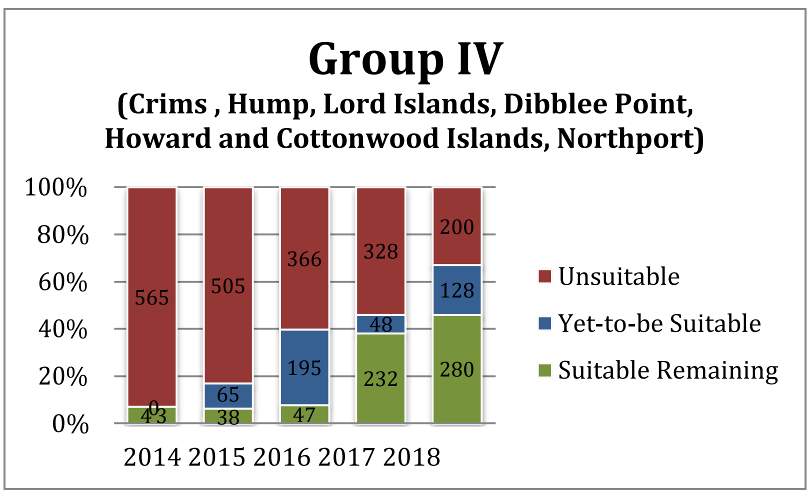


Figure 36: Availability of SHLA Nesting Habitat on Group IV sites, 2014-2018

Sandy Island (RM 75.8)

No placement is planned on the 32-acre Sandy Island upland placement site. Thirty-two (32) acres of suitable SHLA nesting habitat are estimated on site due to a full-site placement in 2011. The site is expected to remain suitable for nesting from 2014 through 2018, as shown in Figure 37. Habitat is expected to become unsuitable after the 2018 nesting season.

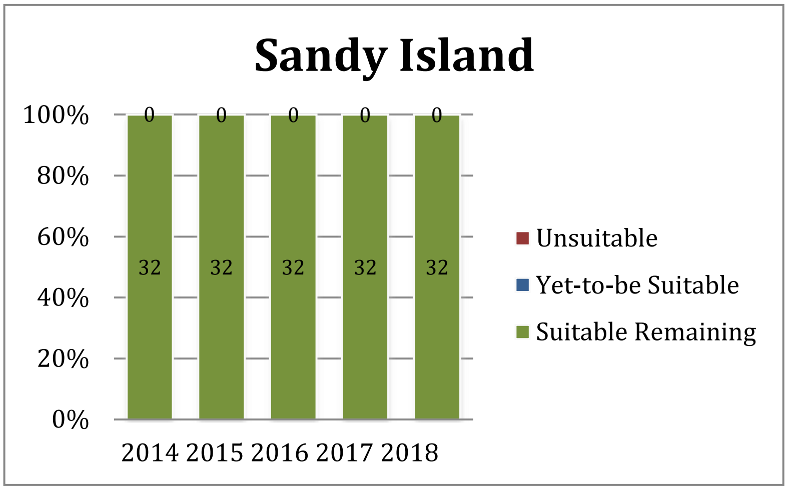


Figure 37: Availability of SHLA Nesting Habitat on Sandy Island, 2014-2018

LOWER DEER ISLAND (RM 77.0)

Placement events on the 24-acre Lower Deer Island site occur in the summer, during the SHLA nesting season. Early season site preparation activities for upland placement will include vegetation removal and dissuasion techniques to preclude SHLA nesting in proposed upland placement locations. Habitat conditions on Lower Deer Island assume vegetation succession takes one growing season following placement to transition into suitable breeding habitat in the second year after placement. Suitable SHLA nesting habitat conditions are assumed to remain viable for six years on Lower Deer Island. The total succession cycle from placement to unsuitable is seven years.

In 2014, no suitable SHLA nesting habitat is available on the site because the site has not been used since 1995 and it has established vegetation. The entire 24-acre site will be unsuitable habitat. No placement is planned in 2014.

In 2015, no suitable SHLA nesting habitat is available. An 11-acre placement is planned on the downstream portion of the site during the nesting season. The entire 24-acre site will be unsuitable habitat.

In 2016, no suitable SHLA nesting habitat is available. The 11-acre placement on the downstream end from 2015 will be yet-to-be suitable habitat. A 12-acre placement is planned on the upstream portion of the site during the nesting season. The remaining one acre of site will be unsuitable habitat. This one-acre portion is underlain by a natural gas line and fiber optics cable. No additional dredged material placement can occur over these utility lines. A total of 13 acres of unsuitable habitat will be present on Lower Deer Island in 2016.

In 2017, the baseline of suitable SHLA nesting habitat is 11 acres due to the 2015 placement area transitioning into suitable habitat on the downstream portion of the site. The 12-acre upstream placement in 2016 will be yet-to-be suitable habitat. The remaining one acre of the site over the utility lines will be unsuitable.

In 2018, the baseline of suitable SHLA nesting habitat is 23 acres due to the 2016 placement area transitioning into suitable habitat on the upstream portion of the site. The remaining one acre of the site over the utility lines will be unsuitable.

Figure 38 displays the percentage and acreage of suitable, yet-to-be suitable, and unsuitable SHLA nesting habitat over the next five years on Lower Deer Island.

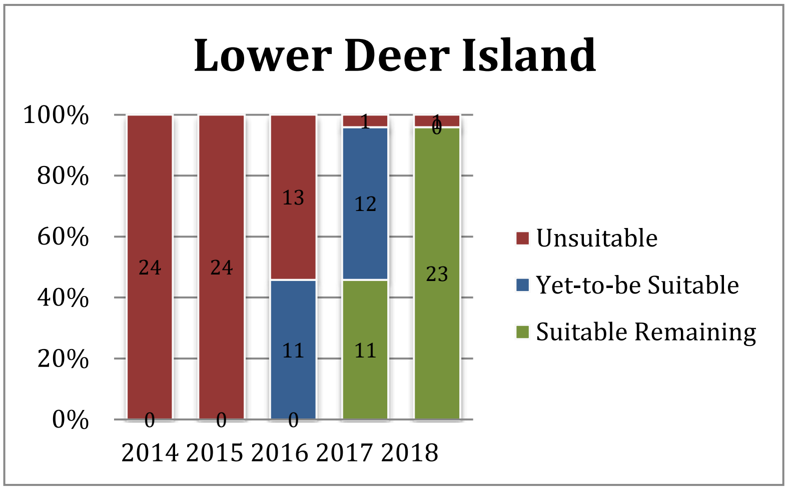


Figure 38: Availability of SHLA Nesting Habitat on Lower Deer Island, 2014-2018

<u>MARTIN BAR (RM 82.0)</u>

Placement events on the 40-acre Martin Bar site occur in the summer, during the SHLA nesting season. The site is composed of a 17-acre North parcel and 23-acre South parcel. The North parcel is leased for agriculture and no suitable SHLA nesting habitat is available. The South parcel is used as a borrow site. The South parcel has exterior berms that preclude SHLA nesting. The CNLM estimated that approximately five acres of suitable lark breeding habitat existed on the site in 2011, and SHLA are not known to use the site, however, Martin Bar has not been recently surveyed for the presence of SHLA. The Corps assumes that suitable SHLA nesting habitat would not be available on the site between 2014 and 2018 because of the high level of human use. As shown in Figure 39, the entire site is assumed to be unsuitable in all years.

A placement is planned in 2014 on the 23-acre South parcel during the SHLA nesting season. However, SHLA are not likely to use the South parcel for nesting due to the existing exterior berms that limit visibility from the 23-acre parcel. The material placed in 2014 on the South parcel is planned for removal in 2014 through 2016 and the exterior berms will remain in place. The entire 40-acre site will be unsuitable habitat. No placement is planned in 2015, 2016, or 2017. The entire 40-acre site is planned for placement during the SHLA nesting season in 2018 and the entire 40-acre site will be unsuitable habitat.

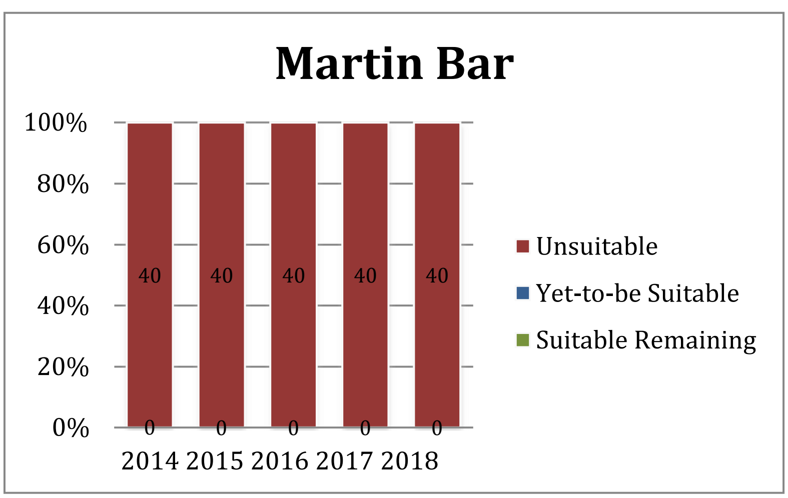


Figure 39: Availability of SHLA Nesting Habitat at Martin Bar, 2014-2018

Sand Island (RM 86.2)

Shoreline placement events on the 28-acre Sand Island occur late in the summer, after the SHLA nesting season ends in mid-August/early-September. Shoreline placements require a 0.10-acre upland staging area can be placed to avoid any nesting larks, if any are identified late in the summer. Therefore, shoreline placement actions on Sand Island are not expected to interfere with active SHLA nesting during the year of dredged material placement. Shoreline placements on Sand Island are not expected to typically develop into suitable SHLA nesting habitat because the placements are expected to erode away in subsequent years. Habitat conditions on Sand Island assume vegetation succession takes one growing season following placement to transition into suitable breeding habitat in the second year after placement. Suitable SHLA nesting habitat conditions are assumed to remain viable for six years on Sand Island. The total succession cycle from placement to unsuitable is seven years. The Sand Island is extensively used for public recreation during the spring, summer, and early fall.

In 2014, the baseline of suitable SHLA nesting habitat is one acre. The remaining 27 acres on the site are unsuitable habitat. No placements are planned in 2014 on the Sand Island site.

In 2015, the baseline of suitable SHLA nesting habitat is one acre. The remaining 27 acres on the site are unsuitable habitat. A 14-acre shoreline placement is planned after the nesting season on the eastern and upstream portion of the site in 2015. No suitable SHLA nesting habitat will be lost to this placement.

In 2016, the baseline of suitable SHLA nesting habitat is one acre. The remaining 27 acres on the site are unsuitable habitat. No placements are planned in 2016 on the Sand Island site.

In 2017, no suitable SHLA nesting habitat is available due to vegetation succession on the upland portions of the site. The entire 28-acre site will be unsuitable habitat. A 14-acre shoreline placement is planned after the nesting season on the eastern and upstream portion of the site in 2017. No suitable SHLA nesting habitat will be lost to this placement.

In 2018, no suitable SHLA nesting habitat is available on the site. The entire 28-acre site will be unsuitable habitat in 2018. No placements are planned in 2018 on the Sand Island site.

Figure 40 displays the percentage and acreage of suitable, yet-to-be suitable, and unsuitable SHLA nesting habitat over the next five years on Sand Island.

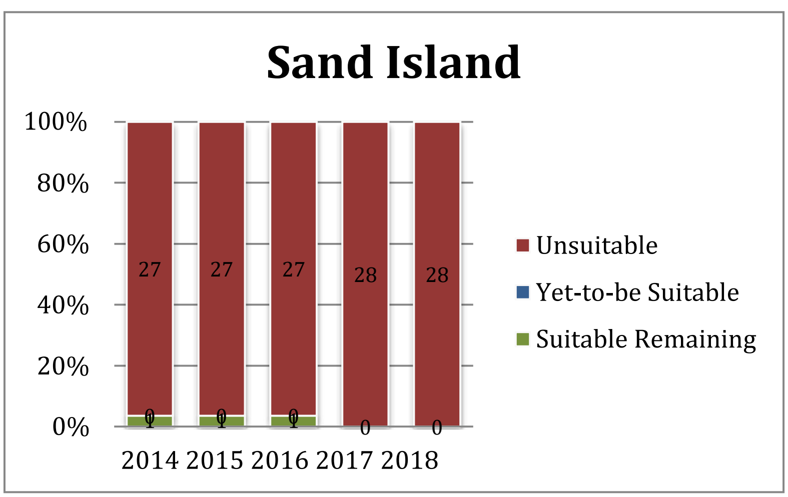


Figure 40: Availability of SHLA Nesting Habitat on Sand Island, 2014-2018

AUSTIN POINT (RM 86.5)

No placements are planned on the 30-acre Austin Point upland placement site. Although larks are not known to historically occupy the site and no formal lark surveys have been conducted recently, several juvenile larks were observed by the Corps in September 2013 prior to placing dredged material across the site. The CNLM estimated that approximately 14 acres of suitable lark breeding habitat existed on the site in 2011. The Corps currently estimates that no suitable SHLA nesting habitat occurs at Austin Point due to ongoing heavy equipment school site grading activities and therefore assumes no suitable habitat would be available between 2014 and 2018 due to regular site disturbance. As shown in Figure 41, and the entire site is assumed to be unsuitable in all years.

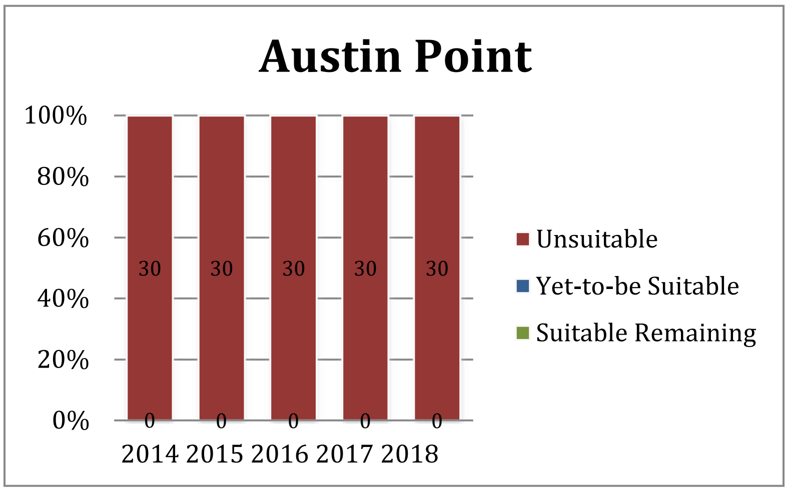


Figure 41: Availability of SHLA Nesting Habitat at Austin Point, 2014-2018

GROUP V

Group V consists of five placement sites located in the lower Columbia River: Sandy Island, Lower Deer Island, Martin Bar, Sand Island, and Austin Point. Of the 154 acres in Group V, only 33 acres (21% of total upland placement area) are baseline suitable SHLA nesting habitat at the time of its listing in October 2013. All 33 acres are suitable nesting habitat during the 2014, 2015, and 2016 breeding seasons. Dredged material placement and/or habitat succession results in an increase of 10 acres (+30%) of suitable nesting habitat during the 2017 breeding season as compared to 2016, for a total of 43 acres available in 2017. Dredged material placement and/or habitat succession results in an increase of 12 acres (+28%) of suitable nesting habitat during the 2018 breeding season as compared to 2017, for a total of 55 acres available in 2018. Overall, suitable nesting habitat is expected to increase by 22 acres from 33 acres of baseline suitable habitat in 2014 to 55 acres available during the 2018 breeding season (+67%). Figure 42 shows the percentage and acreage of suitable, yet-to-be suitable, and unsuitable SHLA nesting habitat over the next five years in Group V.

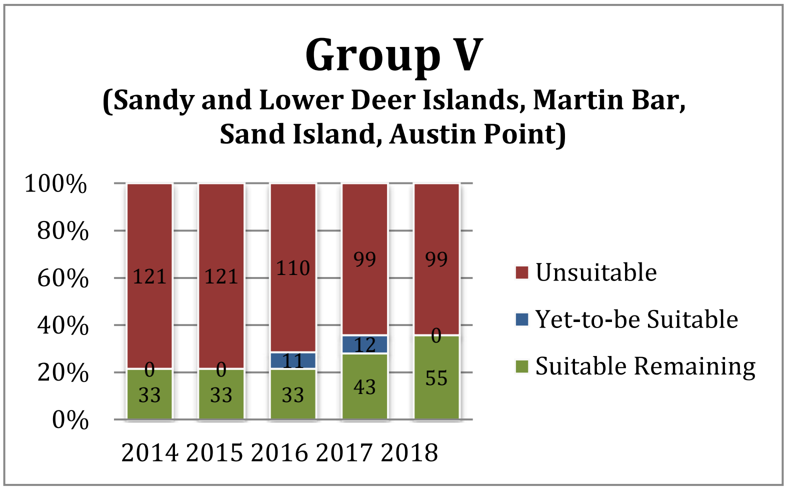


Figure 42: Availability of SHLA Nesting Habitat on Group V Sites, 2014-2018

FAZIO SAND & GRAVEL (RM 97.1)

No placements are planned on the 17-acre Fazio Sand & Gravel upland site. No suitable habitat is known or available in 2014 through 2018 due to ongoing sand and gravel mining and processing activities, as shown in Figure 43, and the entire site is assumed to be unsuitable in all years.

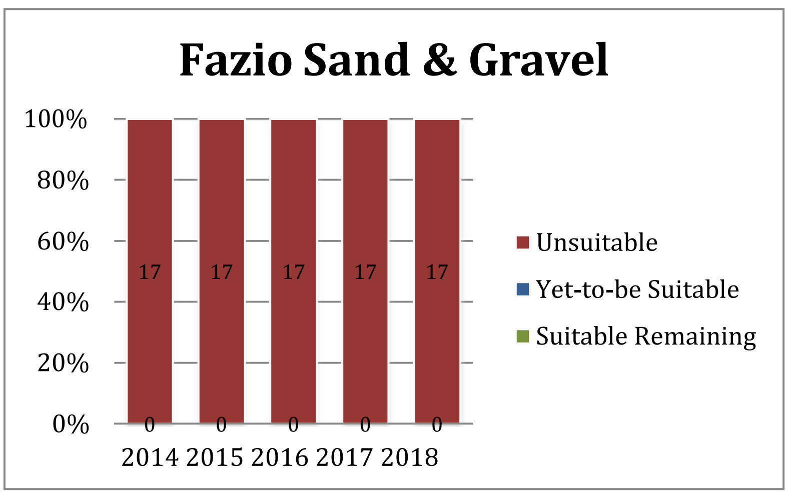


Figure 43: Availability of SHLA Nesting Habitat at the Fazio Sand & Gravel Site, 2014-2018

GATEWAY (RM 101.0)

Placement events on the 40-acre Gateway site occur in the summer, during the SHLA nesting season. The site is actively used for borrow activities and maintained by the Port of Vancouver. It has a 20-foot tall exterior berm along its perimeter and it is separated from the Columbia River by trees. Therefore, suitable SHLA nesting habitat is not expected to occur or develop on the Gateway site as shown in Figure 44.

In 2014 through 2018, no suitable SHLA nesting habitat is available on the site. No placements are planned on the site in 2014, 2015, 2016, or 2017. In 2018, the entire 40-acre site is planned for placement during the nesting season. However, no suitable SHLA nesting habitat is available on the site in 2018. The entire 40-acre site will be unsuitable habitat for nesting in all years.

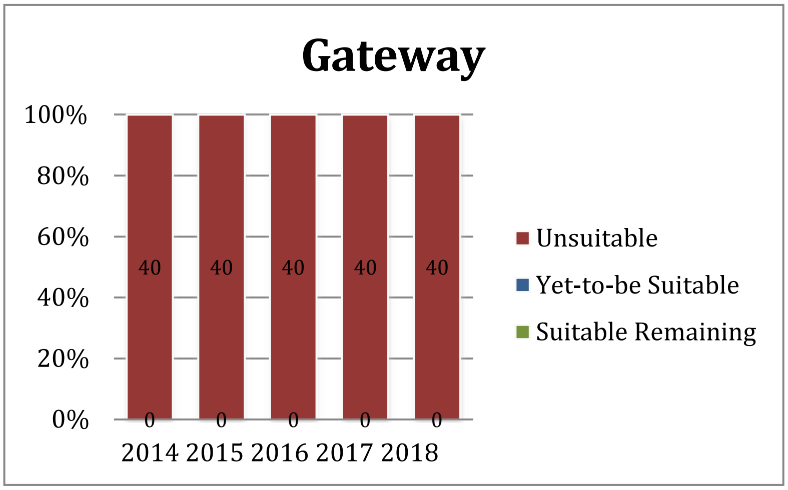


Figure 44: Availability of SHLA Nesting Habitat at Gateway, 2014-2018

WEST HAYDEN ISLAND (RM 105.0)

Placement events on the 116-acre West Hayden Island site occur in the summer, during the SHLA nesting season. The site is actively used by the Port of Portland for placing their dredged materials, storing dredging equipment, and other storage. The site has containment berms, roads, and a mix of trees, shrubs, forbs, grasses, and open ground. The site is separated from the Columbia River by trees. Therefore, suitable SHLA nesting habitat is not expected to occur or develop at West Hayden Island, as shown in Figure 45, and the site is assumed to be unsuitable in all years.

In 2014 through 2018, no suitable SHLA nesting habitat is available on the site. No placements are planned in 2014, 2015, 2017, or 2018. In 2016, an 84-acre placement is planned during the nesting season on the southern portion of the site. However, no suitable SHLA nesting habitat is available on the site in 2016. The entire 116-acre site will be unsuitable habitat for SHLA nesting from 2014 through 2018.

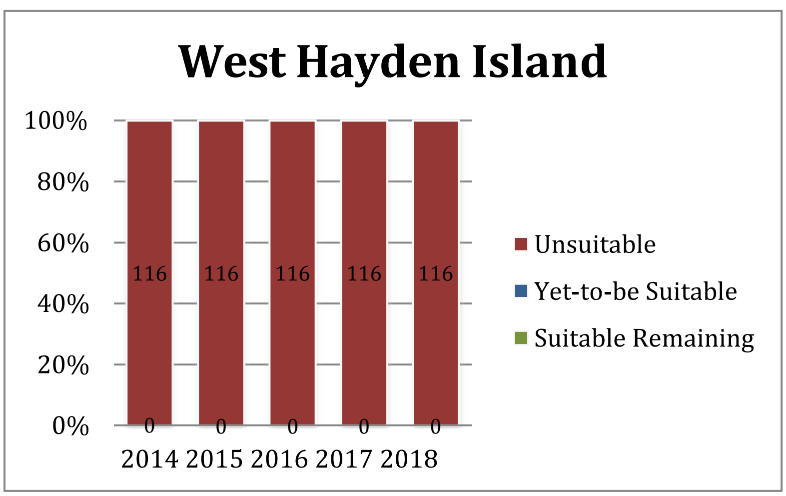


Figure 45: Availability of SHLA Nesting Habitat on the West Hayden Island Site, 2014-2018

GROUP VI

Group VI consists of three placement sites located in the lower Columbia River: Fazio Sand & Gravel, Gateway, and West Hayden Island. No suitable SHLA nesting is currently available within the 173 acres of Group VI. The placement of dredged materials from 2014 through 2018 within Group VI will not result in a loss of suitable nesting habitat or create suitable nesting habitat because the sites are active borrow sites, have external visual barriers, and are actively disturbed by the landowners. Group VI will be unsuitable for nesting over the 5-year placement plan,as shown in Figure 46.

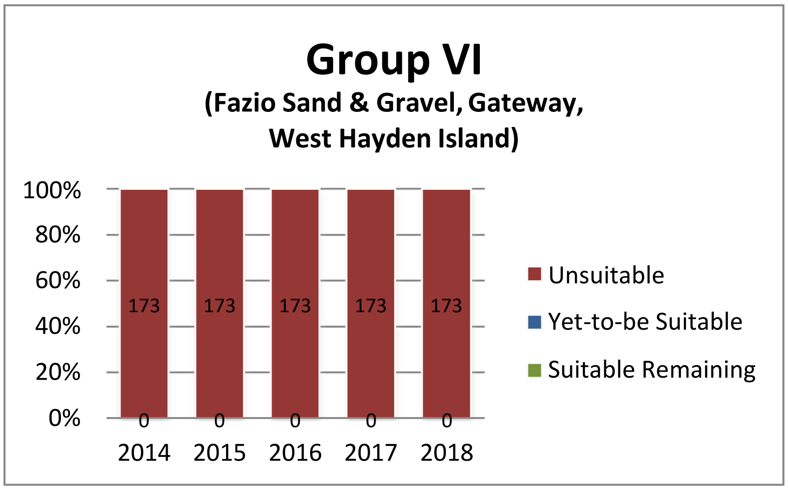


Figure 46: Availability of SHLA Nesting Habitat on the Group VI Sites, 2014-2018

POST-PLACEMENT MODIFICATIONS

Following dredged material placement, all temporary equipment (weirs, outfall pipes, valves, etc.) is removed from a placement site and transferred to the next scheduled location. The site is then graded to a condition to allow development into suitable SHLA habitat if left undisturbed or to dissuade avian species, according to what will most minimize effects. Depending on the remaining capacity within the dredged material placement footprint following placement, the berms may or may not be dismantled. Typically, when a site is not planned for placement the following year, or where sites have limited anthropogenic activity (not active borrow pits and/or public parks) the berms will be disassembled and the sand material distributed across the dredged material placement footprint evenly. The settling pond will be left undisturbed so sparse vegetation is allowed to grow quickly in the organic layer. Sites used annually (in whole or partially), or with regular anthropogenic activity, may be disassembled. However, dissuasion activities may be implemented to prevent active use of the site by larks, terns and/or cormorants (as discussed in Site Preparations).

The Corps does not own the placement sites, and therefore does not manage or regulate use of the sites prior to or following dredged material placement. Some sites may be leased by the landowner (states of Washington or Oregon, private entities, or Ports) to outside parties for the purpose of extracting the dredged material for off-site use. Other sites have public uses. Locations designated as SHLA critical habitat are denoted by # in the lists below.

The following sites are part of the dredged material placement network but are not planned for placement as part of the Columbia River FNC O&M program in the next five years:

- Dibblee Point

- Northport
- Sandy Island #
- Austin Point
- Fazio sand/gravel

The following sites have a high level of human activity and the Corps may not need to implement post-placement dissuasion:

- Skamokawa – Vista Park (county park and port-owned borrow site),
- James River (privately-owned borrow site),
- Dibblee Point (state-owned borrow site) – No planned placement,
- Northport (port-owned borrow site) – No planned placement,
- Martin Bar (port-owned borrow site),
- Sand Island (city park),
- Austin point (port-owned site leased as equipment training school) – No planned placement,
- Fazio Sand and Gravel (privately-owned sand and gravel operation) – No planned placement,
- Gateway (port-owned borrow site), and
- West Hayden Island (actively managed port-owned site with placement by others)

While some sites are currently borrow sites, any site has the potential to become a borrow site if the landowner grants permission to an interested party.

At sites that are not currently borrow sites, but where the Corps plans to return the following year for dredged material placement (on at least a portion of the placement site), the Corps intends to leave the site in a condition that does not attract SHLA. In these instances, dissuasive materials and mounding or trenching may be used to preclude site use by larks, terns and cormorants.

- Pillar Rock #

At West Sand Island, RM 3.1, the Corps will revegetate to the placement area to preclude the establishment of vegetation that could become detrimental to the native dune-grass community south of the placement area.

At sites where the Corps does not plan to repeat placement of dredged material, or repeatedly place dredged material in the same portion of a site, during the five-year dredged material placement plan, the Corps proposes to the leave the site or portions of the site in a condition that could develop into suitable SHLA habitat. These sites include:

- Rice Island #
- Miller Sands #
- Welch Island #
- Tenasillahe Island #
- Brown Island #
- Crims Island #
- Hump Island
- Lord Island (upstream portion)
- Howard Island
- Cottonwood Island
- Lower Deer Island

MONITORING

Part of the proposed action for the five-year dredged material placement plan includes monitoring the actions described above (site preparations, dissuasion, dredging, dredged material placement, and post-dredged material placement site management) across the Network. Monitoring will provide a greater comprehensive understanding of SHLA population distribution and relative abundance within the Network in response to the Corps' proposed action. Data will be collected on the presence/absence of larks throughout the Network, and incidental to this information, observational data will be collected about use of the placement site (breeding, foraging, sheltering). This information will help the Corps verify the effects from management of dredged material placement sites and evaluate the assumptions regarding habitat conditions and use by SHLA. Results will be summarized in an annual report and submitted to the USFWS. The Corps will also be able to use the results of the monitoring to plan long-term use of the Network to provide a shifting mosaic of suitable SHLA nesting habitat.

The Corps is proposing two monitoring efforts: piscivorous birds (terns/cormorants) and SHLA.

TERNS/CORMORANTS

A monitoring protocol has been developed for terns and cormorants on East Sand Island and it has been adapted for use with the dredged material placement network. This protocol has been used at Rice, Miller Sands, and Pillar Rock Islands to detect tern use in dredged material placement areas, subsequently triggering the need for active hazing from the islands during the breeding season (monitoring has not detected tern use to date). As part of the five-year dredged material placement plan, monitoring for terns and cormorants will occur at those islands where hazing should be implemented to preclude tern and cormorant use.

SHLA/SHLA HABITAT

Monitoring efforts for SHLA and SHLA habitat will focus on the sites within the Network. Monitoring for SHLA will document presence/absence, SHLA foraging and nesting, the efficacy of dissuasion efforts, and changes to SHLA habitats. For SHLA habitat, monitoring will document the placement footprint, the amount of suitable habitat modified during placement, the amount of suitable habitat available during the breeding season, and the amount of suitable habitat or yet-to-be suitable habitat remaining after placement. The acreage determinations will be done on a per site (and critical habitat sub-unit) basis, Network wide, and for the critical habitat unit (see Status of Critical Habitat section below).

A specific monitoring plan and methodologies will be developed in coordination with the USFWS and the Corps will begin implementation in 2014. In order to adequately collect data to validate how SHLA are distributed throughout the Network and how they respond to the proposed action, the Corps intends to build upon the existing SHLA data and adopt the Washington Department of Fish and Wildlife (WDFW) survey methodology to evaluate occupancy, abundance, and populations trends of SHLA in the Network.

The WDFW protocol recommends conducting three line-transect surveys during the breeding season between May and early July to confirm presence/absence of SHLA and document abundance and breeding behavior in occupied habitats. There is evidence, however, that this method may over-estimate the number of birds at a site, and some birds may not be detected in some areas where occupation is later confirmed. For example, Anderson did not detect birds at Tenasillahe Island in 2012 or 2013, but nests were discovered by Corps personnel prior to placement in both years (2013). To increase the detection probability for sites where no surveys have been conducted, or where larks are not known to occur but where suitable habitat exists, the Corps proposes to conduct a fourth survey to confirm absence in areas where suitable habitat occurs.

Coordination & Consultation

As part of the proposed action, the Corps requests an annual coordination meeting with the resource agencies (USFWS) and project sponsors to synthesize and discuss results from the prior dredged material placement activities. Regular meetings would guarantee on-going coordination during the five-year implementation schedule, where information about SHLA site use could be evaluated as it relates to the planned dredged material placement activities discussed above. In addition, these meetings would serve as a venue to discuss priorities for the upcoming dredging season and identify any issues needing resolution before dredged material placement commences the following year.

The Corps will initiate scheduling stakeholder meetings with the landowners and resource agencies annually in the winter (January) before site preparations are conducted for the upcoming dredging season, wherein the previous dredging season and monitoring results will be discussed and reviewed. Additional meetings would be scheduled as necessary when unanticipated shoaling necessitates unscheduled critical dredging actions and where these actions may affect SHLA.

STATUS OF THE SPECIES AND CRITICAL HABITAT

STREAKED HORNED LARKS AND LIMITING FACTORS

Horned larks are small ground-dwelling passerines endemic to open grassland habitats. There are 21 subspecies of horned larks found in 15 western states, and specific to the Pacific Northwest, streaked horned larks (SHLA) are considered a genetically distinct evolutionary unit found only in Oregon and Washington (Drovetski et al. 2005). The subspecies was originally proposed for listing by the USFWS on 30 October, 2001, and was formally listed as threatened on 3 October 2013 (FR 78 61452). In addition, to the proposed ESA-listing, SHLA are listed as *Endangered* by the State of Washington, considered *Sensitive* by the Oregon Department of Fish and Wildlife (ODFW), and are Red-listed (extirpated) in British Columbia, Canada (USFWS 2010).

The SHLA subspecies is found in prairie-oak habitats and coastal dune communities west of the Cascade Mountains in Washington and Oregon, where the birds prefer sparsely vegetated areas including sandy islands, wet prairies, oak savannahs and grasslands found at airports, and coastal spits. Prairie-oak habitat is distributed in a linear, north-south gradient in the Pacific Northwest, with the Cascade Mountains serving as a major ecological barrier to the east and the Pacific Ocean to the west. Historically, SHLA were common breeders from southern British Columbia south through the Puget Trough in Washington and into the Willamette and Rogue River Valleys in Oregon (see Figure 47) (Altman 2011, Anderson 2011).

The temporal dynamics of vegetation succession adds an additional layer of complexity to habitat development and maintenance for SHLA. Specific to the Action Area, invasive beach grasses have reduced the overall suitability of available habitat in the Columbia River and along the Washington Coast by altering the erosion/accretion processes that naturally maintain areas of sparse vegetation preferred by SHLA. Conversely, island sites currently used for placement activities may mimic sandy areas that were historically cleared of vegetation during the spring freshet and annual high flow events in the Columbia River basin (Stinson 2005).

The breeding range for SHLA has contracted in response to the loss in quantity and connectivity of native grassland habitats and increased isolation within a narrow band of suitable habitat, as is typical of edge populations (Altman 2011). Streaked horned larks experienced simultaneous north-south contraction between the 1960s and 1990s. The last SHLA in British Columbia, the northern extent of the historical range, was observed at the Vancouver International Airport in 1987; southern extent, the birds were last seen in the Rogue Valley in 1976 (Altman 2011). Currently, populations of SHLA breed in four eco-regions of Oregon and Washington: the Puget Lowlands, sandy areas along the Washington coast, islands in the lower Columbia River, and fallow agricultural fields in the Willamette Valley[2].

The breeding season is initiated with adults arriving on the breeding site in late February/early March. Most nests are constructed in late April or early May, with the first clutch fledging in May/June[3]. Females select the nest location (typically at the base of a bunch grass or forb) and will construct and incubate the nest with little involvement from the male (Stinson 2005). A typical clutch includes three eggs (one egg laid per day), which are incubated for 11 or 12 days. A successful nest will fledge nestlings after 8-10 days, and the altricial young are dependent on the parent birds until they become independent at 21-27 days. Adults and juveniles vacate breeding sites in late August, bound for over-wintering sites farther south.

---

[2] There is some overlap in habitat along coastal Washington, near Willapa National Wildlife Refuge.

[3] The earliest recorded clutch was observed on 15 March (Stinson 2005).

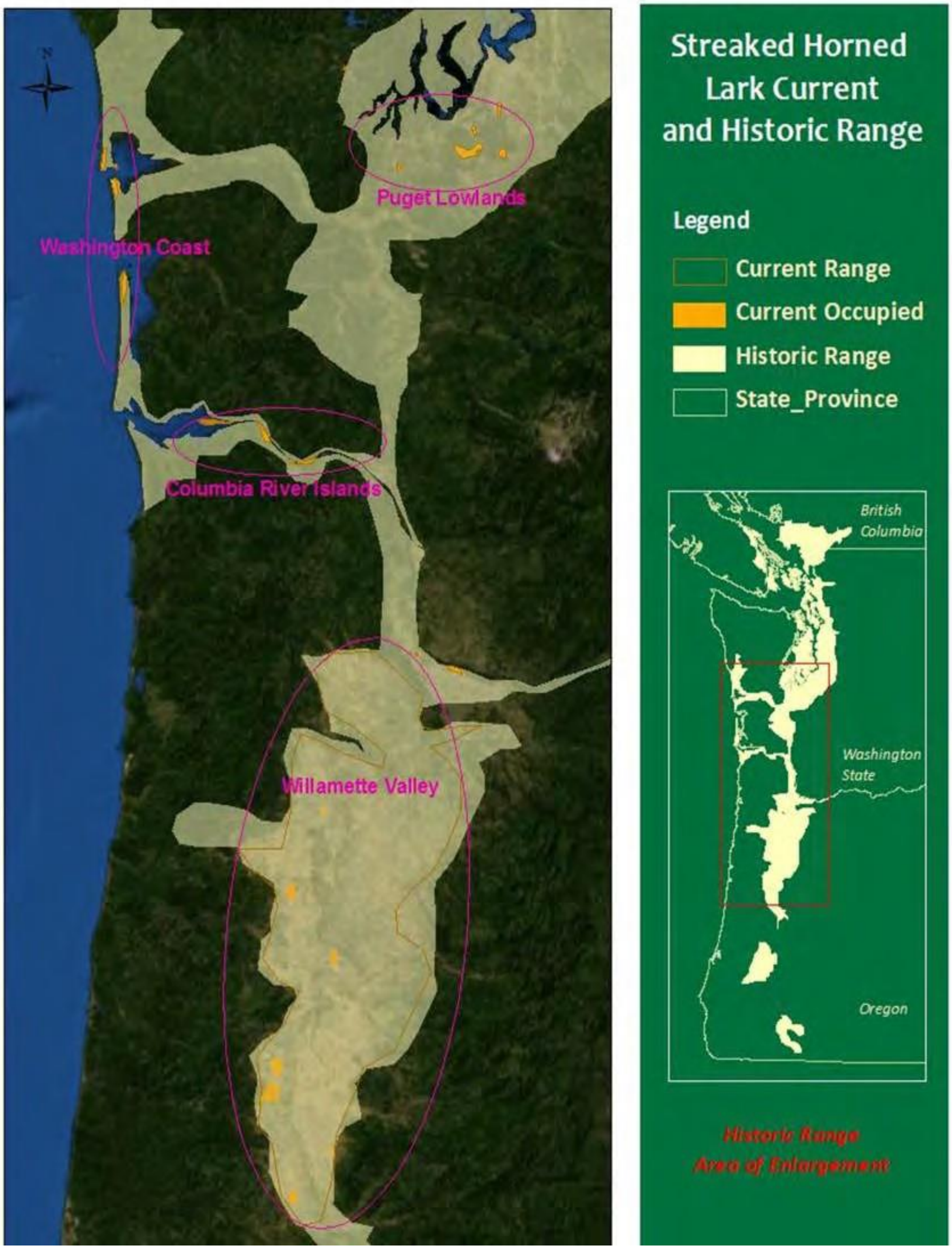


Figure 47: Estimate of Current and Historic Ranges of SHLA Image courtesy of Anderson 2011.

Breeding territories are established after adults form pair bonds in the spring. Average territories range in size between 1.5 to 2.5 acres, with an average of approximately 1.9 acres per breeding pair (Altman 1999, USFWS 2014). Nests are most often (89%) constructed on the north side of perennial forbs in shallow depressions 2 to 3 inches deep (Beason and Franks 1974, Pearson and Hopey 2005, Stinson 2005). If the first nest fails or is abandoned, adults will likely re-initiate a second clutch within 2 days after failure in May or June. If timing allows after the re-nesting attempt, or if the first nestlings fledge successfully, a second (or third) clutch is initiated approximately 1 week following juvenile independence, with the second nest fledging in late July or August (Beason and Franks 1974, Stinson 2005, USFWS 2010 and 2013). Research by Pearson and Hopey showed three peaks in clutch initiation dates in the Action Area, where nesting is started earlier in the Columbia River and last longer into the summer than at sites in the Puget Lowlands in Washington (2005).

Recent population surveys estimate the overall population of SHLA to total approximately 1,170 – 1,600 individuals (Altman 2011, Anderson 2011). Point-count data in 1996 and 2008 indicate populations in the Willamette Valley are largely stable, but the regional population is estimated to be declining by 40% per year in the Puget Lowlands, the Washington coast, and the lower Columbia River (Pearson et al. 2008, Altman 2011, Camfield et al. 2011). The range-wide population is estimated to be declining by 40% per year as a result of low fecundity and low adult survival (Pearson et al. 2008). Model results from Pearson et al., Schapaugh, and Camfield et al. showed adult survival explains a high proportion of the variation in range-wide population growth rates, followed by juvenile survival and fecundity, suggesting adult survival has a significant impact on population growth (2008, 2009, and 2011, respectively). These findings suggest SHLA populations are demographically limited, rather than limited by the availability of suitable habitat conditions.

Direct threats to individuals include predation, natural and anthropogenic factors including low reproductive success, low genetic variation (which leads to inbreeding depression), reduced disease resistance and adaptability to stochastic events, and human disturbance (Stinson 2005, USFWS 2010)[4]. Human disturbance can cause abandonment, which may indirectly increase the predation of eggs or chicks while the nest is left exposed and vulnerable after adults are flushed. As populations continue to decline and become increasingly fragmented, genetic diversity and variability is reduced ultimately leading to reduced adaptability and a high risk of local extirpation and additional range contraction.

The available data estimates there are approximately 120-140 adults (upwards of 60-70 breeding pairs) throughout the Action Area (Altman 2011, Anderson 2013). Of the dredged material placement sites described in Appendix B and surveyed for presence/absence, nine have known breeding pairs of SHLA: Rice, Miller Sands, Pillar Rock, Welch, Tenasillahe, Brown, Wallace, Crims and Sandy Islands. Rice and Brown Island both support a substantial proportion of SHLA, where each island is estimated to sustain over 20 pairs of breeding adults (Anderson 2013). Table 6 shows the number of breeding pairs estimated between 2011 and 2013 (Anderson 2013)[5]. It should be noted that because not all potentially available sites were surveyed by a systematic method, the number of pairs estimated between 2011 and 2013 does not reflect total SHLA abundance throughout the lower Columbia River, but rather the abundance at those sites surveyed during the course of the investigation.

---

[4] While brown-headed cowbirds (*Molothrus ater*) have been observed at all known breeding sites, no parasitism has been observed to date (Stinson 2005).

[5] Breeding pairs were estimated by doubling the number of singing males detected during any one visit; there is some indication that survey methods used to detect SHLA may over-estimate the number of birds occupying each site and some birds may go undetected between site visits. For a complete description of survey methods and results, please refer to Anderson 2013.

Table 6: Estimated Number of SHLA Breeding Pairs in the Lower Columbia River

Site	2011	2012	2013
Rice Island	13	14	22
Miller Sands Island	4	2	5
Pillar Rock Island	4	3	2
Welch Island	0	1	0
Tenasillahe Island	2	2	0
Brown Island	14	18	23
Wallace Island (not in Corps Network)	0	1	0
Crims Island	7	4	2
Northport	-	-	3
Sandy Island	2	1	4
Total	***46***	***46***	***61***

Nesting success within the Action Area is estimated to be approximately 33%, where predation and abandonment are the most frequent causes of nest failure, each contributing equally to failure (40%, each) (Pearson and Hopey 2005, Stinson 2005). While predation is a substantial source of failure, Pearson et al. (2012) showed that nest exclosures commonly used with precocial young (shorebirds and ducks) have no effect on nest success of altricial SHLA. The lower rate of predation associated with nest exclosures was offset by an increased rate of abandonment and predation of adults by raptors.

Streaked horned larks exhibit high site fidelity to (successful) breeding areas, as documented by mark-recapture/re-sight studies where birds return to the same areas year after year to nest semi-colonially. There is no published data documenting intra- or inter-annual movement between nesting sites during the breeding season in the lower Columbia River. Observations have shown a high density of nests in one location with large expanses of nearby unoccupied nesting habitat (Pearson and Altman 2005, Stinson 2005). Over-wintering site fidelity is low and the birds disperse throughout the region to locate suitable foraging habitats, the distribution and availability of which may change from year to year. As a result, while wintering sites are extremely important to the conservation of the species, they are functionally difficult to manage and protect.

While threats to SHLA are not known to be increasing, the existing threats continue to exert unnaturally high pressures on small populations which have low genetic diversity, low growth rates, and congregate in a few over-wintering populations. Few of the existing breeding and wintering habitats are protected, and none are managed exclusively for SHLA (Pearson and Altman 2005). The islands in the lower Columbia River may serve as a geographic link between occupied regions to the north in the Puget Lowlands, to the west along the Washington coast, and to the south in the Willamette Valley. Streaked horned larks are semi-migratory and over-winter in the lower Columbia River and throughout the Willamette Valley. It is estimated that 60% to 70% of the regional population over-winters in the Willamette Valley and the remaining 30% to 40% are distributed largely between islands in the lower river and along the Washington coast (Pearson and Altman 2005, Stinson 2005).

Dynamic ecosystem processes and the management of accretion and erosion are critical to maintaining breeding and wintering habitats along the Columbia River. As described above, many of the islands in the lower Columbia River are state-owned and leased for the placement of dredged material, and the placement of dredged material directly impacts the inter-annual availability of SHLA nesting habitat. Dredged material placement has the potential to maintain existing habitat and create or expand new sites for nesting and foraging. However, these activities ought to be spatially and temporally coordinated to minimize the adverse impacts to SHLA and their breeding habitats. In 2005, Pearson and Altman observed placement activities burying a nest, causing nest failure. However, placement events in recent years (2012 and 2013) were conducted in a manner that avoided burying active nests by isolating the nests from the placement footprint.

Various studies have evaluated habitat characteristics to identify suitable sites for foraging and nesting SHLA. These studies have demonstrated that suitability is predominantly a function of ground substrate, the composition of vegetation and the adjacency or visibility to open water areas (Pearson and Hopey 2005, Anderson 2013). Recent information suggests the percent of bare sand at a particular site can be used as a proxy for identifying suitable habitat conditions for breeding SHLA. In a recent analysis of habitat conditions in the lower river, Anderson showed that areas comprised of 50% to 90% bare sand were indicative of those habitats used most frequently by SHLA for nesting (2013). In this analysis, larks did not nest in areas with no vegetation (>90%) and did not frequent areas with covered by more than 50% vegetation. Furthermore, SHLA preferentially select nest sites at the base of perennial forbs and bunch grasses (as opposed to annual grass and forbs) and sites with low horizontal density and a high percentage of bare ground are preferred foraging areas (Stinson 2005).

Larks are known to use areas outside of what is widely considered "suitable" and while some birds utilize areas where placement of dredged material recently occurred, this BA assumes nesting would be restricted to those areas where the percent cover of vegetation and bare sand meet the suitable conditions (50% to 90% bare sand). In addition, for the purpose of this BA, habitat conditions on the placement sites are divided into three categories based on the best available science: (1) suitable, where habitat consists of 50% to 90% bare sand with some vegetation; (2) yet-to-be suitable, where vegetation has not yet established across the site and there is >90% bare sand; and (3) unsuitable, where vegetation exceeds 50% cover and the area is too dense for SHLAs. In addition, because larks are known to use areas with clear visibility of the surrounding landscape, suitable habitat is also assumed to be 25 meters from a forested edge or the shoreline. This buffer excludes areas where vegetation likely becomes too dense for SHLAs and areas affected by tides and therefore unsuitable for nesting.

The amount of time needed for vegetation succession varies throughout the lower Columbia River. Current research shows that to take longer for vegetation to establish on Rice, Miller Sands, and Pillar Rock Islands, presumably as a result of high winds and harsher climatic conditions (Anderson 2013). For this reason, it is assumed that vegetation takes three growing seasons to become established on these islands, and habitat is suitable for SHLA nesting at the beginning of the fourth breeding season following placement. For all other islands (between Skamokawa–Vista Park at RM 33.4 and West Hayden Island at RM 105), it is assumed that vegetation transitions more quickly and vegetation becomes established after one full growing season. In these areas, it is assumed that placement sites transition into suitable habitat at the beginning of the breeding season in the second year following placement.

In some instance, vegetation has been observed growing in placement areas within one year of placement, likely as a result of organic materials in the dredged sediments supporting establishment of quick-growing plants (Anderson 2013). While vegetation establishment and succession occurs at different rates throughout the Network, a habitat analysis by Anderson showed that once areas become suitable, they remain suitable for approximately 6-7 years (2013), provided the areas do not experience other disturbances during this time. Where vegetation is transforming suitable nesting habitats into densely vegetation areas, controlled burns and mechanical or chemical treatments (tilling, mowing, and herbicide application) can be used to restore and maintain suitable foraging habitat (Pearson and Altman 2005, Anderson 2011). It has been proposed that the strategic placement of dredged materials, in combination with herbicide application, can effectively control invasive species to maintain preferred habitats for SHLA and create additional habitats where naturally erosive processes have eliminated other island habitats (Anderson 2011).

Critical Habitat

The USFWS designated a total of 4,629 acres range wide in Oregon and Washington as critical habitat for streaked horned larks (78 FR 61506). All areas designated as critical habitat constitute areas currently occupied at the time of listing and contain the primary constituent elements (PCEs) to support the life-history needs of the species. The designated areas contain the physical and biological features essential to the conservation of the species, having a minimum of 16% bare ground with sparse, low-stature vegetation comprised primarily of grasses and forbs less than 13 inches in height. In addition, these features are found in flat areas (zero to five percent slope). These areas are 300 acres in size or within a landscape context that provides visual access to open areas, such as open water or fields. These areas provide suitable foraging and nesting habitats.

The USFWS identified a number of activities that may affect the physical and biological features essential to the conservation of SHLA across its range such that special management considerations or protections may be required. Threats include (1) the loss of habitat; (2) control of non-native, invasive species; (3) development; (4) construction and maintenance of roads and utility corridors; and (5) habitat modifications brought on by successive vegetation growth from lack of regular disturbance, both small and large scale. The effects of specific activities on the quality and quantity of essential features vary between areas within the critical habitat designation, particularly where sites are large (greater than 300 acres).

The USFWS identified two units of critical habitat for SHLA, which can be further divided into 16 sub-units, one unit (Unit 3) encompassing 13 subunits along the Washington coast and lower Columbia River and another unit (Unit 4) encompassing 3 subunits in the Willamette Valley. Units 1 and 2 were not designated for SHLA. The relevant subunits for this analysis include those in Unit 3 along the Washington Coast and Columbia River, totaling 2,899 acres, where 2,209 acres are State-owned lands, 564 acres are under Federal ownership, and the remaining 126 acres are privately owned.

The four Washington coastal subunits total 2,235 acres and include:

- Damon Point (subunit 3-A), 480 acres (not part of the Corps' Network)
- Midway Beach (subunit 3-B), 611 acres (not part of the Corps' Network)
- Shoalwater Spit (subunit 3-C), 479 acres (not part of the Corps' Network)
- Leadbetter Point (subunit 3-D), 665 acres (not part of the Corps' Network)

The nine subunits in the lower Columbia River are state-owned, small islands adjacent to open water and landscapes preferred by SHLA. It should be noted that only a portion of each Corps placement site overlaps with designated critical habitat on the island. Within any Corps placement site, only a portion of the site is likely to be suitable and used by SHLA in any year. The designated subunits of critical habitat do not shift over time because they are fixed geographic units. However, the availability of suitable nesting habitat within each placement site and each subunit shifts over time as new materials are deposited, vegetation is established, and older placement sites become too heavily vegetated for nesting by SHLA. The total acreage of designated critical habitat for SHLA throughout the lower Columbia River is 665 acres, including:

- Rice Island (subunit 3-E), 224 acres
- Miller Sands (subunit 3-F), 123 acres
- Pillar Rock/Jim Crow (subunit 3-G), 44 acres
- Welch Island (subunit 3-H), 43 acres
- Tenasillahe Island (subunit 3-I), 23 acres
- Whites/Brown Island (subunit 3-J), 98 acres
- Wallace Island (subunit 3-K), 13 acres (not part of the Corps' Network)
- Crims Island (subunit 3-L), 60 acres
- Sandy Island (subunit 3-M), 37 acres

Of these, all but Wallace Island overlap dredged material placement sites within the Corps' dredged material placement Network. Figure 48 shows the designated critical habitat subunits within Unit 3 for the lower Columbia River.

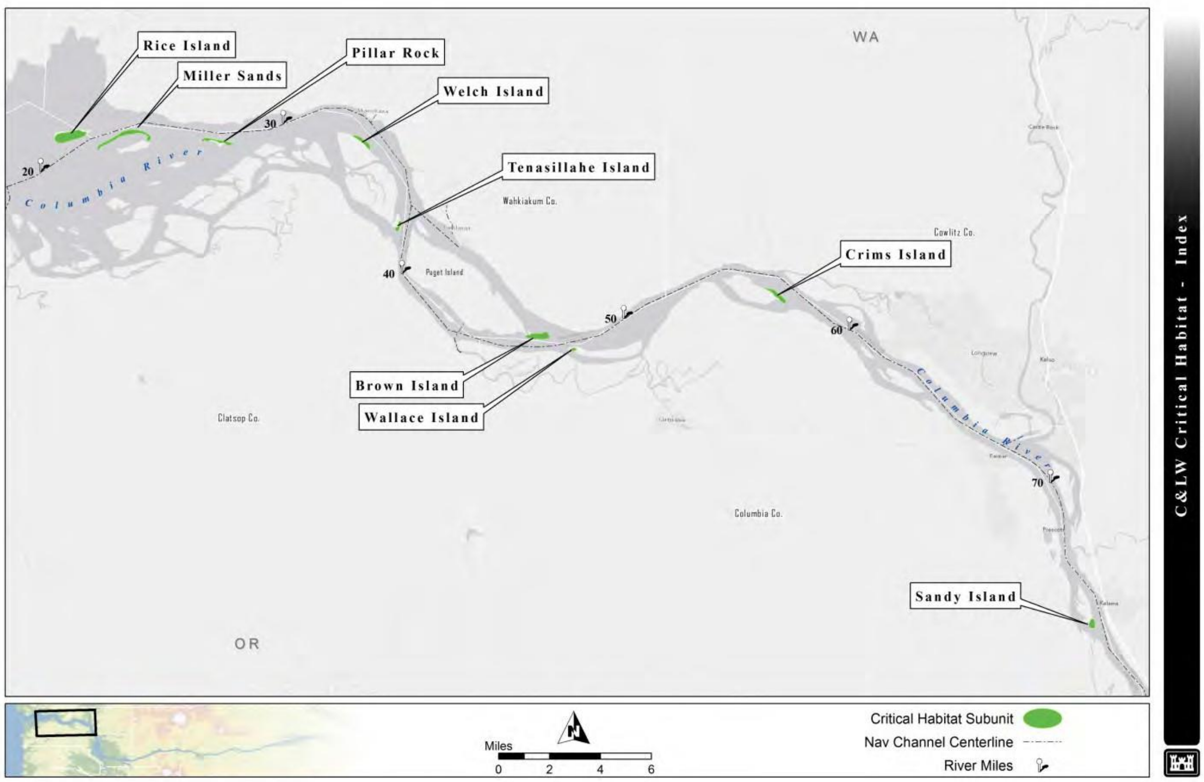


Figure 48: Designated Critical Habitat Subunits of Unit 3 in the Lower Columbia River

The main threats to SHLA critical habitat in the Columbia River subunits are natural vegetation succession, invasive vegetation, direct impacts associated with dredged material placement during the breeding season, and foraging habitat for over-wintering birds (USFWS, 2013).

Table 7 details the acreages of designated SHLA critical habitat, overlap with each placement site, and how much of that critical habitat subunit is currently suitable SHLA nesting habitat. Suitable nesting habitat for SHLA typically contains all the PCEs of SHLA designated critical habitat. However, designated SHLA critical habitat is not always suitable for nesting because of natural vegetative succession both within and adjacent to specific subunits. Wallace Island (*) is not in the Corps' placement network.

Table 7: Designated Critical Habitat within Lower Columbia River and Corps' Network

Subunit	Subunit (acres)	Placement Site (acres)	Designated Critical Habitat (CH) Within Site (acres)	Currently Suitable SHLA Nesting Habitat Within CH (acres)
Rice Island (RM 21.0)	224	264	219	150
Miller Sands Island (23.5)	123	117	88	0
Pillar Rock Island (27.2)	44	52	41	4
Welch Island (RM 34.0)	43	41	37	10
Tenasillahe Island (RM 38.3)	23	41	23	2
Brown Island (RM 46.1)	98	102	97	72
Wallace Island (RM 47)*	13	n/a	n/a	3
Crims Island (RM 57.0)	60	59	53	25
Sandy Island (RM 75.8)	37	32	32	32
TOTAL (acres)	**665**	**708**	**590**	**298 (45% of 665)**

EFFECTS ANALYSIS

The effects of the proposed action are described with respect to the proximity, duration and frequency of the action, and resulting disturbance to species, modifications to habitat, and habitat creation. Some islands have known occupation by SHLA while others have no reported (historical) use by larks. Because habitat suitability is directly linked to vegetation succession, some areas with dense vegetation are not used by larks and have not been used by larks for several years. Placement will vary throughout the Action Area, as some sites will be used annually whereas others will be used once or intermittently during the 5-year plan. The effects to the species and critical habitat will be both localized to entire placement sites, or portions of the placement sites, as well as distributed throughout the placement network. There are eight islands designated as critical habitat in the Network, but only seven islands are in the 5-year Plan: Rice, Miller Sands, Pillar Rock, Welch, Tenasillahe, Brown, and Crims islands. No placement is planned on Sandy Island in the next five years.

Included in the discussion below is the effect of the action on specific stages of the SHLA lifecycle (adults, juveniles, nestlings, eggs) and whether the effects may affect the overall population size and distribution of larks in the Columbia River estuary. Because the Columbia River islands may serve as an increasingly important geographic link between occupied regions to the north (Puget Lowlands), the west (coastal areas), and areas to the south (Willamette Valley), it has been recommended to avoid disturbing nesting areas in the Columbia River between April 15 and August 15 (Anderson 2011). To minimize impacts to breeding birds and nesting areas, certain actions are timed to coincide outside of the breeding. However, some placement activities will occur within this timeframe, and the effects of these actions are described below.

The duration and frequency of dredged material placement has also been evaluated for its effect on SHLA and its habitat. There are immediate, short-term adverse effects to individuals and SHLA habitat from the proposed actions. However, long-term, beneficial effects to SHLA habitat are anticipated from the strategic management of placement within the Network. To the extent practicable, the timing of certain components of the proposed action will minimize disturbance to the birds. Maintenance of the navigation channel requires annual dredging and some effects will be sustained for the life of individuals, which might have lasting effects to population growth rate and recovery of the Columbia River population. However, the long-term beneficial effects to suitable SHLA nesting habitat are expected to outweigh short-term adverse effects to individuals and habitat.

CLIMATE CHANGE

It is likely that climate change will play an increasingly important role in future years in determining the abundance of ESA-listed species and the conservation value of designated critical habitats by exacerbating long-term problems related to temperature, stream flow, habitat access, predation, and marine productivity (CIG 2004, ISAB 2007). According to the U.S. Global Change Research Program (USGRP), the average regional air temperatures have increased by an average of 1.5°F over the last century (up to 4°F in some areas), with warming trends expected to continue into the next century (2009).

Precipitation trends during the next century are less certain than those for temperature, but increased precipitation is likely to occur during October through March and less during summer, with more winter precipitation falling as rain rather than snow (ISAB 2007, USGCRP 2009). Where snow occurs, a warmer climate will cause earlier runoff resulting in lower stream flows and warmer water temperatures in late spring, summer, and fall (ISAB 2007, USGCRP 2009). These changes will not be spatially homogeneous across the entire Columbia River basin. Areas with elevations high enough to maintain temperatures well below freezing for most of the winter and early spring would be less affected. Low-lying areas that historically have received scant precipitation during the winter and contribute little to total stream flow and are likely to be more affected. The ISAB recommends planning now for future climate conditions by implementing protective tributary, mainstem, and estuarine habitat measures; as well as protective hydropower mitigation measures (2007).

Climate change may result in an expansion of prairie-oak habitats northward; however, SHLA population dynamics are declining for a multitude of reasons and not just habitat loss. Until these factors are addressed and regional populations can serve as a source population as opposed to a population sink, habitat expansion as a result from climate change is not likely to provide relief to the current declines in SHLA abundance (Altman 2011).

The effects of climate change in the Action Area could lead to a change in the timing of precipitation, the extent of snowpack, and rain-on-snow events. These changes in weather patterns could influence seasonal river flows, subsequently influencing the presence of size of shoaling in the lower Columbia River, thereby influencing the timing of dredging and placement of materials. However, the proposed placement plan described above is a short-term project, lasting five years in duration. It is assumed that any effects climate change might have across the action area during this timeframe would be negligible and effects to SHLAs or their habitats would be immeasurable.

EFFECTS OF THE ACTION

While a number of measures will be taken to minimize and avoid impacts to birds and their habitats, some direct, indirect, and cumulative effects are expected to occur. Additionally, the upland placement of dredged material will create and sustain suitable SHLA nesting habitat over time. The sections below evaluate the effects of the components of the proposed action, as described above, on the species and its critical habitat, as well as the interrelated and interdependent activities.

SITE PREPARATIONS

The timing of site preparations will occur in the winter and early spring months outside of the breeding season to minimize future direct impacts to nesting birds. During this time period, over-wintering adults may be present on placement sites and these individuals are expected to move out of the area of active site preparation. Site preparation, including the construction of landing ramps, shoreline grading, physical demarcation of the footprint (flagging, berm building, etc.), vegetation removal that is necessary to facilitate dredged material placement could disturb birds and disrupt foraging. These actions could directly injure or harm individuals, however this is likely discountable because birds will likely flush and avoid the activity.

Repeated flushing events during the winter and before the breeding season could lead to a decrease in overall fitness of individuals, where energy is expended or foraging is interrupted to flee from people and equipment. Over-winter foraging success is directly linked to building or maintaining body fat in preparation of migration and the upcoming breeding season. Research has suggested that birds which winter in higher quality wintering habitat are more likely to survive annual migration and have higher reproductive success during the breeding season (Sillett and Holmes 2002). Flushing during site preparations could stress birds and force individuals to expend increased levels of energy to seek safety and shelter.

The physical movement or displacement of sand, vegetation, and other habitat features would fundamentally alter site characteristics and habitat suitability (either making it more or less suitable, depending on the preparations specific to the placement plan). Vegetation removed during site preparations will be buried or made unavailable to nesting birds. If the habitat was suitable for nesting, it is likely that this habitat would no longer be suitable following site preparations. During the winter and early spring, vegetation likely provides a buffer against severe weather and predators. The removal of this vegetation is expected to result in wide open expanses of exposed sand, forcing individuals to seek shelter on unused portions of the placement sites with suitable habitat conditions.

The process of removing vegetation using vehicles and earth-moving equipment will disturb the soil surface, mixing layers of the soil and exposing seeds and insects that were previously buried and inaccessible to foraging songbirds. There may be a short-term benefit to larks immediately following vegetation removal. Seeds would likely be knocked off branches and insects would be exposed when leaf litter is moved during vegetation clearing. This additional foraging material would be valuable during the winter season when forage and prey items are scarce. While there may be a short-term benefit, increased exposure resulting from vegetation removal could also lead to increased predation. However, most recorded predation events occur to juveniles during the nesting season. Streaked horned larks present on the placement sites in the winter/spring are expected to be fully mobile and able to escape most predators. While the lack of vegetation cleared during site preparations would expose SHLA to increased predation, predators would also be likewise exposed and it is expected that healthy adult larks (not injured or sick) would be able to escape predators.

Overall, the number of individuals directly affected by site preparations is expected to be low and should not result in any direct mortality.

DISSUASION

Similar to the effects from site preparations, repeated dissuasion and hazing could also impact SHLA. Dissuasion actions that coincide with site preparations are intended to minimize site use by larks, and other migratory birds where active dredged material placement will occur during the breeding season. The Corps implements early-season (February-March) dissuasion to reduce the potential for more severe impacts to SHLA later in the nesting season. All dissuasion practices are intended to discourage nesting, roosting, and/or foraging behaviors, with the ultimate intent to avoid, minimize, and reduce impacts to adults, juveniles, and/or nestlings during the breeding season. No active dissuasion of SHLA will occur during the breeding season (15 April through 15 August). While some uncertainty remains regarding the effectiveness of early season dissuasion, the Corps is confident that dissuasion efforts would be effective at precluding site use by SHLA based on discussion with species experts in the region. Further, despite dissuasion efforts, some birds may be undeterred from nesting; therefore these individuals may be adversely affected directly through the placement of sediment in their nesting territories, eliminating those areas for nesting in the short term and possibly resulting in mortality to eggs and/or chicks.

As a requirement of the NMFS 2012 BiOp, T&C 1(k), if avian predators (piscivorous birds) are identified in the action area, hazing actions would be implemented to intentionally flush birds and discourage nesting on upland placement sites. If nesting activity is observed on placement sites, the Corps will actively discourage these behaviors, including egg collection. Alternatives to intentional hazing and dissuasion actions include the use of physical barriers (nets and fencing, flagging, etc.) and habitat modifications (vegetation removal, trenching, mounding, etc.) to minimize the extent and suitability of habitat available for foraging and nesting. These activities will include human presence and may involve the use of vehicles. As a result, these activities may result in a range of effects to SHLAs, depending on the timing, location and intensity of hazing and dissuasion. This includes flushing adults and/or young, increased exposure of individuals to weather and predation, nest abandonment and/or destruction, and possible mortality of eggs or young. If these actions occur with substantial frequency and/or duration, dissuasion of avian predators could result in direct effects to SHLA survival.

Currently, dissuasion of piscivorous birds only occurs at Rice, Miller Sands and Pillar Rock islands, which are potential habitat for Caspian terns. In these areas, habitat is modified , silt fences are constructed and terns are hazed from the island to prevent occupation and nesting (Stinson 2005). These actions accelerate the development of dense vegetation, reducing the availability of bare ground and precluding the use of these areas as nesting and foraging habitat for terns or SHLA. Similarly, hazing actions directed at terns can have adverse effects to larks, when active dissuasion occurs in suitable SHLA nesting habitat. Currently, only Pillar Rock Island contains potential tern habitat that overlaps with suitable nesting habitat for SHLA. Terns have not attempted to nest in these areas to date and dissuasion of terns has not occurred. If tern dissuasion is necessary in suitable SHLA nesting habitat in the future, there could be direct and indirect effects to SHLA and its nesting habitat.

Dissuasion to avian predators and SHLA is not expected to result in direct mortality of adults, rather, dissuasion and hazing activities are expected to directly affect or alter adult behavior. Direct effects include flushing of adults, flushing adults from nests, increased exposure of eggs/young to environmental conditions, increased risk of nest predation, accident injury to eggs/young, nest abandonment, and nest failure from activity in nesting habitats. Indirect effects include the loss of suitable nesting habitat that could result in decreased nest success. Indirect effects resulting from dissuasion include modifications to habitat that preclude the use ofsuitable nesting habitat, thereby indirectly affecting individuals. However, habitat availability is not assumed to be a limiting factor in the action area (Pearson et al. 2008, Schapaugh 2009, and Camfield et al. 2011).

Dredging and Ocean and In-Water Placement

All dredging and in-water work is expected to have no effects to SHLA or their critical habitat. In-water dredged material placement has no effect to terrestrial species and therefore, it will not be evaluated in this analysis. Furthermore, it has been determined that all dredged material is suitable for unconfined, in-water placement without further characterization.

Dredged Material Placement at Upland and Shoreline Sites

Efforts have been made in recent years to identify active nests in the placement Network and avoid these areas. As previously stated, site preparations and dissuasion activities should minimize direct effects to adult SHLAs, as these actions occur outside of the breeding season and any reductions to the suitability of placement sites for nesting will occur before the onset of the breeding season. Dredged material placement activities generally include access, equipment staging and set-up, site grading, placement of weirs and outfall pipes using earth-moving equipment, berm construction and discharge of the sand-water slurry into the placement footprint. Based on the results of sediment quality testing described above, no effects to SHLA or their habitat are expected as a result of the quality of the dredged sediments placed on upland or shoreline sites. Following placement of dredged materials, all equipment is removed from the site.

Due to a lack of data supporting the effectiveness of site preparations and dissuasion to preclude site use, SHLA may nest in the placement footprint despite these efforts. Placement sites used during the breeding season will be evaluated for any active nesting by a biologist prior to placement occurring. Adult SHLAs may experience direct effects from the placement of dredged materials if they occupy the site for foraging or nesting. While adult SHLA may be disturbed during placement, they would likely flush from the area , which could result in nest abandonment, increased predation, decreased foraging opportunities, and increased energetic expenditures. Past placement activities have resulted in placement of dredged materials on active SHLA nests. In the event that nests are in the placement footprint, sediment placement will result in the direct mortality and burial of eggs, and nestlings; adults are expected to flush from the area and avoid burial and direct mortality.

Individuals in areas adjacent to the placement footprint (but outside of the placement boundary) are expected to experience similar effects to actions in the placement footprint, including flushing adults and/or young, increased exposure of individuals to weather and predation, nest abandonment and/or destruction. In addition, juveniles and young-of-the-year birds that move into the dredged material placement footprint are expected to have sufficient flight capabilities to flush from the area upon initiation of active material placement or other disturbances.

Indirect effects to SHLA are expected to result from modifications to habitat and an associated loss of nesting and foraging areas following the placement of dredged materials, wherein the net effects are realized later in time. Based on the expected changes to the availability of suitable nesting habitat throughout the Network over the 5-year placement plan, SHLA will experience increases and decreases in the availability of suitable habitat in some years, which may impact territory size for breeding pairs and dispersal of juveniles.

Estimated Breeding Pairs In Suitable SHLA Nesting Habitat

As described in the above sections, the breeding population of SHLA in the Columbia River is estimated to contain approximately 120-140 adults, or 60-70 breeding pairs. Additionally, territories are assumed to range between 1.5 and 2.5 acres per breeding pair (USFWS 2014). For this analysis, all areas identified as suitable are assumed to be available for nesting and the potential number of breeding pairs an area is able to support is based on the estimated number of suitable habitat acres and the given range of breeding territories, where:

$$Number\ of\ breeding\ pairs = \frac{Available\ suitable\ nesting\ habitat\ (X\ acres)}{Territory\ size\ (2.5\ acres)}$$

and

$$Number\ of\ breeding\ pairs = \frac{Available\ suitable\ nesting\ habitat\ (X\ acres)}{Territory\ size\ (1.5\ acres)}$$

Network Scale

Based on recent 2011 through 2013 surveys, the numbers of SHLA breeding pairs observed in the Network were 46, 46, and 61 pairs, respectively (Table 6). Based on the currently available suitable nesting habitat for SHLA and the assumptions about the possible number of breeding pairs habitat can support, the Network can support between 122 and 205 SHLA breeding pairs. This estimate is two to three times the observed number of pairs in recent years. This also assumes the population has a 1:1 sex ratio of males to females, across 315 acres of suitable habitat. This range is supported by population models which suggest SHLAs are not limited by the availability of suitable habitat, but rather by population demographics (adult and juvenile survival, nest success) (Pearson et al. 2008, Schapaugh 2009, Camfield et al. 2011). When the total extent of suitable habitat across the Network is lowest in 2015 (261 acres), the habitat could still support 93 to 157 SHLA pairs throughout the Columbia River, which is 55% more than what is estimated to occupy the lower river under current conditions (60 to 70 pairs). Over time, as suitable habitat conditions increase throughout the Network, it is assumed that the number of breeding pairs will also increase to a maximum range of breeding pairs between 253 and 426 across 643 acres of suitable habitat throughout the Network in 2018 (see Figure 49).

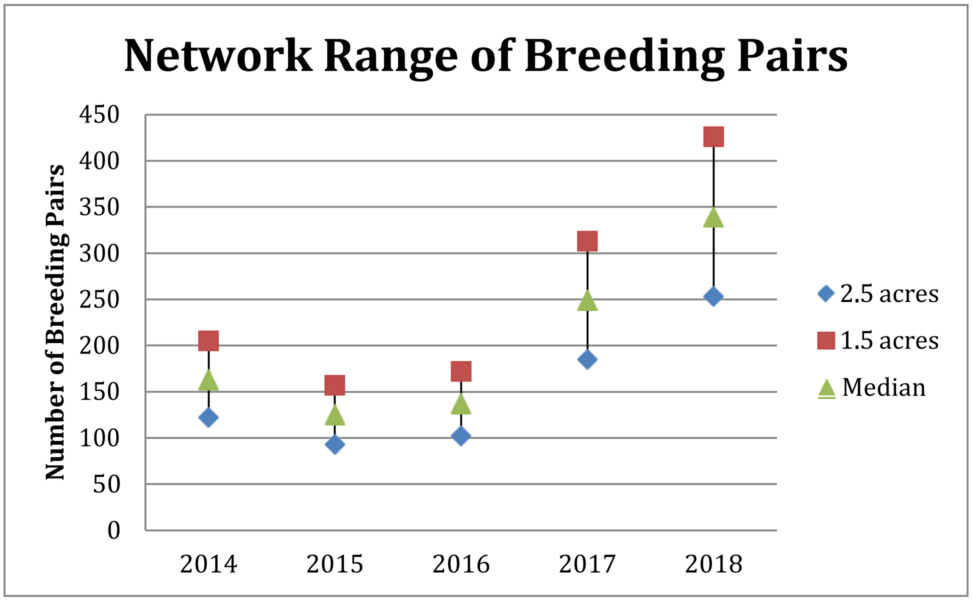


Figure 49: Potential Range of Breeding Pairs throughout Network, 2014-2018

<u>GROUPS I AND VI</u>

The analysis of impacts to breeding SHLA and effective territory size discussed below refers to Groups I through VI described earlier in this document. No breeding SHLA have been observed at any of the placement sites in Group I (Benson Beach and West Sand Island, the Group farthest downstream) or Group VI (Fazio Sand & Gravel, Gateway, and West Hayden Island, the Group farthest upstream). These sites do not contain suitable nesting habitat as identified by the NDVI data from 2011, as all sites in these groups have established vegetation or a high level of anthropogenic disturbances associated with sand and gravel removal or a lack of recent placement of dredged materials to re-start vegetation succession. For these reasons, it is assumed that no suitable habitat will develop on these placement sites for the duration of this consultation, and therefore no SHLA are assumed to breed and nest in these areas (see Figure 50).

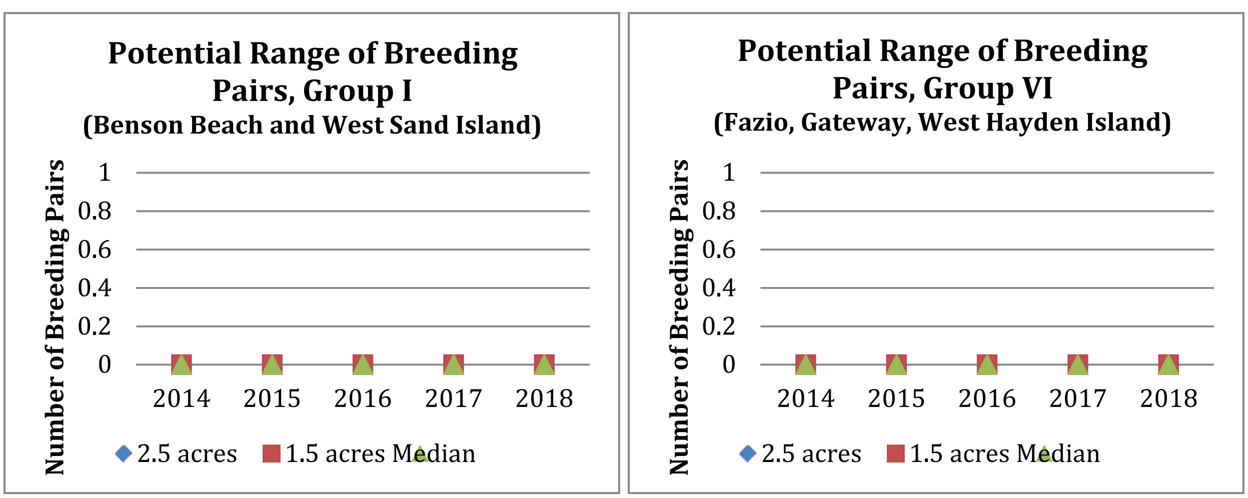


Figure 50: Potential Range of Breeding Pairs in Groups I and VI, 2014-2018

RICE ISLAND (RM 21.0)

Most of the SHLA observed in Group II were observed at Rice Island, where Anderson (2013) observed 22 singing males in 2013 (and assumed a singing male equals one breeding pair). Based on the analysis of habitat availability described above, 150 acres of suitable habitat are present under current conditions at Rice Island, which could support 60 to 100 breeding pairs of SHLA. Even though placement events are proposed for Rice Island in 2014 and 2017 covering upwards of 20% to 50% of the available suitable habitat, the minimum extent of available nesting habitat in any year is 122 acres. This area is expected to support between 48 and 81 breeding pairs (see Figure 51), which is a 118% increase over the actual number of observed breeding pairs at Rice Island.

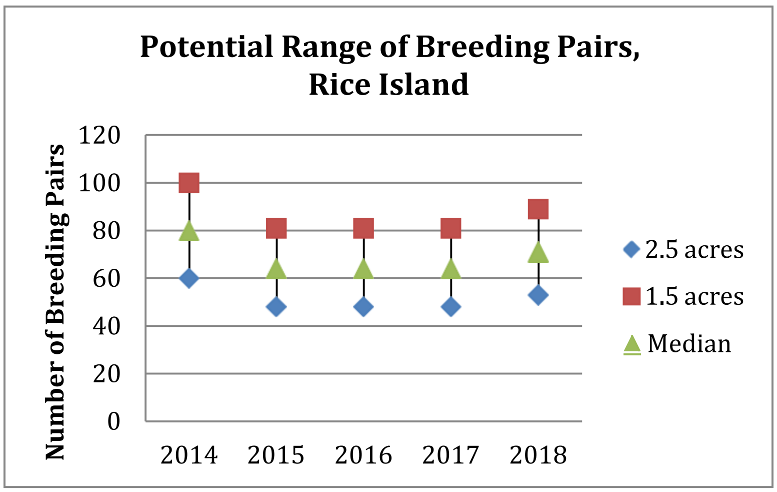


Figure 51: Potential Range of Breeding Pairs at Rice Island, 2014-2018

MILLER SANDS (RM 23.5)

Anderson observed five pairs (singing males) at Miller Sands Island in past years, but the upland habitat areas were mounded during past placement events in 2011, 2012 and 2013. It is unknown if SHLA nest successfully in these mounded areas and the Corps conservatively assumes that nesting might be precluded in the mounded areas. In an effort to maximize the availability of future nesting habitat in Group II when habitat conditions are lowest at Rice Island and Pillar Rock Islands, the mounds will be smoothed in 2014 to encourage vegetation establishment and development into suitable habitat in future years. It is anticipated that no breeding SHLA will be supported at Miller Sands Island in 2014, 2015, 2016, and 2017. It is assumed that SHLA will move to nearby Rice or Pillar Rock Islands for nesting in these years while vegetation is developing at Miller Sands Island. In 2018, it is assumed that vegetation will have transitioned into suitable habitat conditions and approximately 34 acres of suitable habitat will be available which could support between 13 and 22 breeding pairs of SHLA (see Figure 52).

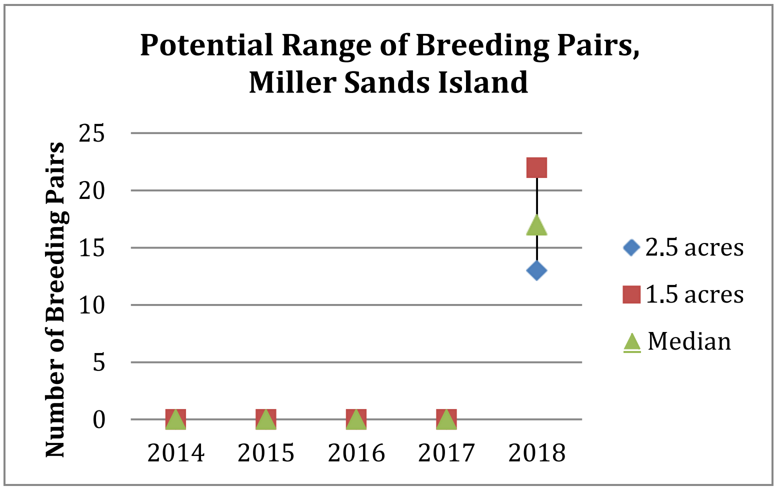


Figure 52: Potential Range of Breeding Pairs at Miller Sands Island, 2014-2018

PILLAR ROCK ISLAND (RM 27.2)

Only four acres are currently available as suitable habitat at Pillar Rock Island, and two pairs (singing males) are estimated to occupy this placement site. The island is significantly eroded, and shoreline placement is required to rebuild the site footprint before upland placement can occur to re-start vegetation succession. The Corps will begin shoreline placement immediately in 2014 so that suitable SHLA habitat can form as quickly as possible. All placement events at Pillar Rock Island between 2014 and 2016 will be shoreline events, so no suitable habitat will be lost to placement. As a result, habitat conditions are not expected to change between 2014 and 2016, and the available habitat is expected to support up to two breeding pairs of SHLA. However, the Corps assumes habitat conditions will become too vegetated in 2017 to support suitable nesting habitat, and therefore habitat conditions will not support any breeding pairs (see Figure 53) in 2017 or 2018.

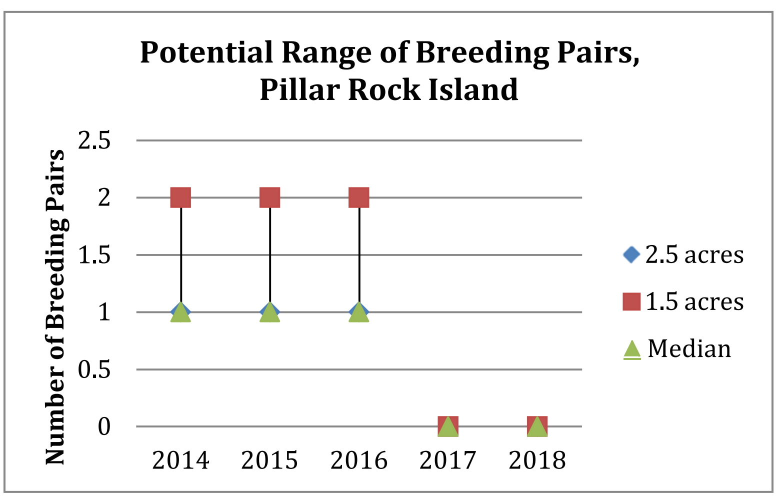


Figure 53: Potential Range of Breeding Pairs at Pillar Rock Island, 2014-2018

Upland placement events will occur at Pillar Rock Island in 2017 and 2018 where each will cover half of the upland portions of the island, re-starting vegetation succession for future years. In 2017, it is assumed that the suitable habitat currently available will become too vegetated and no remnant suitable habitat will be available to support breeding SHLA and the only available suitable habitat within Group II will be at Rice Island. It is assumed that breeding SHLA will disperse to Rice Island in 2017, and Rice and Miller Sands Island in 2018 where habitat is available after upland placements at Pillar Rock Island.

GROUP II

The extent of suitable habitat across Group II (Rice, Miller Sands, and Pillar Rock Islands) is expected to increase by nine percent over the 5-year placement plan from 154 acres to a total of 168 acres in 2018. Following this increase in the availability of suitable habitat, it is assumed that the number of breeding pairs this habitat could support would also increase. Recent observations have estimated that Group II supports approximately 29 pairs of SHLA across the three sites (Anderson 2013). However, suitable habitat will decrease from 154 acres in 2014 to a low of 122 acres in 2017, a decrease of approximately 21%. Based on the assumptions about territory size, current conditions in Group II could potentially support a breeding population between 61 and 102 breeding pairs of SHLA in 2014. This estimate demonstrates the population has not reached saturation for population density and more suitable nesting habitat is available than breeding pairs are present to fill the available nesting habitat.

As the suitable habitat in Group II decreases to a low of 122 acres in 2017, the maximum density of breeding pairs is assumed to decrease to a range between by 48 and 81 breeding pairs, which is still 66% more than what is currently estimated to occupy Group II (see Figure 54). The range of breeding SHLA Group II could support is expected to increase to between 66 and 111 breeding pairs in 2018, when the available suitable habitat is at its maximum of 168 acres across Group II.

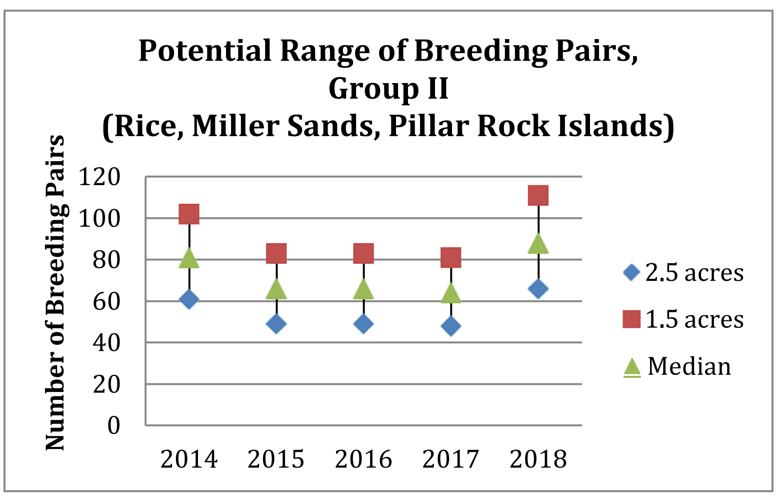


Figure 54: Potential Range of Breeding Pairs at Group II Sites, 2014-2018

SKAMOKAWA – VISTA PARK (RM 33.4)

As described above, the Corps assumes there is currently no suitable nesting habitat for breeding SHLA at Skamokawa – Vista Park and suitable nesting habitat would not develop during the course of this consultation due to the high level of human use and regular disturbance. It is therefore assumed that no SHLA would be present during the nesting season because no suitable habitat would support breeding activities (see Figure 55). No SHLA have been detected at this active borrow site.

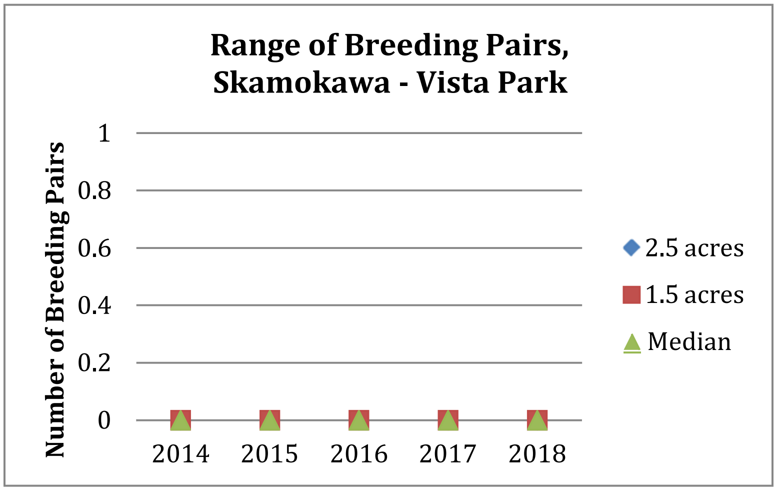


Figure 55: Potential Range of Breeding pairs at Skamokawa - Vista Park, 2014-2018

<u>*WELCH ISLAND (RM 34.0)*</u>

During the past three years of surveys, Welch Island only supported 1 breeding pair of SHLA in 2012 (Anderson 2013). Currently, there are 10 acres of suitable habitat at Welch Island, which could support upwards of 4 to 6 breeding pairs based on the assumptions about territory size and habitat conditions. The 2015 placement event will cover the entire placement site, eliminating all suitable nesting habitat in 2015 and 2016 (see Figure 56). No nesting habitat will be available until habitat transitions into suitable conditions in 2017, at which point 18 acres will be available for nesting and between 7 and 12 breeding pairs of SHLA could nest at Welch Island through 2018.

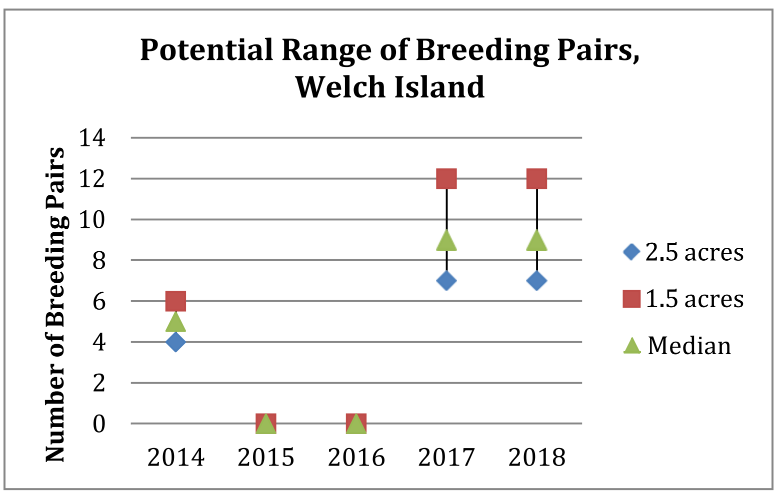


Figure 56: Potential Range of Breeding Pairs at Welch Island, 2014-2018

<u>*TENASILLAHE ISLAND (RM 38.3)*</u>

In the past three years, Tenasillahe Island has recently supported up to two breeding pairs of SHLA. No pairs were observed by Anderson during routine surveys in 2013, but the Corps detected a nesting pair prior to placement activities in 2013 and the nest was avoided during active placement (nest success is unknown). Current conditions at Tenasillahe Island estimate two acres of suitable nesting habitat are available at the beginning of the 2014 breeding season, which could support up to one breeding pair in 2014. As habitat transitions into suitable condition in 2015, upwards of nine to 15 breeding pairs could nest at Tenasillahe Island (see Figure 57). The placement event in 2016 covers some suitable habitat, reducing the area available for nesting pairs to 10 acres, which could potentially support four to six breeding pairs in 2016 and 2017. Following the 2016 placement event, vegetation is estimated to transition into suitable condition and 23 acres of suitable habitat could support nine to 15 breeding pairs of SHLA in 2018.

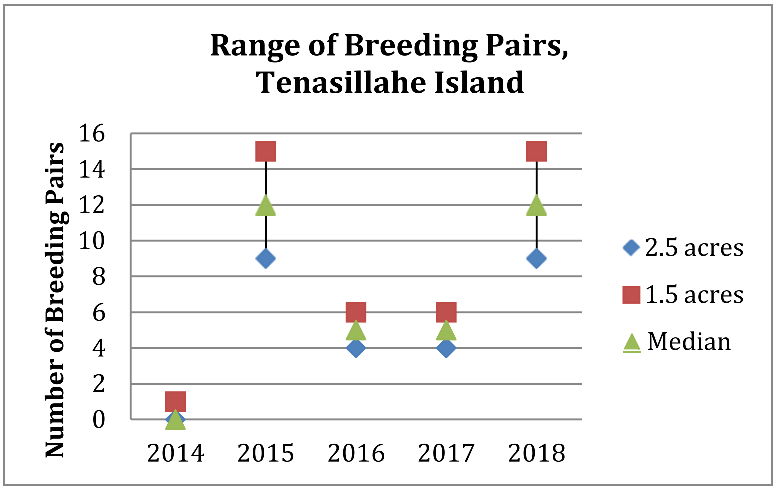


Figure 57: Potential Range of Breeding Pairs at Tenasillahe Island, 2014-2018

<u>James River (RM 42.9)</u>

James River has not been surveyed for potential SHLA occupation. The Corps estimates that there is currently no suitable nesting habitat for SHLA at James River. In addition, the Corps assumes that no suitable nesting habitat would develop during the course of this consultation due to the high level of human use and regular disturbance from sand extraction activities. It is therefore assumed that no SHLA would be present during the nesting season because no suitable habitat would support breeding activities (see Figure 58).

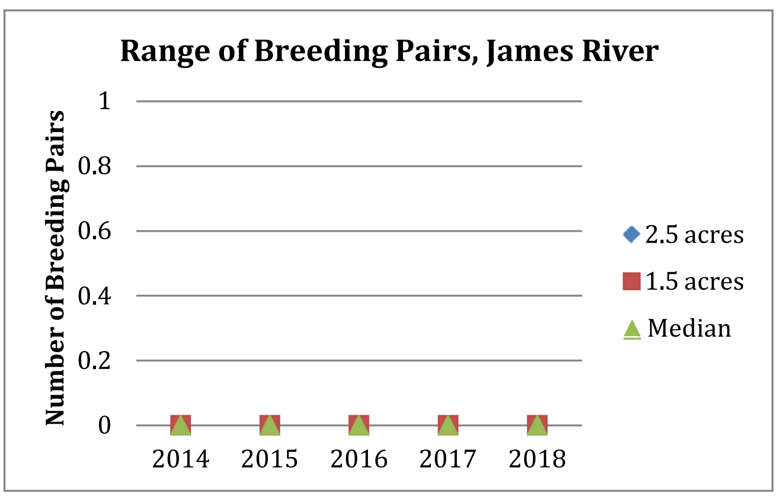


Figure 58: Potential Range of Breeding pairs at James River, 2014-2018

PUGET ISLAND (RM 44.0)

Similar to James River, Puget Island has not been surveyed for SHLA occupation, but it is assumed that SHLA are not present on site based on current agricultural land use activities associated with the area. Immediately following placement events at Puget Island in 2015 and 2018, the Corps will re-seed the entire site to promote a healthy vegetative cover to prevent wind erosion of placed sand onto adjacent agricultural lands. The landowner (independent of Corps action) may pasture cattle on site between placement events. It is assumed that habitat conditions would transition too quickly for suitable habitat to be maintained at Puget Island, in addition to the elevated levels of local disturbance from site maintenance and cattle. Furthermore, the Corps may plant trees and shrubs around the boundary of the site to reduce wind erosion of sediment following placement, precluding open habitat conditions favored by SHLA. For these reasons, no breeding SHLA are expected to occur at Puget Island throughout the 5-year placement plan (see Figure 59).

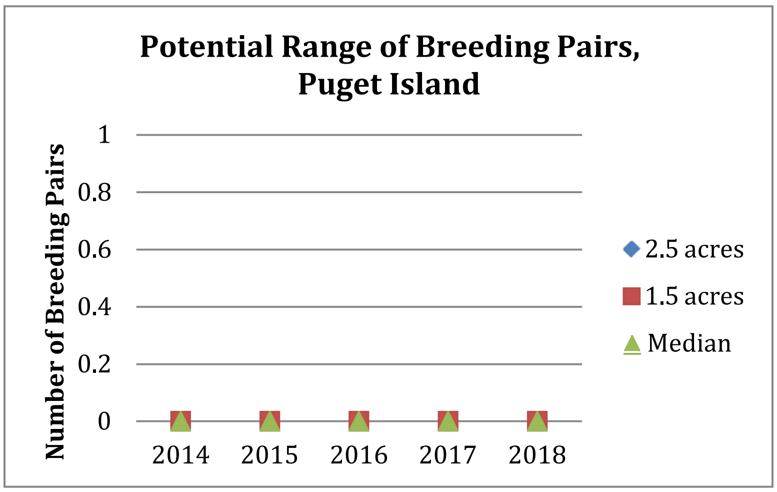


Figure 59: Potential Range of Breeding Pairs at Puget Island, 2014-2018

BROWN ISLAND (RM 46.3)

The majority of SHLA recently observed in Group III have been at Brown Island. In 2012 and 2013, 18 and 23 breeding pairs were observed on Brown Island, respectively, following post-breeding placement in 2011 over approximately 45 acres. Given that entire placement site is 102 acres with 45 acres unsuitable due to the 2011 placement, the Corps estimated that 27 acres were suitable in 2012, which is supported by aerial photography from that same year. Approximately 18 breeding pairs utilized the 27 acres of habitat in 2012, resulting in a territory size of approximately 1.5 acres in 2012. In 2013, 27 acres outside of the 2011 placement area were still suitable and the Corps assumes the entire 45-acre placement site from 2011 was suitable for nesting activities, providing 72 acres of suitable nesting habitat. With 72 acres potentially suitable for nesting, the 23 SHLA pairs observed by Anderson in 2013 may have nesting territories of two acres. This baseline is not expected to change in 2014.

Suitable habitat at Brown Island in 2015 is expected to decrease 70% from baseline conditions (72 acres to 21 acres following dredged material placement). This reduction in suitable nesting habitat may adversely impact nesting SHLA such that the remaining suitable habitat could only support 8 to 14 breeding pairs, which is 0 to 15 fewer pairs than nested in breeding years 2011 – 2013 and at least 50% fewer pairs than the estimated population (28 to 48 pairs in 2014) based on the availability of suitable habitat (see Figure 60).

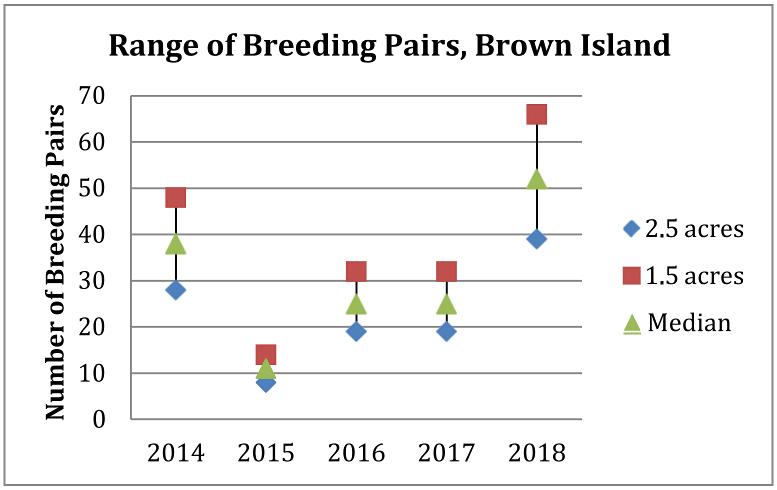


Figure 60: Potential Range of Breeding Pairs at Brown Island, 2014-2018

As mentioned in the discussion about Group III below, the Corps anticipates that SHLA would disperse to adjacent placement sites in 2015 when sufficient acres of suitable habitat are not available at Brown Island to support 20+ pairs of breeding birds. A sufficient quantity of suitable habitat will be available throughout Group III (primarily at Tenasillahe Island) to provide suitable nesting conditions for SHLA in any given year. Following the placement event in 2014, it is assumed that 49 acres of suitable habitat would be available in 2016 and 2017, and Brown Island could potentially support upwards of 19 to 32 breeding pairs. In 2018, following the placement activities in 2016, it is estimated that 99 acres of habitat will be suitable and this quantity of suitable nesting habitat could support 39 to 66 breeding pairs.

Group III

The extent of suitable habitat across Group III (Skamokawa-Vista Park, Welch and Tenasillahe Islands, James River, Puget and Brown Islands) is currently 85 acres and it is expected to increase by 65% to a total of 140 acres by 2018. Group III supports the second highest localized population of SHLA in the lower Columbia River, where 23 pairs were estimated to occupy Brown Island in 2013. The Corps discovered an active nest in 2012 and active nesting behavior in 2013 (nest not located) at Tenasillahe Island, during dredged material placement activities, but the fate of these nests is uncertain. Current conditions in Group III could support a breeding population between 32 and 55 breeding pairs in 2014, similarly demonstrating that more habitat is available than breeding birds are present to occupy nesting territories.

As shown is Figure 61, the availability of suitable habitat in Group III is lowest in 2015, and the estimated number of SHLA that could be supported is expected to range between 17 and 29 breeding pairs, which coincides with the current estimate of breeding pairs in this Group (23 birds in 2013, per Anderson 2013). As the amount of suitable habitat increases across Group III in 2016, 2017 and 2018, and it is estimated that the number of breeding pairs also increases, such that 55 to 93 pairs could potentially occupy nesting habitat across a broader range of placement sites within the Group III sites by 2018.

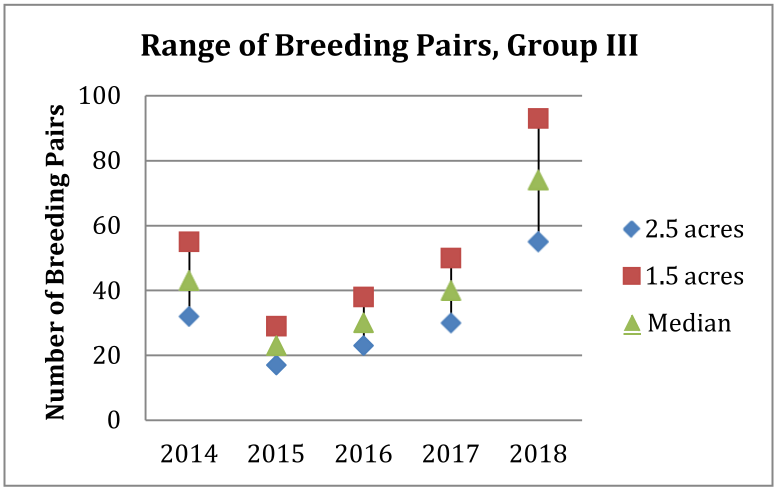


Figure 61: Potential Range of Breeding Pairs at Group III Sites, 2014-2018

<u>CRIMS ISLAND (RM 57.0)</u>

As shown in Figure 62, there are 25 acres of suitable habitat at Crims Island, which could support between 10 and 16 breeding pairs, assuming territories range between 1.5 and 2.5 acres. Surveys in 2011 detected seven breeding pairs of SHLA at Crims Island, and surveys in 2012 detected four pairs of birds (Anderson 2013). The number of breeding pairs declined between 2011 and 2013, even though suitable habitat conditions are assumed to have remained constant during this time. While only two pairs were detected in 2013, additional birds of unknown sex (perhaps females or additional paired males) were documented; this information suggests the number of birds was underestimated as a function of inadequacies in the survey protocol.

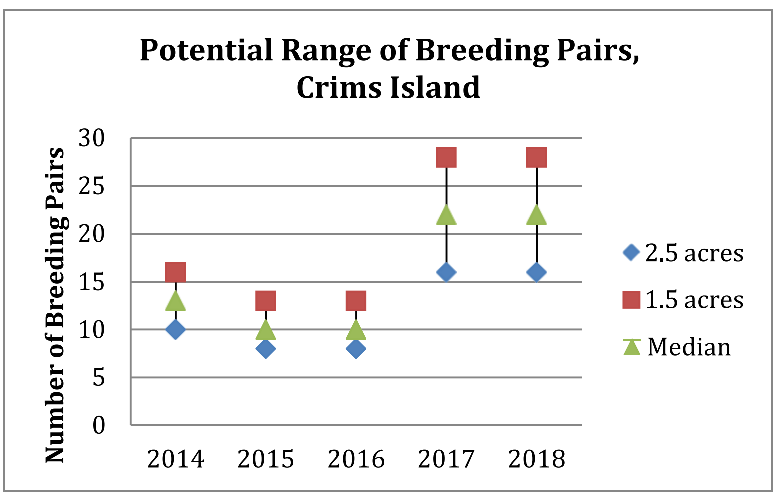


Figure 62: Potential Range of Breeding pairs at Crims Island, 2014-2018

A placement event in 2015 on Crims Island will cover five acres of suitable habitat, reducing the total habitat available for nesting SHLA to 20 acres in 2015 and 2016. However, 20 acres of suitable habitat are expected to support upwards of eight and 13 breeding pairs, which is more than the highest number of detections (7 pairs) in 2011. If some birds from Brown Island disperse onto Crims Island for nesting in 2015, it is assumed that sufficient habitat will be available to support some of these birds in both 2015 and 2016. As the 2015 placement event transitions into suitable conditions in 2017, the entire island will be suitable for nesting in 2017 and 2018, totaling 42 acres, and it is assumed this area could potentially support 16 to 28 breeding pairs of SHLA.

Hump Island (RM 59.7)

Hump Island has not been surveyed for SHLA and it is unknown if suitable habitat conditions exist; the Corps assumes no suitable habitat conditions are present on the island due to the presence of extensive vegetation via aerial photographs and therefore no nesting habitat exists for breeding SHLA (see Hump Island Figure in Appendix C). Placement over the entire 65-acre site is planned to occur in 2014, and a portion of this area would develop into suitable nesting habitat conditions in 2016 due to a second placement covering 48 acres in 2015. In 2016, approximately 17 acres are assumed to be suitable, which could support six to 11 breeding pairs in 2016 and 2017 (see Figure 63). The additional habitat from the 2015 placement event is expected transition into suitable habitat conditions in 2018, and the entire placement is expected to be suitable and could potentially support upwards of 26 to 43 breeding pairs of SHLA.

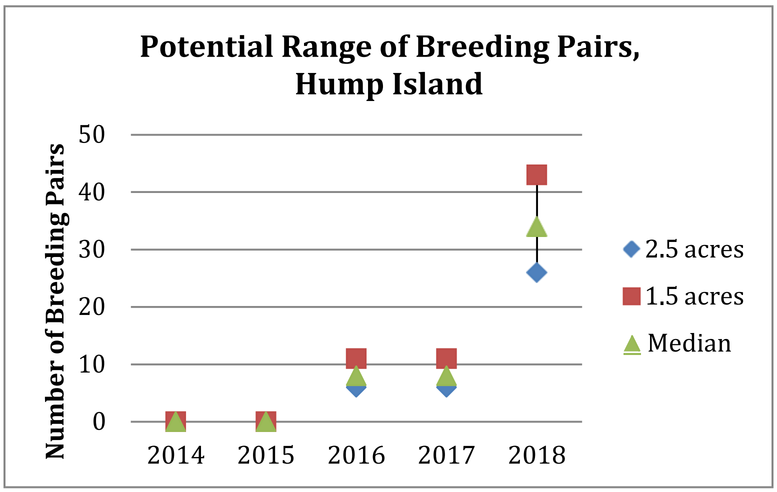


Figure 63: Potential Range of Breeding Pairs at Hump Island, 2014-2018

Lord Island – Upstream (RM 63.5)

Like Hump Island, Lord Island Upstream has not been surveyed from SHLA. However, unlike Hump Island, the Corps assumes that 10 acres of suitable habitat exist on the island, based on NDVI data, which could support four to six breeding pairs of SHLA. It is assumed that habitat conditions will remain constant through the 2016 nesting season. In 2017, the Corps plans to place dredged materials over 20 acres of the site, covering the 10 acres of suitable habitat. This placement event will eliminate all suitable nesting conditions at Lord Island in 2017 and 2018 (see Figure 64). If any breeding SHLA occupy this area between 2014 and 2016 when suitable conditions exist, it is assumed birds could disperse to adjacent sites (Hump Island and Howard Island) where suitable habitat conditions support nesting in 2017 and 2018.

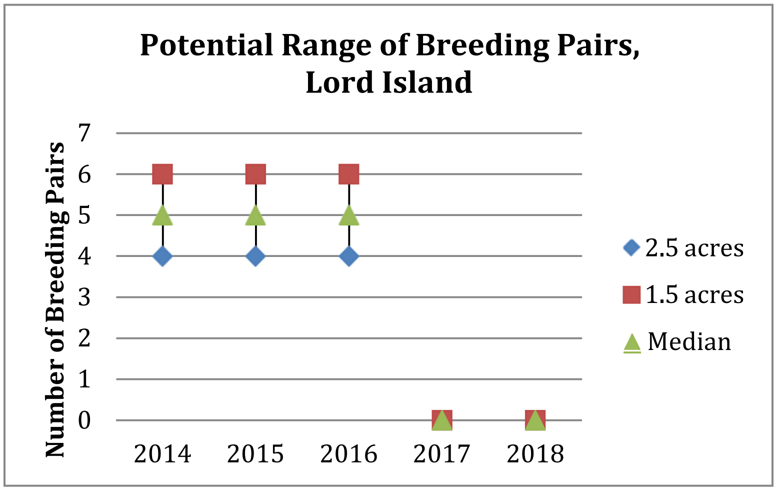


Figure 64: Potential Range of Breeding Pairs at Lord Island (upstream), 2014-2018

DIBBLEE POINT (RM 64.8)

Dibblee Point was surveyed for SHLA in 2013 and even though approximately one acre of suitable habitat was estimate per the 2011 NDVI data, no SHLA were detected. This placement site is an active borrow location where dredged materials are regularly removed for commercial purposes. It is assumed that the high anthropogenic use of this area precludes SHLA occupation of the site and no nesting habitat will be available over the course of this consultation. No placement events are planned for Dibblee Point during the 5-year placement plan described above and no SHLA would be affected at this location because none are assumed to be present (see Figure 65).

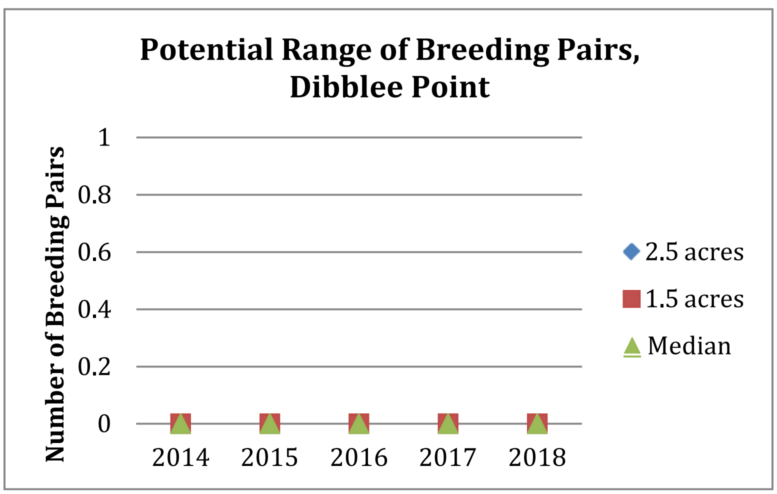


Figure 65: Potential Range of Breeding Pairs at Dibblee Point, 2014-2018

HOWARD ISLAND (RM 68.7)

Howard Island was not surveyed for SHLA in 2013, as much of the island is heavily vegetated. Of the 315 acres that make up the placement site, approximately five acres are currently suitable, based on NDVI data. If SHLA occupy Howard Island, it is assumed the current habitat conditions could support two to three breeding pairs (see Figure 66). In 2015, a 173-acre placement event will cover a portion of the island after the breeding season has ended and it is assumed that no suitable habitat conditions will be present on the island at the beginning of the breeding season in 2016, supporting no SHLA will nest on Howard Island. This placement event is then expected to rotate into suitable habitat at the onset of the 2017 breeding season, where 173 acres of suitable habitat could support 69 to 115 breeding pairs of SHLA if territory sizes range between 1.5 and 2.5 acres. Suitable habitat conditions are assumed to remain constant in 2017 and 2018, and therefore the number of breeding pairs that could be supported on the island would also remain constant.

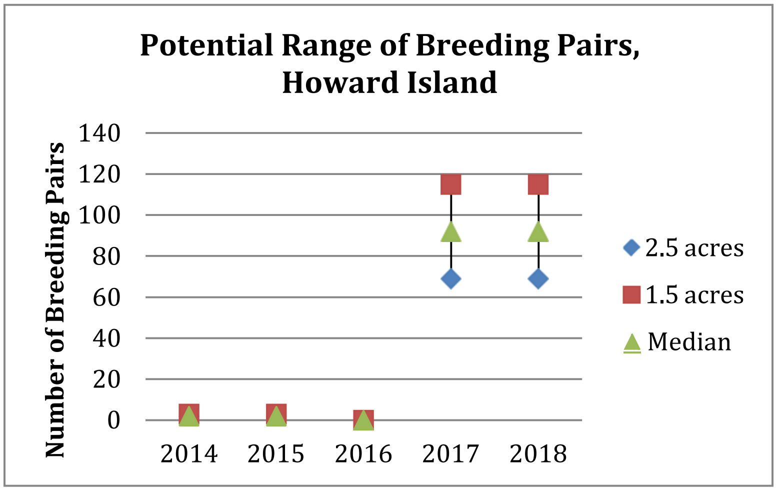


Figure 66: Potential Range of Breeding Pairs at Howard Island, 2014-2018

<u>COTTONWOOD ISLAND (RM 70.1)</u>

No SHLA have been observed at Cottonwood Island in recent years. The Corps does not anticipate that suitable habitat for breeding SHLA would develop at Cottonwood Island during the course of this consultation due to extensive vegetation surrounding the site that precludes an open view of the river and surrounding landscape. Therefore, no SHLA breeding pairs would be present during the nesting season because no suitable nesting habitat is available (see Figure 67).

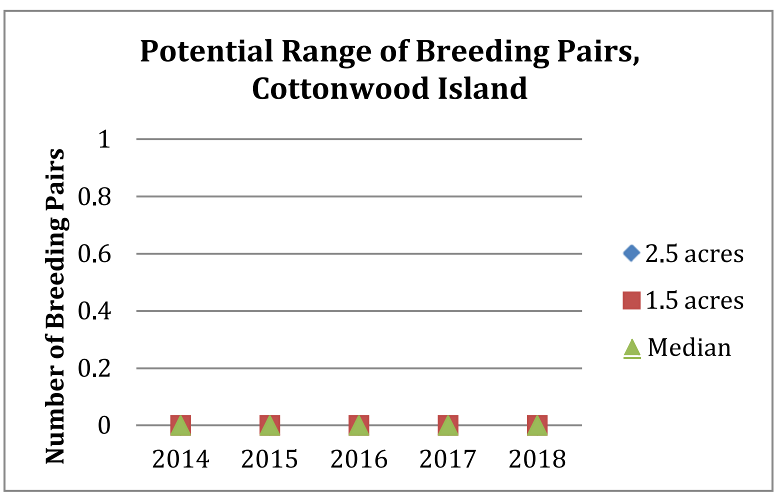


Figure 67: Potential Range of Breeding Pairs at Cottonwood Island, 2014-2018

NORTHPORT (RM 71.9)

Northport is designated as a borrow site, however commercial sand extraction has not occurred in recent years. Three pairs of SHLA were detected during annual surveys in 2013 (Anderson 2013). The NDVI baseline data estimates three acres of suitable habitat conditions were present at the site, which could support one to two breeding pairs under the assumption that territory sizes range between 1.5 and 2.5 acres. If three pairs nested at Northport in 2013, territory sizes would have been lower (1 to 1.5 acres) based on the estimated three acres of suitable habitat conditions present. Breeding behavior (singing males and female presence) was observed at Northport, and the presence of young-of-the-year juveniles indicate SHLA were nesting successfully at Northport.

Habitat conditions at Northport are expected to remain similar to current conditions until 2016, when habitat is expected to become too vegetated (greater than 50% cover) and conditions are no longer suitable for nesting by SHLA (see Figure 68). No placement of dredged materials by the Corps is planned to re-start vegetation succession at Northport during the five-year placement plan. If SHLA continue to occupy Northport and are present in 2016, it is assumed that birds would disperse to favorable nesting conditions on Howard Island in Group IV or Sandy Island in Group V, where suitable habitat is available in 2016 and 2017.

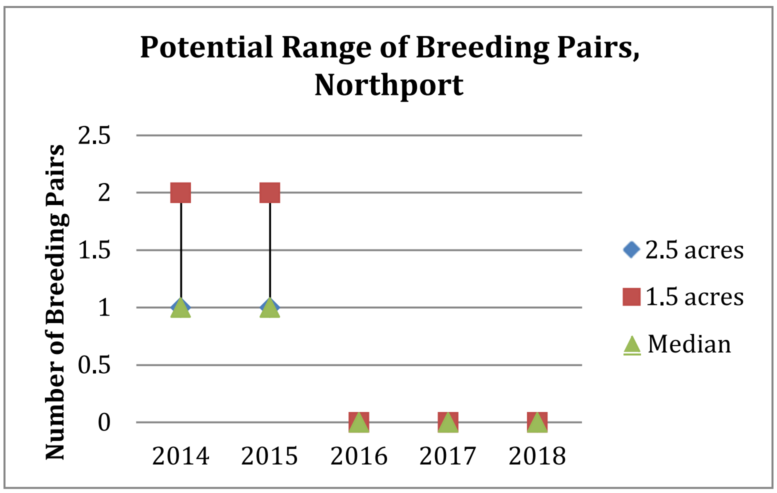


Figure 68: Potential Range of Breeding Pairs at Northport, 2014-2018

GROUP IV

Group IV (Crims, Hump, and Lord Islands, Dibblee Point, Howard and Cottonwood Islands, and Northport) have had comparatively low numbers of observed SHLA breeding pairs in recent years (Anderson 2013). Surveys only detected larks on Crims Island and Northport, where current suitable habitat conditions could potentially support upwards of 17 to 27 breeding pairs. Across the Group, suitable habitat is expected to increase from 43 acres in 2014 to 280 acres in 2018, following a substantial placement event at Howard Island in 2016. This increase in suitable habitat conditions could potentially support 111 to 186 breeding pairs of SHLA by 2018 (see Figure 69).

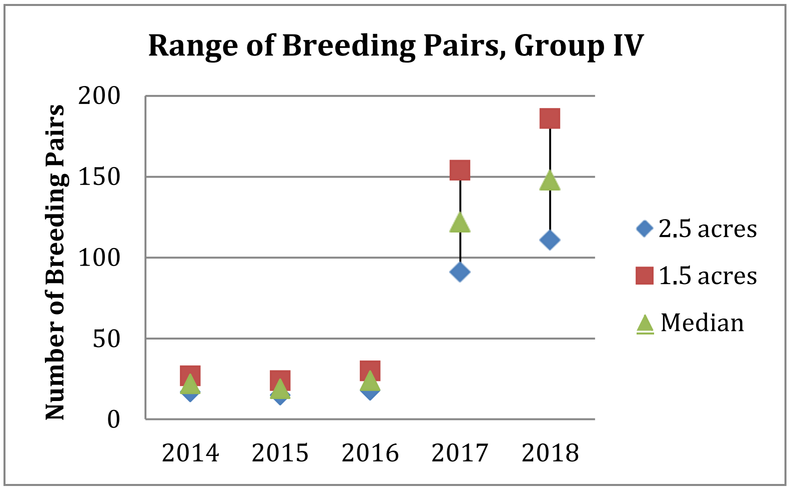


Figure 69: Potential Range of Breeding Pairs at Group IV Sites, 2014-2018

SANDY ISLAND (RM 75.8)

All 32 acres of the Sandy Island placement site is currently classified as suitable nesting habitat. In 2013, Anderson observed four pairs of SHLA in 2013, one pair in 2012, and two pairs in 2011 (2013). No placement events are planned during the 5-year placement plan and the entire island is expected to remain in suitable condition, potentially supporting a constant localized population of SHLA (see Figure 70). Suitable habitat is not expected to transition beyond suitable conditions (greater than 50% vegetation cover) until after 2018. Based on the assumptions regarding the range of territory size, Sandy Island could support between 12 and 21 breeding pairs in all years, providing sufficient space for the recently observed birds, and any offspring that return to their natal site for breeding.

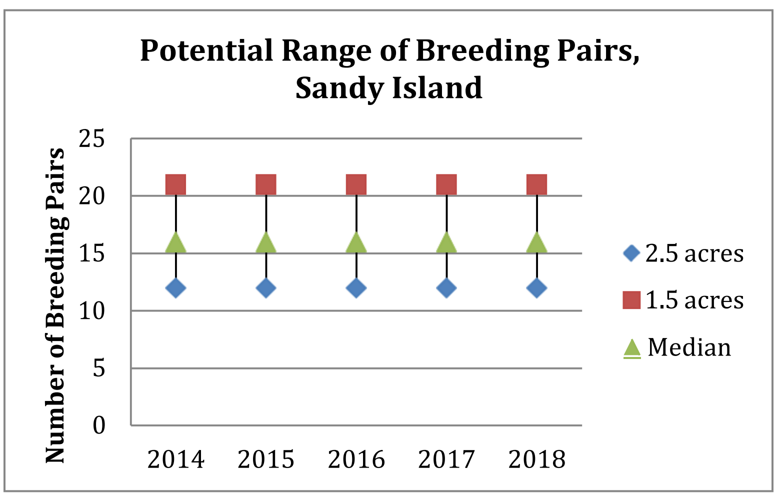


Figure 70: Potential Range of Breeding Pairs at Sandy Island, 2014-2018

LOWER DEER ISLAND (RM 77.0)

No SHLA have been observed at Lower Deer Island in recent years, and no suitable nesting habitat is currently available in the placement area. The 11-acre placement event in 2015 is assumed to trigger vegetation succession and suitable nesting habitat conditions will be present on the downstream portion of the island at the beginning of the second breeding season (2017). The 11 acres of then suitable habitat is expected to support between four and seven breeding pairs in 2017 (see Figure 71). Similarly, a 12-acre placement event on the upstream half of the site in 2016 will initiate vegetation succession that will transition into suitable nesting habitat in 2018. In 2018, 23 acres of suitable habitat could then support between nine and 15 breeding pairs of SHLA.

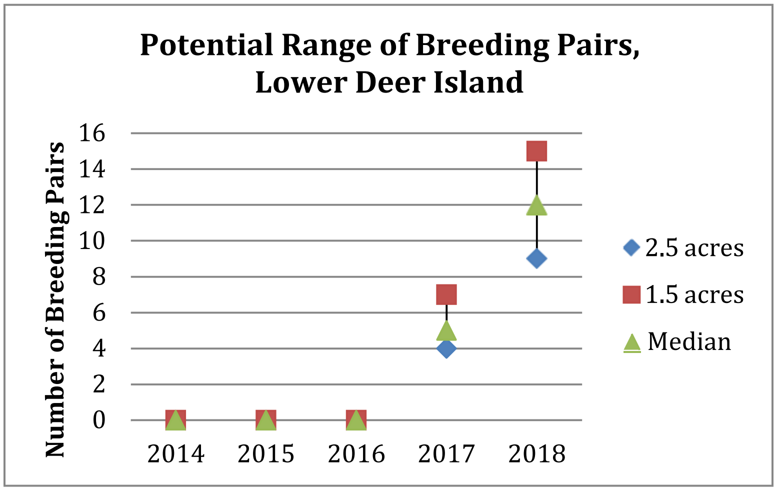


Figure 71: Potential Range of Breeding Pairs at Lower Deer Island, 2014-2018

<u>Martin Bar (RM 82.0)</u>

The Corps estimates that there is currently no suitable nesting habitat for breeding SHLA at Martin Bar and assumes that suitable nesting habitat would not develop during the course of this consultation due to the high level of human use and regular disturbance. It is therefore assumed that no SHLA would be present during the nesting season because no suitable habitat would support breeding activities (see Figure 72).

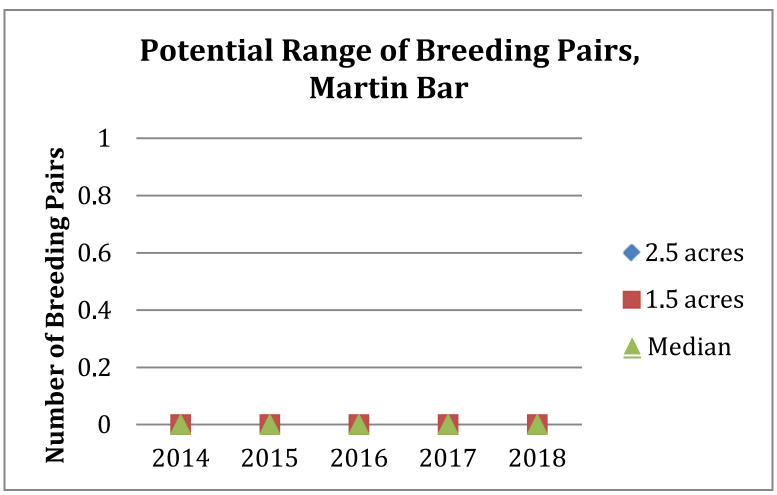


Figure 72: Potential Range of Breeding Pairs at Martin Bar, 2014-2018

<u>Sand Island (RM 86.2)</u>

Currently, there is one acre of suitable nesting habitat at Sand Island according to the 2011 NDVI habitat analysis, but no SHLA have been observed on this placement site. The amount of suitable habitat under baseline conditions is assumed to be too small to support breeding of SHLA. The placement events in 2015 and 2017 are shoreline placement events that will not affect the availability of suitable nesting habitat in upland areas, providing no habitat for breeding SHLA. As a result, no SHLA are assumed to be present at the site for the duration of the consultation because no suitable habitat occurs at the site (see Figure 73).

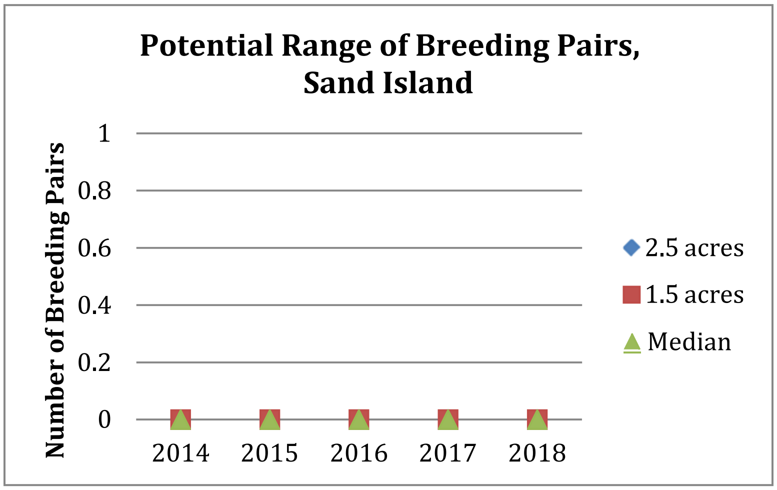


Figure 73: Potential Range of Breeding Pairs at Sand Island, 2014-2018

Austin Point (RM 86.5)

Similar to other sites that include commercial sand removal activities, the Corps does not anticipate that suitable habitat for breeding SHLA would develop at Austin Point during the course of this consultation. Due to the high level of human use and regular disturbance and it is therefore assumed that no SHLA would be present during the nesting season because no suitable habitat would be available (see Figure 74).

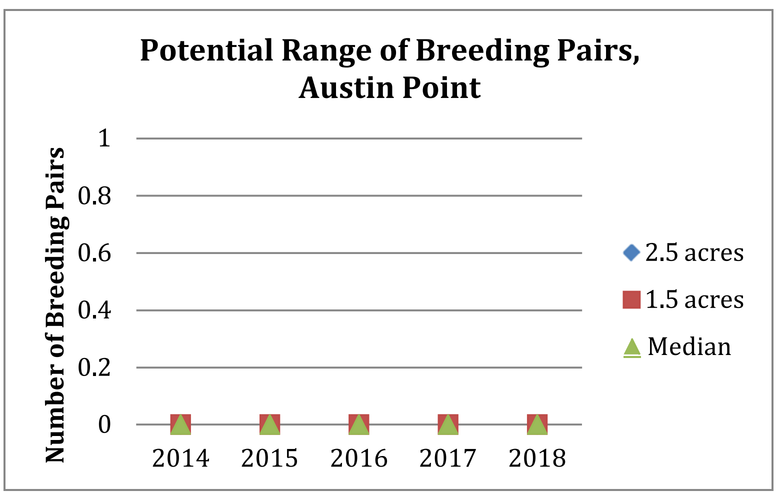


Figure 74: Potential Range of Breeding Pairs at Austin Point, 2014-2018

GROUP V

Group V (Sandy and Lower Deer Islands, Martin Bar, Sand Island and Austin Point) has also had relatively low numbers of observed SHLA breeding pairs in recent years (Anderson 2013). Only surveys at Sandy Island have detected nesting SHLA, where four pairs were observed in 2013. However, it should be noted that non-breeding larks were observed by Corps personnel during a pre-placement site survey at Austin Point in 2013. It is unknown if larks nested at Austin Point in 2013, or if these birds were juveniles dispersing from adjacent islands/sites after the breeding season ended.

Under current conditions, suitable nesting habitat in Group V only occurs at Sandy and Sand Islands, where 32 acres are suitable at Sandy Island and one acre is suitable as Sand Island. Together, the 33 acres of habitat could support between 12 and 21 breeding SHLA, which is at least 200% more pairs than the four observed pairs in recent years. Habitat conditions across Group V are expected to remain constant through 2017. Lower Deer Island will become suitable and the one acre at Sand Island is expected to succeed beyond suitable conditions and become unsuitable to nesting SHLA. In 2017, a total of 43 acres could support 16 to 28 breeding pairs, and in 2018, the extent of suitable nesting habitat is expected to further increase to 55 acres, which could support 21 to 36 breeding pairs of SHLA (see Figure 75).

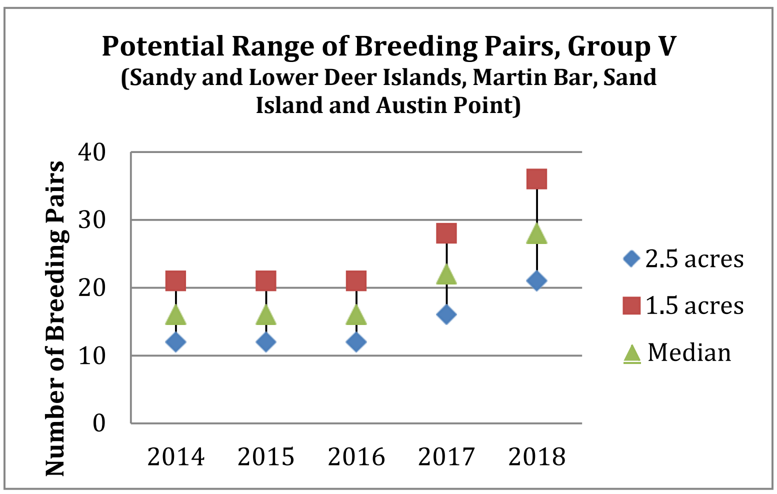


Figure 75: Potential Range of Breeding Pairs at Group V Sites, 2014-2018

POST-PLACEMENT MODIFICATIONS

As discussed above, all temporary equipment (weirs, outfall pipes, valves, etc.) is removed from a placement site following placement of dredged materials. In addition, any habitat modifications (grading, trenching, mounding) that is prescribed will be implemented immediately following placement of materials. The Corps anticipates direct effects to SHLA resulting from these actions to be negligible, as no birds are expected to be present in the placement footprint at the conclusion of a placement event.

Individuals in areas adjacent to the placement footprint (but outside of the placement boundary) are expected to experience similar effects to actions in the placement footprint, including flushing adults and/or young, increased exposure of individuals to weather and predation, nest abandonment and/or destruction. In addition, juveniles and young-of-the-year birds that move into the dredged material placement footprint are expected to have sufficient flight capabilities to flush from the area upon initiation of active material placement or other disturbances. If adults are repeatedly flushed from nests as a result of human disturbance during post-placement modifications, nest abandonment, increased predation of adults and nestlings, decreased foraging opportunities, and increased energetic expenditures could occur.

Similar to the indirect effects resulting from the placement of dredged materials and habitat succession, some post-placement actions are expected to result in beneficial effects to SHLA. Where settling ponds are left undisturbed, vegetation is expected to establish sooner and create suitable habitat conditions favored by SHLA for nesting. Conversely, topographic modifications and/or dissuasion materials may be installed to prevent SHLA use of an area where anthropogenic use could be detrimental to SHLA. In these instances, while the loss of potential habitat could adversely affect birds by reducing the amount of nest habitat, these dissuasion actions would reduce direct harm or mortality of individuals later in time.

MONITORING

Implementing the monitoring plan discussed above would likely result in effects similar to those described in the dissuasion and site preparation sections. Birds will likely be flushed inadvertently while walking transects through the placement site. However, personnel conducting the surveys are expected to be trained in field protocols to minimize any unnecessary flushing and disturbance associated with monitoring, particularly to adults on nests and especially when predators (gulls, crows, ravens, falcons, etc.) are present in the vicinity. It is also very unlikely that monitoring personnel would inadvertently injure or kill eggs or young during survey efforts. As a result, any adverse effects that may occur during the monitoring surveys are expected to be minor and temporary in nature, and are not expected to result in permanent effects to SHLA or their habitats.

EFFECTS OF THE ACTION ON CRITICAL HABITAT

The PCEs contain the physical and biological features essential to the conservation of the species. The PCEs of SHLA designated critical habitat include areas having a minimum of 16% bare ground with sparse, low-stature vegetation comprised primarily of grasses and forbs less than 13 inches in height. In addition, these features are found in flat areas (zero to five percent slope), are 300 acres in size or within a landscape context where ground-dwelling SHLA have visual access to open water or fields.

The placement of dredged materials, site preparation for the placement of dredged materials, and the dissuasion of SHLA from nesting within planned placement locations will physically alter suitable nesting habitat within designated critical habitat subunits. These alterations are described above in the Proposed Action and Effects sections for site preparation, upland placement of dredged materials, and dissuasion of SHLA. These actions are expected to temporarily alter the PCEs of designated critical habitat by removing vegetation, leveling sites, and installing visual deterrents to preclude SHLA from nesting in planned placement locations. In one to three years, the placement areas within critical habitat are expected to transition into suitable nesting habitat that represents the PCEs of critical habitat on these subunits. This will be a beneficial effect to critical habitat by increasing the amount of nesting habitat.

SUITABILITY OF CRITICAL HABITAT IN UNIT 3: WASHINGTON COAST AND COLUMBIA RIVER ISLANDS

Critical Habitat Unit 3 is previously described in the Status Critical Habitat section. It totals 2,899 acres. The acreage of suitable SHLA nesting habitat on the four Washington coast subunits in Unit 3 is not quantified. Therefore, it is not feasible to determine the total acreage of suitable SHLA nesting habitat within Unit 3 or the Washington coast subunits that is currently available and will be suitable through 2018. The Corps is able to collectively and individually estimate the availability of suitable SHLA nesting habitat for the lower Columbia River subunits from 2014 through 2018. The following narrative details the availability of suitable SHLA nesting habitat on designated critical habitat within the lower Columbia River collectively and individual subunits.

FIVE-YEAR DREDGED MATERIAL PLACEMENT PLAN ON SITES THAT OVERLAP WITH DESIGNATED CRITICAL HABITAT SUBUNITS

Of the 20 sites with planned placement in the next five years, seven (7) sites overlap with designated critical habitat subunits for SHLA: Rice Island, Miller Sands, Pillar Rock Island, Welch Island, Tenasillahe Island, Brown Island, and Crims Island. No placement is planned for the Sandy Island (RM 75.8) in the next five years; therefore, no placement will occur within the Sandy Island critical habitat subunit. For the seven placement sites that overlap with designated SHLA critical habitat and have planned placements of dredged materials in the next five years, only portions of each critical habitat subunit will be used in any given year, with the exception of Welch Island in 2015. In 2015, the entire 41-acre Welch Island site (RM 41) is planned for upland placement. However, only 37 acres of placement will overlap with the 43-acre Welch Island critical habitat subunit. Partial placements on all other critical habitat subunits will allow suitable breeding habitat to be available on each critical habitat subunit in every year. Placements of dredged material and availability of suitable SHLA nesting habitat on each designated critical habitat subunit in the Network are displayed on figures located in Appendix D.

Table 8 and the following discussion details the acreages of currently available suitable SHLA nesting habitat, placements of dredged material, regrading events, and the shifting mosaic of yet-to-be suitable to suitable to unsuitable SHLA nesting habitats on each of the designated critical habitat subunits that overlap with the Network from 2014 through 2018. The Wallace Island subunit is included even though it is not within the Corps Network, for reasons described in the following discussion. Figures for each subunit, placement event over the next five years, and suitable SHLA nesting conditions are located in Appendix D.

Table 8: Availability of Suitable Streaked Horned Lark Nesting Habitat within the Designated Critical Habitat Subunits of the Lower Columbia River (2014-2018)

Placement Site	Placement Site Acres	Placement Site Timing	Designated CH[2] Subunit Acres	Designated CH[2] DCH w/in Placement Site Acres	2014 Baseline Suitable CH[3] Acres	2014 Baseline Suitable CH[3] %	2014 Placement (acres)	2014 Suitable Affected Acres	2014 Suitable Affected %	2014 Yet-to-be Suitable Acres	2014 Yet-to-be Suitable %	2014 Suitable Remaining Acres	2014 Suitable Remaining %	2014 Unsuitable Habitat Acres	2014 Unsuitable Habitat %
Rice Island	264	*Post-breeding*	224	219	150	67%	52	28	13%	0	0%	150	67%	74	33%
Miller Sands	117	*During-breeding*	123	88	0	0%	5	0	0%	0	0%	0	0%	123	100%
Pillar Rock Island	52	*During-breeding*	44	41	4	9%	14	0	0%	0	0%	4	9%	40	91%
Group II Total	**433**		**391**	**348**	**154**	**39%**	**71**	**28**	**7%**	**0**	**0%**	**154**	**39%**	**237**	**61%**
Welch Island	41	*During-breeding*	43	37	10	23%	0	0	0%	0	0%	10	23%	33	77%
Tenasillahee Island	41	*During-breeding*	23	23	2.3	10%	2	0.3	1%	17	74%	2	9%	4	17%
Brown Island	102	*Post-breeding*	98	97	72	73%	68	51	52%	0	0%	72	73%	26	27%
Wallace Island[1]	0	*N/A*	13	N/A	3	23%	0	0	0	0	0	3	23%	10	77%
Group III Total	**184**		**177**	**157**	**87.3**	**49%**	**70**	**51.3**	**29%**	**17**	**10%**	**87**	**49%**	**73**	**41%**
Crims Island	59	*During-breeding*	60	53	25	42%	0	0	0%	0	0%	25	42%	35	58%
Group IV Total	**59**		**60**	**53**	**25**	**42%**	**0**	**0**	**0%**	**0**	**0%**	**25**	**42%**	**35**	**58%**
Sandy Island	32	*N/A*	37	32	32	86%	0	0	0%	0	0%	32	86%	5	14%
Group V Total	**32**		**37**	**32**	**32**	**86%**	**0**	**0**	**0%**	**0**	**0%**	**32**	**86%**	**5**	**14%**
Total Acres	*708*		***665***	*590*	***298***	***45%***	***141***	*79.3*	***12%***	***17***	***3%***	*298*	***45%***	***350***	***53%***

Placement Site	2015 Baseline Suitable CH[4] Acres	2015 Baseline Suitable CH[4] %	2015 Placement (acres)[3]	2015 Suitable Affected[4] Acres	2015 Suitable Affected[4] %	2015 Yet-to-be Suitable CH Acres	2015 Yet-to-be Suitable CH %	2015 Suitable CH Remaining Acres	2015 Suitable CH Remaining %	2015 Unsuitable Habitat Acres	2015 Unsuitable Habitat %
Rice Island	122	54%	0	0	0%	56	25%	122	54%	46	21%
Miller Sands	0	0%	14	0	0%	34	28%	0	0%	89	72%
Pillar Rock Island	4	9%	14	0	0%	0	0%	4	9%	40	91%
Group II Total	**126**	**32%**	**28**	**0**	**0%**	**90**	**23%**	**126**	**32%**	**175**	**45%**
Welch Island	10	23%	37	10	23%	0	0%	0	0%	43	100%
Tenasillahee Island	19	83%	0	0	0%	2	9%	19	83%	2	9%
Brown Island	21	21%	0	0	0%	68	69%	21	21%	9	9%
Wallace Island[1]	3	23%	0	0	0%	0	0%	3	23%	10	77%
Group III Total	**53**	**30%**	**37**	**10**	**6%**	**70**	**40%**	**43**	**24%**	**64**	**36%**
Crims Island	25	42%	20	5	8%	0	0%	20	33%	40	67%
Group IV Total	**25**	**42%**	**20**	**5**	**8%**	**0**	**0%**	**20**	**33%**	**40**	**67%**
Sandy Island	32	86%	0	0	0%	0	0%	32	86%	5	14%
Group V Total	**32**	**86%**	**0**	**0**	**0%**	**0**	**0%**	**32**	**86%**	**5**	**14%**
Total Acres	***236***	***35%***	*85*	*15*	*4%*	***160***	***24%***	***221***	***33%***	***284***	***43%***

Placement Site	2016 Baseline Suitable CH[2] Acres	2016 Baseline Suitable CH[2] %	2016 Placement (acres)[3]	2016 Suitable Affected[4] Acres	2016 Suitable Affected[4] %	2016 Yet-to-be Suitable CH Acres	2016 Yet-to-be Suitable CH %	2016 Suitable CH Remaining Acres	2016 Suitable CH Remaining %	2016 Unsuitable Habitat Acres	2016 Unsuitable Habitat %
Rice Island	122	54%	0	0	0%	56	25%	122	54%	46	21%
Miller Sands	0	0%	11	0	0%	34	28%	0	0%	89	72%
Pillar Rock Island	4	9%	14	0	0%	0	0%	4	9%	40	91%
Group II Total	**126**	**32%**	**25**	**0**	**0%**	**90**	**23%**	**126**	**32%**	**175**	**45%**
Welch Island	0	0%	0	0	0%	37	86%	0	0%	6	14%
Tenasillahee Island	21	91%	12	10	43%	0	0%	9	39%	14	61%
Brown Island	89	91%	50	50	51%	0	0%	39	40%	59	60%
Wallace Island[1]	3	23%	0%	0	0%	0	0%	3	23%	10	77%
Group III Total	**113**	**64%**	**62**	**60**	**34%**	**37**	**21%**	**51**	**29%**	**89**	**50%**
Crims Island	20	33%	0	0	0%	20	33%	20	33%	20	33%
Group IV Total	**20**	**33%**	**0**	**0**	**0%**	**20**	**33%**	**20**	**33%**	**20**	**33%**
Sandy Island	32	86%	0	0	0%	0	0%	32	86%	5	14%
Group V Total	**32**	**86%**	**0**	**0**	**0%**	**0**	**0%**	**32**	**86%**	**5**	**14%**
Total Acres	***291***	***44%***	*87*	*60*	***21%***	***147***	***22%***	***229***	***34%***	***289***	***43%***

Placement Site	2017 Baseline Suitable CH[2] Acres	2017 Baseline Suitable CH[2] %	2017 Placement (acres)[3]	2017 Suitable Affected[4] Acres	2017 Suitable Affected[4] %	2017 Yet-to-be Suitable CH Acres	2017 Yet-to-be Suitable CH %	2017 Suitable CH Remaining Acres	2017 Suitable CH Remaining %	2017 Unsuitable Habitat Acres	2017 Unsuitable Habitat %
Rice Island	122	54%	104	64	29%	56	25%	122	54%	46	21%
Miller Sands	0	0%	9	0	0%	34	28%	0	0%	89	72%
Pillar Rock Island	0	0%	14	0	0%	0	0%	0	0%	44	100%
Group II Total	**122**	**31%**	**127**	**64**	**16%**	**90**	**23%**	**122**	**31%**	**179**	**46%**
Welch Island	37	86%	20	20	47%	0	0%	17	40%	26	60%
Tenasillahee Island	9	39%	0	0	0%	12	52%	9	39%	2	9%
Brown Island	39	40%	0	0	0%	50	51%	39	40%	9	9%
Wallace Island[1]	3	23%	0	0	0%	0	0%	3	23%	10	77%
Group III Total	**88**	**50%**	**20**	**20**	**11%**	**62**	**35%**	**68**	**38%**	**47**	**27%**
Crims Island	20	33%	0	0	0%	0	0%	40	67%	20	33%
Group IV Total	**20**	**33%**	**0**	**0**	**0%**	**0**	**0%**	**40**	**67%**	**20**	**33%**
Sandy Island	32	86%	0	0	0%	0	0%	32	86%	5	14%
Group V Total	**32**	**86%**	**0**	**0**	**0%**	**0**	**0%**	**32**	**86%**	**5**	**14%**
Total Acres	***262***	***39%***	*147*	*84*	*29%*	***152***	***23%***	***262***	***39%***	***251***	***38%***

Placement Site	2018 Baseline Suitable CH[2] Acres	2018 Baseline Suitable CH[2] %	2018 Placement (acres)[3]	2018 Suitable Affected[4] Acres	2018 Suitable Affected[4] %	2018 Yet-to-be Suitable CH Acres	2018 Yet-to-be Suitable CH %	2018 Suitable CH Remaining Acres	2018 Suitable CH Remaining %	2018 Unsuitable Habitat Acres	2018 Unsuitable Habitat %
Rice Island	85	38%	4	4	2%	104	46%	85	38%	35	16%
Miller Sands	34	28%	9	0	0%	0	0%	34	28%	89	72%
Pillar Rock Island	0	0%	14	0	0%	13	30%	0	0%	31	70%
Group II Total	**119**	**30%**	**27**	**4**	**1%**	**117**	**30%**	**119**	**30%**	**155**	**40%**
Welch Island	17	40%	0	0	0%	20	47%	17	40%	6	14%
Tenasillahee Island	21	91%	2	2	9%	0	0%	19	83%	4	17%
Brown Island	89	91%	0	0	0%	0	0%	89	91%	9	9%
Wallace Island[1]	3	23%	0	0	0%	0	0%	3	23%	10	77%
Group III Total	**130**	**73%**	**2**	**2**	**1%**	**20**	**11%**	**128**	**72%**	**29**	**16%**
Crims Island	40	67%	0	0	0%	0	0%	40	67%	20	33%
Group IV Total	**40**	**67%**	**0**	**0**	**0%**	**0**	**0%**	**40**	**67%**	**20**	**33%**
Sandy Island	32	86%	0	0	0%	0	0%	32	86%	5	14%
Group V Total	**32**	**86%**	**0**	**0**	**0%**	**0**	**0%**	**32**	**86%**	**5**	**14%**
Total Acres	***321***	***48%***	*29*	*6*	*2%*	***137***	***21%***	***319***	***48%***	***209***	***31%***

[1] Wallace Island is not included in the placement network, and therefore will not be impacted by placement activities.

[2] All calculations for baseline suitable habitat, suitable habitat affected (by the placement event), and the suitable, yet-to-be, and unsuitable habitat represent the number of acres within the Critical Habitat subunit, not those acres within the placement site boundary.

[3] Baseline suitable habitat in 2014 equals the extent of habitat within the CH boundary which is suitable for SHLA at the beginning of the breeding season based on the best scientific information available (Anderson 2013). In addition, the area is calculated by subtracting a 25m buffer from the edge of shorelines, unsuitable vegetation (trees, shrubs). While larks are known to forage in these areas, they are not known to nest and breed in these areas.

[4] Baseline suitable habitat for 2015, 2016, 2017, and 2018 estimate suitable habitat within the CH boundary at the beginning of the breeding season. These values are assumed to equal the quantity of suitable habitat remaining from the preceding year plus any areas that become suitable from previous placement events. Where placement occurs after the breeding season, any loss of suitable habitat acres are not realized until the beginning of the following breeding season, and thus reflected in the baseline suitable conditions.

Network Wide-Designated Critical Habitat Suitability

Figure 76 below shows suitable SHLA nesting habitat on designated critical habitat subunits throughout the Network during to the 5-year placement plan, as detailed in Table 8. Suitable nesting habitat for SHLA typically contains all the PCEs of SHLA designated critical habitat. However, designated SHLA critical habitat is not always suitable for nesting because of natural vegetative succession both within and adjacent to specific subunits. A total of 665 acres of critical habitat are designated across the lower Columbia River, but only 590 acres of critical habitat overlap with the Corps dredged material placement Network. The remaining 75 acres of critical habitat in the lower Columbia River consist of the 13-acre Wallace Island subunit and numerous small areas adjacent to the Corps' site boundary that are open water, vegetated land, shorelines, or wetlands.

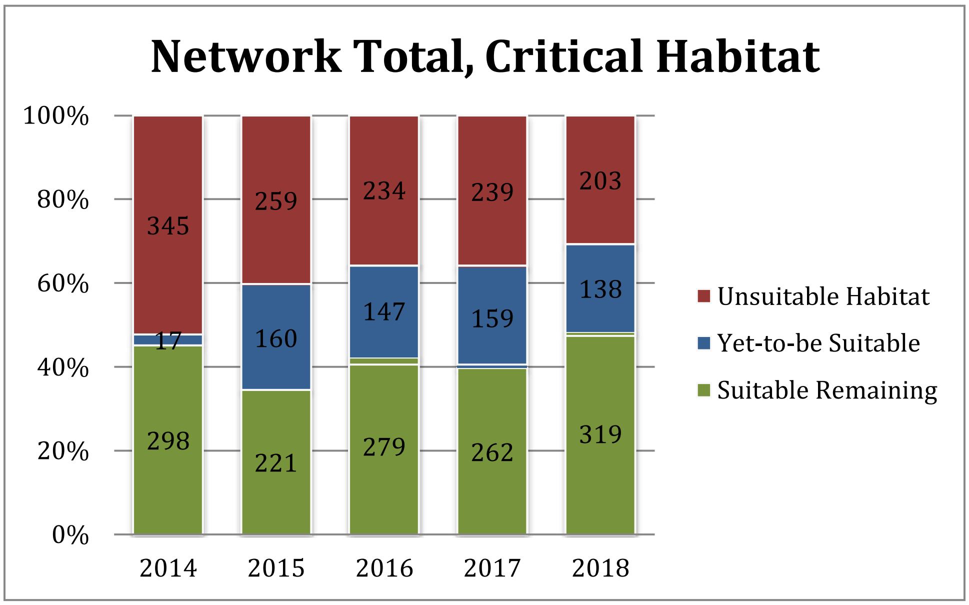


Figure 76: Availability of SHLA Nesting Habitat within Designated Critical Habitat across the Network including Wallace Island, 2014-2018

The Wallace Island critical habitat subunit is not in the Corps dredged material placement Network and no Corps placement will occur on Wallace Island. However, the 13-acre subunit is included in this discussion because it is within the same geographic reach of the lower Columbia River as the Corps' Network, it has been surveyed recently for breeding pairs, and it has been evaluated for suitable SHLA nesting habitat using the 2011 NDVI data. Therefore, this discussion will provide a more complete analysis of the availability of suitable SHLA nesting habitat within designated critical habitat on the lower Columbia River.

The 665 acres of designated critical habitat are categorized as suitable habitat (contains the PCEs of critical habitat), yet-to-be suitable habitat, or unsuitable habitat based on the assumptions previously discussed. Based on the 2011 NDVI habitat data, Corps placement events in 2011, 2012, 2013, and placement events during the 2014 nesting season, the Corps anticipates there will be 298 acres (45% of 665 acres) of suitable SHLA nesting habitat available within the designated critical habitat sub-units on the lower Columbia River for the nesting season in 2014. Following the placements in 2014, the suitable acreage of designated critical habitat will initially experience a

26% reduction (loss of 77 acres) of suitable SHLA nesting habitat to a low of 221 acres in 2015. The acreage of suitable nesting habitat available within designated critical habitat increases by 8 acres (4% of 221 acres) to 229 acres in 2016 due to placement of dredged materials and vegetation succession. The acreage of suitable nesting habitat available within designated critical habitat decreases 33 acres (14% of 229 acres) to 262 acres in 2017 due to placement of dredged materials and vegetation succession. The acreage of suitable nesting habitat available within designated critical habitat increases 57 acres (22% of 262 acres) to 319 acres in 2018 due to placement of dredged materials and vegetation succession. Overall, suitable SHLA nesting habitat within designated critical habitat will increase to 107% of the 2014 baseline conditions (298 acres) for the nesting season (319 acres) in 2018. Thereby, the proposed action will result in an increase of suitable nesting habitat containing the PCEs of critical habitat that will allow for further conservation and recovery of the species.

RICE ISLAND SUBUNIT

The Rice Island subunit is 224 acres, but only 219 acres are within the Corps placement site. Upland placement events on the Rice Island critical habitat subunit occur late in the summer, after the SHLA nesting season ends in mid-August/early-September. Therefore, placement actions on Rice Island are not expected to alter critical habitat during the year of dredged material placement. This subunit is within the Corps' Group II.

In 2014, the baseline of suitable breeding habitat within the 224-acre subunit is 150 acres with the remaining 74 acres of the site as unsuitable. The 2014 placement events will occur after the breeding season has ended and will cover 52 acres of critical habitat currently classified as a suitable (28 acres) and unsuitable (24 acres) conditions. The placement events will occur in two locations on the subunit: (1) on the downstream end of the island which is currently covered by short vegetation, and (2) along a strip of low-ground in the interior portion of the island. In addition to the placement of dredged materials, four acres on the upstream end of the subunit, which was trenched following placement activities in September 2013, will be smoothed out after the 2014 breeding season. This regraded area will develop into suitable breeding habitat in 2018.

Approximately 122 acres will remain in suitable nesting conditions within the subunit for the SHLA breeding season in 2015. No placement will occur in 2015 on the Rice Island subunit and therefore no designated critical habitat will be affected. The 56 acres covered by the 2014 placements and regrading work are expected to be mostly bare sand for the duration of 2015. Therefore, the 56 acres of yet-to-be suitable habitat do not possess the PCEs. All remaining areas (46 acres) of the subunit are considered unsuitable as breeding habitat in 2015 and do not possess the PCEs.

No placement will occur in 2016 on the Rice Island subunit, and therefore no designated critical habitat will be affected. Approximately 122 acres are available SHLA nesting habitat, possessing the PCEs. The areas covered by the 2014 placement events (56 acres total) will be yet-to-be suitable habitat and the remaining 46 acres are unsuitable.

Approximately 122 acres will be available as suitable nesting habitat on the Rice Island subunit in the 2017 breeding season. The 56 acres of yet-to-be suitable habitat from the 2014 re-grading and placement activities will be in the third year of vegetation succession and the remaining 46 acres of the site are still expected to unsuitable nesting habitat. The placement event in 2017 will cover approximately 104 acres in the center of the island after the breeding season, whereupon 64 acres of suitable habitat and 27 acres of yet-to-be suitable habitat would be lost to nesting SHLA in the following breeding season.

Approximately 85 acres will be suitable nesting habitat on the Rice Island subunit in the 2018 breeding season. The change is due to the loss of 64 acres of suitable habitat by the placement event in 2017 and the addition of the remaining 27 acres from the 2014 placement and regraded areas that were yet-to-be suitable becoming suitable in 2018. The 104-acre placement event in 2017 is yet-to-be suitable habitat and the remaining 35 acres are expected to remain unsuitable in 2018. A 2018 placement event will cover approximately four acres at the upstream end of the subunit after the breeding season, resulting in a loss of four acres of suitable breeding habitat in the subsequent three years on the Rice Island subunit. These four acres had recently transitioned into viable nesting habitat from the 2014 re-grading event. The four-acre placement event will increase the acreage of yet-to-be suitable habitat in subsequent three years.

In summary, placement will occur in three of the five years on the Rice Island subunit resulting in a loss of suitable habitat from 150 acres to 122, a gain of yet-to-be suitable habitat from 0 acres to 104 acres, and a loss of unsuitable habitat from 74 acres to 35 acres. Figure 77 displays the availability of suitable SHLA nesting habitat containing the PCEs of critical habitat over the next five years on the Rice Island subunit.

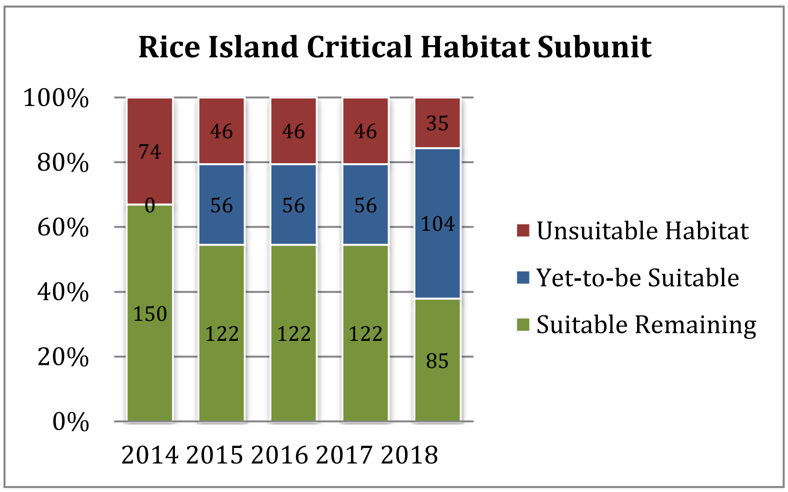


Figure 77: Availability of SHLA Nesting Habitat on the Rice Island Critical Habitat Subunit, 2014-2018

MILLER SANDS ISLAND SUBUNIT

The Miller Sands critical habitat subunit is 123 acres, but only 88 acres overlap with the Corps placement site. Shoreline placements occur during the SHLA nesting season and are not expected to affect critical habitat PCEs. Shoreline placements on Miller Sands are not expected to typically develop into the PCEs (suitable SHLA nesting habitat) of critical habitat because the placements are expected to erode away in subsequent years. The Miller Sands subunit is within the Corps' Group II.

In 2014, the baseline of suitable breeding habitat is zero (0) acres due to the succession of vegetation on the Miller Sands subunit. The entire 123-acre subunit are considered unsuitable and do not possess the PCEs of critical habitat. In 2014, a five-acre shoreline placement will occur during the breeding season on the upstream tip of the subunit. In addition to the shoreline placement, 34 acres on the middle of the island will be smoothed during the 2014 breeding season. This area was previously mounded to dissuade tern and cormorant use. This regraded area is expected to develop PCEs and become suitable SHLA breeding habitat in 2018.

No suitable SHLA nesting conditions will be present on the Miller Sands subunit in 2015. The 34-acre regraded mound area is expected to be yet-to-be suitable habitat and does not possess the PCEs of critical habitat. All remaining areas (89 acres), including the prior shoreline placement, are considered unsuitable 2015. A 14-acre shoreline placement will occur on the mid-downstream portion of the subunit, during the 2015 breeding season.

No suitable SHLA nesting conditions will be present on the Miller Sands subunit in 2016. The 34-acre re-graded mound area is expected to be in its second year of yet-to-be suitable habitat and does not possess the PCEs of critical habitat. All remaining areas (89 acres), including the prior shoreline placements, are considered unsuitable in 2016. An 11-acre shoreline placement will occur on two downstream portions of the subunit, during the 2016 breeding season.

No suitable SHLA nesting conditions will be present on the Miller Sands subunit in 2017. The 34-acre re-graded mound area is expected to be in its third year of yet-to-be suitable habitat and does not possess the PCEs of critical habitat. All remaining areas (89 acres), including the prior shoreline placements, are considered unsuitable as breeding habitat in 2017. A nine-acre shoreline placement will occur where necessary to repair erosion, during the 2017 breeding season.

Approximately 34 acres will be develop PCEs of critical habitat and will be available as suitable SHLA nesting habitat on the Miller Sands subunit in the 2018. The 34 acres are the regraded mound area from 2014. All remaining areas (89 acres), including the prior shoreline placements, are considered unsuitable as breeding habitat in 2018. A nine-acre shoreline placement will occur where necessary to repair erosion, during the 2018 breeding season.

In summary, shoreline placement will occur each year on the Miller Sands subunit but will not affect the PCEs of critical habitat. The 2014 regrading event will result in 34 acres developing the PCEs of critical habitat by 2018. By 2018, unsuitable habitat will decrease from 123 acres in 2014 to 89 acres. No yet-to-be suitable habitat will be on the site in 2018. Figure 78 displays the availability of suitable SHLA nesting habitat containing the PCEs of critical habitat over the next five years on the Miller Sands Critical Habitat subunit.

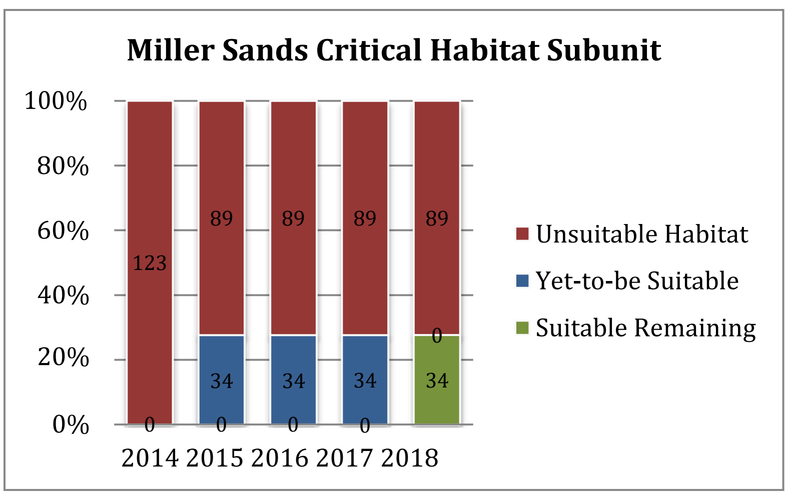


Figure 78: Availability of SHLA Nesting Habitat on the Miller Sands Critical Habitat Subunit, 2014-2018

PILLAR ROCK ISLAND SUBUNIT

The Pillar Rock Island critical habitat subunit is 44 acres, but only 41 acres overlap with the Corps placement site. Both shoreline and upland placement events on the subunit occur during the SHLA nesting season. Shoreline placements are not expected to affect critical habitat PCEs or to typically develop into the PCEs (suitable SHLA nesting habitat) of critical habitat because the placements are expected to erode away in subsequent years. Upland placement will require early season site preparation activities that will include vegetation removal and dissuasion techniques to preclude

SHLA nesting in planned upland placement locations. Upland placement could result in the loss of habitat containing the PCEs of critical habitat if suitable habitat is lost. However, no suitable habitat will be lost on the Pillar Rock Island subunit due to upland placement. The Pillar Rock Island subunit is within Corps' Group II.

In 2014, the baseline of suitable SHLA breeding habitat containing the PCEs is four acres due to the succession of vegetation and active erosion of the Pillar Rock Island subunit. The remaining 40 acres of the subunit are considered unsuitable and do not possess PCEs. In 2014, a 14-acre shoreline placement will occur on the northern portion to rebuild the shore. The 2014 shoreline placement event will occur during the breeding season.

In 2015, the baseline of suitable SHLA breeding habitat containing the PCEs is four acres. The remaining 40 acres of the subunit are considered unsuitable and do not possess PCEs. In 2015, a 14-acre shoreline placement will occur on the northern portion to rebuild the shore. The 2015 shoreline placement event will occur during the breeding season.

In 2016, the baseline of suitable SHLA breeding habitat containing PCEs is four acres. The remaining 40 acres of the subunit are considered unsuitable and do not possess PCEs. In 2016, a 14-acre shoreline placement will occur on the northern portion to rebuild the shore. The 2016 shoreline placement event will occur during the breeding season on the shore.

No habitat possessing the PCEs of critical habitat (suitable SHLA nesting habitat) will be present on the Pillar Rock Island subunit in 2017 due to the succession of vegetation since the upland placement last occurred in 2001, 15 years prior. A 14-acre placement will occur during the breeding season in 2017 on the subunit. Approximately one acre will be shoreline placement to maintain the shore and the other 13 acres will be placed in uplands that had vegetation removed and SHLA dissuasion techniques installed in the early spring. The entire 44-acre subunit is considered unsuitable for SHLA nesting in 2017.

No habitat possessing the PCEs of critical habitat (suitable SHLA nesting habitat) will be present on the Pillar Rock Island subunit in 2018. Approximately 13 acres of yet-to-be suitable habitat is expected from the 2017 upland placement. The remaining 31 acres of the subunit are considered unsuitable 2018. A 14-acre placement will occur during the breeding season in 2018 on the Pillar Rock Island subunit. Approximately one acre will be shoreline placement to maintain the shore and the other 13 acres will be placed in uplands that had vegetation removed and SHLA dissuasion techniques installed in the early spring. The 13-acre upland placement in 2018 will not overlap with the 2017 upland placement.

In summary, shoreline placement will occur each year on the Pillar Rock Island subunit but will not affect the PCEs of critical habitat. Upland placement will occur in 2017 and 2018, but no critical habitat containing PCEs will be affected because the subunit will become too vegetated in 2017. By 2018, upland placement will result in a gain of yet-to-be suitable habitat from 0 acres to 13 acres and a loss of unsuitable habitat from 44 acres to 31 acres. Figure 79 displays the suitability of SHLA nesting habitat containing the PCEs of critical habitat over the next five years on the Pillar Rock Island Critical Habitat subunit.

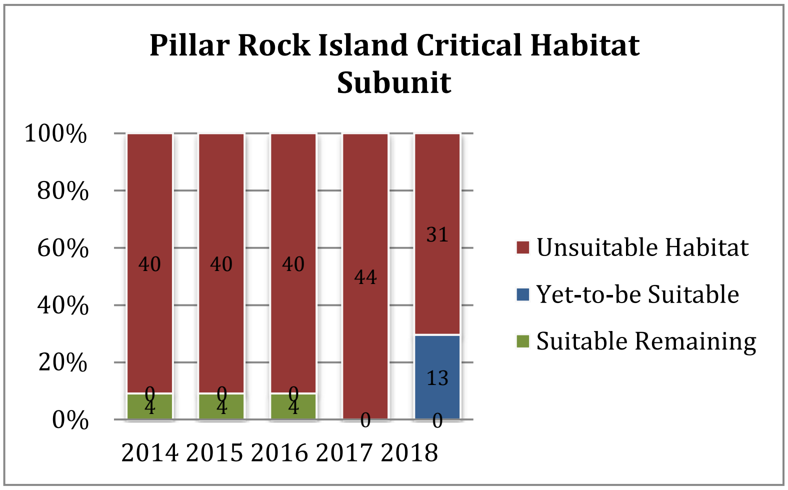


Figure 79: Availability of SHLA Nesting Habitat on the Pillar Rock Island Critical Habitat Subunit, 2014-2018

WELCH ISLAND SUBUNIT

The Welch Rock Island critical habitat subunit is 43 acres, but only 37 acres overlap with the Corps placement site. Placement events on the Welch Island critical habitat subunit occur in the summer, during the SHLA nesting season. Upland placement will require early season site preparation activities that will include vegetation removal and dissuasion techniques to preclude SHLA nesting in planned upland placement locations. Upland placement could result in the loss of habitat containing the PCEs of critical habitat if suitable habitat is lost. The Welch Island subunit is within Corps' Group III.

In 2014, the baseline of suitable SHLA breeding habitat containing critical habitat PCEs is 10 acres with the remaining 33 acres of the subunit as unsuitable habitat. No placements are planned in 2014 and critical habitat will not be affected.

In 2015, the baseline of suitable SHLA breeding habitat is 10 acres. However, the 37 acres of the subunit will used for upland placement during the breeding season resulting is a loss of 10 acres of suitable habitat containing the PCEs of critical habitat. Therefore, the entire 43-acre subunit would be unsuitable for SHLA nesting in 2015.

In 2016, no habitat containing the PCEs of critical habitat (suitable SHLA breeding habitat) will be available on the subunit. The 37-acre placement event from 2015 is classified as yet-to-be suitable and the remaining six acres of subunit are unsuitable and do not possess the PCEs of critical habitat. No placement is planned in 2016 and critical habitat will not be affected.

In 2017, the baseline of habitat containing the PCEs of critical habitat (suitable SHLA nesting habitat) is 17 acres. This increase is due to 37 acres of yet-to-be suitable habitat transitioning into suitable SHLA nesting habitat and a 20-acre placement during the breeding season on the upstream portion of the subunit. The remaining 26 acres of the subunit will be unsuitable habitat and do not possess the PCEs of critical habitat.

In 2018, the baseline of habitat containing the PCEs of critical habitat (suitable SHLA nesting habitat) is 17 acres. Approximately 20 acres of yet-to-be suitable habitat from the 2017 upland placement and the remaining six acres of the subunit will be unsuitable habitat and do not possess the PCEs of critical habitat. No placement is planned in 2018 and critical habitat will not be affected.

In summary, placement will occur in two of the five years on the Welch Island subunit resulting in a gain of suitable habitat from 10 acres to 17 acres, a gain of yet-to-be suitable habitat from 0 acres to 20 acres, and a loss of unsuitable habitat from 33 acres to six acres. Figure 80 displays the availability of suitable SHLA nesting habitat containing the PCEs of critical habitat over the next five years on the Welch Island subunit.

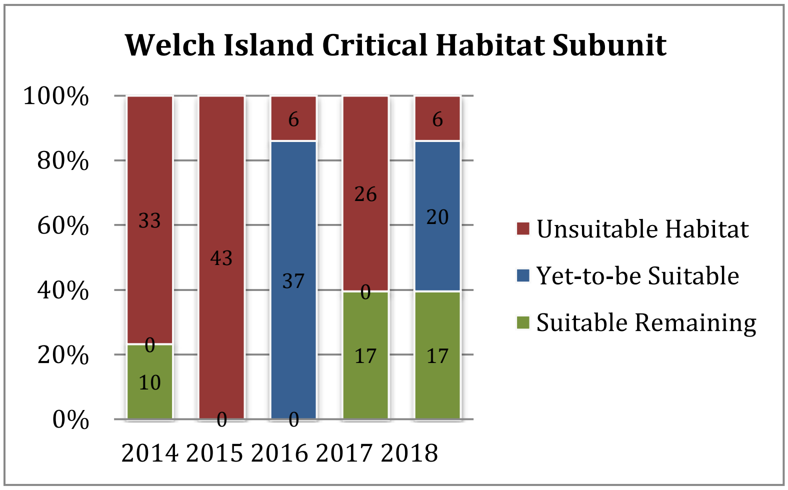


Figure 80: Availability of SHLA Nesting Habitat on the Welch Island Critical Habitat Subunit, 2014-2018

<u>TENASILLAHE ISLAND SUBUNIT</u>

The Tenasillahe Island critical habitat subunit is 23 acres and all 23 acres overlap with the Corps placement site. Upland placement events on the 23-acre Tenasillahe Island critical habitat subunit occur in the summer, during the SHLA nesting season. Upland placement will require early season site preparation activities that will include vegetation removal and dissuasion techniques to preclude SHLA nesting in planned upland placement locations. Upland placement could result in the loss of habitat containing the PCEs of critical habitat if suitable habitat is lost. The Tenasillahe Island subunit is within the Corps' Group III.

In 2014, a two-acre placement is planned during the breeding season on the downstream portion of the subunit, resulting in a loss of approximately 0.3 acre of habitat containing the PCEs of critical habitat (suitable SHLA nesting habitat). Therefore, the baseline of suitable SHLA breeding habitat in 2014 is two acres on the subunit. Approximately 17 acres of yet-to-be suitable habitat are anticipated due to placements in 2012 and 2013 and approximately four acres on the subunit is unsuitable and do not contain the PCEs of critical habitat.

In 2015, the baseline of suitable SHLA breeding habitat containing PCEs is 19 acres because the 17 acres of placement in 2013 have become suitable habitat. The two-acre placement in 2014 is classified as yet-to-be suitable in 2015 with the remaining two acres as unsuitable habitat on the subunit. No placement is planned in 2015 and critical habitat will not be affected.

In 2016, a 12-acre placement is planned during the breeding season on the downstream portion of the subunit, resulting in a loss of 10 acres of suitable nesting habitat that possess the PCEs of critical habitat. Therefore, the baseline of habitat containing PCEs (suitable SHLA nesting habitat) on the subunit in 2016 is nine acres. The remaining 14 acres are unsuitable habitat.

In 2017, the baseline of habitat containing PCEs (suitable SHLA breeding habitat) on the subunit is nine acres. The 12-acre placement area from 2016 is yet-to-be suitable habitat and the remaining two acres of the site is unsuitable habitat. No placement is planned in 2017 and critical habitat will not be affected.

In 2018, the baseline of habitat containing PCEs (suitable SHLA nesting habitat) on the subunit is 19 acres. A two-acre placement is planned during the breeding season on the downstream portion the subunit, preventing two acres of suitable SHLA nesting habitat developing from the 12-acre placement event in 2016. However, there will be a net gain of 10 acres of suitable habitat. The remaining four acres are considered unsuitable habitat.

In summary, placement will occur in three of the five years on the Tenasillahe Island subunit resulting in a gain of suitable habitat from two acres to 19 acres, a loss of yet-to-be suitable habitat from 17 acres to 0 acres, and no change in unsuitable habitat (4 acres). Figure 81 displays the availability of suitable SHLA nesting habitat containing the PCEs of critical habitat over the next five years on the Tenasillahe Island subunit.

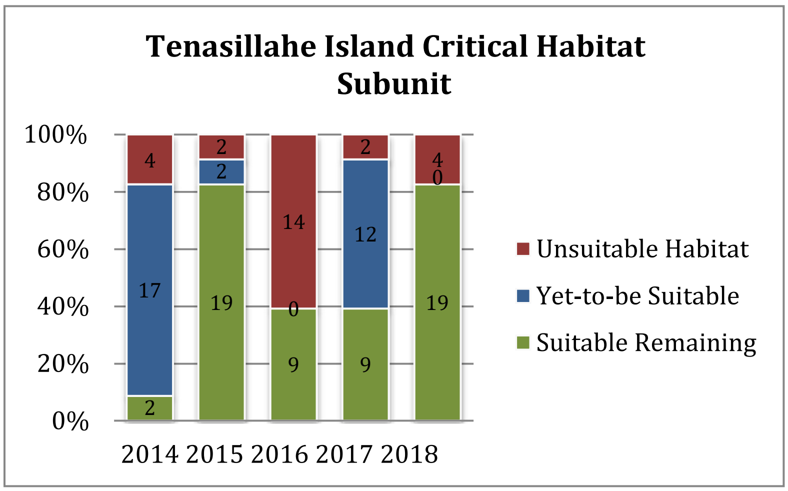


Figure 81: Availability of SHLA Nesting Habitat on the Tenasillahe Island Critical Habitat Subunit, 2014-2018

BROWN ISLAND SUBUNIT

The Brown Island critical habitat subunit is 98 acres, but only 97 acres overlap with the Corps placement site. Upland placement events on the Brown Island Critical Habitat subunit typically occur in the summer, during the SHLA nesting season. Upland placement will require early season site preparation activities that will include vegetation removal and dissuasion techniques to preclude SHLA nesting in planned upland placement locations. Upland placement could result in the loss of habitat containing the PCEs of critical habitat if suitable habitat is lost. Placement actions after the breeding season are not expected to alter critical habitat during the year of dredged material placement. The Brown Island subunit is within the Corps' Group III.

In 2014, the baseline of habitat containing PCEs (suitable breeding habitat) on the subunit is 72 acres due to placement activities in 2011. The remaining 26 acres of the subunit are unsuitable during the nesting season. A 68-acre placement is planned after the nesting season, resulting is a loss of 51 acres of suitable nesting habitat (PCEs) in the following year. The placement will occur adjacent the shoreline and downstream end of the subunit.

In 2015, the baseline of habitat containing PCEs (suitable breeding habitat) on the subunit is 21 acres. Approximately 68 acres of yet-to-be suitable habitat and nine acres of unsuitable habitat occur in the subunit. No placement is planned in 2015 on Brown Island and critical habitat will not be affected.

In 2016, 39 acres of habitat containing PCEs (suitable SHLA nesting habitat) will be available during 2016 breeding season due to a 50-acre placement on the north side and downstream end of the subunit will occur during the breeding season. The 50-acre placement will result in a loss of 21 acres of suitable nesting habitat and prevent 29 acres of yet-to-be habitat (68 acres) becoming suitable 2016. Therefore, the remaining 39 acres of the 68-acre placement event in 2014 will become suitable nesting habitat containing the PCEs of critical habitat. The remaining 59 acres of the subunit will be unsuitable habitat.

In 2017, the baseline of habitat containing PCEs (suitable SHLA nesting habitat) will be 39 acres. The 50-acre placement event in 2016 will be yet-to-be suitable habitat with nine acres of unsuitable habitat. No placement is planned in 2017 on the Brown Island subunit and critical habitat will not be affected.

In 2018, the 50-acre placement event from 2016 will become suitable. Therefore, the baseline of habitat containing PCEs (suitable SHLA nesting habitat) in 2018 on the Brown Island subunit is approximately 89 acres. The remaining nine acres will be unsuitable. No placement is planned in 2018 on the Brown Island subunit and critical habitat will not be affected.

In summary, placement will occur in two of the five years on the Brown Island subunit resulting in a gain of suitable habitat from 72 acres to 89 acres, no change in yet-to-be suitable habitat (0 acres), and a loss of unsuitable habitat from 26 acres to nine acres. Figure 82 displays the availability of suitable SHLA nesting habitat containing the PCEs of critical habitat over the next five years on the Brown Island subunit.

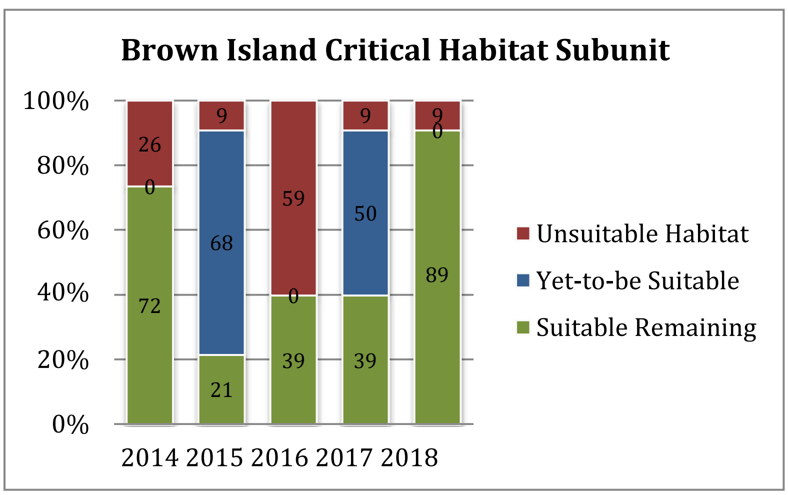


Figure 82: Availability of SHLA Nesting Habitat on the Brown Island Critical Habitat Subunit, 2014-2018

<u>WALLACE ISLAND SUBUNIT</u>

The Wallace Island critical habitat subunit is not in the Corps' dredged material placement Network and no Corps placement will occur on the subunit. However, the 13-acre subunit is included in this discussion because it is within the same geographic reach of the lower Columbia River as the Corps' Network, it has been surveyed recently for breeding pairs, and it has been evaluated for suitable SHLA nesting habitat using the 2011 NDVI data. Therefore, this discussion will provide a more complete analysis of the availability of habitat containing the PCEs of critical habitat (suitable SHLA nesting habitat) within designated critical habitat subunits on the lower Columbia River.

Wallace Island is located near RM 47, between the Corps' placement sites on Brown Island (RM 46.3) and Crims Island (RM 57.0). One pair of breeding larks was observed in 2012. No pairs were observed in 2011 or 2013 surveys. In 2011, the NDVI analysis identified three suitable acres of SHLA nesting habitat on the 13-acre subunit.

From 2014 through 2018, the Corps anticipates that three acres of suitable SHLA nesting habitat will remain available on the Wallace Island subunit due to the absence of known placements of dredged materials by others or other habitat altering events.

Figure 83 displays no change in habitat containing the PCEs of critical habitat (suitable SHLA nesting habitat) over the next five years on the Wallace Island critical habitat subunit.

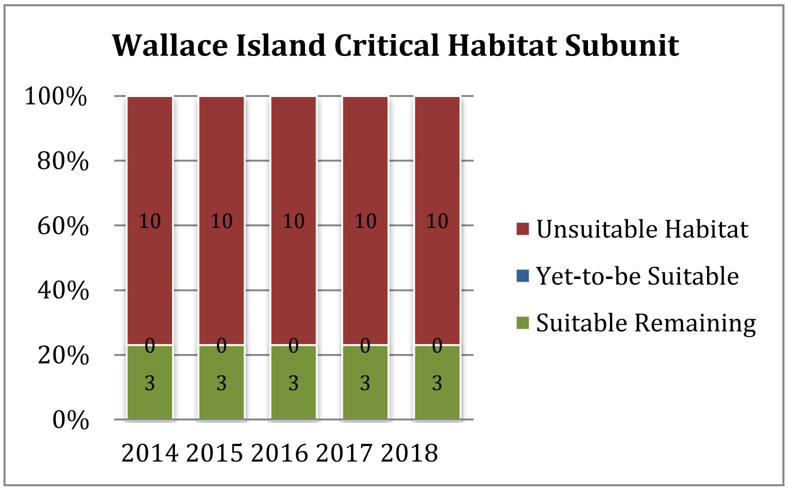


Figure 83: Availability of SHLA Nesting Habitat on the Wallace Island Critical Habitat Subunit, 2014-2018

CRIMS ISLAND SUBUNIT

The Crims Island critical habitat subunit is 60 acres, but only 53 acres overlap with the Corps placement site. Upland placement events on the Crims Island critical habitat subunit occur in the summer, during the SHLA nesting season. Upland placement will require early season site preparation activities that will include vegetation removal and dissuasion techniques to preclude SHLA nesting in planned upland placement locations. Upland placement could result in the loss of habitat containing the PCEs of critical habitat if suitable habitat is lost. The Crims Island subunit is within the Corps' Group IV.

In 2014, the baseline of habitat containing PCEs (suitable SHLA nesting habitat) is 25 acres with the remaining 35 acres of the subunit as unsuitable habitat. No placements are planned in 2014 on the Crims Island subunit and critical habitat will not be affected.

In 2015, a 20-acre placement on the downstream end of the subunit during the breeding season will result in a loss of five acres of suitable SHLA nesting habitat. Therefore, there will be an estimated 20 acres of habitat containing PCEs (suitable SHLA nesting habitat) in 2015. The remaining 40 acres will be unsuitable habitat.

In 2016, the baseline of habitat containing PCEs (suitable SHLA nesting habitat) is 20 acres. The 20-acre placement event in 2015 will be yet-to-be suitable habitat and the remaining 20 acres will be unsuitable habitat. No placement is planned in 2016 on the Crims Island subunit and critical habitat will not be affected.

In 2017, the 20-acre placement event in 2015 will transition to suitable habitat. Therefore, there will be an estimated 40 acres of habitat containing PCEs (suitable SHLA nesting habitat) in 2017.

The remaining 20 acres will be unsuitable habitat. No placement is planned in 2017 on the Crims Island subunit and critical habitat will not be affected.

In 2018, the baseline of habitat containing PCEs (suitable SHLA nesting habitat) is 40 acres. The remaining 20 acres will be unsuitable habitat. No placement is planned in 2018 on the Crims Island subunit and critical habitat will not be affected.

In summary, placement will occur in one of the five years on the Crims Island subunit resulting in a gain of suitable habitat from 25 acres to 40 acres, no change in yet-to-be suitable habitat (0 acres), and a loss of unsuitable habitat from 35 acres to 20 acres. Figure 84 displays the availability of suitable SHLA nesting habitat containing the PCEs of critical habitat over the next five years on the Crims Island subunit.

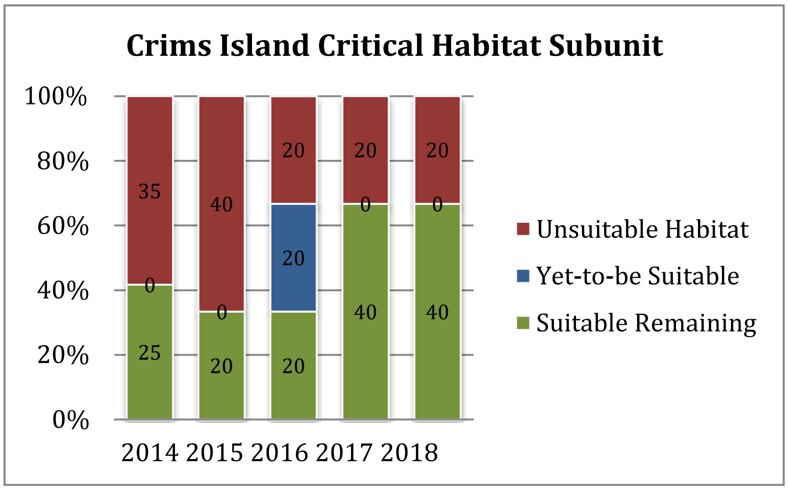


Figure 84: Availability of SHLA Nesting Habitat on the Crims Island Critical Habitat Subunit, 2014-2018

SANDY ISLAND SUBUNIT

The Sandy Island critical habitat subunit is 37 acres, but only 32 acres overlap with the Corps placement site. No placements are planned on the Sandy Island critical habitat subunit from 2014 to 2018. In 2014, the baseline of habitat containing PCEs (suitable SHLA nesting habitat) is 32 acres on the subunit due to a 32-acre placement in 2011. The remaining five acres of the subunit are unsuitable habitat through 2018. The 32 acres of suitable SHLA nesting habitat is expected to become unsuitable after the 2018 nesting season. The Sandy Island subunit is within the Corps' Group V. Figure 85 displays the availability of suitable SHLA nesting habitat containing the PCEs of critical habitat over the next five years on the Sandy Island subunit.

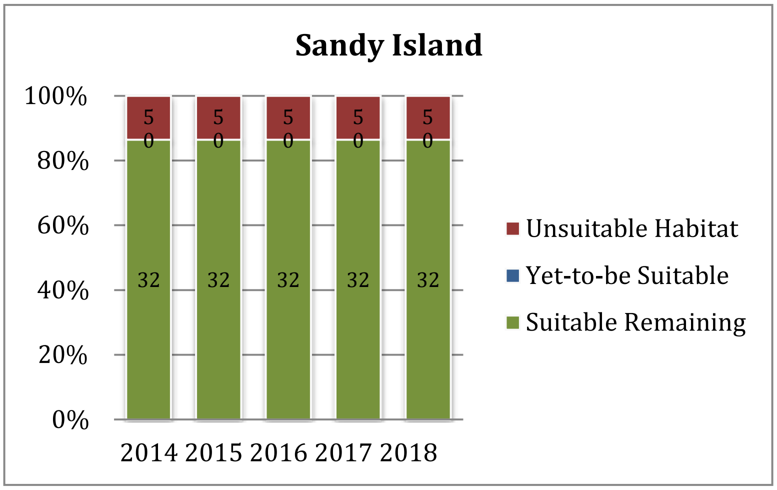


Figure 85: Availability of SHLA Nesting Habitat on the Sandy Island Critical Habitat Subunit, 2014-2018

In summary, the proposed action will result in an increase of suitable SHLA nesting habitat containing the PCEs of critical habitat that will allow for further conservation and recovery of the species.

EFFECTS FROM INTER-RELATED AND INTER-DEPENDANT ACTIONS

Interrelated actions are part of a larger action and depend on the larger action for their justification (50 CFR § 402-02). Interrelated actions are typically associated with the proposed action. The Corps considered whether the following action may be interrelated or interdependent to the continued dredging and placement activities of the Project:

Inter-related and interdependent effects of the Corps action include changes in other avian species that use the placement sites. The placement of dredged material at shoreline and upland sites in the lower Columbia River, particularly at Rice Island, Miller Sands, and Pillar Rock Island, has in part, increased the nesting habitat for Caspian terns and cormorants (FR 78, #192, 2013). The nesting of these larger avian species may reduce the quality, quantity, and success of SHLA nesting habitat on Corps placement sites in the Columbia River estuary. As described in the effects section above, efforts to reduce the establishment of other avian species (terns and cormorants) include habitat modifications and physical barriers (placing fences in open areas); these deterrent actions are also expected to reduce available habitat for larks; currently the overlap of potentially suitable habitat occurs only on Pillar Rock Island.

Commercial sand mining currently occurs at several upland placement sites within the Network. These commercial facilities operate as a result of the Corps' placement of dredged material at these sites. Due to the frequent site disturbance at active sediment borrow sites (Skamokawa, James River, Dibblee Point, Northport, Martin Bar, and Gateway) and Austin Point (heavy equipment training school) and lack of suitable nesting habitat, it is unlikely that SHLA will use these sites and be exposed to potential adverse effects in the future. However, the effects to SHLA from these actions are discussed above in the effects section and will not be analyzed in detail here. In summary, the effects from on-going commercial sand mining at upland placement sites within the Network will generally preclude SHLA from nesting due to the amount of human activity and constant habitat disturbance that prevents suitable nesting habitat from developing.

There may be requests in the future to mine or borrow placed dredged materials from current, non-commercial dredged material placement sites. On-going placement of dredged material creates a source of sediment for commercial purposes, independent from the Corps' action. The Corps does not own or maintain any of the placement sites, or own the dredged material following placement, and therefore the Corps has no authority for long-term management or control of the sites or the dredged materials. The Corps is aware that the State of Oregon, Department State Lands (DSL) has recently received a proposal for sediment extraction at Rice Island. It is uncertain at this point when or if this will occur. If the proposal is approved by Oregon DSL, the Corps expects modifications to SHLA critical habitat and adverse effects to individual SHLAs and its habitat. However, given the known use of the site by SHLA, it is reasonable to expect that the DSL will work with the USFWS to secure a Habitat Conservation Plan prior to issuing a permit to remove sand from the island.

Cumulative Effects

Cumulative effects are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the Action Area of the Federal Action subject to consultation (50 CFR § 402.02). To determine whether there are other future actions reasonably certain to occur in the Project Area, local and state government websites were reviewed and local entities queried. Current non-Federal activities in the area that are anticipated to continue at relatively the same levels include: upland and shoreline recreation, including camping, fishing, and all-terrain (ATV) and/or off-highway vehicle (OHV) operations, continued regional and shoreline development in support of economic growth by local communities, and non-federal actions to protect and restore habitat within the river and estuary.

The Portland/Vancouver metro area has grown 10.3% over the past decade. Residential, commercial, industrial, or recreational development may occur within the vicinity of the project area. As the metro area expands, there are increasing needs for recreational areas and greenspace. Easily accessible placement sites will likely continue to be popular recreational use areas for the foreseeable future, including ATV and/or OHV use. Those sites that are only accessible by boat generally will have very limited access, but still may receive some use, mostly for shoreline camping and recreational fishing. These recreational activities may cause adult SHLA to be disturbed, likely flush from the area that could result in nest abandonment, increased predation, decreased foraging opportunities and increased energetic expenditures. In the event that nests are in the area, recreational activities may result in the direct mortality to eggs and nestlings; adults are expected to flush from the area and avoid direct mortality. However, areas that receive a high amount of recreational activity likely preclude use by SHLA, so the number of birds directly affected is likely very low.

The Corps is not aware of any further non-federal actions within the Network that may affect SHLA or their designated critical habitat. Future federal actions that may affect SHLA or their designated critical habitat within the Network are required to undergo Section 7 consultation with the USFWS to evaluate the effects of those actions on species listed under the ESA.

Summary of Effects

Summary of Effects to Streaked Horned Larks and Their Habitats

Implementation of the proposed action will result in a range of beneficial and adverse effects to SHLA and their habitat. Site preparation and sediment placement will likely disturb adults and subadults from suitable nesting habitat and sediment placement may lead to the direct mortality of eggs and nestlings. Disturbance-related effects are expected to cause flushing of adults and subadults and could result in nest abandonment, nest failure, and increased susceptibility of eggs and chicks to predation. While some very low levels of direct mortality of eggs and juvenile SHLA may occur during placement of dredged materials (via burial), it is anticipated that adults will not be buried during placement activities and would instead flush from the area. However, despite these short-term adverse effects to individual SHLAs, the on-going dredging and sediment placement activities over the next five-years will result in a considerable increase in the amount of suitable nesting habitat within the Network.

Dredged material placement at shoreline and upland sites results in temporary modifications of nesting habitat, but is outweighed by the long-term benefits of maintaining a broad network of large, suitable nesting habitat areas within the lower Columbia River. Because the natural process of vegetation succession reduces the suitability of habitats for SHLA over time, upland dredged material placement can periodically reset the vegetative successional clock returning these areas to a more suitable habitat condition. While some areas may experience an immediate, short-term loss of suitable nesting habitat in the first two – four years following placement of dredged materials, these areas are expected to transition into suitable habitat as vegetation becomes established soon thereafter and remain suitable for six to 12 years following the placement event, provided no additional disturbance occurs which alters the vegetation communities. Therefore, habitat modification throughout the Network will result in both short-term adverse and long-term beneficial effects depending on existing habitat condition, the timing of placement relative to nesting, as well as the extent, frequency, and location of upland dredged material placements.

Within the entire 1,826-acre Network, there are currently 315 acres (17% of Network acreages) of suitable nesting habitat for SHLA. Through the five-year placement plan, suitable habitat ranges from a low of 241 acres in 2015 to a high of 643 acres (35% of Network acreages) by 2018 (104% increase over 2014 acreage), the final year of the current placement plan. The proposed action effectively doubles that acreage of suitable SHLA nesting habitat across the Network. Similarly, given this potential increase in suitable habitat, the potential number of breeding pairs that could occupy nesting habitat across the Network also doubles over the five-year placement plan (see Figure 86). However, recent literature and the best available scientific information suggests the regional population of SHLA is not limited by a lack of suitable nesting habitat, but rather by demographics, specifically adult and juvenile survival (Pearson and Hopey, 2005, Schapaugh 2009, USFWS 2014). Therefore, even with the temporary reduction in amount of suitable habitat in 2015, there is adequate suitable habitat remaining across the Network to support more than the current SHLA population within the lower Columbia River.

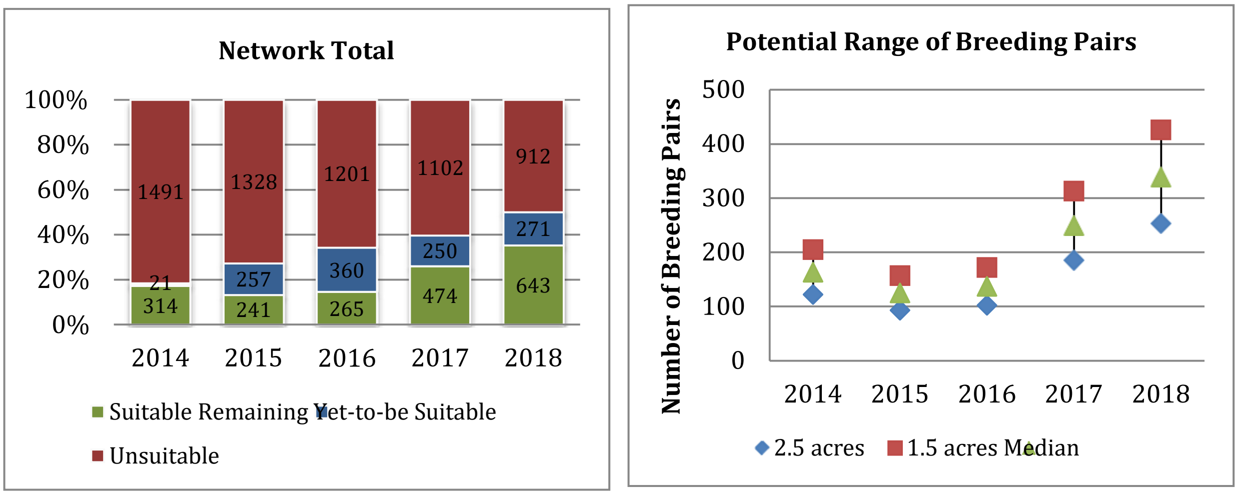


Figure 86: Summary of effects to suitable habitat and potential range of breeding pairs, 2014 – 2018.

Without periodic placement of dredged materials, the 1,826 acres of the Network would eventually transition to conditions unsuitable SHLA nesting habitat in the next 12 to 20 years. Figure 87 below shows habitat condition and associated number of potential SHLA breeding pairs without implementation of shoreline and upland placement of dredged material within the Network (compared to Figure 86 above). Implementation of the five-year dredged material placement plan more than doubles the amount of suitable nesting habitat within the Network, while also providing a substantial amount of yet-to-be suitable habitat acres ready to transition into suitable after 2018. Without implementation of the five-year dredging plan, suitable habitat acreage within the Network is reduced by about a third, with zero acres of yet-to-be suitable habitat available to transition into suitable after 2018. Therefore, while the analysis in this BA is only for the years 2014 – 2018, comparing Figure 86 Figure 87 clearly indicates the long term benefits to suitable SHLA habitat from the periodic placement of dredged materials at shoreline and upland sites across the Network and the downward trajectory of suitable habitat condition that could support the local population of SHLA that would result without these activities.

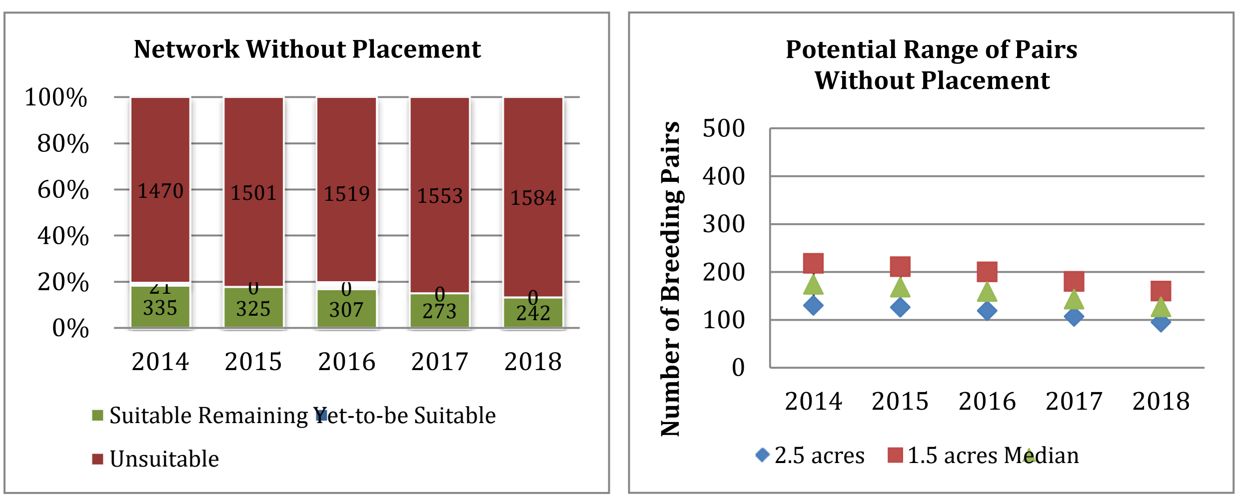


Figure 87: Summary of effects to suitable habitat and potential range of breeding pairs if no placement occurs, 2014-2018

Summary of Effects to Streaked Horned Lark Critical Habitat

As stated above, only eight dredged material sites overlap with designated critical habitat subunits for SHLA: Rice Island, Miller Sands, Pillar Rock Island, Welch Island, Tenasillahe Island, Brown Island, Crims Island, and Sandy Island. No placement is planned for the Sandy Island (RM 75.8) in the next five years; therefore, no effect to the Sandy Island critical habitat subunit will occur. The Wallace Island subunit is not within the Corps' Network and will not be affected by the proposed action. Only portions of each critical habitat subunit in the Corps' Network will be used in any given year. Placements on critical habitat subunits will allow suitable breeding habitat to be available on the Rice Island, Tenasillahe, Brown Island, Wallace Island, Crims Island, and Sandy Island subunits in every year. The Miller Sands subunit will not have suitable habitat until 2018, which would not form without the Corps' action. The Pillar Rock Island subunit will lose its suitable habitat to natural vegetation succession while the Corps rebuilds the site with shoreline placements. The Welch Island subunit will not have suitable habitat in 2015 and 2016, but will increase suitable habitat from 2014 (10 acres) to 2018 (17 acres)

Not all habitats within individual subunits are suitable nesting habitat for SHLA. Currently, only 298 acres of the 665 acres designated as critical habitat contain all the PCEs that correlate with suitable nesting habitat (approximately 45% of all designated critical habitat in the lower Columbia River). Through the five-year placement plan, suitable nesting habitat within the designated critical habitat subunits ranges from current baseline (2014) estimates of 298 acres to a low of 221 acres (33%) in 2015 and a high of 319 acres (48%) by 2018, a seven percent increase over 2014 baseline acreage.

Without periodic dredged material placement within the designated critical habitat subunits, these areas would all eventually transition to unsuitable habitat conditions that do not support the necessary PCEs for SHLA. The long-term beneficial effects from periodically resetting the vegetative successional clock through shoreline and upland placement of dredged materials cannot be overstated. Through implementation of the proposed action, the Corps sustains the important habitat elements identified as PCEs within the critical habitat subunits within the Network. Should shoreline and upland placement cease in these critical habitat subunits, the long-term viability of critical habitat in the lower Columbia River will be in doubt.

Determination and Conclusion

The abundance and geographic distribution of SHLA is not expected to be affected from implementing the proposed action, and therefore the placement of dredged materials is not expected to directly contribute to population declines throughout the lower Columbia River. However, based upon the above analysis and assessment of the direct effects, indirect effects, effects from interrelated and interdependent actions, and cumulative effects to SHLA resulting from the placement of dredged materials in the CR FNC, together with the conservations measure implemented as part of the proposed action, the Corps has determined that the proposed five-year placement plan ***"may affect, and is likely to adversely affect"*** to individual SHLA and their habitats in the lower Columbia River. In addition, based on the analysis of effects to designated critical habitat resulting from implementation of the proposed action, the Corps has determined the proposed five-year placement plan ***"may affect, and is likely to adversely affect"*** designated critical habitat in Unit 3.

REFERENCES AND LITERATURE CITED

Altman, B. 2011. Historical and Current Distribution and Populations of Bird Species in Prairie-Oak Habitats in the Pacific Northwest. Northwest Science, 85(2):194-222.

Anderson, H. 2011. FY 2012 Recovery Funding Proposal. Prepared by Hannah Anderson, Center for Natural Lands Management for the U.S. Fish and Wildlife Service. 14 November 2011.

Anderson, H. 2013. Streaked Horned Lark Habitat Analysis and Dredged Material Deposition Recommendations for the Lower Columbia River. Center for Natural Lands Management.

Beason, Robert C. and Edwin C. Franks. 1974. Breeding behavior of the horned lark. The Auk 91: 65-74. January 1974.

Camfield, A. F., S. F. Pearson, and K. Martin. 2011. A demographic model to evaluate population declines in the endangered streaked horned lark. Avian Conservation and Ecology 6(2): 4.

CIG (Climate Impacts Group). 2004. Overview of climate change impacts in the U.S. Pacific Northwest (July 29, 2004, updated August 17, 2004). Climate Impacts Group, University of Washington, Seattle.

Columbia River Estuary Task Force. 2002. Columbia River Estuary Dredged Material Management Plan. CREST, Astoria, Oregon. 71 pages.

Drovetski, S.V., S.F. Pearson, and S. Rohwer. 2005. Streaked horned lark *Eremophila alpestris strigata* has distinct mitochondrial DNA. Conservation Genetics. 6:875-883

ISAB (Independent Scientific Advisory Board). 2007. Climate change impacts on Columbia River Basin fish and wildlife. ISAB Climate Change Report, ISAB 2007-2, Northwest Power and Conservation Council, Portland, OR.

Knopf, Fritz L. 1994. Avian assemblages on altered grasslands. Studies in Avian Biology, No. 15:247-257.

NMFS (National Marine Fisheries Service). 2012. *Reinitiation of Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Columbia River Navigation Channel Operations and Maintenance, Mouth of the Columbia River to Bonneville Dam, Oregon and Washington (HUCs 1708000605, 1708000307, 1708000108).* Biological Opinion, July 2012.

Pacific Flyway Council. 2012. Pacific Flyway Plan: A Framework for the Management of Double-crested Cormorant Depredation on Fish Resources in the Pacific Flyway. Pacific Flyway Council, U.S. Fish and Wildlife Service, Portland, Oregon. Available at: http://www.pacificflyway.gov/Documents/Dcc_plan.pdf.

Pearson, S., and B. Altman. 2005. Range-wide streaked horned lark (*Eremophila alpestris strigata*) assessment and preliminary conservation strategy. Washington Department of Fish and Wildlife, Olympia, WA. 25 pp.

Pearson, S., H. Anderson, and M. Hopey. 2005. Streaked horned lark monitoring, habitat manipulations, and a conspecific attraction experiment. Washington Department of Fish and Wildlife. Olympia, WA. 38 pp.

Pearson, S., A.F. Camfield, and K. Martin. 2008. Streaked Horned Lark (*Eremophila alpestris strigata*) fecundity, survival, population growth and site fidelity: Research progress report. Washington Department of Fish and Wildlife, Wildlife Science Division, Olympia, WA. 24 pp.

Pearson, S., and M. Hopey. 2005. Streaked horned lark nest success, habitat selection, and habitat enhancement experiments for the Puget lowlands, coastal Washington, and Columbia River Islands. Natural Areas Report 2005–01. Washington Department of Natural Resources, Olympia. 49 pp.

PNWA (Pacific Northwest Waterway Association. 2010. Columbia Snake River System Facts. Available at: http://www.pnwa.net/new/Articles/CSRSFactSheet.pdf.

Schapaugh, A. 2009. The dynamics and viability of the endangered streaked horned lark (*Eremophila alpestris strigata*). M.S. Thesis, The Evergreen State College, Olympia, Washington. 40 pp.

Sillett, T. Scott and Richard T. Holmes. 2002. Variation in survivorship of a migratory songbird throughout its annual cycle. Journal of Animal Ecology 71: 296-308.

Stinson, D.W. 2005. Washington State status report for the Mazama pocket gopher, streaked horned lark, and Taylor's checkerspot. Washington Department of Fish and Wildlife, Olympia. 129+ xii pp.

U.S. Army Corps of Engineers (USACE). 1975. Columbia and Lower Willamette River Environmental Impact Statement. Portland District.

USACE. 1989. Environmental Assessment Columbia River Maintenance Dredging. Portland District.

USACE. 1994. Environmental Assessment Columbia River Maintenance Dredging. Portland District.

USACE. 1999. Integrated Feasibility Report for Channel Improvements and Environmental Impact Statement for the Columbia and Lower Willamette River Federal Navigation Channel. Portland District.

USACE. 2003. Columbia River Channel Improvement Project (CRCIP) Final Supplement Integrated Feasibility Report and Environmental Impact Statement. Portland District.

USFWS (U.S. Fish and Wildlife Service). 1998. Final Endangered Species Consultation Handbook: Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act. U.S. Fish and Wildlife Service and National Marine Fisheries Service. March 1998.

USFWS. 2010. Species Assessment and Listing Priority Assignment Form. *Eremophila alpestris strigata*. Region 1, April 2010. 25 pp.

USFWS 2014. Status of the Streaked Horned Lark (*Draft*). Prepared by the U.S. Fish and Wildlife Service, Oregon Fish and Wildlife Office.

USGCSP (U.S. Global Change Research Program). 2009. Our Changing Planet: The U.S. Climate Change Science Program. Available at http://www.usgcrp.gov/usgcrp/Library/ocp2009/.

Congressional Authorizations for the Columbia River Dredging Program

Congress authorized construction and maintenance of the Columbia River Federal Navigation Channel (CR FNC) from the Columbia River mouth to Bonneville Dam (River Mile (RM) -3.0 to 145). Several federally authorized projects are included in the CR FNC.

- Mouth of the Columbia River (MCR) Project (RM -3.0 to 3.0),
- Columbia River (RM 3.0 to 106.5) deep draft project, also includes lower 12 miles of Willamette River
- Columbia River from Vancouver to The Dalles (RM 106.5 to 145) Project,
- Nine (9) side channel projects (Baker Bay, Chinook Channel, Hammond Boat Basin, Skipanon Channel, Skamokawa Creek, Wahkiakum Ferry Channel, Westport Slough, Old Mouth Cowlitz River, and Upstream Entrance to Oregon Slough), and
- Portland-Vancouver Anchorages.

MOUTH OF THE COLUMBIA RIVER

The MCR Project was authorized under the Rivers and Harbors Act of 5 July 1884; however, the originally authorized project depth of 40 feet for the MCR was not completed until 1918. The South Jetty was completed in 1914 and the North Jetty completed in 1917. A spur jetty (Jetty A) was completed in 1939 for the purpose of channel stabilization. The Rivers and Harbors Act of 3 September 1954 authorized a 48-foot channel depth. Public Law 98-63 (30 July 1983) authorized deepening of the northernmost 2,000 feet of the channel to 55 feet.

Four to five MCY of sand are dredged from the MCR Project annually and placed at U.S. Environmental Protection Agency (EPA) approved disposal sites and one Clean Water Act site. In 2008, sand was placed on the north side of the MCR North Jetty for the purpose of protecting the jetty from scour as a result of storm surges. The South Jetty and North Jetty were constructed to maintain the FNC through the ocean entrance to the Columbia River. The South Jetty is about 6.6 miles long. The first 4.5 miles of the South Jetty were constructed from 1885 to 1895. It was extended to its present footprint length from 1913 to 1914; however, about 6,200 feet (head loss) have eroded. Portions of the South Jetty head loss were repaired in 1982. The North Jetty is about 2.5 miles long and was constructed from 1915 to 1917. Approximately 1,900 feet of head loss has occurred at the North Jetty. These existing project features were authorized by the Rivers and Harbors Acts of July 5, 1884; March 3, 1905; and September 3, 1954.

The jetties were constructed at the entrance to the Columbia River to confine tidal currents, to obtain scouring velocities in the bar and entrance channels for the purpose of maintaining the authorized channel dimensions, and to help protect vessels entering and exiting the river. The North and South Jetties at the MCR have experienced damage to both jetty heads and along the jetties at several locations. Some of these damages were repaired in 2005 to 2007.

COLUMBIA RIVER (DEEP DRAFT)

In the Rivers and Harbors Act of 18 June 1878, Congress authorized the Columbia River Project and directed the Corps to establish and maintain a 20-foot minimum channel depth. Maintaining this depth required dredging in only a few shallow reaches of the river where the natural controlling depths were in the 12 to 15 foot range. In the Rivers and Harbors Act of 13 July 1892, Congress increased the authorized navigation channel depth to 25 feet. The maintenance dredging associated with this increase was still limited to a few particularly shallow reaches where sporadic dredging was conducted, as needed. In the Rivers and Harbors Act of 13 June 1902, Congress adopted a 25-foot channel to the sea (which included the mouth of the Columbia River).

In the Rivers and Harbors Act of 25 July 1912, Congress increased the channel depth to 30 feet. At that time, the navigation channel width was established at 300 feet. Increasing the channel depth to 30 feet resulted in the need for increased maintenance dredging to ensure that authorized navigation depths were safe for shipping and to address shoaling associated with the new depth.

In the Rivers and Harbors Act of 3 July 1930, House Document 195, Congress increased the authorized depth from Portland to the sea to 35 feet. The navigation channel width was also increased to 500 feet and realigned in certain reaches. The channel modifications were completed in 1935. From 1936 to 1957, Congress authorized additional channel alignment adjustments that added to the dredging requirements. During this period, dredging averaged 6.7 million cubic yards (mcy) per year.

By 1958, the channel alignment had stabilized, but maintenance dredging was augmented to increase the advanced maintenance dredging (AMD) depth from two feet to five feet in areas of active shoaling. Advanced maintenance dredging removes additional material from a shoal for the purpose of maintaining the authorized depth of the navigation channel for a longer between dredging events. This AMD approach enhances navigational safety by maintaining the authorized channel depth (which is necessary to ensure adequate under-keel clearance) during periods of channel shoaling that occur between maintenance dredging events and is done at the same time as routine maintenance dredging.

The 40-foot deep by 600-feet wide navigation channel was authorized by the Rivers and Harbors Act of 23 October 1962, and construction took place in stages from 1964 to 1976.

The current 43-foot deep channel in the Columbia River from RM 3 to 106.5 was authorized by the Water Resources Development Act (WRDA) of 17 August 1999 (Public Law 106-53) and constructed from 2005 to 2010. The channel is 43 feet deep and 600 feet wide from RM 3.0 to 101.4; 43 feet deep and 400 feet wide from RM 101.4 to 105.5; 43 feet deep and 400 feet wide in the downstream 1.5 miles of Oregon Slough; and 35 feet deep from RM 105.5 to 106.5 (from the Burlington Northern and Santa Fe Railway Bridge to the Interstate 5 Bridge). Advanced maintenance dredging is authorized up to five feet below the authorized depth (-48 feet) and up to 100 feet outside the authorized channel width. The navigation channel generally follows the deepest part of the natural river channel. Most of the channel is naturally deeper than 43 feet; however, shoals tend to form in channel reaches where natural depths are less than 43 feet. The reach from RM 102.5 to 105.5 also includes the Portland/Vancouver Anchorage (Rivers and Harbors Act of 1960, Section 107 project), which consists of one deep-draft anchorage and one anchorage used primarily for empty vessels.

From 1976 to the onset of the most recent channel improvement, maintenance dredging averaged approximately 5.5 to 6.5 MCY per year, excluding emergency dredging related to the 1980 eruption of Mount St. Helens (Corps 1999). Since channel improvement was completed in 2010, the average volume of annual dredging required to maintain the channel has increased as expected. After unusually high flows in 2011 and 2012, it is difficult to predict shoaling volumes, which will need to be dredged over the next five years as the new channel, comes into equilibrium.

COLUMBIA RIVER FROM VANCOUVER TO THE DALLES

The portion of the Columbia River navigation channel from Vancouver, Washington to The Dalles, Oregon (RM 106.5-192), was authorized by the Rivers and Harbors Acts of 26 August 1937 and 24 July 1946. The portion of the navigation channel from Vancouver to Bonneville Dam is authorized for maintenance to a depth of 27 feet. Currently, this portion of the navigation channel is maintained for barge traffic only. Based on draft requirements of current users, the channel is maintained to a depth of 17 feet, with 2 feet of AMD for maximum channel depth of 19 feet.

AUXILIARY SIDE CHANNELS

The side-channel projects included in this BA were first authorized at various times, as shown below. Descriptions for the side channel projects, as well as their recent dredging history, can be provided, as requested for this consultation.

1933 – The Columbia River at Baker Bay was first authorized by the Rivers and Harbors Act of 11 December 1933. The Baker Bay West Channel is authorized by the Rivers and Harbors Act of 2 March 1945.

1938 – Chinook Channel was authorized by the Rivers and Harbors Act of 20 June 1938.

1975 – Hammond Boat Basin was authorized under Section 107 of the Rivers and Harbors Act of 1960.

1930 – Skipanon Channel was authorized by the Rivers and Harbors Act of 3 July 1930.

1919 – Skamokawa Creek was authorized by the Rivers and Harbors Act of 2 March 1919.

1993 – Wahkiakum Ferry was also authorized under Section 107 of the Rivers and Harbors Act of 1960.

1937 – Westport Slough was authorized by the Rivers and Harbors Act of 26 August 1937.

1945 – The Old Mouth of the Cowlitz River, as part of the Columbia (and Lower Willamette) deep draft project, was authorized by the Rivers and Harbors Act of 2 March 1945.

1946 – The Upstream Entrance to Oregon Slough, as part of the Columbia River from Vancouver to The Dalles project, was authorized by the Rivers and Harbors Act of 24 July 1946.

Columbia River Operations and Maintenance Dredging Program: Dredging, Placement, Ocean Disposal and the Placement Network

DREDGING

The Corps uses two general types of dredging equipment: hydraulic dredges and mechanical dredges. Hydraulic dredging is typically conducted by either a hopper dredge or a pipeline dredge. Mechanical dredging includes clamshell or backhoe dredging. Hopper and pipeline dredges currently handle the majority of operations and maintenance (O&M) dredging needs for the Columbia River Federal Navigation Channel (CR FNC). Each year, the Corps dredges 3-5 million cubic yards of sediment at mouth of the Columbia River (MCR) project to maintain the inlet's 6-mile long deep-draft navigation entrance channel, placing the dredging material in ocean disposal sites. In addition, approximately 6 to 9 million CY of material is dredged from the lower Columbia River and placed at upland, shoreline, or in-water dredged material placement sites.

DREDGING VESSELS

Figure 1 shows the four vessels, or types of vessels the Corps anticipates using to conduct the O&M dredging mission.

Figure 1: Dredging equipment

HYDRAULIC DREDGING

HOPPER DREDGE

Hopper dredges are typically self-propelled vessels that provide flexibility for dredging operations because of their maneuverability. They are most often used on small-volume sand wave shoals in the river, on large shoals in the estuary, and in the high-current areas at the mouths of rivers. As shown in Figure 2, hopper dredges use dragheads (1) at the end of drag- or trailer arms (2) located on both sides of the dredge. The dragheads are lowered to the channel bottom, and suction from the pump (3) is used to transport material through the dragarm and into the "hopper" or holding area of the dredge (4). The Corps dredging procedures for hopper dredging (and pipeline dredging below) call for the draghead to be buried in the riverbed during operations or raised no more than three feet off the bottom when the pumps are running to prevent fish entrainment.

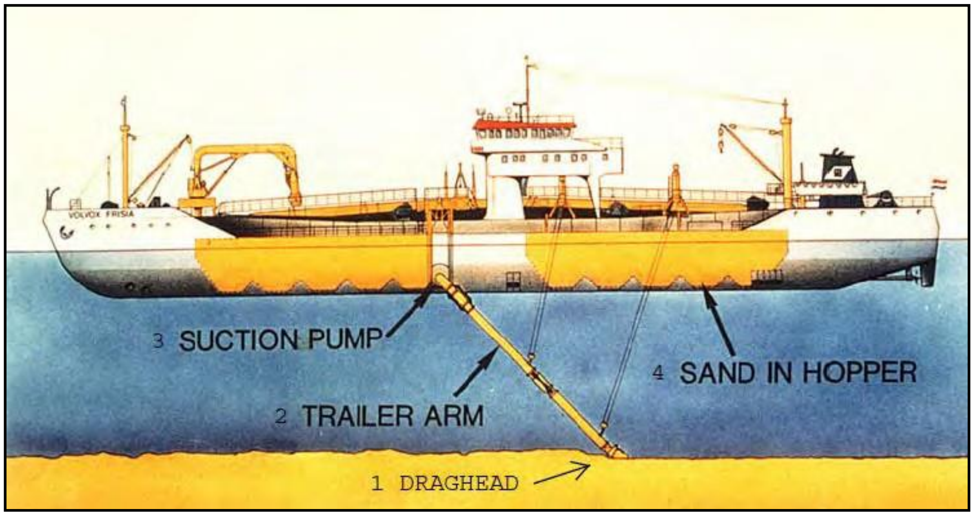


Figure 2: Hopper dredge

Hopper dredges collect dredged material in the hopper until it is near capacity. When the hopper is filled, the dragarms are raised and the vessel moves to the placement site. Some hopper dredges are of the "split hull" type, and some are of the "hopper door" type. Contractor hopper dredges typically employ a split-hull design. In split hull hopper dredges, the hull is split open for discharging and the rate of discharge is varied by how far the hull is opened. The split-hull method of placement is more rapid (time-efficient) than bottom-door hopper dredges and reduces the horizontal dispersal of dumped dredged material on the seabed. The Corps' hopper dredge, the *Essayons*, utilizes a series of doors located on the hull bottom to release each load of dredged material. The bottom doors are sequentially opened during placement until the entire load of dredged material is released from the vessel, resulting in a gradual release of dredged material from the vessel. In dredges with hopper doors, as the dredge is moving the hopper doors are opened and the material is discharged at varying rates, depending on how many hopper doors are opened. In some cases, the hopper dredge can use its pump to discharge the dredged material directly overboard or through a pipeline to a placement site not accessible by the hopper dredge (e.g. beach, upland or shallow nearshore locations). This process is often referred to as *pump-ashore* dredged material placement.

PIPELINE DREDGE

Pipeline dredges are used for large cutline shoals and areas with continuous sand wave shoals. Pipeline dredging in the Columbia River is typically used to remove material from the navigation channel between river mile (RM) 21 to 106.5. Only those shoals that have formed in a reach are dredged, not the entire reach. A typical shoal would include an area that is 250 to 300 feet wide by 2,000 to 4,000 feet long, though shoals vary in length, width and depth depending on flow conditions. Although many reaches of the navigation channel are annually dredged by pipeline, other reaches may require dredging on a less frequent basis depending upon the hydrographic surveys and flow conditions.

As shown in Figure 3, a pipeline dredge uses a "cutterhead" on the end of an arm that is buried three to six feet deep in the river bottom and swings in a 250- to 300-foot arc in front of the dredge. Spuds extend from the back of the dredge to the river bottom to anchor the dredge in place while the cutterhead and suction arm are in operation. Dredged material is sucked up through the cutterhead, then pumped through the pipes to placement areas; the material is placed in upland sites, beach nourishment sites or in the flowlane.

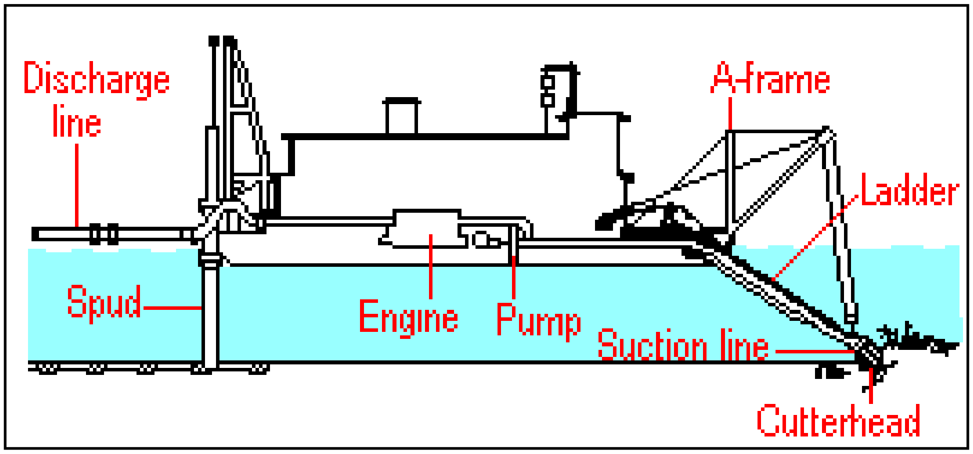


Figure 3: Pipeline dredge

MECHANICAL DREDGING

CLAMSHELL DREDGE

As shown in Figure 4, clamshell dredging is performed using a bucket operated from a crane or derrick that is mounted on a barge or operated from shore. Sediment from the bucket is usually placed on a barge for offloading and placement to an upland or in-water site. Because clamshell dredges are not self-propelled, they are not typically used in high traffic areas; rather, they are used in tighter spaces such as around docks and piers. Clamshell dredges can be used in restricted areas and shallow areas where draft restrictions may limit other dredges.

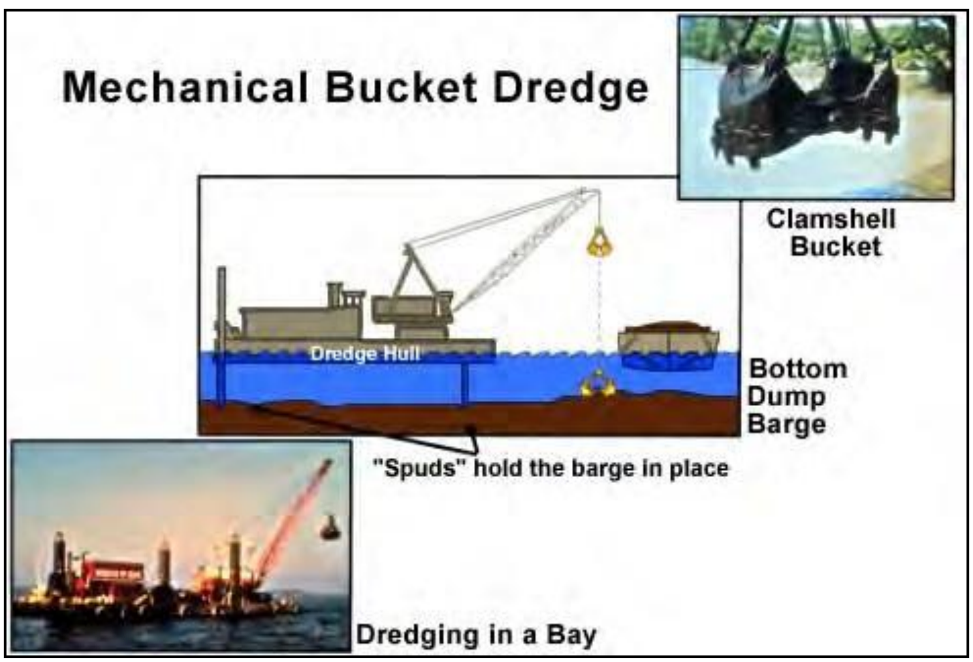


Figure 4: Clamshell dredge

Clamshell dredges equipped with special buckets are often regarded as being particularly useful when dredging silts or contaminated materials. Clamshell dredges are often used in areas with debris concerns which could damage other dredges. Also, a clamshell may be used if the placement site is very far from the dredging area, because multiple barges can be used to cycle to and from the placement area and keep the dredge working continuously, whereas hopper and pipeline dredges are limited by capacity and distance from the placement site. Clamshell dredges are primarily used for the side-channel projects related to the FNC.

BACKHOE DREDGE

Backhoe dredging, as seen in Figure 5, is performed using a bucket on the end of a backhoe arm. Although the backhoe is typically mounted on a barge, it can also be land-based and operated from shore. Backhoes can be used in both shallow- and deep-draft channels. Sediments removed by backhoe are usually placed on a barge for offloading and placement at an upland or in-water site. Backhoe dredges are often used to remove clays, rock, hard-packed materials, and fine-grained sediments, but also may be used in certain locations to remove sands. Like clamshell dredges, backhoes are often used in restricted areas near docks and in shallow-draft projects.

Figure 5: Backhoe dredge

BEST MANAGEMENT PRACTICES AND SPILL CONTROL FOR DREDGING

Table 1. Proposed Minimization Practices and BMPs for Dredging

Measure	Justification	Duration	Management Decision
Hopper Dredging			
Reverse purging of intake lines shall not be done with dragheads more than 3 ft off the bottom. If	This restriction minimizes or eliminates entrainment of juvenile	Continuous during dredging operations.	Maintain until new information becomes available that would warrant change.

Measure	Justification	Duration	Management Decision
water is pumped through the dragheads to clean the hopper, the dragheads must be -20 ft below the surface while dredging at the Mouth of the Columbia River, and the Columbia River RM 3 to RM 106.5; and -9 ft for RM 106.5-145 and the shallow-draft side channels.	salmon during normal dredging operations.		
Dredging in shallow water areas (less than 20 feet) outside of the Columbia River mainstem should occur only during the recommended ESA in-water work periods for the Columbia River.	The top 20 feet of the water column is considered salmon migratory habitat. Dredging or disposal in these areas could adversely impact salmonids, delay migration or reduce or eliminate food sources.	Continuous during dredging and disposal operations.	Maintain until new information becomes available that would warrant change.
Pipeline Dredging			
Maintain dragheads and/or cutterheads such that they do not exceed an elevation of 3 ft off the river bottom for dredging at the Mouth of the Columbia River, and the Columbia River RM 3 to RM 106.5; -9 ft for RM 106.5-145; and -9 ft for the shallow-draft side channels.	This restriction minimizes or eliminates entrainment of juvenile salmon during normal dredging operations.	Continuous during dredging operations.	Maintain until new information becomes available that would warrant change.
Typically, dredging in shallow water areas (less than 20 feet) only occurs during the recommended ESA in-water work periods for the Columbia River.	The top 20 feet is considered salmon migratory habitat. Dredging or placement in these areas could adversely impact salmonids, delay migration or reduce or eliminate food sources.	Continuous during dredging and placement operations.	Maintain until new information becomes available that would warrant change.
General Provisions for All Dredging			
The contractor shall not release any trash, garbage, oil, grease, chemicals, or other contaminants into the waterway.	The provision is enacted for the protection of water resources.	Life of contract or action.	If material is released, it shall be immediately removed and the area restored to a condition approximating the adjacent undisturbed area. Contaminated ground shall be excavated and removed and the area restored as directed. Any in-water release shall be immediately reported to the nearest U.S. Coast Guard Unit for appropriate response.

Measure	Justification	Duration	Management Decision
The contractor, where possible, will use, or propose for use, materials that may be considered environmentally friendly in that waste from such materials is not regulated as a hazardous waste or is not considered harmful to the environment. If hazardous wastes are generated, disposal shall be done in accordance with 40 CFR parts 260-272 and 49 CFR parts 100-177.	The provision describes the accepted disposal of hazardous wastes.	Life of contract or action.	If material is released, it shall be immediately removed and the area restored to a condition approximating the adjacent undisturbed area. Contaminated ground shall be excavated and removed and the area restored as directed. Any in-water release shall be immediately reported to the nearest U.S. Coast Guard Unit for appropriate response.

PLACEMENT OF DREDGING MATERIALS

PLACEMENT SITES

The placement method and type of site used for placing dredged materials can vary depending on the type of dredge used, distance from the shoal, site capacity, and available funding. Typical placement sites for dredging the CR FNC include in-water, ocean, upland, and shoreline sites.

OCEAN DREDGED MATERIAL DISPOSAL SITES

As mentioned above and in Appendix A, dredged material placement sites actively used for maintenance at the MCR include the Shallow Water Site (SWS), Deep Water Site (DWS), the North Jetty Site (NJS), and the South Jetty Site (SJS) (Figure 6). The SWS and DWS are Ocean Dredged Material Disposal Site (ODMDS) locations, which were designated by the U.S. Environmental Protection Agency (EPA) in 2005, and they can be used for the placement of material dredged from either the MCR or the Lower Columbia River. The NJS and SJS are Clean Water Act (CWA), Section 404 Sites that are limited to placement of dredged material from the MCR. Historically, dredged material originating from maintenance of the CR FNC from RM 3 to RM 30 has been placed within estuarine placement sites and not at the ocean sites.

The beneficial uses of dredged material placed at nearshore sites make utilization of these sites (SWS, NJS, and SJS) preferred over allocations of dredged material to the DWS where the sediment is lost to the active littoral system. However, due to safety restrictions (which limit access to the nearshore sites to one dredge at a time) it is sometimes necessary to use the DWS before capacity of the nearshore sites is fully utilized.

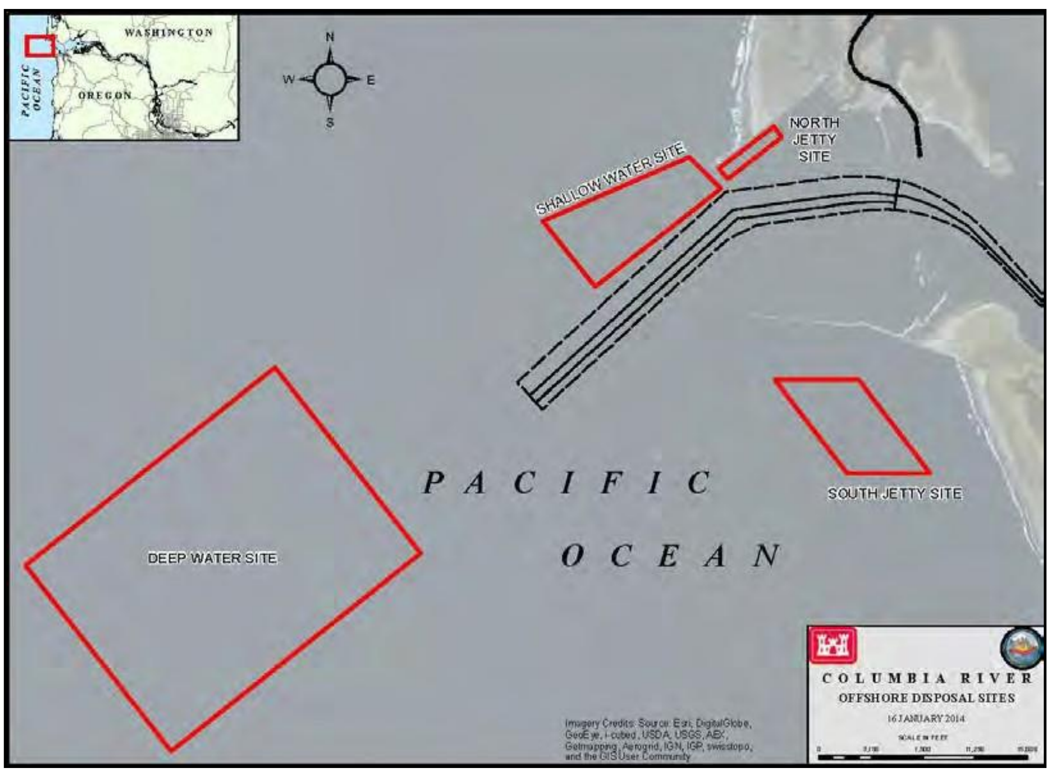


Figure 6: Shallow Water Site, Deep Water Site, North Jetty Site and South Jetty Site

Shallow Water Site

The Shallow Water Site (SWS), as seen in Figure 6, is a dispersive site that occupies a trapezoidal area of 3,100 to 5,600 feet wide by 11,500 feet long and lies within two miles of the MCR in a water ranging in depth from 45 feet to 75 feet. The overall site and placement area occupies approximately 1,198 acres or 1.4 square nautical miles (sq. nmi.). The SWS drop zone is 1,054 feet to 3,600 feet wide by 10,000 feet long and covers approximately 531 acres or 0.626 sq. nmi. The continual use of the SWS has supplemented Peacock Spit with 79 million cy of material since 1973, maintained the littoral sediment budget north of the MCR, protected the North Jetty from scour and wave attack, and has stabilized the MCR inlet. Site monitoring since 1997 has shown the released material temporarily deposits on the sea bottom, resulted in a truncated mound. The majority is subsequently eroded away to the north and northwest following the summer dredging season by the stronger winter waves and currents. Although this is a dispersive site, dredging operations in recent years have been limited in the use of this site and the North Jetty Site, described below, which is also a dispersive site because of bathymetric restrictions.

Deep Water Site

The Deep Water Site (DWS), as seen in Figure 6, is a non-dispersive site (material placed at the site remains in the site) that consists of an inner "placement area" and a surrounding buffer. The overall site (placement area and buffer) has a rectangular dimension of 17,000 feet by 23,000 feet and occupies approximately 8,975 acres or 10.5 sq. nmi. The inner placement area has a rectangular dimension of 11,000 feet by 17,000 feet, occupying an area of approximately 4,293 acres or 5.0 sq. nmi in the center of the site. Placement of dredged material within the DWS is limited to specific drop zones, which are inscribed within the DWS placement zone. Use of the DWS occurs only when the nearshore disposal sites have been used to the maximum extent practicable or when inclement weather conditions or operational constraints temporarily preclude the safe use of the other disposal sites. Sediment placed at these depths is lost to the active littoral system that feeds and maintains the coastline within the area.

North Jetty Site

The North Jetty Site, as seen in Figure 6, is located approximately 200 feet south of the MCR north jetty and occupies an area of 1,000 feet by 5,000 feet. The range in water depth within the NJs is 35 feet to 55 feet below MLLW. The NJS overall site boundaries coincide with the site's drop zone and placement area boundary. The NJS was selected in 1999, under Section 404 of the CWA, for the purpose of allowing placement of MCR dredged material along the toe of the North Jetty. Approximately 5.45 million cubic yards (MCY) were placed within the NJS during 1999-2012 to reduce erosion and scour. Approximately 100,000 to 500,000 CY of sand is placed at this site each year for these purposes.

South Jetty Site

The South Jetty Site, as seen in Figure 6, is a new nearshore site that was first used in 2012 under Section 404 of the CWA. The SJS occupies an area approximately 9,500 feet by 7,000 feet and is located approximately one mile south of the MCR inlet, in water ranging from 40 to 53 feet in depth. This sub-tidal site is intended to provide sand needed to reverse recent erosion in the nearshore area adjacent to the South Jetty. Erosion of nearshore substrates by the South Jetty is increasing, which, in turn, increases the intensity of waves hitting the jetty.

Dredged material disposal at this location would be a beneficial use, as the intent would be for dredged material to enter the littoral drift system along the coastline, mimicking conditions sediment accretion that existed historically at the mouth of the Columbia River. Studies indicate this area is losing between 88,000 and 270,000 CY per year and pre-historic clay layers are being exposed. Use of this site is intended to reverse this trend and as the material gradually builds up at the new site, it would also serve to break waves at a distance from the South Jetty, which would decrease wave damage to the jetty itself. To protect aquatic wildlife, use of the site will be limited by site management provisions that only allow placement after August 15 when the crab season in Oregon ends. The estimated annual volume within the site is estimated to be between 200,000 to 500,000 cubic yards.

IN-WATER AND SUMPS

In-water dredged material placement is done throughout the CR FNC from RM 0 to RM 145, where placement depends on the condition of the channel each year. Most in-water placement occurs in the flowlane within or directly adjacent to the navigation channel by hopper or pipeline dredge, or by bottom-dump barges used with mechanical dredges. As deeper flowlane areas are filled with dredged material, new deep areas are formed elsewhere as a result of natural river processes. Maintenance activities within the navigation channel generally use flowlane sites between 20 and 65 feet in depth with occasional exceptions, when placement occurs in the flowlane where depths are greater than 65 feet. The average annual quantity of material disposed at in-water sites is approximately 4.5 MCY.

Hopper dredges collect material in the hopper of the vessel until it is near capacity and then move to a flowlane site and release material gradually while moving to avoid mounding. Conversely, discharge from pipeline dredges differs from hoppers in that material is continuously discharged during dredging operations. Placement of material at flowlane sites from a pipeline dredge is done using a down-pipe with a diffuser plate at the end. This down-pipe extends 20 feet below the water surface (-20 feet) to minimize impacts to migrating juvenile salmonids. During placement of dredged material, the down-pipe is frequently moved to minimize mounding on the river bottom.

A “sump” is a designated site outside the navigation channel, where a pipeline dredge can reach from the sump location to an upland or shoreline placement site. Sumps are used to most efficiently temporarily store and move material dredged from shoals to upland or shoreline placement sites. Material dredged from shoals may be initially placed in a sump until there is enough material in the sump to make it time and cost-efficient for a pipeline dredge to rehandle the material and place it at the nearby upland or shoreline placement site.

There are two sumps in the CR FNC: the Harrington Sump and the Puget Island Sump. The Harrington Sump, as seen in Figure 7, is located in the flow lane along Rice Island from RM 20 to 22 and is used by hopper and pipeline dredges for placement of dredged material when performing annual maintenance dredging between RM 17 to 25. Portions of the sump may be dredged annually to provide renewed capacity. The sump is dredged to -48 feet below Mean Lower Low Water (MLLW) with a pipeline dredge and the material is pumped to Rice Island for upland placement. On average, a total of approximately 0.2 to 1 MCY of sand is removed from Harrington Sump each time it is dredged. Its overall capacity is approximately 2 MCY.

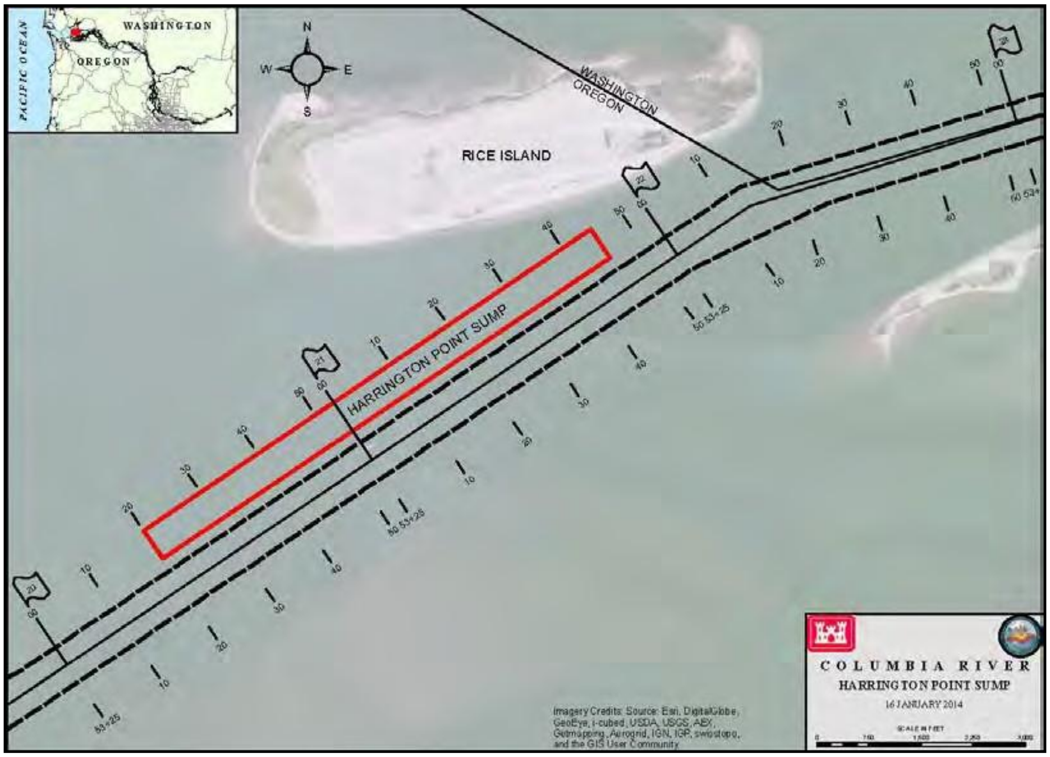


Figure 7: Harrington Point sump

The Puget Island sump (Figure 8) is located along the southern side of Puget Island from RM 44 to 45. The reach is used by hopper dredges and pipeline dredges for placement of dredged material when performing annual maintenance dredging in adjacent reaches. Portions of the sump may be dredged annually to provide renewed capacity. The Puget Island Sump may be dredged to -44 feet (CRD) with a pipeline dredge and the material is then pumped to Puget Island for upland placement. The 50-acre sump is located 300 feet north of the FNC and 400 feet south of Puget Island and is approximately 4,300 feet long and 500 feet wide. The depth of the existing profile is -30 to -40 feet. The initial material to be dredged is coarse grained sand, based on the proximity of the sump area to the FNC and nearby sandy beaches.

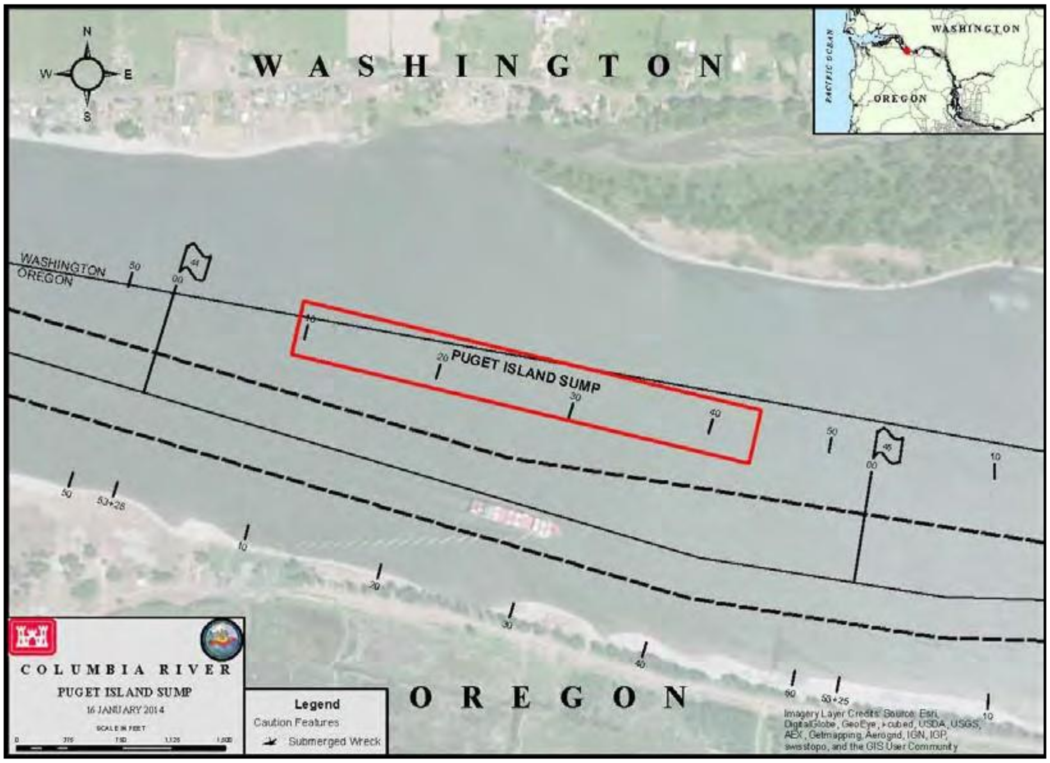


Figure 8: Puget Island sump

Additional in-water placement sites include Site BB-3 and Area D. Site BB-3 (Figure 9) is located immediately downstream of RM 3 and is primarily used when dredging side channel projects such as Baker Bay. The site may receive 100,000 to 150,000 CY of material annually.

Figure 9: In-water placement site BB-3

Area D (Figure 10) is within the Columbia River estuary north of the main CR FNC, at approximately RM 7. Area D is approximately 24-45 feet deep and it is not expected to receive more than 3.5 MCY of material between 2014 and 2018.

Figure 10: In-water placement Area D

Benson Beach Intertidal Site

The Benson Beach intertidal site, as seen in Figure 11, is located directly adjacent to the north side of the North Jetty. This27-acre beach placement site has been authorized for use since 2000 by Water Resources Development Act (WRDA). In 2002, sand was placed on Benson Beach for the first time. Since then, it has been a study placement area. The Corps identifies this intertidal placement area as a key component in the development of a network of ocean-based locations. This intertidal site was identified in 2007 as the zone within this region that would have the most potential for improved beach nourishment and drift restoration.

Dredged materials from the MCR Project would be placed directly onshore via pump-ashore hopper dredges, with the intent of minimizing erosion at Benson Beach and allow for sediment accretion along the beach. The materials would be naturally and mechanically distributed. Material placement would start 1,500 feet north of the North Jetty, in order to reduce the reintroduction of dredged materials southward towards the jetty. Typically, sand would be placed in the intertidal zone, between the elevations of -10 to +14 ft NAVD along a shoreline extent of 900 to 1,300 feet by 700 to 900 feet. A maximum of 500,000 CY of dredged material could be placed annually. The intent is for natural wave action to disperse the sediment within the littoral cell.

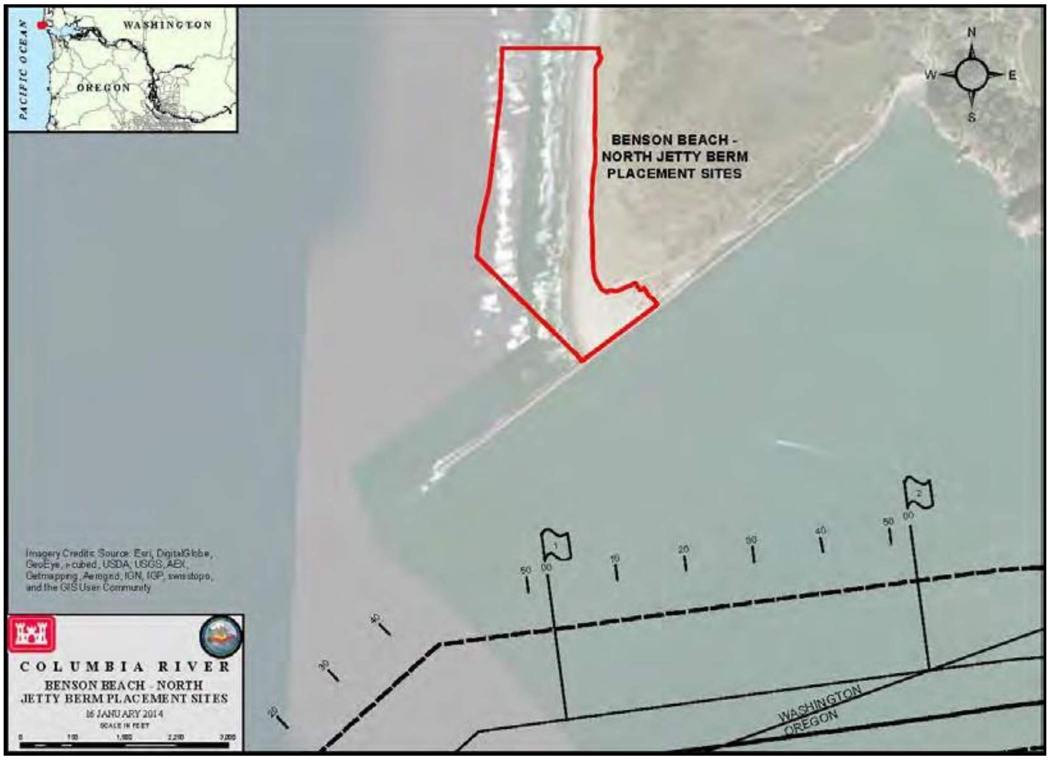


Figure 11: Benson Beach Intertidal Site

<u>*BEACH NOURISHMENT AND SHORELINE PLACEMENT*</u>

The combination of river flows, waves, and tidal effects naturally erodes material from shorelines. Beach nourishment is a method of replenishing material that has been eroded away from shorelines, and is conducted as needed. Beach nourishment or shoreline placement occurs at the sand/water interface, not in open water. Shoreline placement operations differ from beach nourishment operations in that the premise of placement is also used to directly protect a Corps asset. For example, shoreline placement is conducted when the integrity of an upland placement site is compromised by rapidly eroding shorelines. For the purposes of this Biological Assessment, shoreline placement and beach nourishment are used interchangeably with regards to placement methodology.

There are currently three beach nourishment sites available for use for the O&M program of the CR FNC: Miller Sands Island (RM 23.5), Skamokawa Vista Park beach (RM 33.4), and Sand Island (RM 86.2). Miller Sands and Sand Island are beach nourishments currently used in the State of Oregon; Skamokawa beach is in Washington. In 2011, the Corps placed approximately 227,586 CY of material at Washington and Oregon beach nourishment sites. In 2012, the Corps placed approximately 700,000 CY of material at Washington and Oregon beach nourishment sites. In 2013, the Corps placed approximately 300,000 CY of material at Washington and Oregon beach nourishment sites.

As part of the proposed action, the Corps is adding shoreline placement to the existing upland placement action at Pillar Rock Island. By conducting shoreline placement to the original footprint, the intended upland placement capacity will be restored and available. Once the site reaches upland capacity, shoreline placement will be used to maintain the integrity of the upland site.

Beach nourishment/shoreline placement involves pumping dredged material through a floating discharge pipe from the pipeline or hopper dredge to an existing shoreline. If necessary, the dredge first pumps a landing area on the shoreline to establish a point from which additional material placement occurs. Dredged material is pumped out in a sand-and-water slurry (about 20 percent sand) and as it exits the pipe, sand settles out on the shoreline while the water returns to the river. Settling rates of Columbia River sands are very quick and turbidity from the operation is minimal. After sufficient sand has settled out and begins to increase in height, the settled sand is moved by bulldozers to match the elevation and profile of the existing shoreline at approximately the high water line.

During beach nourishment/shoreline placement, a temporary sand berm is constructed to retain sand on the beach during pump-out, otherwise much of the sand would be immediately lost to the river. The temporary berms typically are approximately 5 feet high and 12 feet wide at the base. The berms are built gradually by earth-moving equipment as pump-out continues and are created from existing beach sand, pumped sand, or a combination of both. The process continues by adding material to the shore and proceeding longitudinally along the shoreline. The length, width and depth of material placed on the shoreline are dependent on the quantity of material dredged from the channel and hydraulics of the river adjacent to the placement site. After placement, the slope of the shoreline is graded to a steepness of 10 to 15 percent to minimize the creation of areas where juvenile fish could be stranded from vessel wakes on the new shoreline.

UPLAND

Upland placement sites can be islands or locations on the mainland accessible from the riverbank. Upland placement is accomplished using clamshell, hopper, and pipeline dredges. Clamshell-dredged material deposited onto a barge can be off-loaded at a transfer point for placement at an upland site. Hopper and pipeline dredges pump sediments as a slurry mixture directly into a diked, upland site near the dredging area. Pipeline dredges are capable of placing material from approximately one mile away without a booster pump depending on site height; if a booster pump is available, the pipeline range can potentially increase up to two miles and pump to higher elevations. Hopper dredges can work in tandem with a pipeline dredge to maintain the navigation channel at distances farther than a pipeline dredge reach. When a hopper dredge is working in tandem with a pipeline dredge to place material upland or along the shoreline, the hopper dredge works on adjacent shoals and places its material temporarily in-water at the primary shoal which is being dredged or will be dredged by the pipeline dredge. The pipeline dredge then pumps all of the material from the primary and adjacent shoals to the upland or shoreline placement site.

Regardless of the type of dredge used, the placement area at an upland site is delineated and prepared prior to placement. Access to the site occurs either from the river via a landing barge or from local access roads if accessible from the mainland. Placement activities utilize earth-moving equipment (bulldozers, backhoes, etc.), and these vehicles are barged or driven to the site. Staging of all construction vehicles and placement equipment occurs within the boundary of the placement site. When equipment is barged in from the river, the barge(s) is maneuvered to the shoreline and anchored for the duration of the operation. A wide sand berm is constructed from the barge to land for movement of equipment. Sand from the site may be used to form a ramp to transport equipment from the shoreline up to higher elevations of the site.

To prepare a site for placement, a containment berm is constructed by pushing material from the center of the site outward to the edges of the placement footprint. One or two bulldozers are used to construct berms at each site. Woody vegetation may be removed from within the boundary of the dredged material placement site to prep the area for placement. Grassy forbs and shrubs may be covered during site preparations and/or placement of dredged material. A temporary weir system is installed for control of return water, consisting typically of two weirs, each having one 30-inch diameter outfall pipe. The weirs are typically installed and removed after each placement event. Location of the outfall structures may vary with each placement event, but discharge typically occurs on the channel-ward side of the placement site.

A floating pipeline is used as a conduit for the slurry mixture between the dredge and the upland site, wherein the dredge pumps material directly into the interior of the placement site, pumping the sediment over the containment berm constructed during site preparations. As the slurry is discharged from the pipe, the sand quickly settles out and the water flows across the site before passing through the weir system and back to the river.

Discharged water is controlled by the strategic use of weirs and follows conditions permitted in state water quality certificates, such that as much sediment as possible settles out before water is discharged back to the river to minimize turbidity. Larger upland sites provide more distance/area/time for sediments to settle while the slurry flows across the site. Bulldozers are used throughout the placement process to move both the pipeline and discharged sediments at regular intervals to minimize unintentional mounding on the site. As the level of sand within the site nears berm height, some of the sand is pushed to the edges of the site (using bulldozers) to raise the containment berm and provide additional storage capacity. When placement is complete, all vehicles, piping, and temporary weirs are removed from the site.

Best Management Practices for Placement Sites

Table 2. Minimization Practices and BMPs for Placement

Measure	Justification	Duration	Management Decision
Ocean Disposal			
Placement in accordance with the site management and monitoring plan.	This action minimizes conflicts with users and impacts to ocean resources.	Continuous during dredging operations.	Maintain until new information becomes available that would warrant change.
Flow Lane Placement			
Placement of material in a manner that prevents mounding of the dredged material.	Spreading the material out will reduce the depth of the material on the river bottom, which minimizes adverse impacts to fish and invertebrate populations.	Life of contract or action.	Maintain until new information becomes available that would warrant change.
Maintain discharge pipe of pipeline dredge at or below 20 feet of water depth during placement.	This measure reduces the impact of placement and increased suspended sediment and turbidity to migrating juvenile salmonids, as they are believed to migrate principally in the upper 20 feet of the water column.	Continuous during placement operations.	Maintain until new information becomes available that would warrant change.
Shoreline Placement			
Grade placement site to a slope of 10 to 15 percent, with no swales, to reduce the possibility of stranding of juvenile salmonids.	Ungraded slopes can provide conditions on the shoreline that will create small pools or flat slopes that strand juvenile salmonids when washed up by wave action.	Continuous during placement operations.	Maintain until new information becomes available that would warrant change.
Upland Placement			
Berm upland placement	This action reduces the	Continuous during	Maintain until new

Measure	Justification	Duration	Management Decision
sites to maximize the settling of fines in the runoff water.	potential for increasing suspended sediments and turbidity in the runoff water	placement operations.	information becomes available that would warrant change.
Maintain 300-foot habitat buffer.	Maintains important habitat functions.	Life of contract or action.	Maintain until new information becomes available that would warrant a change.
Fine deposits should be deep-ripped after dredged material placement has occurred. Future settling area sediments should continue to be graded level or slightly convex to shed water and avoid concentrated low areas.	Prevent formation of wetlands within placement sites.	After placement operations.	Maintain until new information becomes available that would warrant a change.
General Provisions For All Placement			
The contractor, where possible, will use or propose for use, materials that may be considered environmentally friendly in that waste from such materials is not regulated as a hazardous waste or is not considered harmful to the environment. If hazardous wastes are generated, disposal of this material will be done in accordance with 40 CFR parts 260-272 and 49 CFR parts 100-177.	Dispose of hazardous waste.	Life of contract or action.	If material is released, it will immediately be removed and the area restored to a condition approximating the adjacent undisturbed area. Contaminated ground will be excavated and removed, and the area restored as directed. Any in-water discharge will be immediately reported the nearest U.S. Coast Guard Unit for appropriate response.

DREDGED PLACEMENT NETWORK

As mentioned above, the Columbia River Dredged Material Placement Network (Network) is a complex and varied assortment of upland and shoreline placement sites distributed throughout the lower river.

UPLAND AND SHORELINE/BEACH NOURISHMENT DREDGED MATERIAL PLACEMENT SITES

There are currently 25 dredged material placement sites associated with the CR FNC, between RM 3.1 to 105.0. These dredged material placement sites are strategically located throughout the lower Columbia River. Thirteen of the sites are located in Oregon. One site is shared by Oregon and Washington (Rice Island), and the remaining 11 sites are in Washington (see Table 3). There are 21 upland placement sites, two shoreline placement site, and two sites where both upland and shoreline placement occurs.

Table 3. Upland and Shoreline Dredged Material Placement Sites.

Site	State – River Mile	Site Type
West Sand Island	O-3.1	Upland
Rice Island	O/W-21.0	Upland, Sump
Miller Sands	O-23.5	Shoreline
Pillar Rock Island	O-27.2	Upland, Shoreline
Skamokawa - Vista Park	W-33.4	Upland, Shoreline
Welch Island	O-34.0	Upland
Tenasillahe Island	O-38.3	Upland
James River	O-42.9	Upland
Puget Island	W-44.0	Upland, Sump
Brown Island	W-46.3	Upland
Crims Island	O-57.0	Upland
Hump Island	W-59.7	Upland
Lord Island (Upstream)	O-63.5	Upland
Dibblee Point	O-64.8	Upland
Howard Island	W-68.7	Upland
Cottonwood Island	W-70.1	Upland
Northport	W-71.9	Upland
Sandy Island	O-75.8	Upland
Lower Deer Island	O-77.0	Upland
Martin Bar	W-82.0	Upland
Sand Island	O-86.2	Shoreline
Austin Point	W-86.5	Upland
Fazio Sand & Gravel	W-97.1	Upland, In-water
Gateway	W-101.0	Upland
W. Hayden Island	O-105.0	Upland

The narrative below describes the site history, existing environmental baseline conditions, details recent placement events, SHLA use, and human uses at each of the shoreline and/or upland placement sites in the dredged material placement Network for the CR FNC.

WEST SAND ISLAND (O-3.1)

The West Sand Island dredged material placement site is located on the west end of Sand Island. The irregularly shaped island is located in the Columbia River estuary in the southwestern end of Baker Bay and is approximately 530 acres, including approximately 50 acres of intertidal sand flats along the eastern and northern shorelines. Baker Bay is a shallow waterbody, totaling approximately 15 square miles. Sand Island separates the bay from the Columbia River. The island is in the state of Oregon, in Clatsop County.

West Sand Island is used for the placement of dredged material from the Baker Bay side channel, but was historically a low-lying island, rising only a few feet above the high tide line. The Corps has not used the site for placement since 1986. The West Sand Island dredged material placement site (Figure 12) is approximately 83 acres. The site is adjacent to the Baker Bay federal side channel project. Dredged materials from the Baker Bay side channel were historically placed on the site via pipeline.

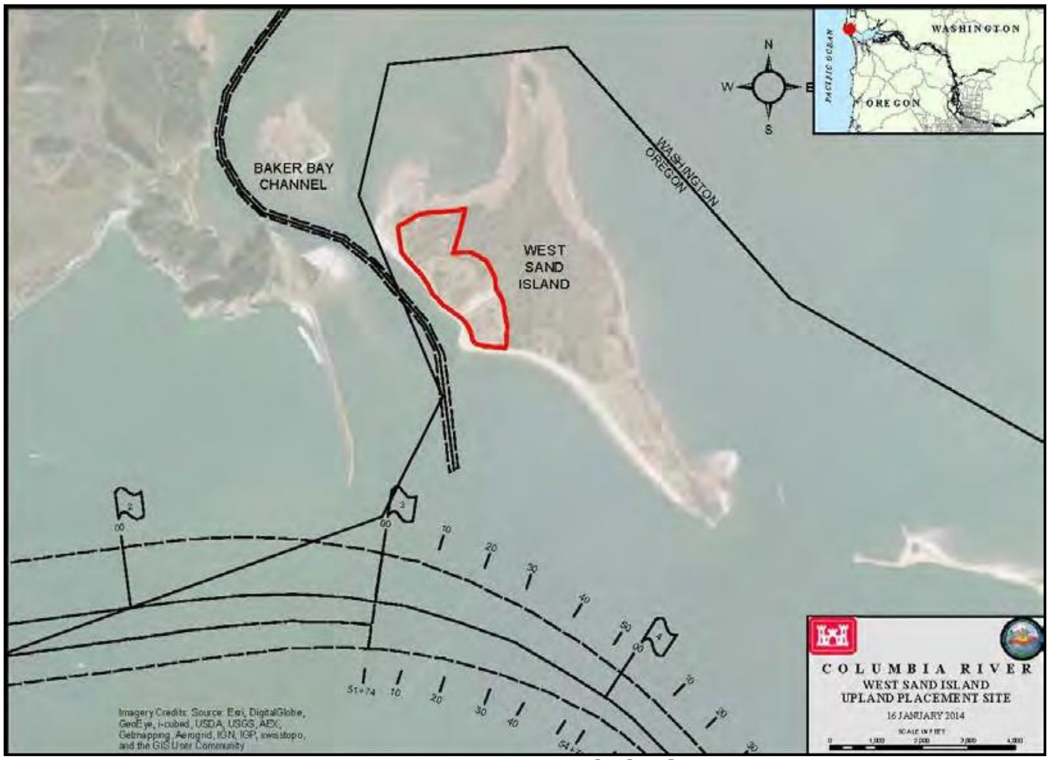


Figure 12: West Sand Island

West Sand Island is owned by the Corps. The estimated site capacity is 2,500,000 CY. Approximately 420,000 CY were placed between 1979 and 1986.

The site's elevations range from 0 feet (MLLW) to approximately 20 feet. There is a containment levee on the southern side of the site. The site is generally level, but slopes from east to west towards the water. No wetland delineation has been conducted on West Sand Island. The site is almost entirely vegetated, primarily with grasses, forbs, and low shrubs. Many low trees are visible in aerial photographs of the placement site, which are likely less than 30 years old. The shoreline is actively disturbed by wave action and does not support vegetation. The site is not designated critical habitat for SHLA. The site has not been assessed for suitable SHLA nesting habitat because of its dense vegetation and no lark surveys have been conducted. The Corps currently estimates that no suitable SHLA nesting habitat is available on the West Sand Island site.

There are two pile dikes that are perpendicular to the western boundary of the placement site. There are three other pile dikes west of the island that help maintain flows for the Baker Bay side channel. A third pile dike extends south from the southern tip of the island into the CR FNC. South of the West Sand Island placement site, native dune-grass communities dominant the southern tip of the island. Non-native plant species may be encroaching on this community. Revegetation of the placement site is restricted to plant species and planting techniques that would not negatively affect the native dune-grass community (CREST DMMP, 2002). The remaining portion of the island is heavily vegetated with low trees, scrub-shrub, and grasses.

RICE ISLAND (O/W-21.0)

Rice Island, which is located in the lower Columbia River estuary, is composed of approximately 365 acres, including approximately 100 acres of intertidal mudflats along the western and northern shorelines. The linear bar island is generally oriented from east-northeast to west-southwest, and it is bisected by the Oregon-Washington state line. The eastern tip of the island is within the State of Washington. The states of Washington and Oregon own their respective portions of the island. The Harrington Sump is located adjacent to Rice Island, between RM 20 and 22.

Rice Island was created in the past with dredged material from the CR FNC. The Corps has used the site for upland placement of dredged material for several decades. The dredged material placement site (Figure 13) covers approximately 264 acres. The portion of the placement site in the State of Washington is approximately 37 acres; the remaining portion of the placement site in the State of Oregon and is approximately 227 acres. The entire placement site is located from approximate RM 21 to 22.3 and at its closest point, the site is 1,000 ft. north of the CR FNC.

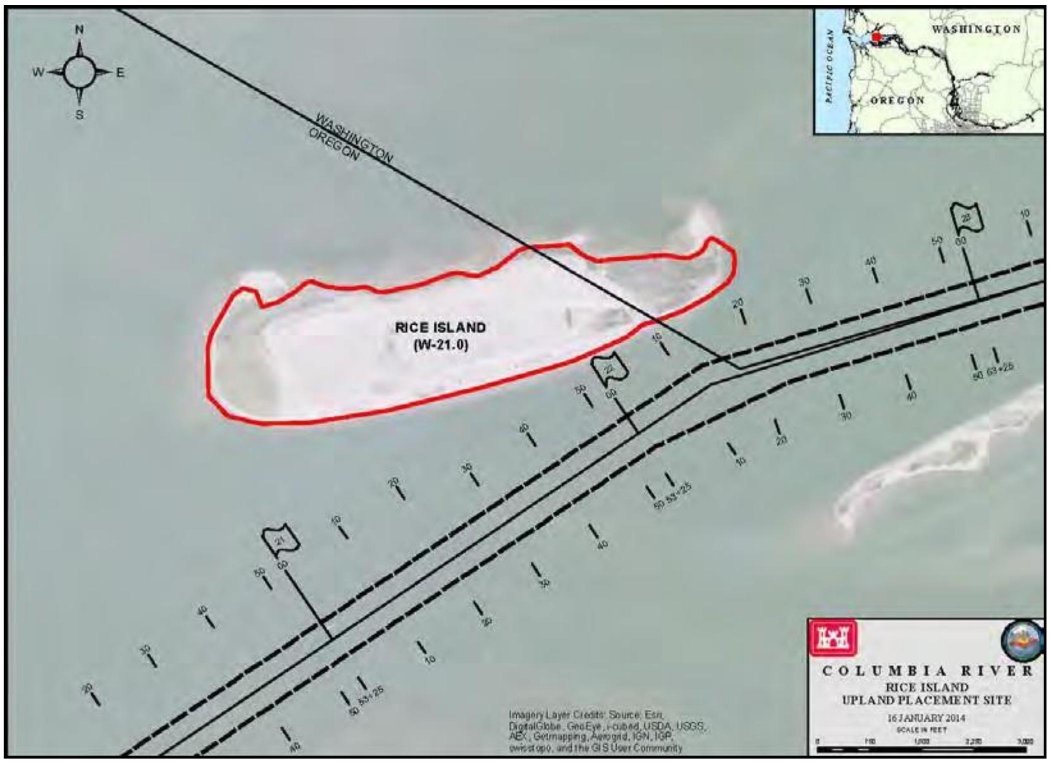


Figure 13: Rice Island

The Port of Portland has 25-year easement with the State of Oregon (Department of State Lands [DSL]) for upland placement of dredged material by the Corps for the portion of the site in Oregon. The Port of Portland's easement from the Oregon DSL expires in 2030. The Washington ports have a 30-year easement with the State of Washington (Department of Natural Resources [DNR]) for upland placement of dredged material by the Corps for the portion of the site in Washington. The Washington ports' easement from the Washington DNR expires in 2037. Dredged material was last placed on the western tip prior to 2000. The Corps placed approximately 1,000,000 CY dredged material in 2002 on the remaining portion of the island in Oregon. In 2012, site preparation work was conducted on the Washington side of the island. In 2013, an estimated 3,350,000 CY of site capacity remained. In 2013, approximately 400,000 CY of dredged materials were placed on the Washington portion of the site.

Almost the entire upland portion of the island is above elevation 10 feet (Columbia River Datum [CRD]), up to 73 feet in the southwest portion of the placement area. The vast majority of the placement site is unvegetated, bare sands. One wetland was delineated in the Rice Island placement area in 2013. Wetland A is a 0.06-acre, palustrine emergent (PEMx) wetland-swale feature is located in the eastern portion of the placement area within the State of Oregon. It is approximately 20 feet above the river in the lowest part of a dredged material-settling basin. Itwas formed as a depression and connecting swale near the vertical drainpipe. The wetland is dominated by hydrophytic plants, including dune willow, soft rush, Baltic rush, and Lyngbye's sedge. The wetland is fed by direct precipitation and subsurface water from precipitation within the eastern drainage basin area. There is no surface hydrologic connection between the wetland and Columbia River. Uplands immediately adjacent to Wetland A are dominated by broom fescue and silver hair grass, interspersed with thistle, yellow flag iris, blackberry, and clover.

One non-wetland aquatic feature, a 0.29-acre man-made pond, is located in the western settling basin, within the placement area in the State of Oregon. This basin area is used to infiltrate water during the placement of dredged material. This perennial retention pond is more than six feet deep, and it is fed by direct precipitation and runoff within the western drainage basin area. There is no hydrologic surface connection between the pond and Columbia River. Non-native, water milfoil is the dominant submerged aquatic vegetation in the pond.

Several bird species have been observed on the site, with nesting by gulls along the northwest portion of the site in 2013. Approximately 224 acres on the island have been designated as a critical habitat subunit for streaked horned larks. Approximately 219 acres of the placement site overlaps with designated critical habitat. Larks have been observed on this island during recent surveys. In 2013, 22 breeding pairs were recorded by the Center for Natural Lands Management (CNLM) on Rice Island. Based on USFWS information, larks are currently using the 180-acre bowl in the center of the site where placement occurred most recently in 2002. The CNLM estimated that approximately 146 acres of suitable lark breeding habitat existed on the site in 2011. The Corps currently estimates that there are approximately 150 acres of suitable SHLA breeding habitat on Rice Island and in the Rice Island critical habitat subunit.

The island's overall elevations range from 0 feet (CRD) at the riverward edge of the mudflats to 73 feet in placement area. The northern riparian edge adjacent to the placement area is dominated by cottonwood trees, Himalayan blackberry, dune willow, and Scotch broom. The northeastern tip of the island is dominated by dune grasses. A second wetland (Wetland B) is located outside the boundary of the Corps' placement area. It encompasses the northwest corner of the island and it is outside the toe of the dredged material placement slope. This approximately four-acre wetland transitions from an intertidal, estuarine emergent (E2EM) wetland to a palustrine, emergent (PEM) wetland. The palustrine portion of the wetland is dominated by Baltic rush, yellow flag iris, *Ludwigia* sp., *Eleocharis* sp., black cottonwood, and dune willow. Wetland B is directly influenced by the ebb and flow of tide and has a continuous hydrologic connection to the Columbia River. Dredged material is not placed in Wetland B on the northwest corner of island, nor along the northern shoreline's riparian edge. Fishermen use the island for shoreline fishing. The island has habitat for waterfowl, shorebirds, and sporadic aquatic mammals on the shores.

<u>MILLER SANDS (O-23.5)</u>

The Miller Sands dredged material placement site (Figure 14) is a horse shoe-shaped shoreline placement site. It forms a spit island in the lower Columbia River estuary, from approximate RM 22.2 to 24.6. The curvilinear site is oriented east to west with a sheltered embayment on the southern side.

Figure 14: Miller Sands

Historically, the site was formed as a flow control structure, approximately three miles long. It was a 90-acre site used primarily for the dredged material placement from the Miller Sands Bar. Currently, the site is approximately 117 acres. At its closest point, the site is approximately 400 feet south of the CR FNC. The Miller Sands site is in Clatsop County, Oregon.

The site is owned by the State of Oregon and the Port of Portland has a 25-year easement with Oregon DSL for placement by the Corps, expiring in 2030. Since the site is continually eroded by river currents, the available placement capacity is not fixed and it varies year to year. Shoreline placement occurred in 2007 on the center portion of the upstream edge, in 2008 on the upper portion of the upstream edge, in 2010 and 2011 on the center of the site, in 2012 on the downstream end of the site and the lower portion of the upstream edge, and in 2013 on the center of the upstream edge. Approximately 150,000 CY were placed in 2013.

The elevations on the site range from 0 feet (CRD) at the waterline to approximately 25 feet along the northern face at the site's midpoint. The site is relatively level, consisting of open sands. No wetland delineation has been conducted on the Miller Sands site. Beach grass, sparse shrubs, herbaceous plants, and trees form the southern edge of the site. Approximately 123 acres are designated as s critical habitat subunit for streaked horned larks at this island. Larks have been observed on this island during recent surveys. In 2013, five breeding pairs were recorded by the CNLM on Miller Sands. The CNLM estimated that approximately 29 acres of suitable lark breeding habitat existed on the site in 2011. The Corps currently estimates that there are zero (0) acres of suitable SHLA nesting habitat on Miller Sands due to vegetative succession on the site.

The embayment south of Miller Sands site is sheltered from the mainstem flows by the placement site. The embayment has a network of mud flats, tidal marsh, and sub-tidal waters and provides high value habitat for foraging shorebirds, waterfowl, eagles, other birds, and aquatic mammals. A secondary island is also located south of the site, separated by a narrow, tidal channel at the upstream end of the placement site. The secondary island is vegetated with numerous trees, shrubs, and grasses.

<u>PILLAR ROCK ISLAND (O-27.2)</u>

Pillar Rock Island, which is in the Columbia River estuary, is a dredged material placement site for upland and shoreline placement. The linear island is oriented east to west and it is within the Lewis and Clark National Wildlife Refuge.

Historically, the island was a shoal and past placement practices in the 1980s and 1990s increased the island elevations. The current dredged material placement site (Figure 15) on the island is approximately 52 acres. Pillar Rock Island is in Clatsop County, Oregon. The site is located from approximate RM 26.8 to 28. At its closest point, the island is approximately 1,100 feet south of the CR FNC.

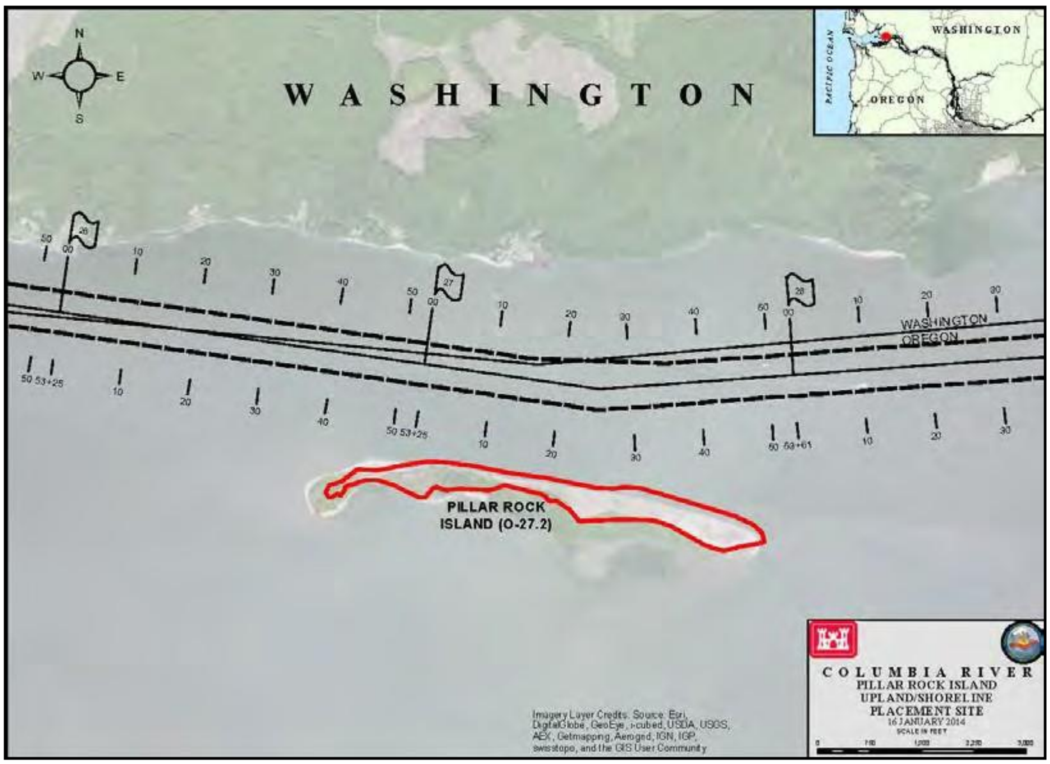


Figure 15: Pillar Rock Island

The site is owned by the State of Oregon and the Port of Portland has a 25-year easement with Oregon DSL for placement by the Corps. The Port of Portland's easement from the Oregon DSL expires in 2030. The Corps placed material on the downstream and middle portions of the site in 2000 and on the upstream quarter of the site in 2001. Approximately 250,000 CY were placed in 2001. In 2003, the estimated upland site capacity for placement of dredged material was 2,555,000 CY. Since the site is continually eroded by river currents, the site's available capacity is not fixed and it varies year to year. Between 2003 and 2013, approximately 32% of Pillar Rock Island eroded away, primarily from the north side of the island.

The elevations on the island range from 0 feet (CRD) at the low waterline to approximately 30 feet on the northern bank. Steep 10 to 25 feet banks exist along portions of the island but the island interior is relatively level. Two pile dikes extend north from the downstream portion of the island. Much of the placement site is covered in sandy dredged material. Stands of young cottonwoods, scattered shrubs, and forbs with grasses are visible on the island. The presence of vegetation is due to Corps limited use of the site in the past five years. The upstream edge of the island has eroded away. Approximately 44 acres of Pillar Rock Island have been designated as a critical habitat subunit for streaked horned larks. Larks have been observed on this island during recent surveys. In 2013, two breeding pairs were recorded by then CNLM on Pillar Rock Island. The CNLM estimated that approximately two acres of suitable lark breeding habitat existed on the site in 2011. The Corps currently estimates that there are less than four acres of suitable SHLA nesting habitat on Pillar Rock Island site and within the critical habitat subunit due to natural erosion of the shoreline and vegetation succession.

There are approximately 50 acres of tidal flats and marsh located outside the placement site, along the southern side of the island. These aquatic habitats have developed over time due to the wind and current protection provided by the placement area. The island and tidal wetlands are used by waterfowl during the fall and winter and aquatic mammals throughout the year. Mudflats and intertidal marsh areas are used by shorebirds.

SKAMOKAWA-VISTA PARK (W-33.4)

The Skamokawa-Vista Park, which is located in the upper Columbia River estuary, is a multi-use county parcel. The park is on the northern bank of the Columbia River, at RM 33.4, downstream of Skamokawa Creek.

Historically, the dredged material placement site was used for several years and was then developed into a county park. The current placement site (Figure 16) is approximately 15 acres and it is approximately 2,400 feet long. The site is currently used as a shoreline and upland placement site from which materials are excavated by others. The site is located in Wahkiakum County, Washington. At its closest point, the site is approximately 200 feet northeast of the CRFNC.

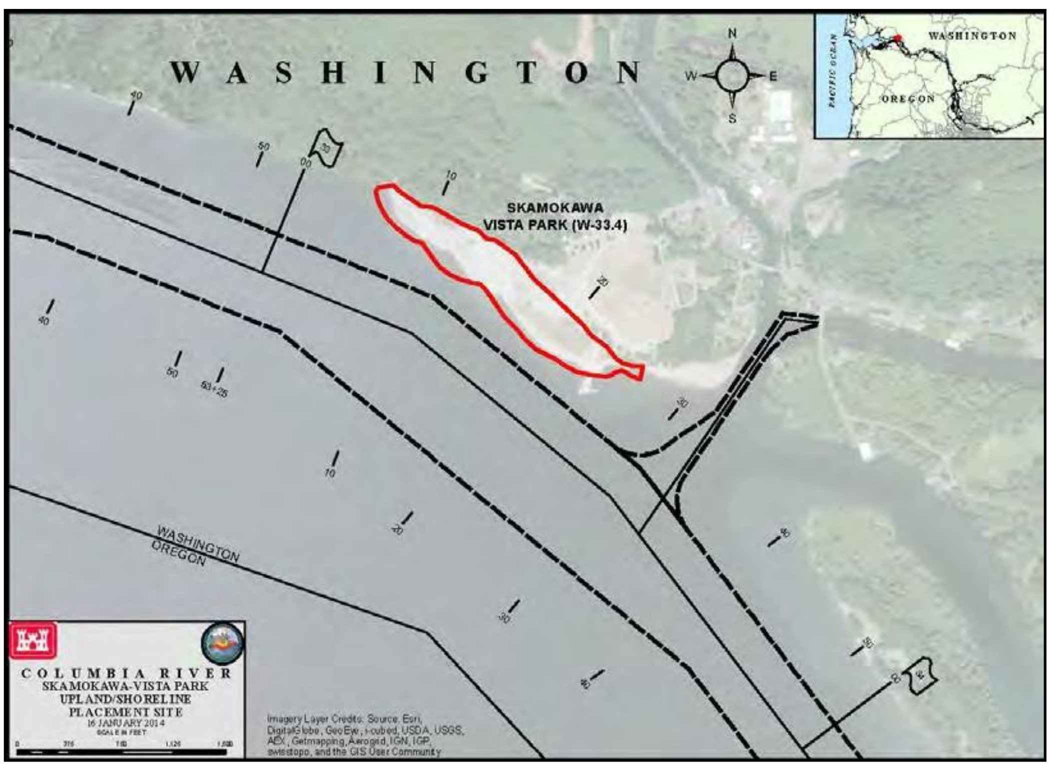


Figure 16: Skamokawa-Vista Park

The site is owned by the Port of Wahkiakum II and the other Washington ports are pursuing a multi-year easement for placement by the Corps. Since the riverward portion of site is continually eroded by river currents and the upland area has sand removal activities by others, the site capacity is variable year to year. In 2012, approximately 150,000 CY were placed over the entire site.

The elevations on the site range from 2 feet (CRD) at the waterline to approximately 22 feet at the highest point in the site's center. The site has a steep 10 to 12 foot edge on the upstream portion of the site that is adjacent to an open area of the park. The downstream portion of the site has a gentle slope from the waterline to the landward edge of the site, adjacent to a forested edge of the park. Minimal wildlife use is associated with the site due to the human recreational use of the park and limited available habitat. The site is not designated as critical habitat for streaked horned larks. The CNLM habitat analysis estimated that approximately five acres of suitable lark breeding habitat existed on the site in 2011. The site was surveyed for larks in 2013 by CNLM, but no individuals were observed. Despite the suitable habitat that was mapped from the 2011 CNLM data, the Corps assumes that no suitable habitat is available for SHLA nesting Skamokawa-Vista Park due to the amount of human activity that occurs on the site from commercial sand extraction. The adjacent park and forestlands are used by songbirds and small mammals.

<u>WELCH ISLAND (O-34.0)</u>

Welch Island, which is located in the upper end of the Columbia River estuary, is approximately 950 acres with multiple interior waterways. Welch Island and Tenasillahe Island form a discontinuous island, separated by a narrow waterway called Multnomah Slough. Welch Island is within the Lewis and Clark National Wildlife Refuge.

Historically, the Corps' placement area on Welch Island was used for both upland and shoreline placement of dredged materials. Currently, the Corps utilizes a 41-acre area (Figure 17) for upland placement on the northeast bank of Welch Island in Clatsop County, Oregon. The site is located from approximate RM 33.5 to 34.5. At its closest point, the site is approximately 2,800 feet southwest of the CR FNC.

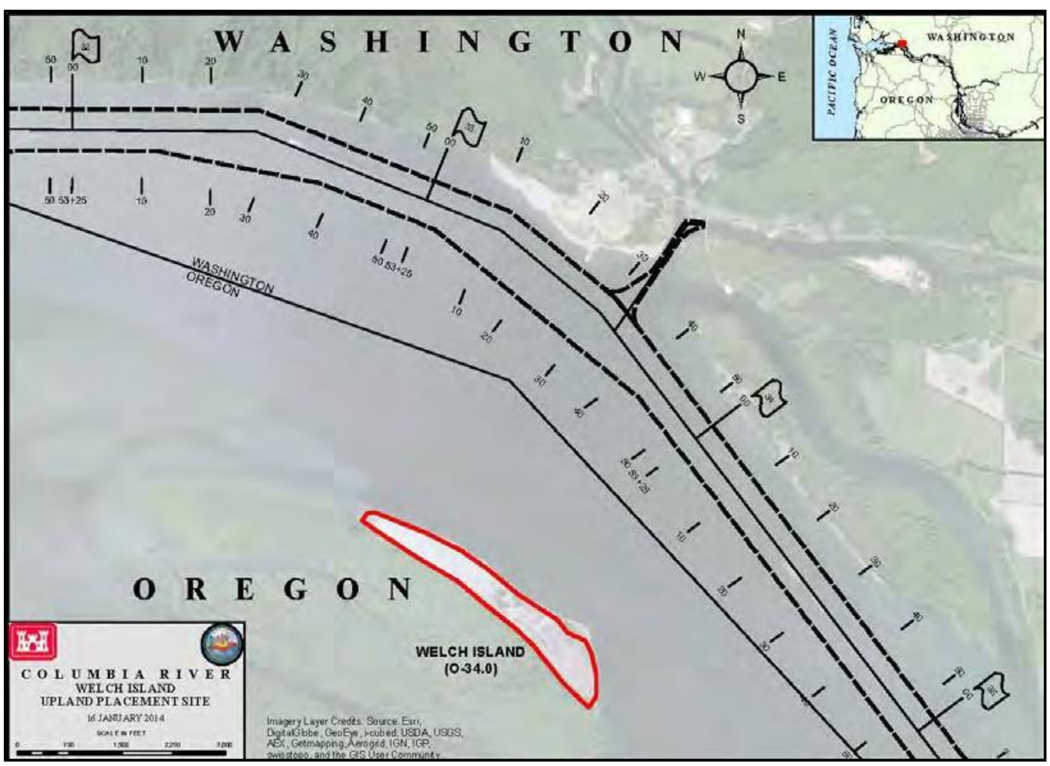


Figure 17: Welch Island

The site is owned by the State of Oregon. The Port of Portland acquired a 25-year easement with Oregon DSL for upland placement by the Corps which expires in 2030. In 2003, the estimated site capacity for placement of dredged material was 400,000 CY. The most recent action by the Corps was the placement of approximately 400,000 CY over 40 acres in 2008. In 2013, the revised site capacity was 700,000 CY.

The elevations on the Corps' placement site range from 0 feet (CRD) at the low waterline to approximately 36 feet along the face of the downstream portion. The site is generally level, but gently increases in elevation from upstream to downstream. The majority of the Welch Island placement site is devoid of vegetation. A few scattered shrubs and grasses are visible in the central portion of the site. The landward (southern) boundary of the site is a forested riparian edge. The shoreline of the placement site is utilized by foraging shorebirds. Approximately 43 acres, including the placement site, have been designated as a critical habitat subunit for streaked horned larks. In 2012, one breeding pair was recorded but no birds were observed by CNLM during 2013 survey efforts. The CNLM estimated that approximately 10 acres of suitable lark breeding habitat existed on the site in 2011. The Corps currently estimates that there are 10 acres of suitable SHLA nesting habitat on Welch Island and within the critical habitat subunit. In March 2009, the USFWS funded habitat restoration trials on Welch Island, which involved tilling plots of land on the upstream quarter of the site. The Corps is not aware of any further actions on the site.

The remainder of Welch Island, outside of the placement site, ranges from 4 feet to 12 feet. The majority of Welch Island outside the Corps placement site is dominated by tidal scrub-shrub and emergent wetlands. The adjacent wetlands on Welch Island provide high-quality wildlife habitats for birds and aquatic mammals.

<u>TENASILLAHE ISLAND (O-38.3)</u>

Tenasillahe Island, which is located in the upper end of the Columbia River estuary, is approximately 2,050 acres. Tenasillahe Island is generally heart-shaped and it is approximately 2.8 miles long by 1.7 miles wide. Tenasillahe Island is separated from the Oregon mainland by Clifton Channel. Tenasillahe Island is within the Julia Butler Hansen National Wildlife Refuge for Columbian white-tailed deer.

Historically, the Tenasillahe Island placement site was a shoreline placement site. Currently, the Corps utilizes a 41-acre site (Figure 18) on the southeastern, upstream tip of the island for upland placement. This tip of the island encompasses approximately 105 acres and is separated from the rest of Tenasillahe Island by a narrow tidal flat. The placement site is located from approximate RM 37.9 to 38.4, in Clatsop County, Oregon. The site is generally oriented south to north and at its closest point, it is approximately 1,000 feet west of the CR FNC.

Figure 18: Tenasillahe Island

The site is owned by the State of Oregon and the Port of Portland has a 25-year easement with Oregon DSL for placement by the Corps, which expires in 2030. The downstream portion of the site was last used for placement prior to 2000. In 2003, the estimated site capacity for placement of dredged material was 2,300,000 CY. In 2012, material was placed in the remaining upstream portion of the site, excluding an area where streaked horned larks were nesting in 2012. In 2013, the revised site capacity was 1,270,000 CY. In 2013, 300,000 CY of material were placed on the upstream portion of the site, excluding an area where larks were nesting in 2013. The 2013 lark nesting location was different from the 2012 location.

The elevations on the Corps' placement site range from 5 feet (CRD) at the low waterline to approximately 38 feet in southern portion of the site. The site is generally level, but gently slopes from upstream to downstream. A pile dike is located off the southeast corner of the site.

The northern portion of the site is dominated by grasses, but has a row of shrubs and trees in the center. The western and northern boundary of the site is bound by trees that transition to an adjacent tidal wetland and marsh. One 0.17-acre wetland was delineated in the northeast portion of the placement site. The wetland is classified as a palustrine shrub scrub (PSS) wetland-swale that is hydrologically connected to Columbia River during periodic high river flows. The dominant wetland vegetation is dune willow, red-osier dogwood, reed canary grass, and cocklebur. The adjacent upland vegetation with the placement area is dominated by scotch broom, blackberry, and silver hair grass, interspersed with thistle. The bank area provides a narrow foraging area for wading and shorebirds. The western site boundary of trees and shrubs provides additional riparian habitat for birds, small mammal, and other wildlife. Approximately 23 acres of the island has been designated as a critical habitat subunit for streaked horned larks. Larks have been observed on this island during recent years, but were not observed in 2013 CNLM surveys. In 2012 and 2013, one breeding pair was recorded by the Corps on Tenasillahe Island. The CNLM estimated that approximately 11 acres of suitable lark breeding habitat existed on the site in 2011. The Corps currently estimates that there are three acres of suitable SHLA nesting habitat on Tenasillahe Island and two acres within the critical habitat subunit due to placement activities in 2012 and 2013. Bald eagles were historically known to nest near the Tenasillahe Island placement site.

JAMES RIVER (O-42.9)

The James River site, which is on the south bank of the Columbia River and immediately downstream of the lower entrance to Westport Slough, is located near RM 42.9 of the Columbia River. The site (Figure 19) is irregularly shaped and has an access road from State Highway 30 that crosses the Portland and Western Railroad. The site is in Clatsop County, Oregon.

Figure 19: James River

Historically, the site was used as an upland placement area for dredged material from federal navigation channels. Trees were removed in the past by the owner to expand the site to its current extent of 53 acres. The upland placement site is privately owned and actively used for commercial sand removal. At its closest points, the Corps' upland placement site is approximately 400 feet south of the CR FNC and approximately 600 feet west of the Westport Slough and Wahkiakum Ferry FNCs.

The site is owned by a private landowner and the Port of Portland has a 20-year easement for placement by the Corps, which expires in 2027. The Corps has not used the site since before 2000. In 2003, the estimated site capacity for placement of dredged material was 1,280,000 CY. In 2013, the revised site capacity was 1,350,000 CY.

The elevations on the placement site range from 10 feet (CRD) in the unused portions of the site to 30 feet along the top of the containment berm. The berm extends along the western, southern, and eastern boundaries of the 53-acre site. The recently used or disturbed portions of the site are bare sand, while the remaining portions of the site are covered in grasses and shrubs. Much of the site has been actively graded and leveled due to use by others and the Corps' placement of dredged materials. The site provides limited wildlife habitat due to its frequent use and disturbance by the landowner. The site is not designated critical habitat for streaked horned larks and it has not been surveyed due to expected low habitat value and frequent site disturbance. The CNLM estimated that approximately 14 acres of suitable lark breeding habitat existed on the site in 2011. However, the Corps assumed that no suitable SHLA nesting habitat is available at James River because of the amount of human activity and commercial sand extraction that occurs.

The Columbia River is the northern site boundary and the railroad is the southern boundary. An open grassy area is adjacent to the northwest portion of the site and the remaining adjacent lands area forested. The adjacent upland habitats are used by songbird, deer, and small mammals.

PUGET ISLAND (W-44.0)

Puget Island, which is located in the lower Columbia River, is approximately 4,785 acres and it is oriented southeast to northwest. Cathlamet Channel separates Puget Island from the Washington shoreline. Puget Island has multiple sloughs and several smaller islands along its perimeter. The majority of Puget Island is protected by levees that sever direct hydrologic surface connections for the interior sloughs. Puget Island is entirely within the State of Washington.

Historically, the Puget Island site has been in agricultural use. The Puget Island upland placement site (Figure 20) is located in the southern interior of Puget Island, near RM 44. The Corps' 96-acre placement site (approximately 2 % of the entire island) is bound by East Sunny Sands Road to the south and agricultural fields on the remaining sides. The roughly rectangular site is in Wahkiakum County, Washington. At its closest point, the Corps' placement site is approximately 2,000 feet north of the CR FNC. The Puget Island Sump (Figure 8) is located immediately south of the placement site, between RM 44 and 45.

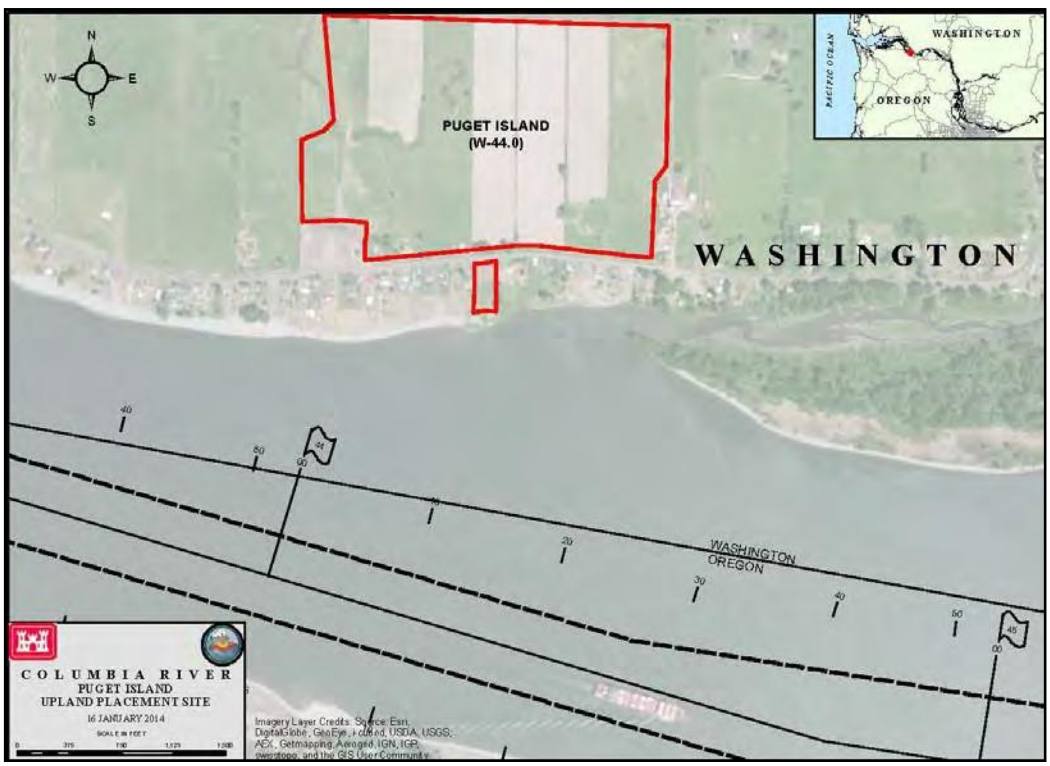


Figure 20: Puget Island

The site is composed of six contiguous properties, five of which are owned by ports in Washington and one by a private landowner. The Corps has 20-year right of entry (ROE) agreements for the five properties owned by the Washington ports, expiring in 2025 or 2030. The Washington ports are currently in negotiation for access to the private property. As required by the Ports' the pending easement, the site will be reseeded with grass after each placement. Trees will be planted along the perimeter of the site to prevent wind erosion of the sand onto adjacent properties. The landowner may lease the site for cattle between placement events. The Corps has not placed material at the site. In 2013, the site capacity was 3,500,000 CY.

The sites elevations range from 5 feet to 10 feet (CRD) across the site. East Sunny Sands Road, south of the site, is a levee with a road top elevation of 16 feet. The site is generally flat due to agricultural practices. The site is partitioned by narrow fence lines that have scattered shrubs along their lengths. Farmed wetlands are known on the site and account for approximately 5.4 acres. The upper end of Gilbertson Slough extends west from the site. Due to existing levees, the site does not have a direct hydrologic surface connection to the Columbia River. The site has limited wildlife habitat value beyond foraging of croplands by birds and small mammals. The site is not designated critical habitat for streaked horned larks and has not been surveyed for larks. The CNLM estimated no suitable SHLA breeding habitat existed on the site in 2011 due to ongoing agricultural activities. The Corps currently estimates that there is no suitable SHLA nesting habitat on Puget Island.

The adjacent parcels are active farm lands and have limited wildlife habitat values. Deer, songbirds, raptors, waterfowl, and small mammals utilize the adjacent agricultural lands for foraging and resting.

<u>BROWN ISLAND (W-46.3)</u>

Brown Island is located off the upstream end of Puget Island in the Columbia River and is approximately 170 acres. Brown Island is currently connected to Whites Island but they are separated from Puget Island by Cut-Off Slough.

Historically, the placement site was a shoreline extension to Brown Island to reduce downstream erosion and to provide an upland placement area on the upstream end. This work was done to promote wildlife use in the created uplands. The Corps' upland placement site (Figure 21) currently encompasses 102 acres on the upstream portion of Brown Island. The site is from RM 45.8 to 46.9, in Wahkiakum County, Washington. At its closest point, the upland placement site is approximately 1,200 feet north of the CR FNC.

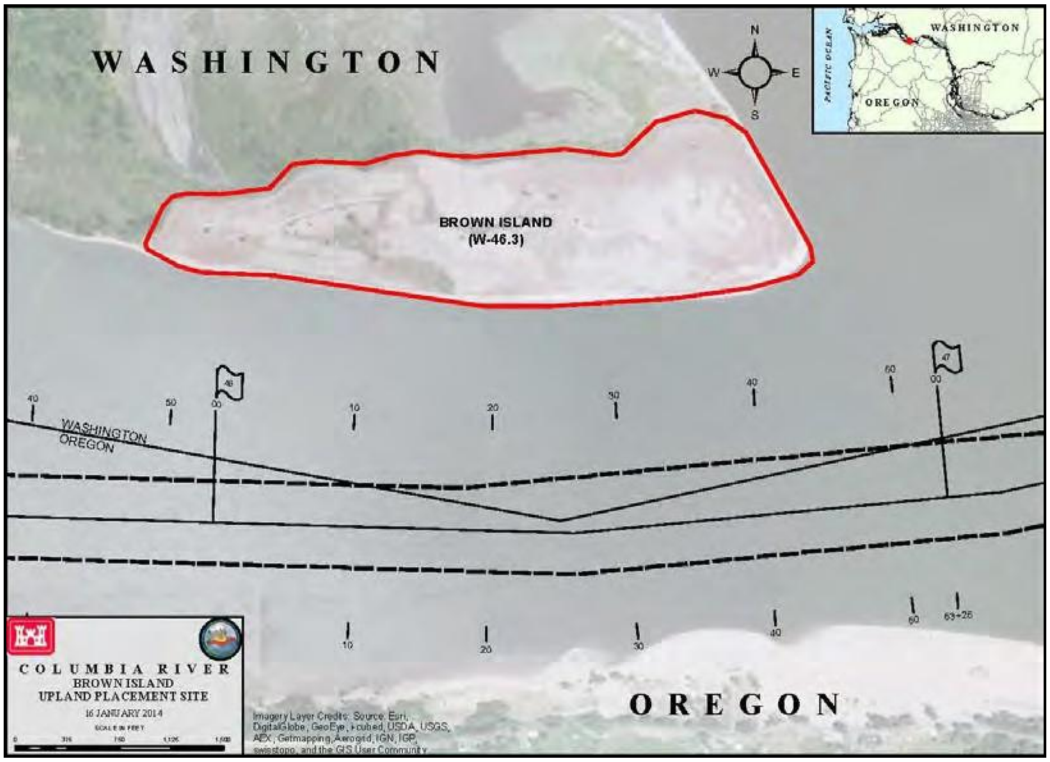


Figure 21: Brown Island

The site is owned by the State of Washington and the Washington ports have a 30-year easement with Washington DNR for placement by the Corps expiring in 2037. In 2003, the estimated site capacity for placement of dredged material was 4,700,000 CY. Material was placed on the entire site footprint in 2006. In 2011, 200,000 CY of material was placed in the upstream portion of the site. In 2013, the site capacity was 4,700,000 CY.

The elevations on site range from 5 feet (CRD) at the low water line to 50 feet in the west-central portion of the site and 56 feet at the upstream bank. The perimeter of the site has steep banks of 10 to 40 feet in height. The upstream portion of the site is bare sand while the lower third is vegetated with sparse grasses. A few scattered shrubs are visible in the central portion of the site. Waterfowl have nested on the upland portion of the site. Approximately 98 acres of the island have been designated as a critical habitat subunit for streaked horned larks. Larks were observed on this island during CNLM surveys. In 2013, 23 breeding pairs were recorded on Brown Island. The CNLM estimated that approximately 61 acres of suitable lark breeding habitat existed on the site in 2011. The Corps currently estimates that there are 72 acres of suitable SHLA nesting habitat on the site and the critical habitat subunit.

The adjacent portions of Brown Island have elevations of 5 to 15 feet (CRD). Wetlands and several tidal channels occur north and west of the placement site. The marsh habitats are used for foraging, resting, and rearing young waterfowl.

CRIMS ISLAND (O-57.0)

Crims Island is located in a bend of the lower Columbia River and it is separated from the Oregon shoreline by Bradbury Slough. Gull Island is located on the northern (downstream) end of Crims Island. Crims Island is dissected by several natural and manipulated waterways.

Historically, this site was used as a beach nourishment site on a former sand spit to shelter adjacent wetlands on Crims Island. The Corps' 59-acre, upland placement area (Figure 22) is oriented southeast to northwest, upstream of Crims Island. The placement area is separated from Crims Island by a narrow channel. The placement area is located from approximate RM 56 to 57, in Columbia County, Oregon. A pile dike protects the upstream end of the placement area. Three short pile dikes extend perpendicular from the northeastern shore of the placement site. At its closest point, the upland placement site is approximately 2,400 feet southwest of the CR FNC.

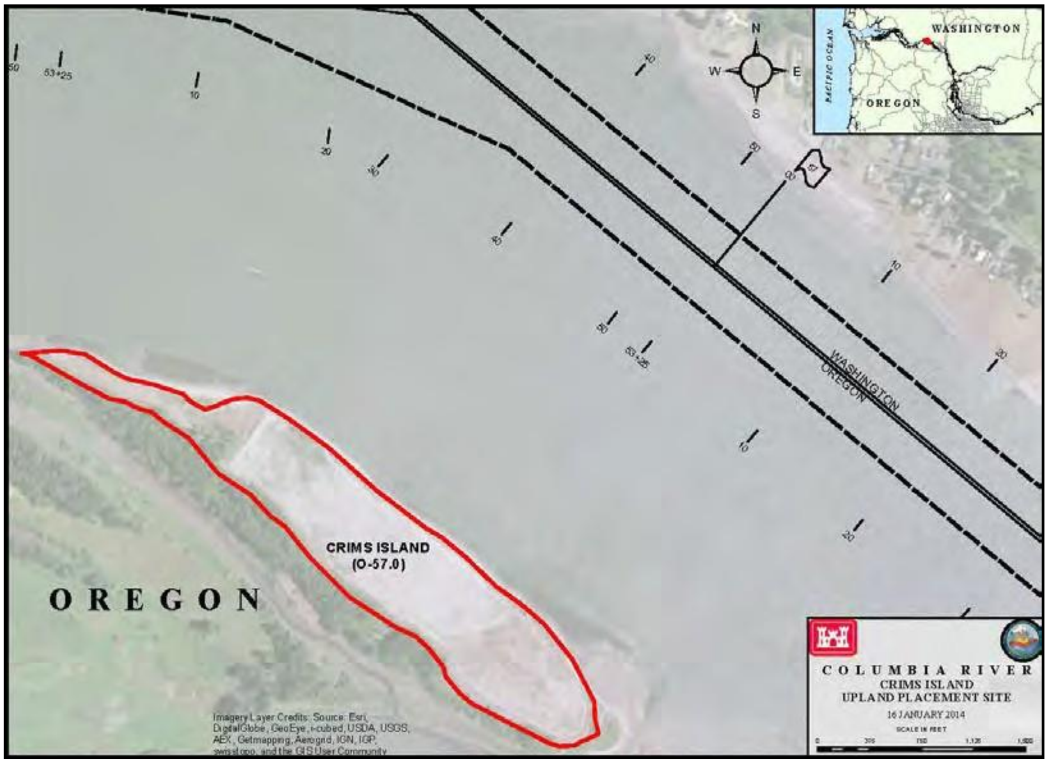


Figure 22: Crims Island

The site is owned by the State of Oregon and the Port of Portland has a 25-year easement with Oregon DSL for placement by the Corps. The Port of Portland's easement from the Oregon DSL expires in 2030. The downstream third of the site has not had material placed since before 2000. In 2003, the estimated site capacity for placement of dredged material was 1,600,000 CY. In 2008, the upper two thirds of the site received dredged materials. In 2010, approximately 250,000 CY of dredged materials were placed in the upstream end of the site. In 2013, the revised site capacity was 880,000 CY.

The elevations on site range from 5 feet (CRD) at the low waterline to 40 feet in the center of the site. The downstream (west) portion of the site tapers to a point and it has a level elevation of 12 feet. The downstream, tapered portion of the site is vegetated with grasses and herbaceous cover, and a few shrubs and trees. The 40-foot high center of the site is relatively flat. The upstream portion of the site is concave from 38 feet at its edge down to 20 feet in the center. The central and upstream portions of the 59-acre site are largely bare sand with very little vegetation and scattered shrubs. Known wildlife use of the site includes waterfowl and shorebirds. Approximately 60 acres of the island are a designated critical habitat subunit for streaked horned larks. Larks have been observed on this island during recent USFWS-sponsored surveys and in 2013, at least two breeding pairs were recorded on Crims Island. The CNLM estimated that approximately 25 acres of suitable lark breeding habitat existed on the site in 2011. The Corps currently estimates that there are 25 acres of suitable SHLA nesting habitat on placement site and critical habitat subunit.

The adjacent land, west of the site, is forested, with an elevation of approximately 16 feet. This forested area is densely covered with cottonwood trees and it has a marshy margin along the narrow channel. Nearby eagle nests are known on Crims Island and Gull Island. Shorebirds and waterfowl use both islands.

HUMP ISLAND (W-59.7)

Hump Island, which is located in the middle reach of the lower Columbia River, is approximately 77 acres. The linear island is oriented from southeast to northwest. The southeastern end of Hump Island is connected to Fisher Island by mudflats and vegetated lowlands. Hump Island is south of Fisher Island, separated by a shallow lagoon. Fisher Island Slough is a side channel of the Columbia River that separates Fisher Island from the Washington shoreline.

Historically, the Hump Island site had extensive placement activities since it acts as a flow control structure. As a properly functioning flow control structure, Hump Island minimizes the need for maintenance dredging of the CR FNC. Repeated upland placement and grading is necessary to maintain proper functioning. The Corps' 65-acre placement area (Figure 23) covers the riverward shore and inland area of Hump Island from its downstream (northwest) end to the island's upstream connection with Fisher Island. The site is in Cowlitz County, Washington, from RM 58.6 to 60.3. At its closest point, the Corps' upland placement site is approximately 500 feet north of the CR FNC.

Figure 23: Hump Island

The site is owned by the State of Washington and the Washington ports have a 30-year easement with Washington DNR for placement by the Corps, which expires in 2037. No materials have been placed on site since before 2000. In 2003, the estimated site capacity for placement of dredged material was 1,500,000 CY. In 2013, the revised site capacity was 550,000 CY.

The elevations of the placement site range from 10 feet (CRD) at the low water line to 30 feet at the downstream end. The site is vegetated with grasses, woody shrubs, saplings, and trees. Dominant vegetation includes Scotch broom, cottonwood, blackberry, barnyard grass, and brome grasses. No wetlands were delineated within the Corps placement site in 2013. Fishermen use the site for shoreline fishing. Hump Island is not designated as critical habitat for streaked horned larks and it has not been surveyed recently due to the lack of open habitat larks prefer. The CNLM estimated that no suitable SHLA breeding habitat existed on the site in 2011 due to extensive vegetation and the Corps currently estimates that there is no suitable SHLA nesting habitat on Hump Island. The placement area provides avian and mammal terrestrial habitats.

The 10-acre riparian area on the backside (north) of the island ranges in elevation from 0 to 15 feet (CRD). The riparian area is densely vegetated and dominated by trees, shrubs, and blackberries. Tidally and non-tidally influenced forested wetlands were observed north of the riparian buffer. Historically, waterfowl and eagle nesting are known to occur near the site. The lagoon between the islands provides avian foraging habitat, as well as tidal and sub-tidal aquatic habitats for fish and small mammals.

LORD ISLAND UPSTREAM (O-63.5)

Lord Island, which is located in the middle reach of the lower Columbia River, is approximately 415 acres, excluding intertidal mudflats along the northwestern shorelines of the island. A 2,000-foot long pile dike runs parallel to the upstream end of the island, approximately 200 ft from shore. Lord Island is oriented from southeast to northwest.

Historically, the Lord Island placement site was an upland site that became vegetated with alder and cottonwoods. The current 24-acre upland dredged material placement site, Lord Island Upstream, (Figure 24) is situated on the southern-most tip of the island across from Longview, Washington. The site is located from approximately RM 63.4 to 63.8, in Columbia County, Oregon. At its closest point, the site is approximately 750 feet southwest of the CR FNC.

Figure 24: Lord Island Upstream

This island is owned by the State of Oregon and the Port of Portland has a 25-year lease with Oregon DSL for placement by the Corps, which expires in 2030. In 2003, the estimated site capacity for placement of dredged material was 1,500,000 CY. In 2009, approximately 200,000 CY of material was placed over the entire footprint. In 2013, the revised site capacity was 550,000 CY.

The dredged material placement site elevations range from 10 feet (CRD) at the low waterline to 56 feet at its high peak. Steep 20 to 40 foot banks drop off along the edges of the site to the Columbia River. The interior of the dredged material site slopes to the island profile adjacent to the dredged material placement site. The placement site's riparian edges are primarily vegetated with cottonwood trees. The vast majority of the Lord Island Upstream site is unvegetated, bare sands. Patches of Himalayan blackberry, dune willow, and Scotch broom populate the sandy interior parts of the dredged material placement site. The eastern tip of the site is dominated by dune grasses. An established riparian forest lies to the west and northwest boundary of the dredged material placement site. The island is not designated critical habitat for streaked horned larks and has not been surveyed for larks. The CNLM estimated that approximately four acres of suitable lark breeding habitat existed on the site in 2011. The Corps currently estimates that there are 10 acres of suitable SHLA nesting habitat on the Lord Island Upstream site.

The remainder of Lord Island, aside from the dredged material placement site, is covered with riparian forest and shallow channels. The island is used for fishing access and waterfowl, foraging and resting.

DIBBLEE POINT (O-64.8)

The Dibblee Point peninsula is on the southern bank of the Columbia River, in Columbia County, Oregon. The point was created from dredged material placement. The artificial peninsula has been heavily modified over time by land clearing, dredged material placement, and excavation activities. Portions of the peninsula have been undisturbed and are vegetated with mature trees and shrubs.

The entire Dibblee Point peninsula was historically used for placement of dredged material. Currently, the approximately 52-acre placement site is used as an upland placement and borrow site. An approximately 500-foot long pile dike runs perpendicular out from the dredged material placement site. The site (Figure 25) is between RM 64 and 65, downstream of Rainier, Oregon. At its closest point, the site is approximately 650 feet southwest of the CR FNC.

Figure 25: Dibblee Point

The site is owned by the State of Oregon and the Port of Portland has a 25-year lease with Oregon DSL for placement by the Corps expiring in 2030. In 2003, the estimated site capacity for placement of dredged material was 2,235,000 CY. In 2009, 1,500,000 CY of the material was placed over the entire site. The site was last used in 2010 for placement of 1,000,000 CY of material from the CRCIP. Since the site is an active borrow site, its long-term capacity varies as material is removed by others.

The elevations on the site range from 10 feet (CRD) at the waterline to 65 feet in the western portion of the placement area. The southwest corner of the property is utilized by a sand and gravel mining operation. Dibblee Point has high levels of human activity and is sparsely vegetated with grasses with some shrubs clustered throughout the site. The west, south, and east perimeters of the current site boundary are comprised of well established stands of hardwoods. The site is not designated as critical habitat for streaked horned larks. The site was surveyed for larks in 2013, but none were observed by the CNLM. The CNLM estimated that approximately one acre of suitable lark breeding habitat existed on the site in 2011. However, the Corps assumes that no suitable nesting habitat occurs at Dibblee Point because sand extraction activities preclude site use by SHLA.

Outside of the placement site boundary, the ground surface slopes downhill from the center of the peninsula to the Columbia River on the north and towards a backwater slough to the south. Portions of this peninsula are heavily vegetated with mature cottonwoods, while other areas contain wetlands and pond areas. There is a tidal marsh to the south of the buffer of cottonwoods and willows. The peninsula shoreline is used for fishing access, while the backwater slough is used for waterfowl resting.

HOWARD ISLAND (W-68.7)

Howard and Cottonwood Islands were combined into an approximately 950-acre island during dredging and placement activities following the Mount St. Helen's eruption. This larger island extends from RM 68.2 to 71.7 of the Columbia River. The island is composed of two placement areas, Howard Island and Cottonwood Island, as well as forests, shrub lands, wetlands, ponds, and several waterways. A disturbed area is largely a dredged material placement site, with approximately 500 acres of exposed sand or sand covered by a layer of moss and lichen. Carrolls Channel, on the northern and eastern sides of the larger island, separates the island from the Washington shoreline.

Historically, the Howard Island site was used as an upland and beach nourishment site. This site has been used for approximately 50 years. Currently, the Corps has a 315-acre site (Figure 26) for upland placement on the downstream end of the larger island. The Howard Island Site is located from RM 68.2 to 70, in Cowlitz County, Washington. At its closest point, the site is 450 feet northeast of the CR FNC.

Figure 26: Howard Island

The site is composed of two parcels, separately owned by the Washington ports and the State of Washington. The Corps' 20-year ROE agreement for the ports-owned parcel expires in 2033. The Washington ports have a 28-year easement with Washington DNR for the State's parcel for placement by the Corps that expires in 2037. In 2003, the estimated site capacity for placement of dredged material was 6,400,000 CY. Approximately 200,000 CY of material was placed on the downstream side of Carrolls Channel in 2007. The remainder of the site has not been used since prior to 2000. In 2013, the revised site capacity was 2,700,000 CY.

The site elevations range from 10 feet (CRD) at the waterline to 50 feet at the downstream tip of the site. Although the site slopes from northwest to southeast based on past placement efforts, it is uniformly level along certain reaches. There are steep banks (20 ft banks) that drop off to the Columbia River and Carrolls Channel. The vegetated area consists of mixed deciduous habitat. A lowland area with a pond and wetlands are located adjacent to the northwestern site boundary and Carrolls Channel. A small drainage channel runs north from the pond into the channel. The wetland area is avoided during placement activities. The island is not designated as critical habitat for streaked horned larks and has not been surveyed for larks. The CNLM estimated that approximately seven acres of suitable lark breeding habitat existed on the Howard and Cottonwood sites, combined, in 2011. The Corps currently estimates that there are five acres of suitable SHLA nesting habitat on Howard Island. The site is used by deer, songbirds, and small mammals.

Forests, wetlands, and a former, inactive placement area abut the placement site's northeastern and eastern boundary. There are several ponds situated on the island near the site. Eight pile dikes are situated along the Columbia River side of the island, and other navigation aids and groins are distributed along the shoreline. The Corps also maintains a 110-acre wildlife mitigation site on Port-owned lands in the center of the Howard-Cottonwood Island that was constructed as part of the 43-foot Columbia River channel improvement project in 2011. The wildlife mitigation site includes tree and shrub plantings and wetland habitat. In 2012, the USFWS planted about 16 acres of forage grass for Columbian white-tailed deer on Port-owned lands outside the placement area. While there is no direct access to the island, the area is not closed to the public and it is commonly used as a recreational site for camping and fishing. Bald eagles nest on the island and the waters around the island are regularly used for waterfowl hunting.

<u>COTTONWOOD ISLAND (W-70.1)</u>

As described in the Howard Island narrative, Cottonwood and Howard Islands were combined into one island following emergency dredging in the wake of the Mount St. Helens eruption. Historically, the Cottonwood Island site was a beach nourishment site prior to the Mount St. Helens placement. The site has been continuously used for placement and the Corps currently uses the 62-acre site (Figure 27) for upland placement on Cottonwood Island. The site is located on the interior of the island, at the upstream end of the larger island. The Cottonwood Island site is located from RM 70.5 to 71.5, in Cowlitz County, Washington. At its closest point, the site is approximately 600 feet east of the CR FNC.

Figure 27: Cottonwood Island

The site is owned by Washington ports and is available for placement by the Corps. The Corps' 20-year ROE agreement from the Washington ports expires in 2027. In 2003, the estimated site capacity for placement of dredged material was 3,200,000 CY. In 2008, approximately 1,400,000 CY of material was placed on the upstream half of the site. In 2013, the revised site capacity was 640,000 CY.

The elevations on the site range from 20 to 30 feet (CRD) in upstream half of the site to 30 to 60 feet in the downstream portion of the site. Unlike Howard Island, the Cottonwood Island site does not abut the Columbia River or Carrolls Channel. The island is not designated as critical habitat for streaked horned larks. The downstream portion of the site has a few stands of trees but it is largely covered by grasses, mosses, and lichens. The elevated, upstream portion of the site is covered by grasses, mosses, and lichens. Surveys were conducted by CNLM staff in 2010 and no SHLA were detected, even though the vegetation structure appeared adequate to support breeding larks. The CNLM estimated that approximately seven acres of suitable lark breeding habitat existed on the combined Howard and Cottonwood island sites in 2011. The Corps currently estimates that there is no suitable SHLA nesting habitat on Cottonwood Island. Larks are not expected to utilize the site for nesting due to the trees that surround the placement site. Waterfowl are known to rest on the site and the site is used by deer, songbirds, and small mammals. In 2012, the USFWS planted forage grass for Columbian white-tailed deer on a portion of the site filled in 2008.

Forests and open lands abut the placement site. There are steep banks dropping to both the Columbia River and Carrolls Channel along the upstream reaches of this island. The island has some beacons and five timber pile dikes adjacent to or on the site. There are visible trails, but no developments are on the island other than the Corps wildlife mitigation site discussed in the Howard Island narrative above. There is no direct access to the island, but recreational camping and fishing has been observed. Bald eagles nest on the island and the waters around the island are used for waterfowl hunting.

<u>NORTHPORT (W-71.9)</u>

The Northport placement site is on a peninsula contiguous with the Port of Kalama. The peninsula is located on the eastern shore of the Columbia River from RM 71.7 to 72.2. The Port's developed land is from the upstream entrance to Carrolls Channel south to the Kalama River. This area includes the Port of Kalama's waste water treatment area, open industrial land, and an active industrial dock.

Historically, the Corps used the Northport site as a shoreline placement area. The Corps has a 31-acre site (Figure 28) for upland placement from which others borrow placed materials. The site is on the downstream end of the Port's property, in Cowlitz County, Washington. At its closest point, the site is approximately 1,000 feet west of the CR FNC.

Figure 28: Northport

The site is owned by the Port of Kalama and is available for placement by the Corps. The Corps' 20-year ROE agreement from the Port of Kalama expires in 2024. In 2003, the estimated site capacity for placement of dredged material was 900,000 CY. Approximately 500,000 CY of material was placed on 27 acres of the site in 2008. In 2013, the revised site capacity was 200,000 CY.

The elevations on the site range from 10 feet (CRD) to 41 feet. The western, riverward site boundary is 30 to 20 feet above the river. The site is used by others to excavate placed dredged materials during which the property is routinely traversed by vehicles and heavy equipment. A relic weir remains on the site, surrounded by dense Scotch broom. Portions of the site are covered in sparse moss, grasses, and lichens, as well as excavated bare areas. Streaked horned larks are known to use the site due to its sparse vegetation, but the site is not designated as critical habitat. Three pairs were observed during CNLM surveys in 2013, and for this reason, placed materials have not been removed recently, even though the site is regularly accessed by public vehicles. The CNLM estimated that approximately three acres of suitable lark breeding habitat existed on the site in 2011 which the Corps estimates is still available as suitable SHLA nesting habitat. While the site has little wildlife value, it is used by coyotes, raccoons, and birds, such as crows, killdeer, and various raptors. Bald eagles forage in the vicinity of the site.

The rectangular peninsula is bordered by the river to the west, port lands to the south and southeast, and forested lands to the east and northeast. Most of the peninsula and the adjoining properties to the south have received fill from previous placement operations. The public uses the site for dog walking.

SANDY ISLAND (O-75.8)

Sandy Island, which is located in lower Columbia River near Kalama, Washington, is approximately 340 acres, excluding several waterways and side channels. Sandy Island is bean shaped and is separated from the Oregon shore by a side channel of the Columbia River. There is a 5,500-foot long pile dike along the upstream portion of the island, parallel to the flow of the river and the island.

Historically, the placement site on Sandy Island was used for upland and beach nourishment placement. The island is likely a relic sand bar and approximately 2.5 miles of beach nourishment have occurred on Sandy Island. The Corps currently uses 32 acres as an upland site (Figure 29). The upland placement site is located on the upstream, southern tip of Sandy Island, from RM 75.8 to 76.2. At its closest point, the site is approximately 1,300 feet west of the CR FNC, in Columbia County, Oregon.

Figure 29: Sandy Island

The site is owned by the State of Oregon and the Port of Portland has a 25-year lease with Oregon DSL for placement by the Corps. The Port of Portland's easement from the Oregon DSL expires in 2030. In 2003, the estimated site capacity for placement of dredged material was 1,100,000 CY. In 2011, approximately 400,000 CY of material was placed on the entire site footprint. In 2013, the site was evaluated and it was determined that the site had reached capacity, such that materials need to be removed to provide capacity for future placement.

The site elevations range from 10 feet (CRD) at the waterline to 50 feet on the upstream bank of the site. The topography of the site is relatively flat with a sloping center from east to west. Steep 40 to 50 foot banks are located along the northern, eastern, and southern boundaries of the site. Dikes were constructed to manage dredged material during prior placement events. The site is mostly bare sand with a small, triangular cluster of approximately 20 trees in the northwest portion of the site. Approximately 37 acres have been designated as a critical habitat subunit for streaked horned larks, including the 32-acre placement site. Larks have been observed on this island during recent USFWS-sponsored surveys. In 2013, four breeding pairs were recorded on Sandy Island. The CNLM estimated that approximately 13 acres of suitable lark breeding habitat existed on the site in 2011. The Corps currently estimates that there are 32 acres of suitable SHLA nesting habitat on the

Sandy Island site and within the critical habitat subunit. The site is used for fishing access, as well as low-quality songbird habitat and resting waterfowl, deer and small mammals.

The topography of Sandy Island is relatively flat. It is vegetated by forests, shrub land, wetlands, and some open grassland along the eastern bank.

<u>LOWER DEER ISLAND (O-77.0)</u>

Deer Island is located in the lower Columbia River near Saint Helens, Oregon and is approximately 2,900 acres. The island is approximately 5.2 mile long, with pointed tips and a wide middle. It is generally oriented south to north, and it is separated from the Oregon shore by Deer Island Slough. It has a levee around its perimeter that runs the entire western boundary of the island and physically separates the island's interior from the direct flows of the Columbia River. Pumps and tide gates are used to control interior water levels in the sloughs on the island.

Historically, the Corps' placement area was used to replace sediments that had eroded away. Currently the Corps uses the 24-acre Lower Deer Island site (Figure 30) for upland placement. The placement area is almost entirely composed of previously dredged material and it is located at the downstream, northern end of the island in Columbia County, Oregon. The site is located from approximate RM 76.5 to 77.1. At its closest point, the site is approximately 580 feet west of the CR FNC.

Figure 30: Lower Deer Island

This placement area is owned by the State of Oregon and the Port of Portland has a 25-year easement with Oregon DSL for placement by the Corps expiring in 2030. There has been no placement of dredged materials or site preparation work at the site since 1995. In 2003, the estimated site capacity for placement of dredged material was 1,500,000 CY. In 2013, the site capacity was revised to 650,000 CY.

The elevations in the placement area range from 8 feet (CRD) at the river's edge to 32 feet in the northern portion. The majority of the placement area is above elevation 10 feet. Dredged material has historically been placed above elevation of 10 feet. The Lower Deer Island placement area is riverward of the levee on Deer Island. There are three pile dikes perpendicular to the site which extend into the river, all of which are in satisfactory to poor condition. The dredged material placed near the southern tip of the placement area is partially stabilized with herbaceous vegetation, but the downstream portion is also eroding due to river currents.

Both a natural gas pipeline and a fiber optic cable pass through this site, dividing it roughly in half. Placement is not allowed within the 3.4-acre pipeline easement area. The site is dominated by herbaceous vegetation, moss, and lichens, with sparse shrubs. The shrubs on the site are typically scotch broom and the site is bounded by young stands of woody vegetation. No wetlands were delineated on the site in 2013. The island is not designated as critical habitat for streaked horned and it has not been surveyed. The CNLM estimated that no suitable SHLA breeding habitat existed on the site in 2011 due to extensive vegetation and visual separation from the river. The Corps currently estimates that there is no suitable SHLA nesting habitat on Lower Deer Island. Fishermen regularly use the site for shoreline fishing.

There is an extensive tidally influenced emergent, shrub, and forested wetland outside of the placement area, adjacent to the site's northern end. Forested wetlands are located west of the southern portion of the placement area. Vegetation adjacent to the dredged material placement site is either a mix of herbaceous plants and shrubs or stands of cottonwoods. The adjacent riparian habitat and forest on Deer Island provide good wildlife value.

MARTIN BAR (W-82.0)

The Martin Bar area is located on the eastern shoreline of the lower Columbia River. The area is composed of two separate parcels, Martin Bar North (~17 acres) and Martin Bar South (~23 acres). The parcels are separated by an unimproved road and a cluster of trees that form Lions Day Park and boat launch area. Both parcels are riverward of a levee.

Martin Bar North is leased for farming and Martin Bar South is used as for upland placement and it is a borrow site. Combined, the parcels form a 40-acre site (Figure 31) from RM 81.8 to 82.3, in Cowlitz County, Washington. At its closest point, the site is approximately 1,000 feet west of the CR FNC.

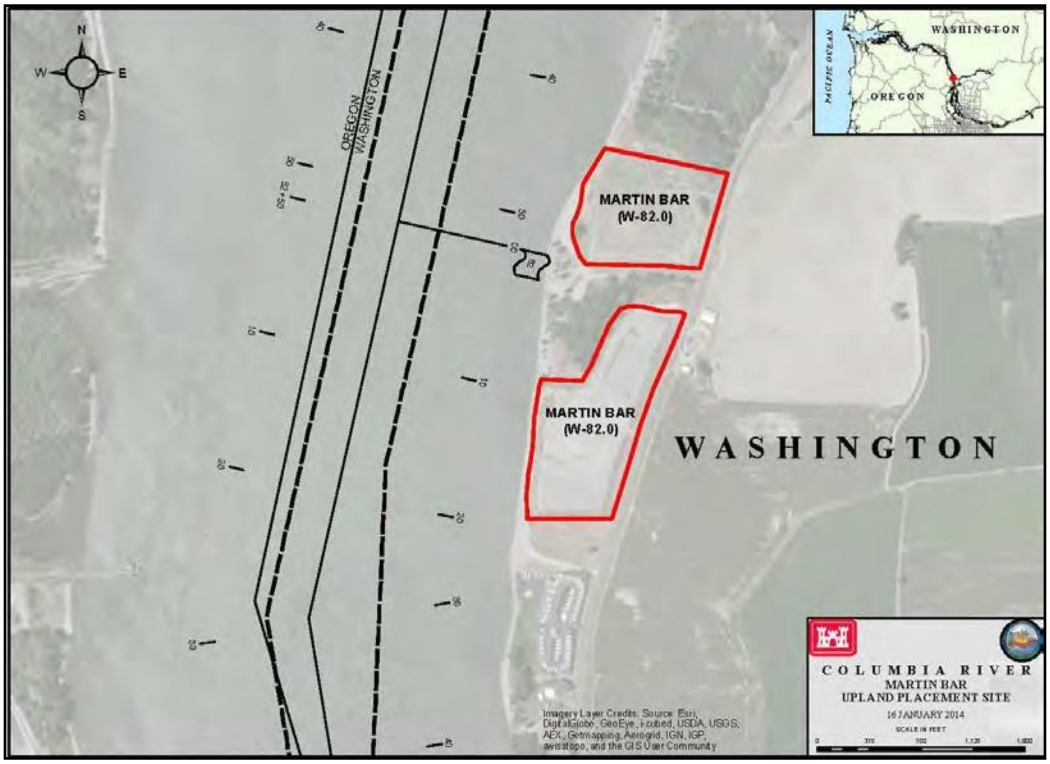


Figure 31: Martin Bar

The upland placement sites are owned by the Port of Woodland and available for placement by the Corps. The Corps' 20-year ROE agreement from the Port expires in 2025. In 2003, the estimated site capacity for placement of dredged material was 1,500,000 CY. In 2008, the Martin Bar South parcel was filled with 500,000 CY of material. The Port of Woodland leased the site for sand mining and most of the sand placed in 2008 has been removed. In 2008, the Martin Bar North site had exterior diking work, but no placement occurred even though the external berms remain in place. In 2013, the site capacity was estimated at 720,000 CY.

The elevation on the north parcel averages approximately 20 feet (CRD). The elevation on the south parcel averages approximately 29 feet (CRD). One pile dike protects the shoreline of the southern parcel. The northern parcel is vegetated with grasses, while the southern parcel is mostly bare sand with scattered low plants. The parcels are not designated as a critical habitat subunit for streaked horned larks due to the farming and borrowing activity. Larks are not known to use the site and it has not been recently surveyed. The CNLM estimated that approximately five acres of suitable lark breeding habitat existed on the site in 2011. The Corps currently estimates that there is no suitable SHLA nesting habitat on Martin Bar South due to the site's exterior berms and regular use as a borrow site. No habitat is expected on Martin Bar North due to current agricultural practices. Together, the parcels provide little to no wildlife habitat.

Cottonwoods populate the area north of the northern parcel. Nearby improvements include a beacon for navigational purposes and groin placed perpendicular to the shoreline, fencing, shed, an outhouse, and several unimproved roads. An RV park is located south of the southern parcel. The lands east of the levee are used for agricultural farming.

<u>SAND ISLAND (O-86.2)</u>

Sand Island is approximately 55 acres and is located at the downstream entrance to Multnomah Channel. The Multnomah Channel separates Sand Island from the town of Saint Helens, Oregon.

Sand Island is immediately downstream of Sauvie Island. The island is developed as a marine park, has two boating piers on its western shore, and it is used for public recreation.

Historically, Sand Island served as a flow control structure to minimize maintenance dredging of the adjacent St. Helens Bar. Dredged materials were placed on the east bank of the island to maintain the structure and replace eroded sediments. Currently, the Corps has 28-acre shoreline placement site (Figure 32) along the east side of Sand Island, in Columbia County, Oregon. The shoreline site extends beyond the existing island's footprint to the north, east, and south. A 1,920-foot long pile dike extends along the upstream end of the site. At its closest point, the site is approximately 750 west of the CR FNC.

Figure 32: Sand Island

The placement site is owned by the State of Oregon and the Port of Portland has 25-year easement for placement by the Corps expiring in 2030. In 2003, the estimated site capacity for placement of dredged material was 1,250,000 CY. In 2012, material was placed on the downstream shoreline of the site. In 2013, approximately 150,000 CY of material was placed on the upstream shoreline and tip of the island. The site capacity varies annually due to continual erosion of the shoreline by river flows.

The elevations in the placement site range from -15 feet (CRD) at the downstream limit to 20 feet on the landward edge adjacent to the park. The site is a highly erosive beach of mostly bare sand, with sparse grasses and ground cover on the higher portions. Current recreational use of island excluded the area from designation as critical habitat for streaked horned larks. Larks have historically occupied the site, but no larks were observed during 2013 surveys by the CNLM. The CNLM estimated that approximately one acre of suitable lark breeding habitat existed on the site in 2011. The Corps currently estimates that there is approximately one acre of suitable SHLA nesting habitat on Sand Island and due to the high level of human disturbance during the summer, SHLA are not expected to utilize the site for breeding.

The interior and western bank of the island is forested, interspersed open grassland and beach areas. The island has approximately 25 acres of well-established woody vegetation. Areas with woody vegetation are outside the dredged material placement boundaries. Dredged material is placed on the island to support beach nourishment along this reach. The wooded portions of site provide songbird and raptor habitats, while the beaches are used by shorebirds and a few waterfowl. Anglers use the site for shoreline fishing.

AUSTIN POINT (W-86.5)

The Austin Point placement site is located on east bank of the lower Columbia River, outside of the levee for Woodland, Washington. Austin Point is at the confluence of the Lewis River with the Columbia River.

Historically, this site was a beach nourishment site to facilitate wildlife mitigation efforts on Austin Point 30 to 40 years ago. The site was also used for upland placement. Currently, the Corps' 30-acre upland placement site (Figure 33) is used as a heavy equipment, crane, and rigging training school in Cowlitz County, Washington. The site is located from RM 86.0 to 86.3. At its closest point, the site is approximately 600 feet west of the CR FNC.

Figure 33: Austin Point

The Austin Point placement site is owned by the Port of Woodland and available for placement by the Corps. The Corps' 20-year ROE from the Port of Woodland expires in 2025. In 2003, the estimated site capacity for placement of dredged material was 1,645,000 CY. In 2008, material was placed on the entire site. In 2013, 250,000 CY of material was placed on the downstream 2/3 of the site. Material will need to be removed from the site to provide capacity for future placement events.

The site elevations range from15 to 35 feet (CRD). The topography of site is open, level, and devoid of vegetation. An elevated dike runs along the western edge of the property. The site is primarily a large, undulating sand pit. Current site uses excluded designating the site as critical habitat for streaked horned larks. Although larks are not known to historically occupy the site and no formal lark surveys have been conducted recently, several juvenile larks were observed by the Corps in September 2013 prior to placing dredged material. The CNLM estimated that approximately 14 acres of suitable lark breeding habitat existed on the site in 2011. The Corps placed dredged material on the downstream two thirds of the site in 2013. The Corps currently estimates that there is no suitable SHLA nesting habitat on Austin Point due to ongoing heavy equipment school site grading activities. Overall, the site provides low wildlife habitat values.

A water supply well house and groundwater well for the equipment school are situated near the site. There is approximately 150 feet of open sand between the shoreline and the western edge of the dredged material placement site. Two pile dikes extend perpendicular from the shoreline into the river. Blackberries, weedy grasses, low-lying shrubs, and cottonwoods are located north and south of the site. Bald eagles nest in the area and forage downstream of the site. Fishermen use the area for shoreline fishing, while songbirds, small mammals, and waterfowl use the nearby lands and waterways.

FAZIO SAND & GRAVEL (W-97.1)

The Fazio Brothers Sand Company, Inc. has a 220-acre sand and gravel facility located on the east bank of the Columbia River, near RM 97. The company has been in operation at this site since the 1950's. This company has an open parcel upstream of their facility that is used for sorting and processing sandy materials removed from the river. The operation is located in Clark County, Washington upstream of the Ridgefield National Wildlife Refuge.

The Corps has placed dredged materials in-water near the 17-acre upland site (Figure 34). Materials are currently placed riverward of the shoreline. The placed materials are mined by dredging and processed by the company under a separate permit for commercial uses. The site is located from RM 97.1 to 97.3. At its closest point, the site is approximately 1,400 feet east of the CR FNC.

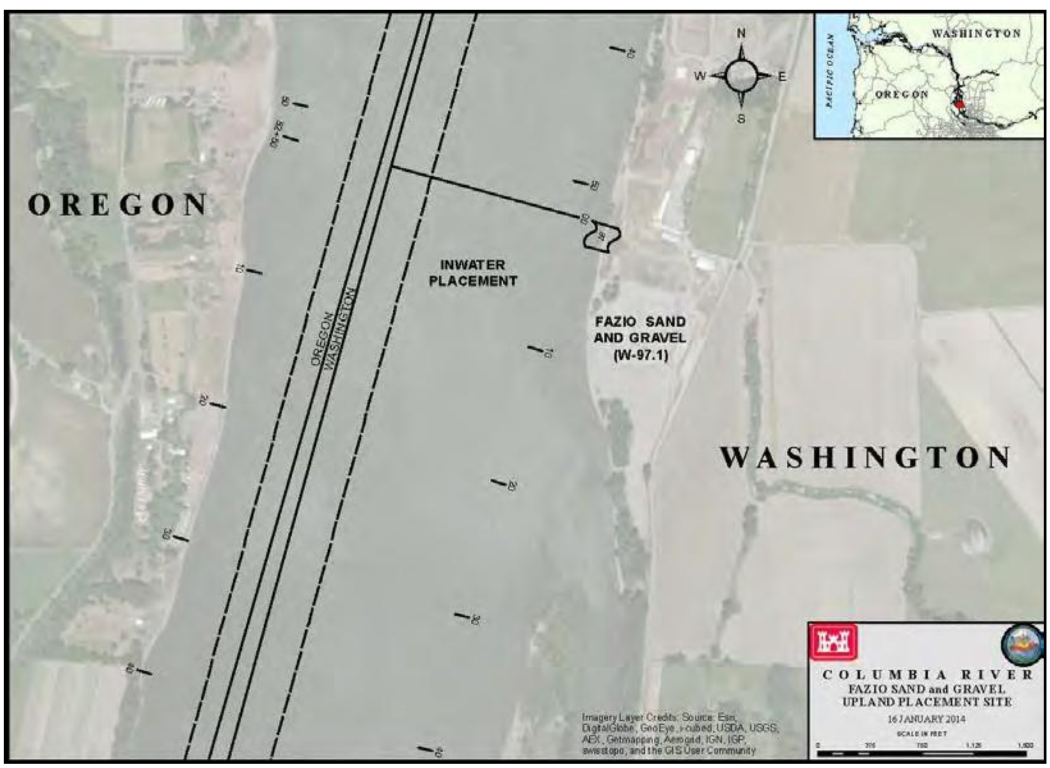


Figure 34: Fazio Sand & Gravel

The Washington Ports have an easement with the Fazio Brothers Sand Company, Inc. for direct placement of dredged material by the Corps into their upland processing area. However, the current practice by the Corps is to place material in-water in the State of Washington so Fazio Brothers Sand Company, Inc. can later mine the material for upland processing at their site under separate permitting. In 2003, the estimated upland site capacity for placement of dredged material was 1,200,000 CY for the life of the project. The Corps intends to continue placing material in-water annually as Fazio Brothers Sand Company, Inc. mining operations continue to provide in-water placement capacity each year.

The site elevations range from 10 feet (CRD) at the shoreline placement area to 45 feet in the processing area. The upland area is open, bare sands. A few stands of cottonwood trees are located along the shore. The site is not designated as critical habitat for streaked horned larks and has not been recently surveyed for larks. The CNLM did not map suitable habitat at Fazio Sand & Gravel in 2011 because the habitat status cannot be inferred through imagery. The Corps currently estimates there is no suitable SHLA nesting habitat on the Fazio Sand & Gravel site. Due to the active sand mining and processing activities, the site provides little wildlife habitat and it is assumed to provide no suitable nesting habitat for larks.

GATEWAY (W-101.0)

The Gateway upland placement site is located at RM 101 of the Columbia River, in Clark County, Washington. The site is located approximately 500 feet inland from the river and 450 feet south of a man-made channel, known as the Vancouver Lake Flushing Channel. This area is located between the Columbia River and Vancouver Lake, downstream from the City of Vancouver.

Historically, the Gateway site was a major placement area. Currently the 40-acre placement site (Figure 35) is used for upland placement and as an active borrow site. The site is located from approximately RM 100.9 to 101.2 and at its closest point is approximately 2,200 feet northeast of the CR FNC.

Figure 35: Gateway

The site is owned by the Port of Vancouver and available for placement by the Corps. The Corps' 20-year ROE agreement from the Port of Vancouver expires in 2025. The site was constructed in 2005 with a height-restricted capacity of 2,000,000 CY. In 2005 and 2007, the Corps placed approximately 1,150,000 CY of material over the entire site. The Port of Vancouver has removed all but 3,000 CY of materials, leaving a renewed site capacity of 2,000,000 CY.

The site elevations range from 20 feet (CRD) in the interior to 40 feet along portions of the site's containment berm. The site is actively used to borrow placed materials, which precludes the establishment of woody shrubs or trees onsite. The majority of the site is bare, with some areas of grasses and low herbaceous plants. The site was not designated as critical habitat and there is no known SHLA breeding at the site. The site has not been recently surveyed by the USFWS for larks but the Port performed surveys from April to July and in November 2013, following the Washington Department of Fish and Wildlife (WDFW) survey protocol. The only larks observed during the surveys were three females who touched down briefly (5-15 seconds). No other larks or any nests were observed by the Port in 2013. The CNLM did not map suitable habitat at Gateway in 2011 because the habitat status cannot be inferred through imagery. The site has exterior visual barriers (containment berms and trees), and therefore the Corps currently estimates there is no suitable SHLA nesting habitat on the Gateway site. Due to borrow activities, topography of the site, visual barriers (trees) between the site and the river, and lack of suitable foraging opportunities, the site provides little wildlife value.

This site is bounded to the north, east, and south by agricultural lands used for growing corn for silage. Woodlands are located to the west, separating the site from the Columbia River. The woodlands are cottonwoods and with some shrubs. The adjacent agricultural lands have limited wildlife habitat, though some songbirds, raptors, waterfowl, and small mammals utilize the adjacent agricultural lands for foraging and resting.

WEST HAYDEN ISLAND (O-105.0)

Hayden Island is located in the lower Columbia River, upstream of the confluence of the Willamette and Columbia Rivers. Hayden Island is approximately 1,400 acres and it is oriented southeast to northwest. Hayden Island is entirely within Multnomah County, Oregon and it is separated from the Oregon shore by Oregon Slough. The Oregon shore across from the island is developed for commercial and industrial land uses, including docks for the Port of Portland and others.

The eastern portion of the island is within the City of Portland and it is heavily developed for commercial, retail, residential, and recreational land uses. There are many houseboat and boat moorages along the banks of the eastern portion of the island, primarily along Oregon Slough. The western portion of island, which is delineated from the eastern portion by a railroad line, is not developed but has been altered by utility lines, prior dredged material placement, and land clearing.

Historically, the Corps has used the downstream portion of Hayden Island for placement of dredged material. Material has been placed as beach nourishment in the past. Currently, the Corps has a 116-acre upland placement site (Figure 36), referred to as the West Hayden Island site, on the northern side of the island from RM 104.6 to 105.4. At its closest point, the site is approximately 1,200 feet southwest of the CR FNC.

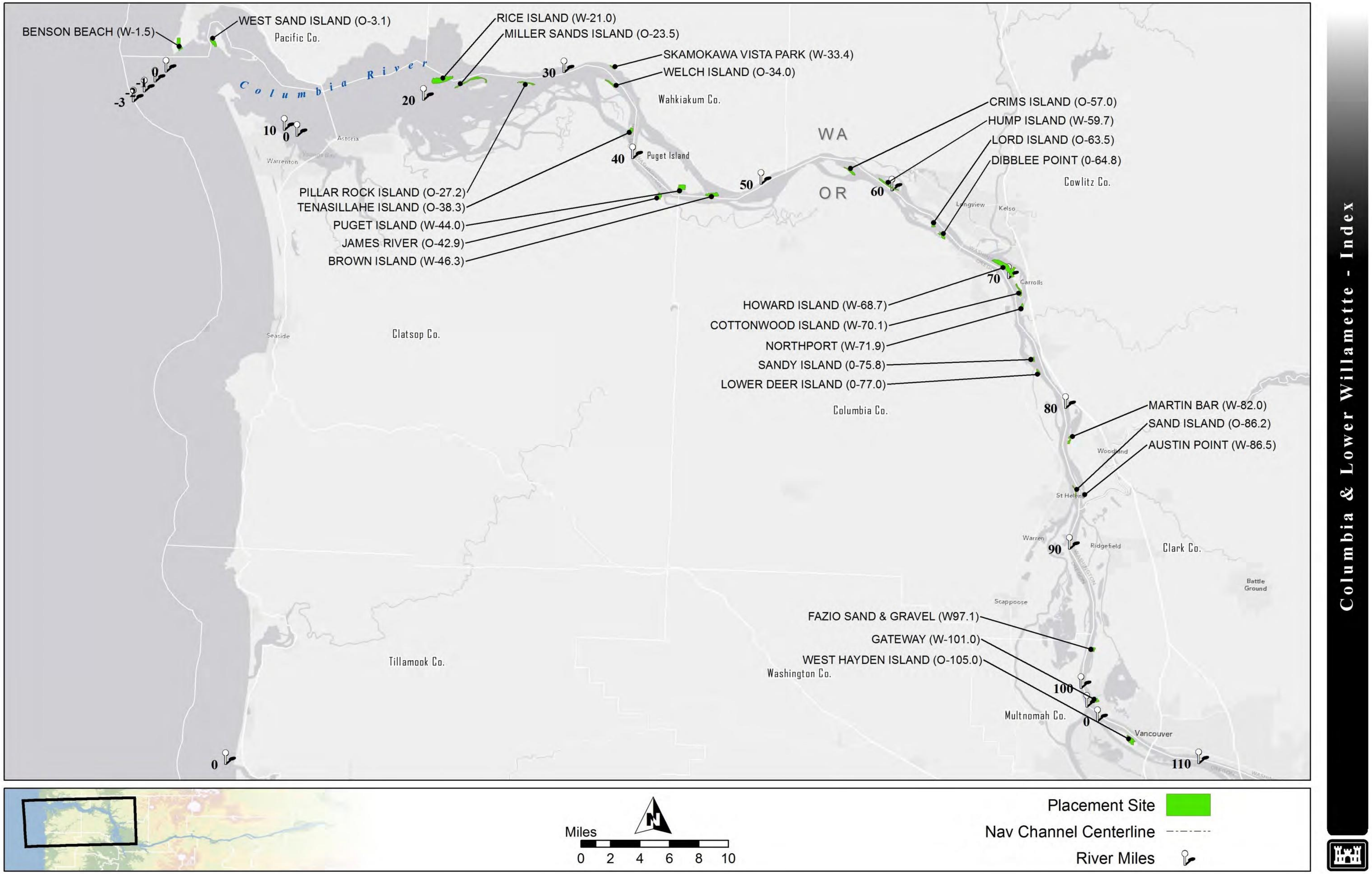
Figure 36: West Hayden Island

The site is owned by the Port of Portland and available for placement by the Corps. The Corps' 20-year ROE agreement from the Port of Portland expires in 2025. In 2003, the estimated site capacity was 5,750,000 CY. In 2011, approximately 50,000 CY of materials were placed in the southern corner of the site as part of the Corps maintenance program in the Willamette River. In 2013, the site capacity remained the same.

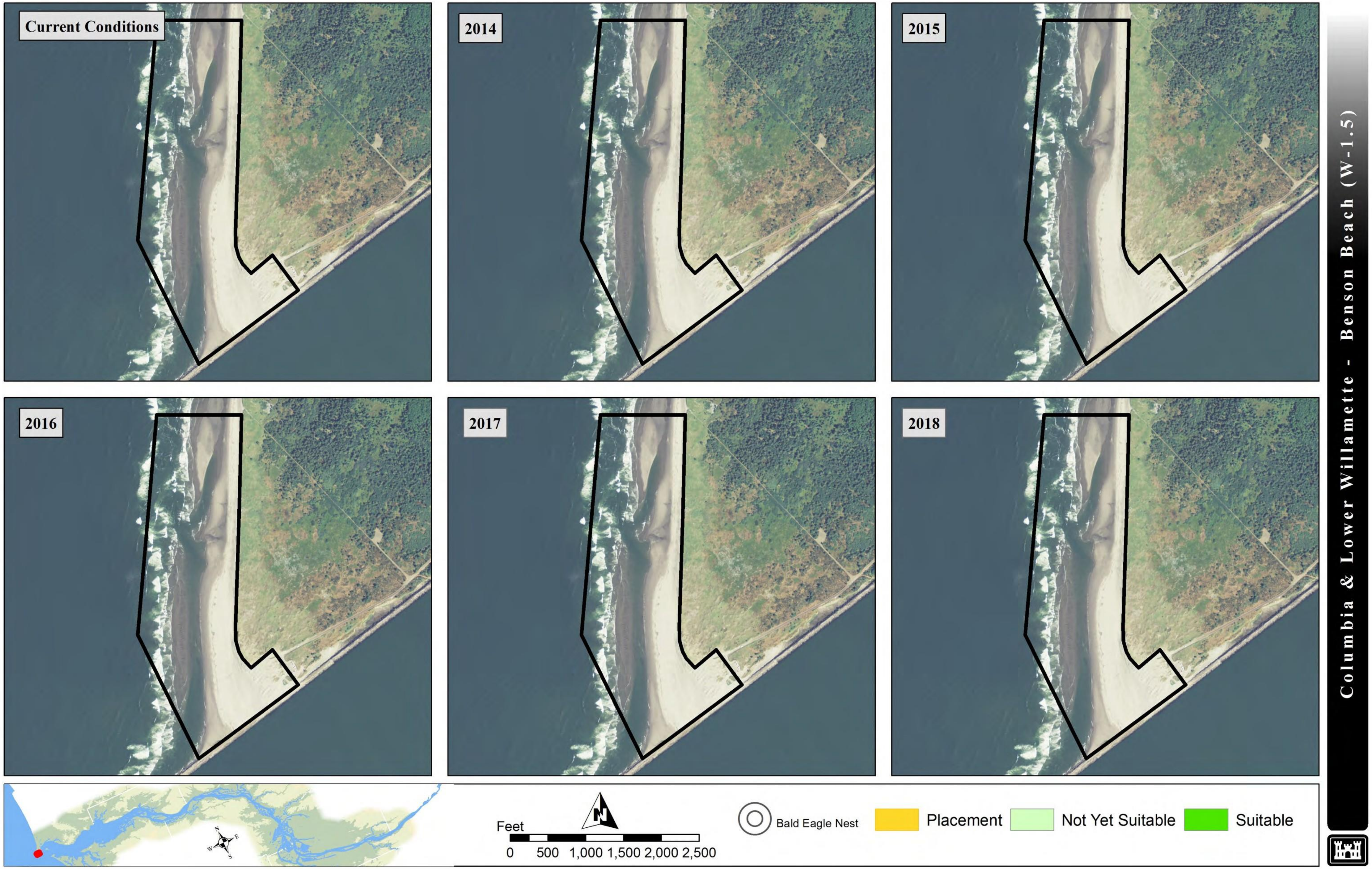
The site elevations range from 15 feet (CRD) at the top of the riverbank to 40 feet in the center of the site. The site is undulating due containment berms and grading activities from placement of dredged materials. Large portions of the site are comprised of open sand and weedy grasses. Two stands of trees are located in the northwest portion of the site. An unimproved dirt road provides land access to the site and there are several weirs placed throughout the site. The site is actively used by the Port for placing their dredged materials, dredging equipment, and other storage. The Port maintains roads on the site and manages the island to prevent the establishment of trees. The site is not designated as a critical habitat subunit for streaked horned larks. The CNLM surveyed the site in 2013, but no larks were observed. The CNLM did not map suitable habitat at West Hayden Island in 2011 because the habitat status cannot be inferred through imagery. The site has exterior visual barriers (containment berms and trees), and therefore the Corps currently estimates there is no suitable SHLA nesting habitat on the West Hayden Island site. The site does provide open habitats for songbirds and shorebirds.

A deciduous forest is located to the east, south, and west of the placement site. The Columbia River is the northeast perimeter of the site. The western portion of Hayden Island is largely vegetated and provides high quality forested, riparian, wetland, and pond habitats for resident and migratory wildlife.

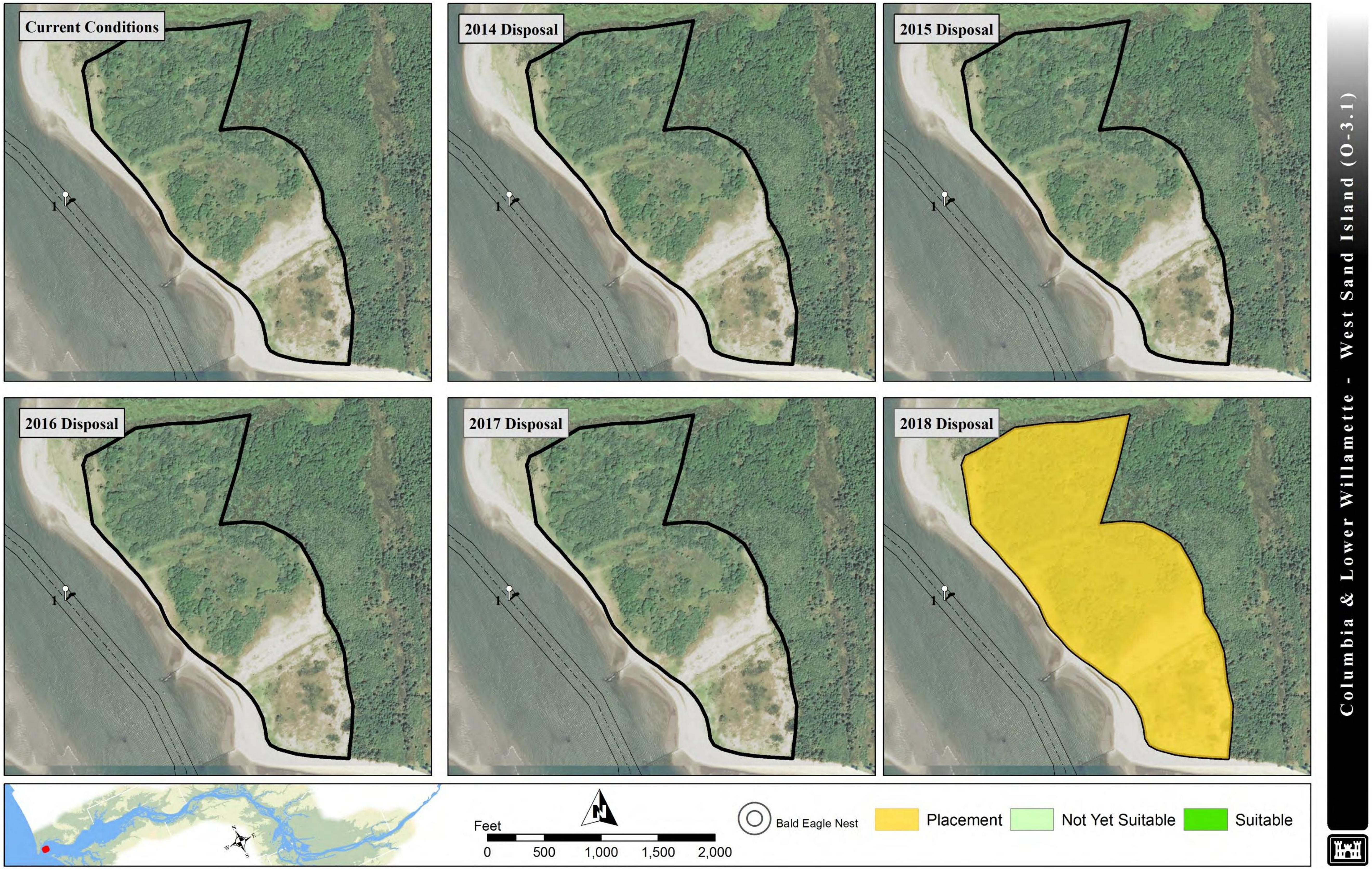
Suitable Streaked Horned Lark Nesting Habitat 2014-2018



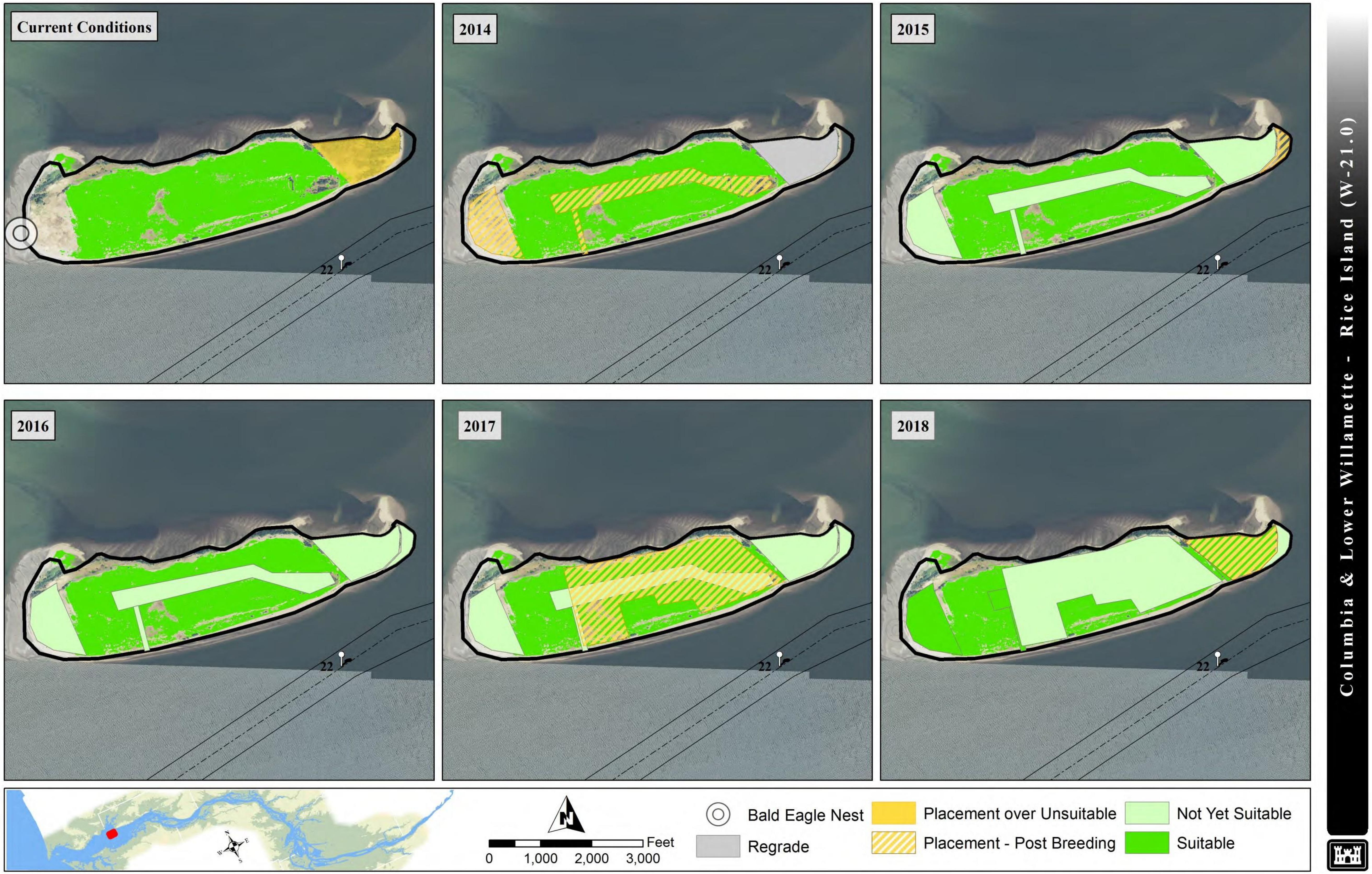
Suitable Streaked Horned Lark Nesting Habitat 2014-2018



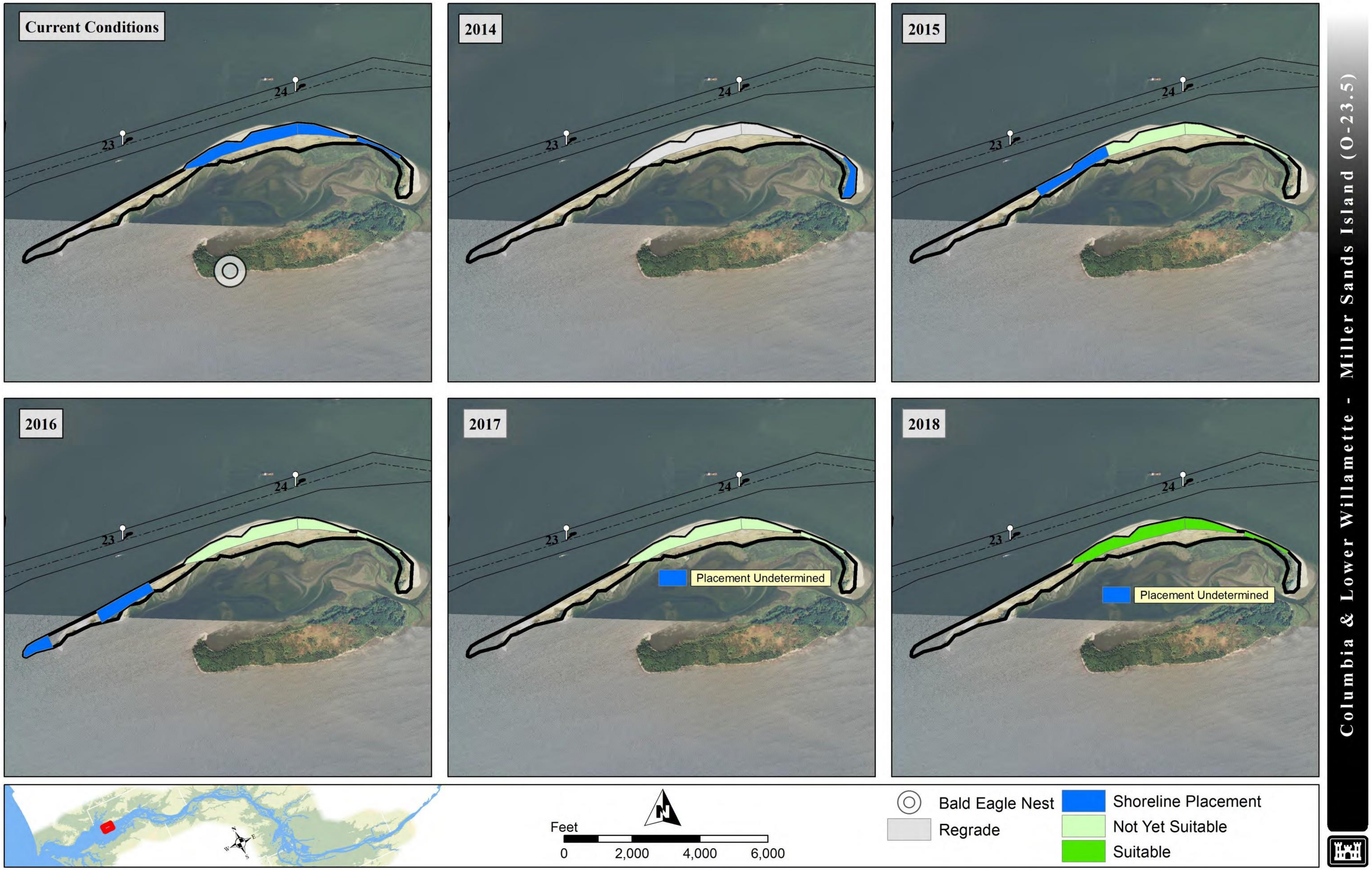
Suitable Streaked Horned Lark Nesting Habitat 2014-2018



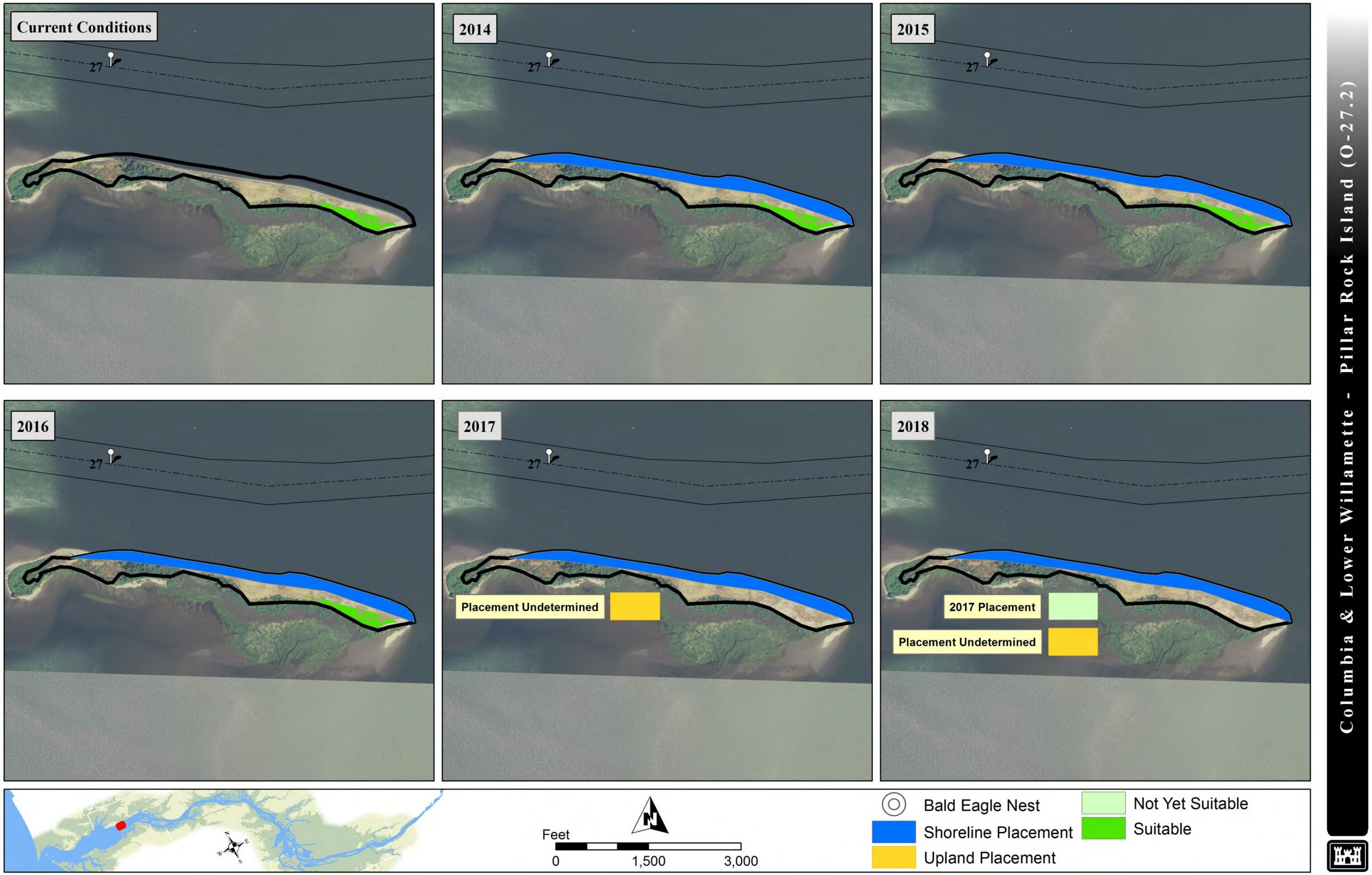
Suitable Streaked Horned Lark Nesting Habitat 2014-2018



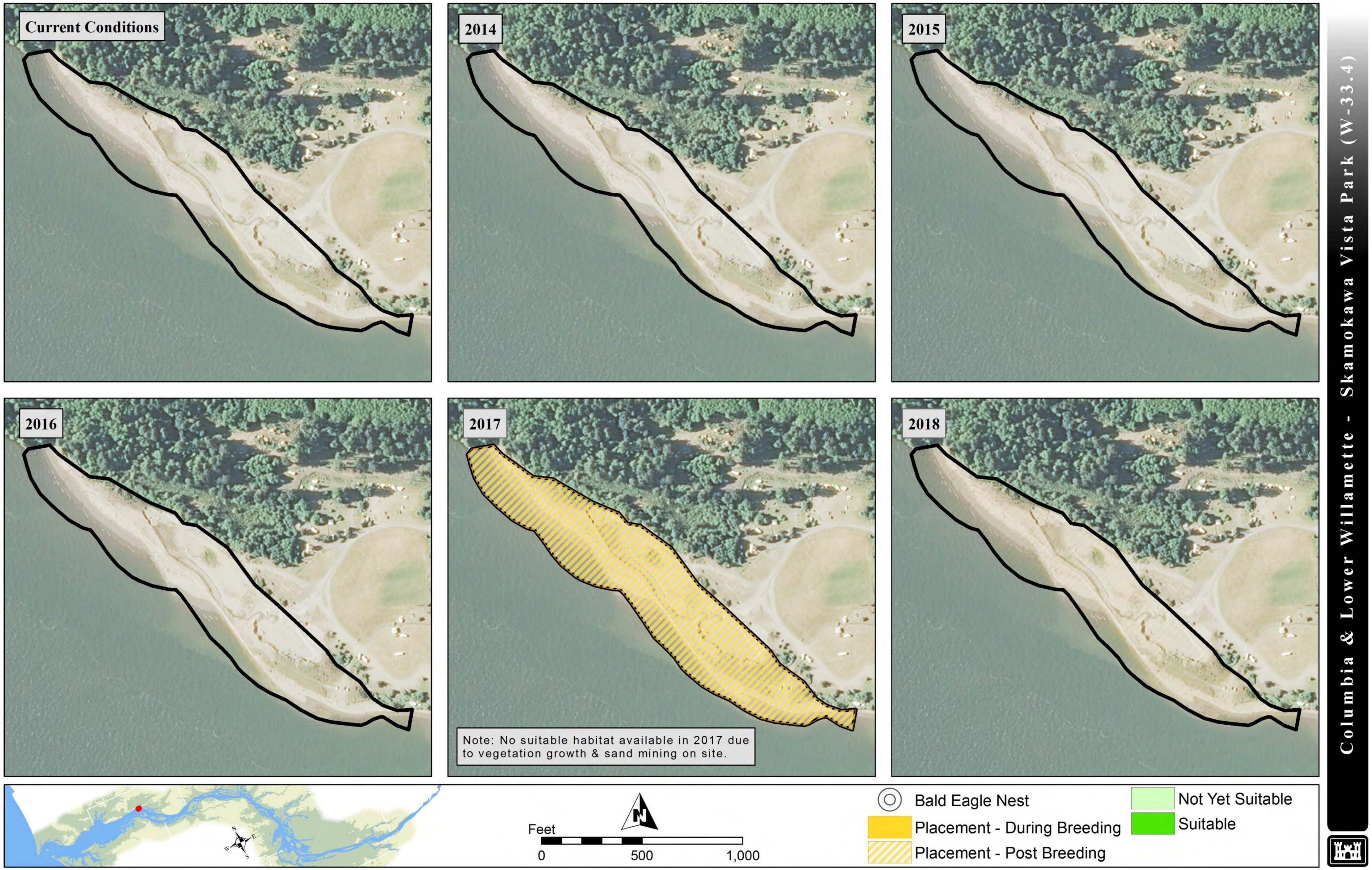
Suitable Streaked Horned Lark Nesting Habitat 2014-2018



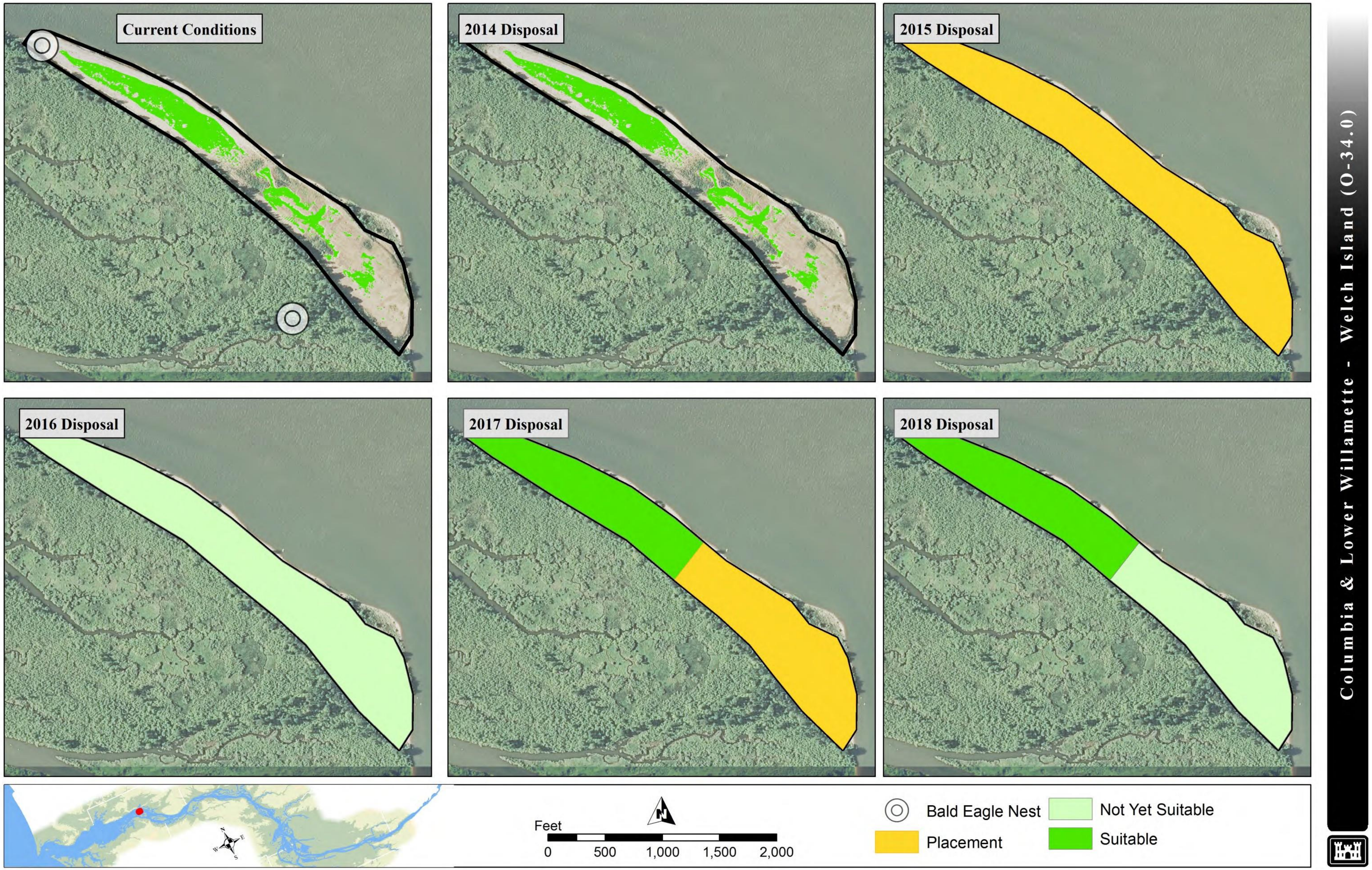
Suitable Streaked Horned Lark Nesting Habitat 2014-2018



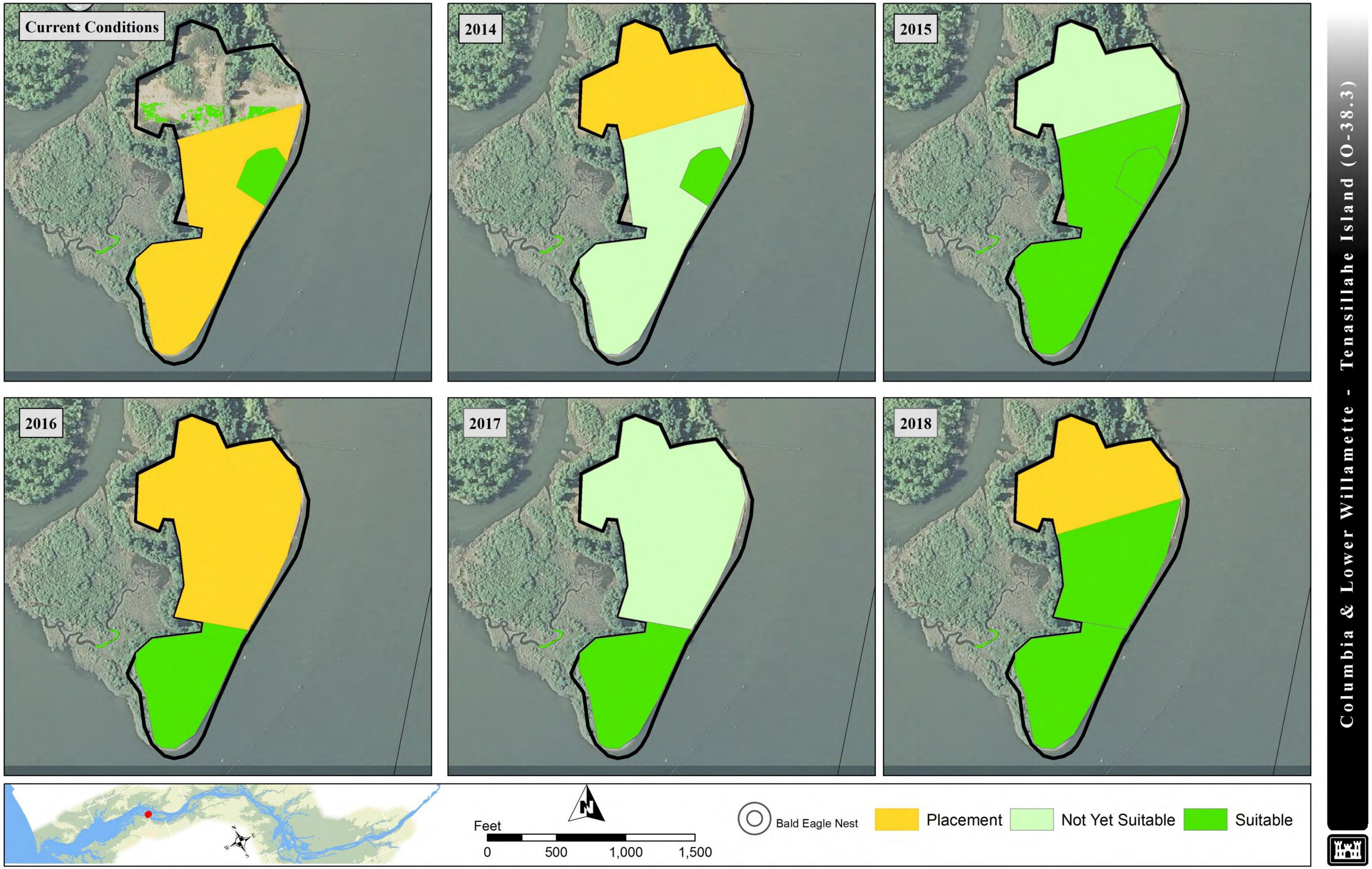
Suitable Streaked Horned Lark Nesting Habitat 2014-2018



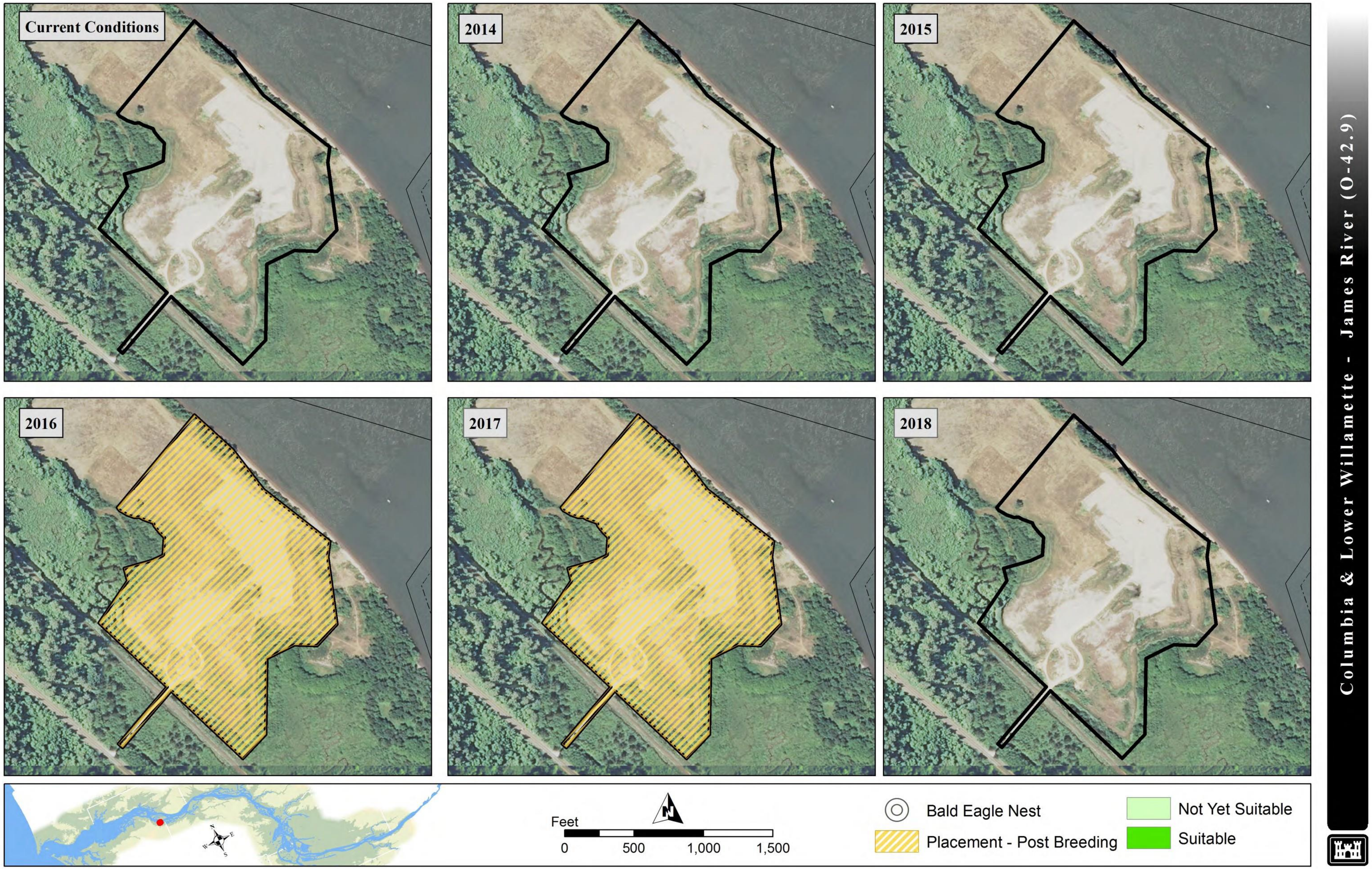
Suitable Streaked Horned Lark Nesting Habitat 2014-2018



Suitable Streaked Horned Lark Nesting Habitat 2014-2018

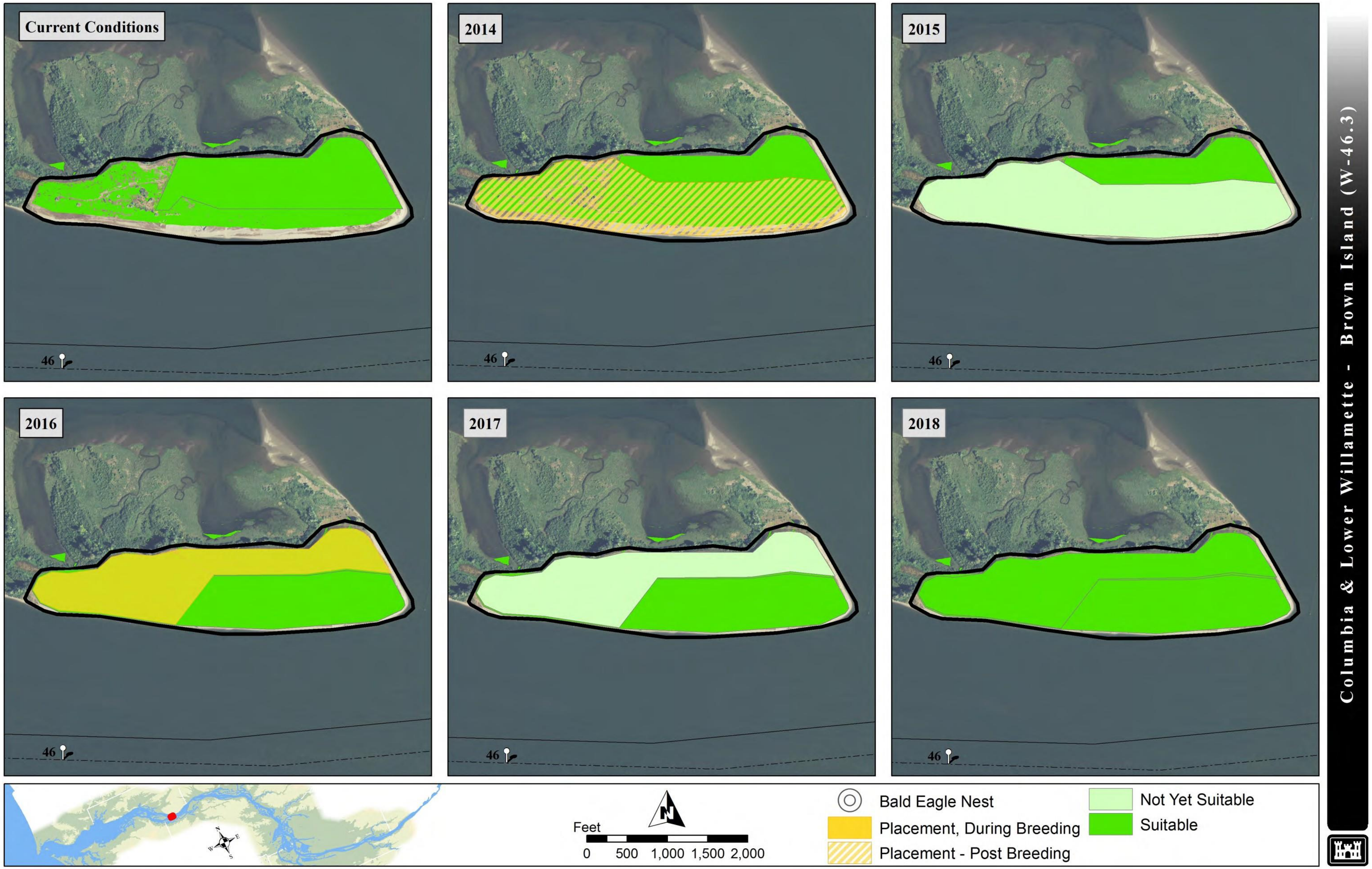


Suitable Streaked Horned Lark Nesting Habitat 2014-2018

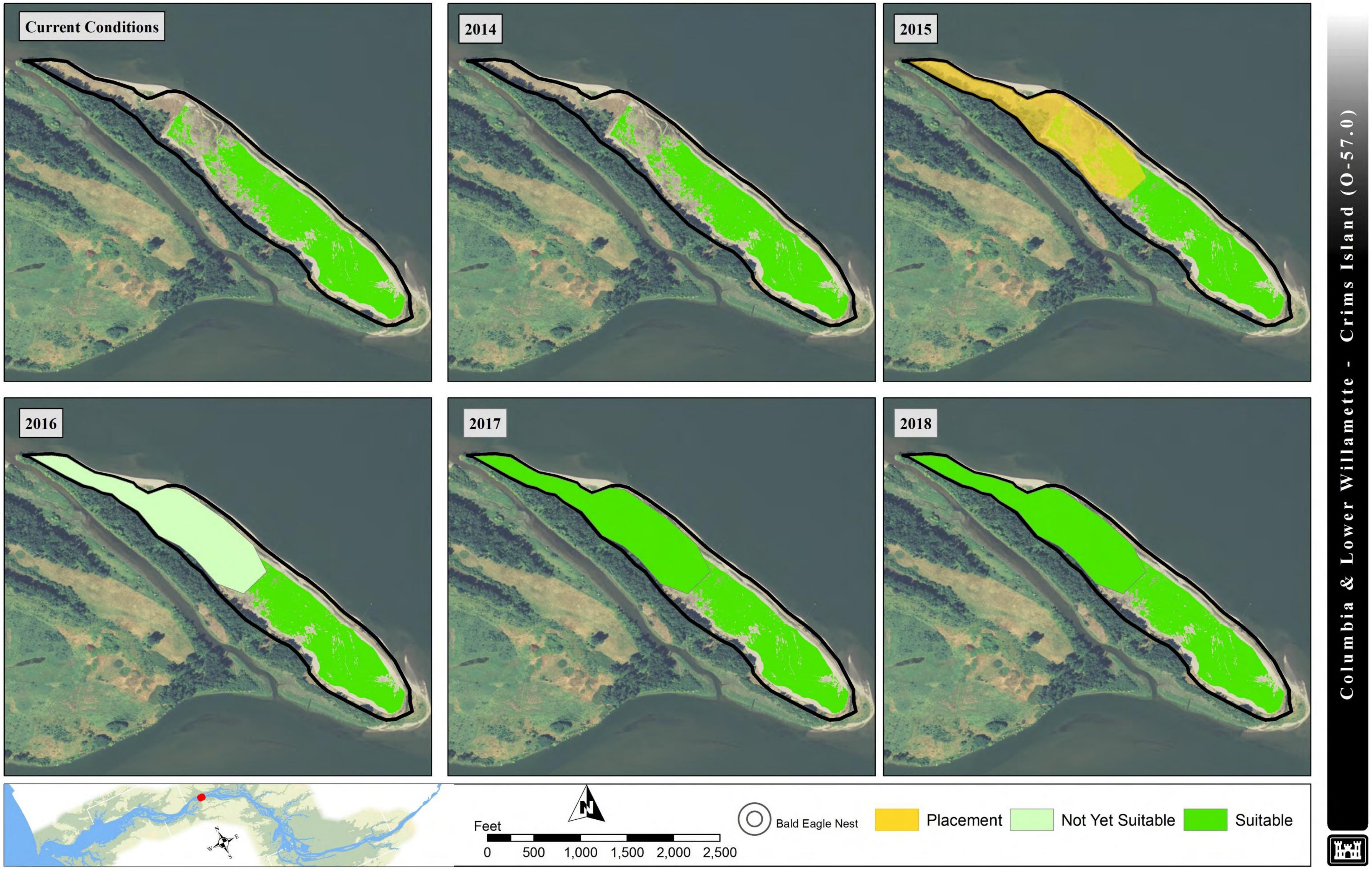


Suitable Streaked Horned Lark Nesting Habitat 2014-2018

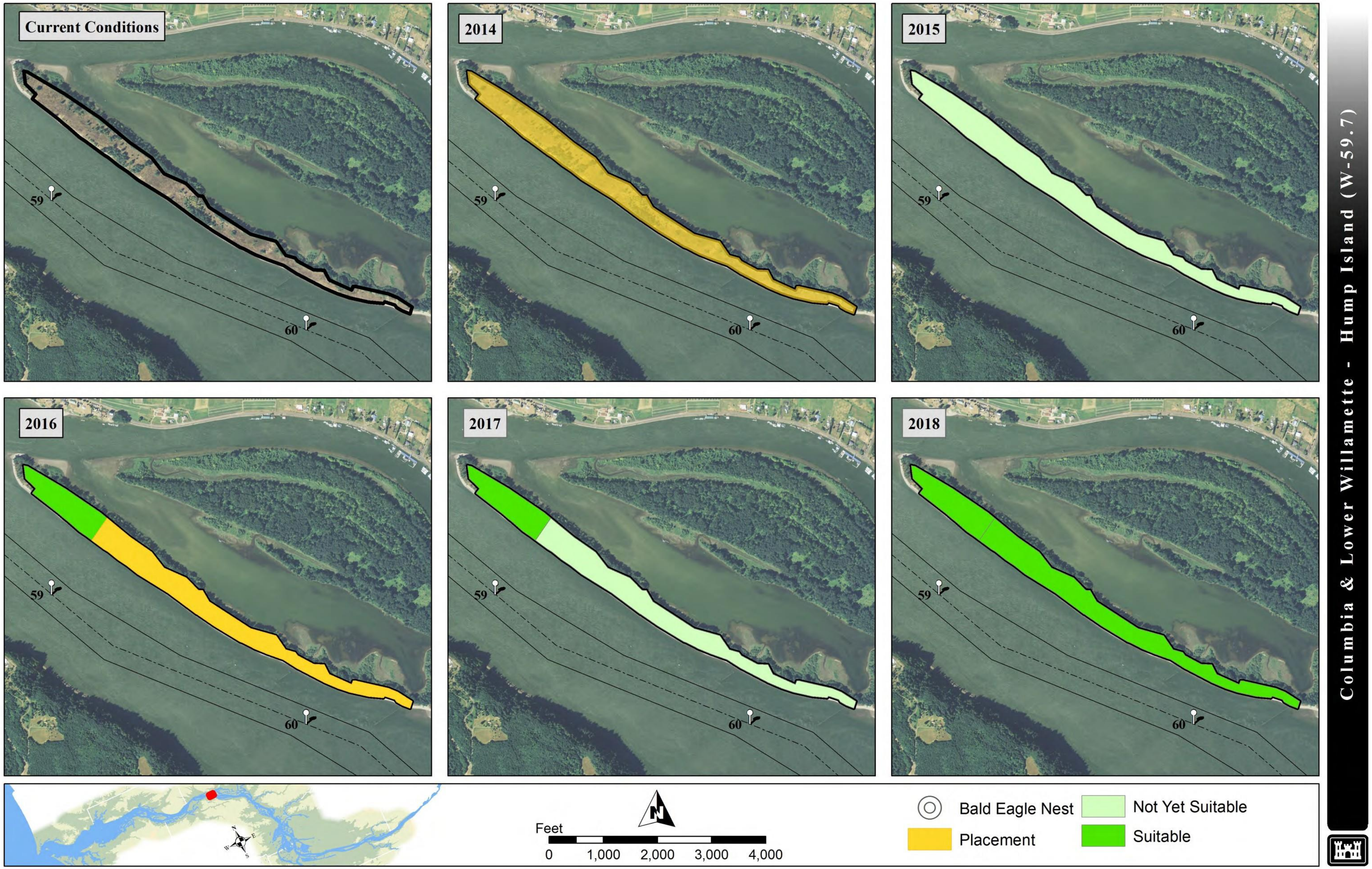
Suitable Streaked Horned Lark Nesting Habitat 2014-2018



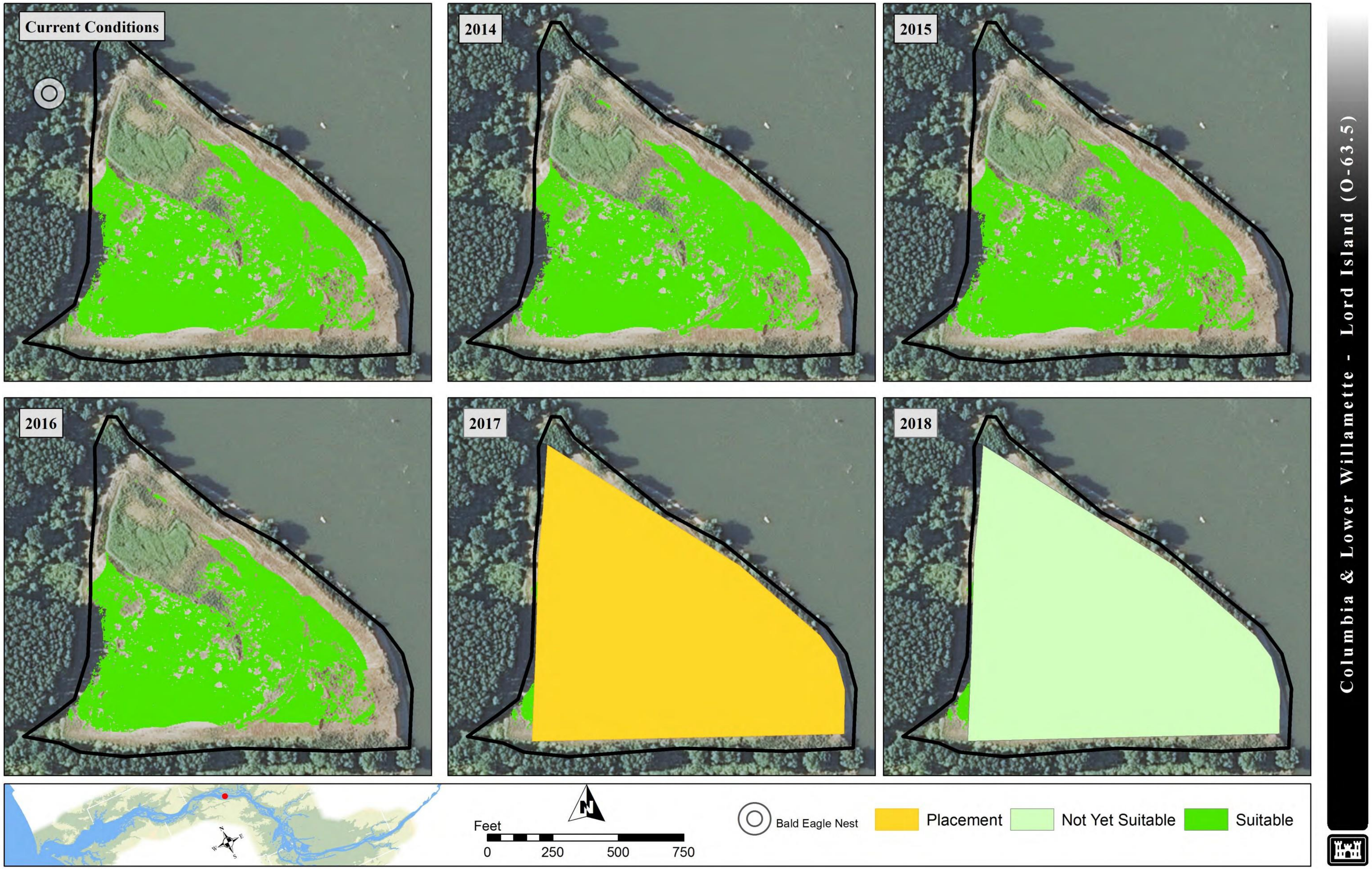
Suitable Streaked Horned Lark Nesting Habitat 2014-2018



Suitable Streaked Horned Lark Nesting Habitat 2014-2018

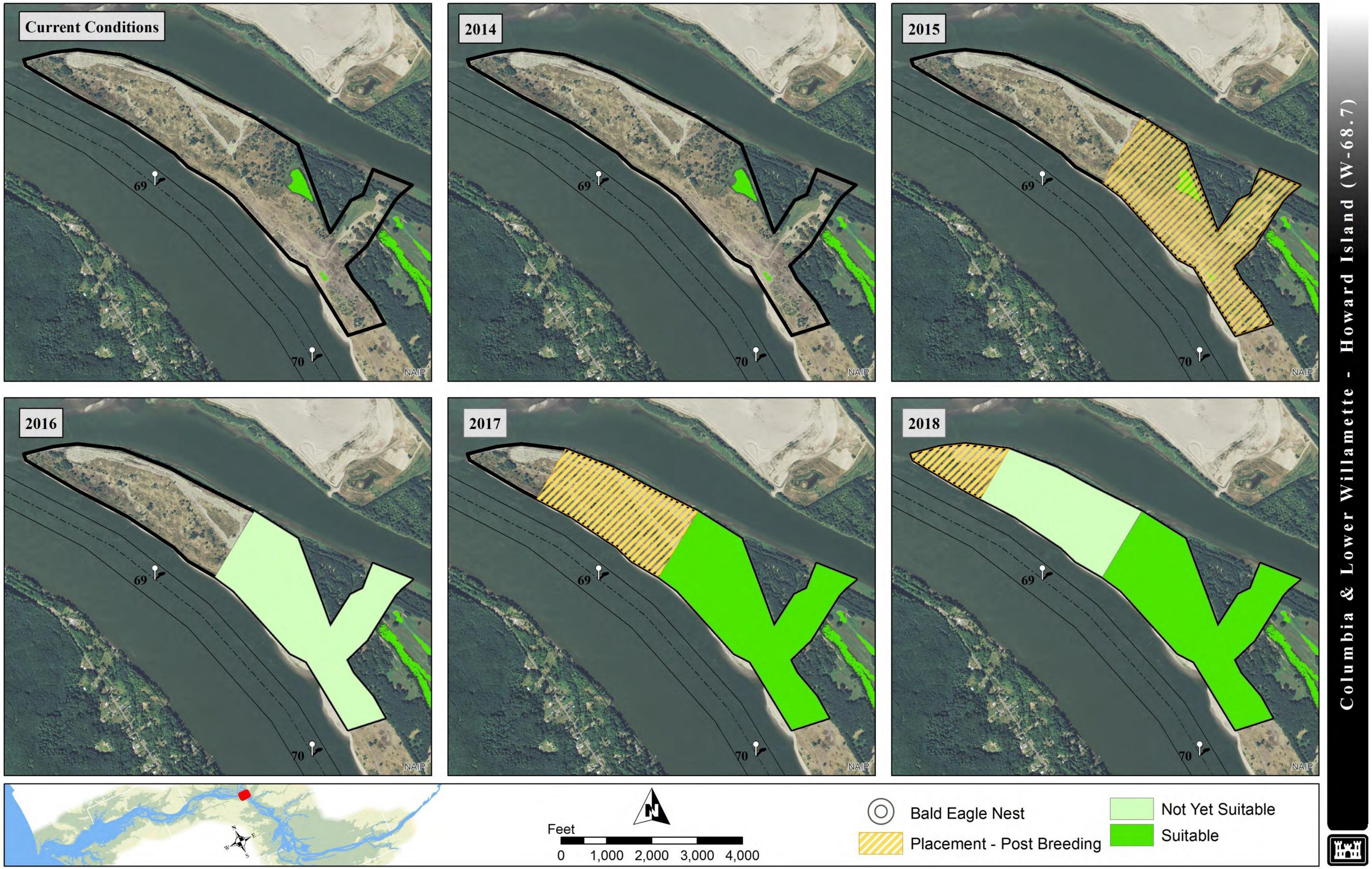


Suitable Streaked Horned Lark Nesting Habitat 2014-2018



Suitable Streaked Horned Lark Nesting Habitat 2014-2018

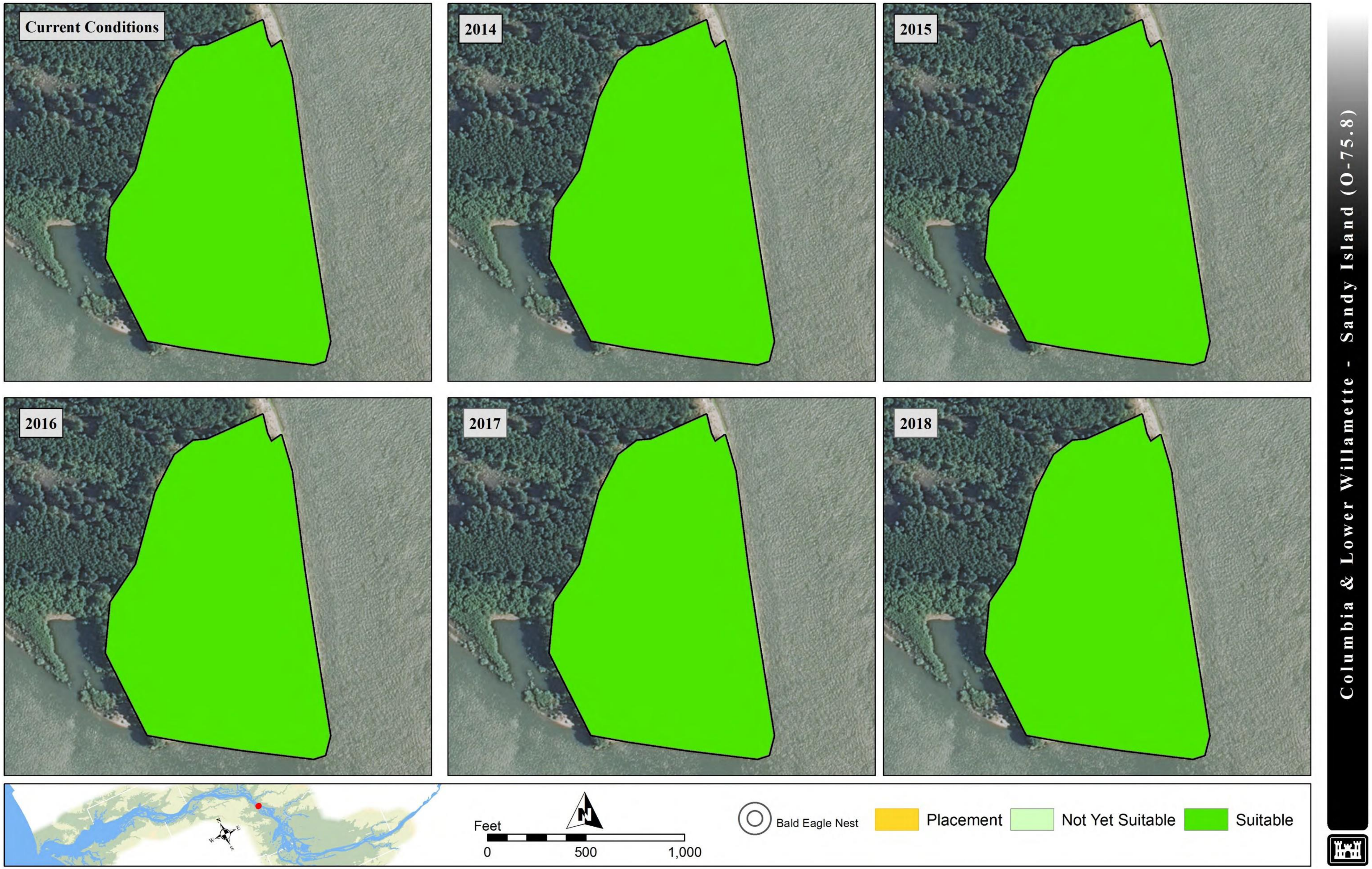
Suitable Streaked Horned Lark Nesting Habitat 2014-2018



Suitable Streaked Horned Lark Nesting Habitat 2014-2018

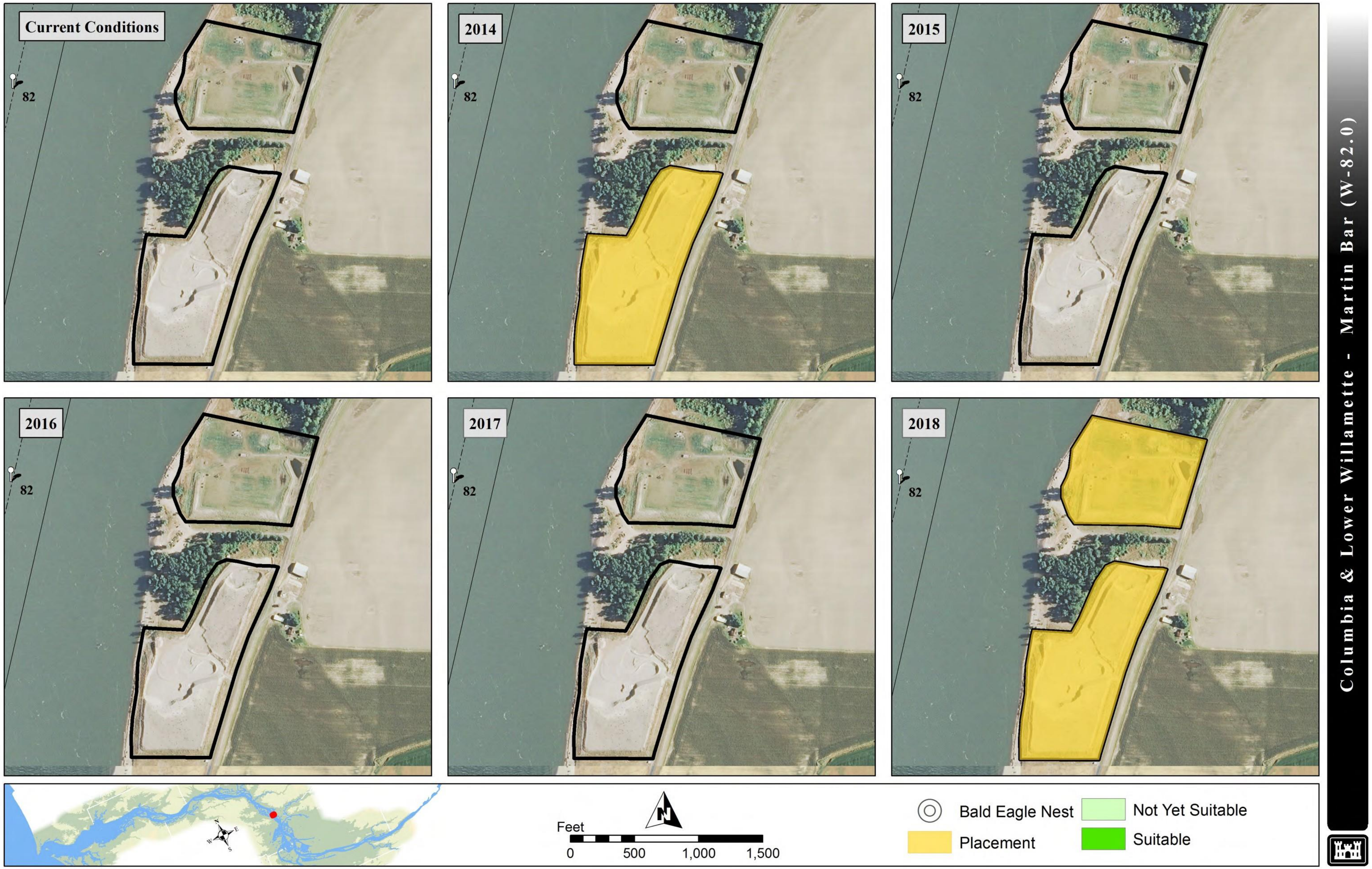
Suitable Streaked Horned Lark Nesting Habitat 2014-2018

Suitable Streaked Horned Lark Nesting Habitat 2014-2018

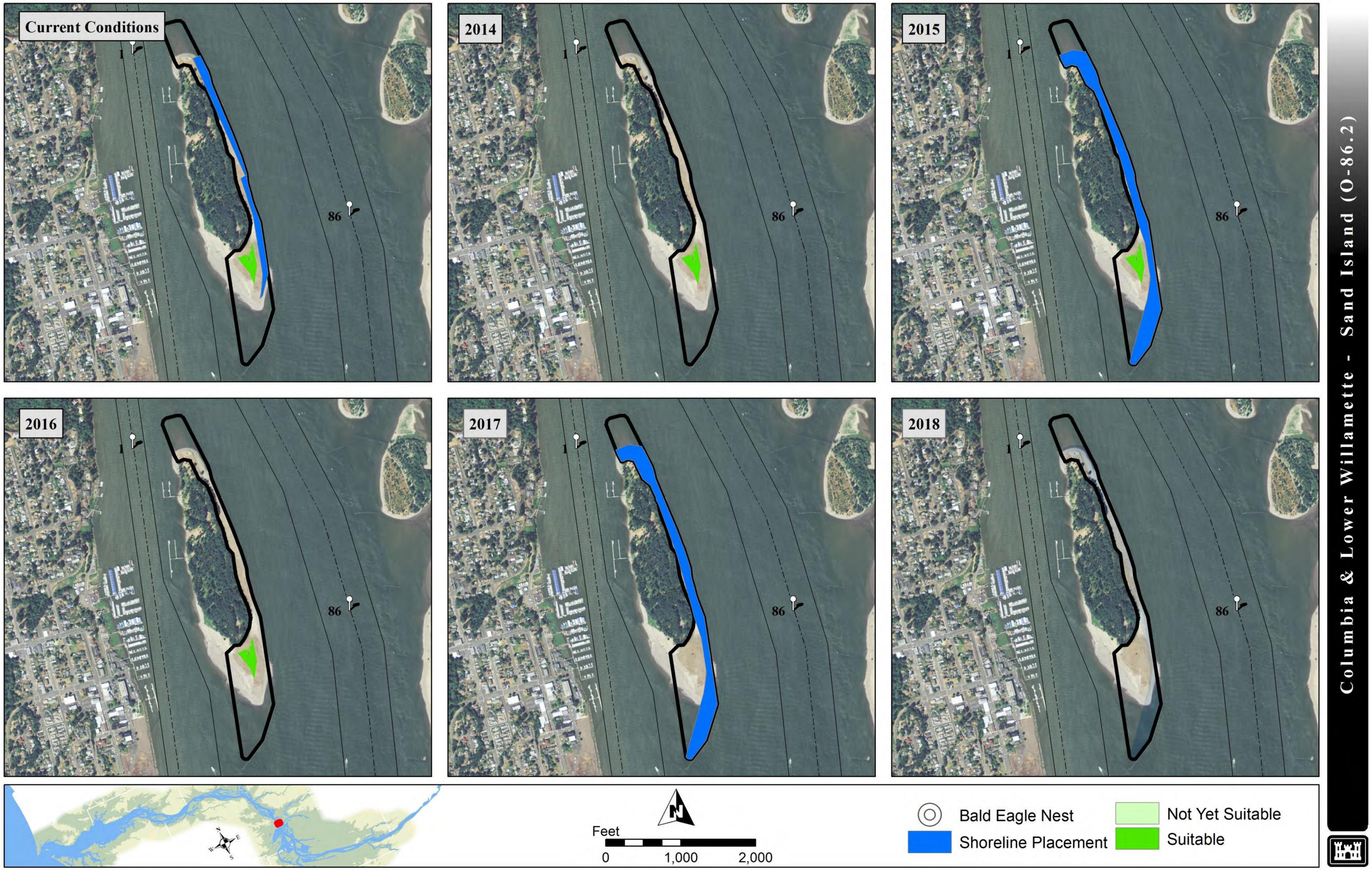


Suitable Streaked Horned Lark Nesting Habitat 2014-2018

Suitable Streaked Horned Lark Nesting Habitat 2014-2018



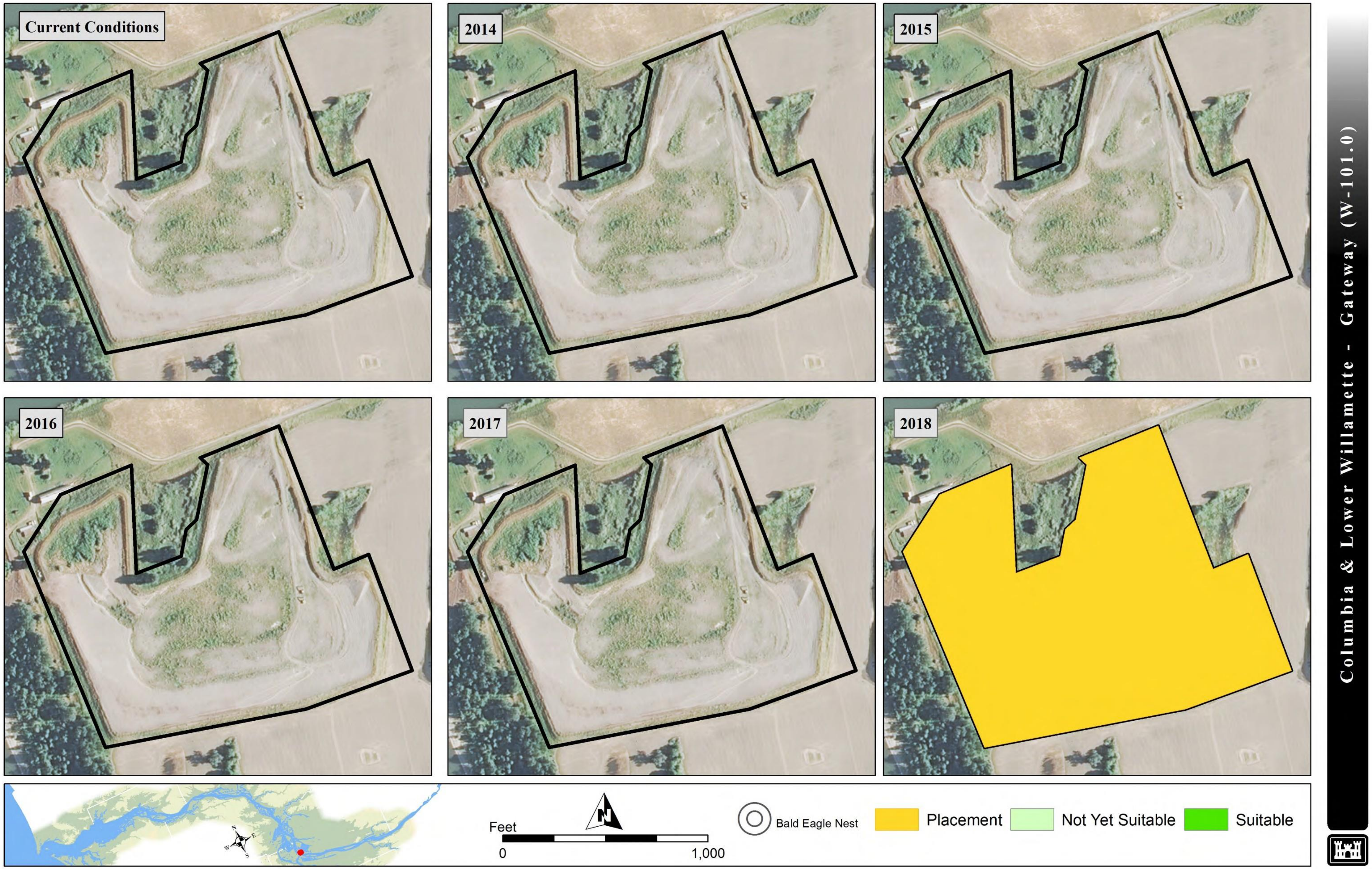
Suitable Streaked Horned Lark Nesting Habitat 2014-2018



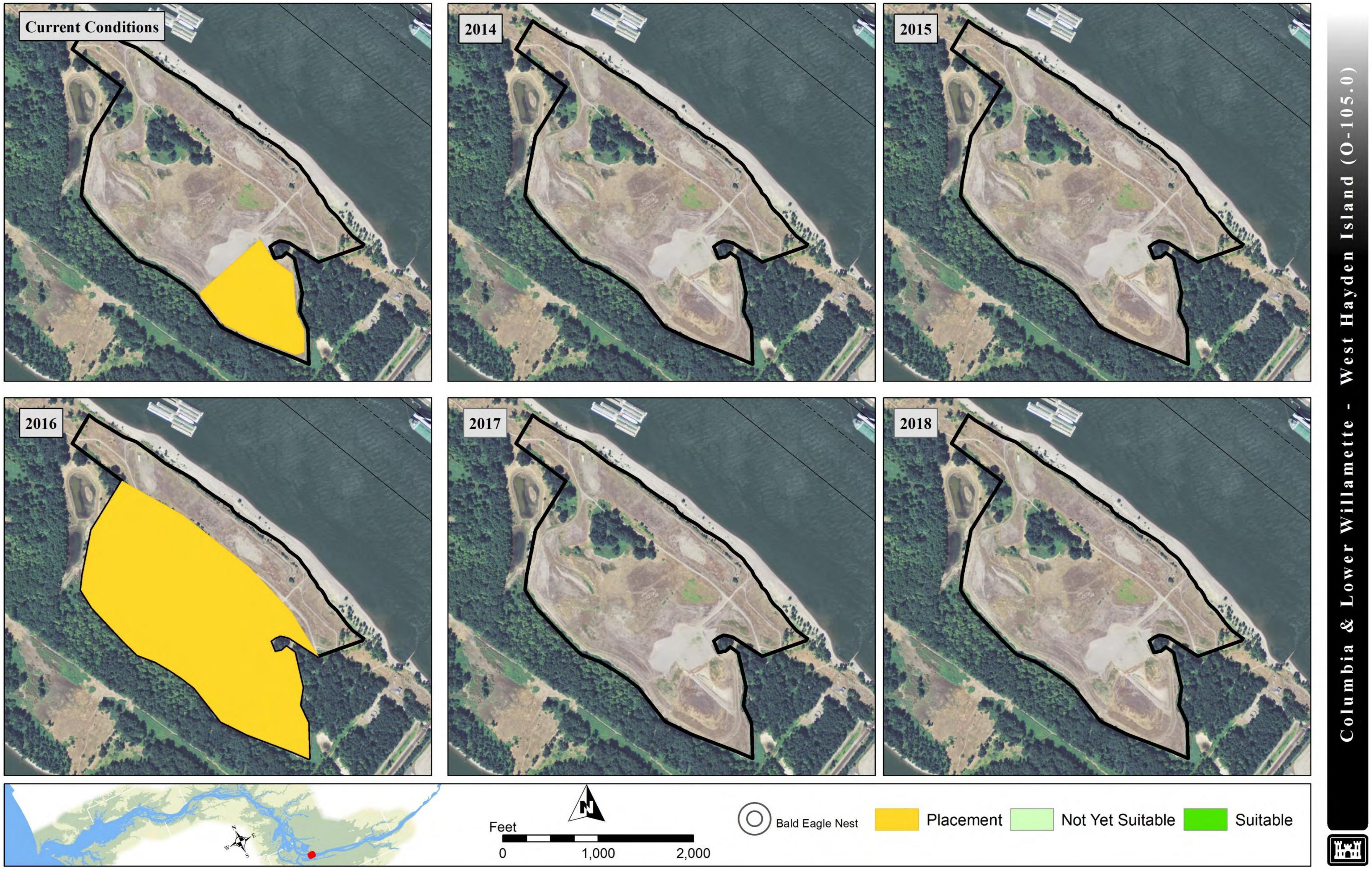
Suitable Streaked Horned Lark Nesting Habitat 2014-2018

Suitable Streaked Horned Lark Nesting Habitat 2014-2018

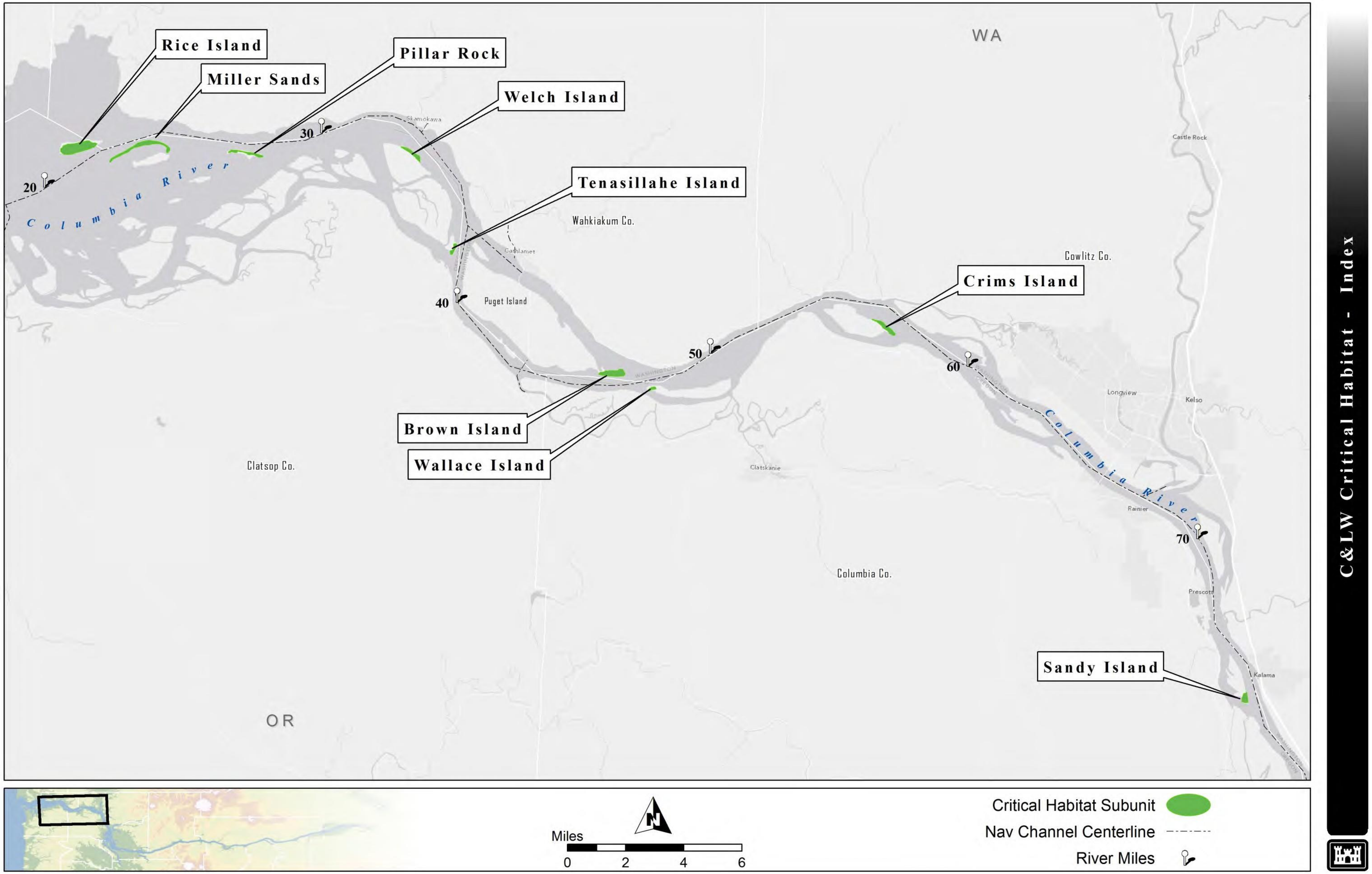
Suitable Streaked Horned Lark Nesting Habitat 2014-2018



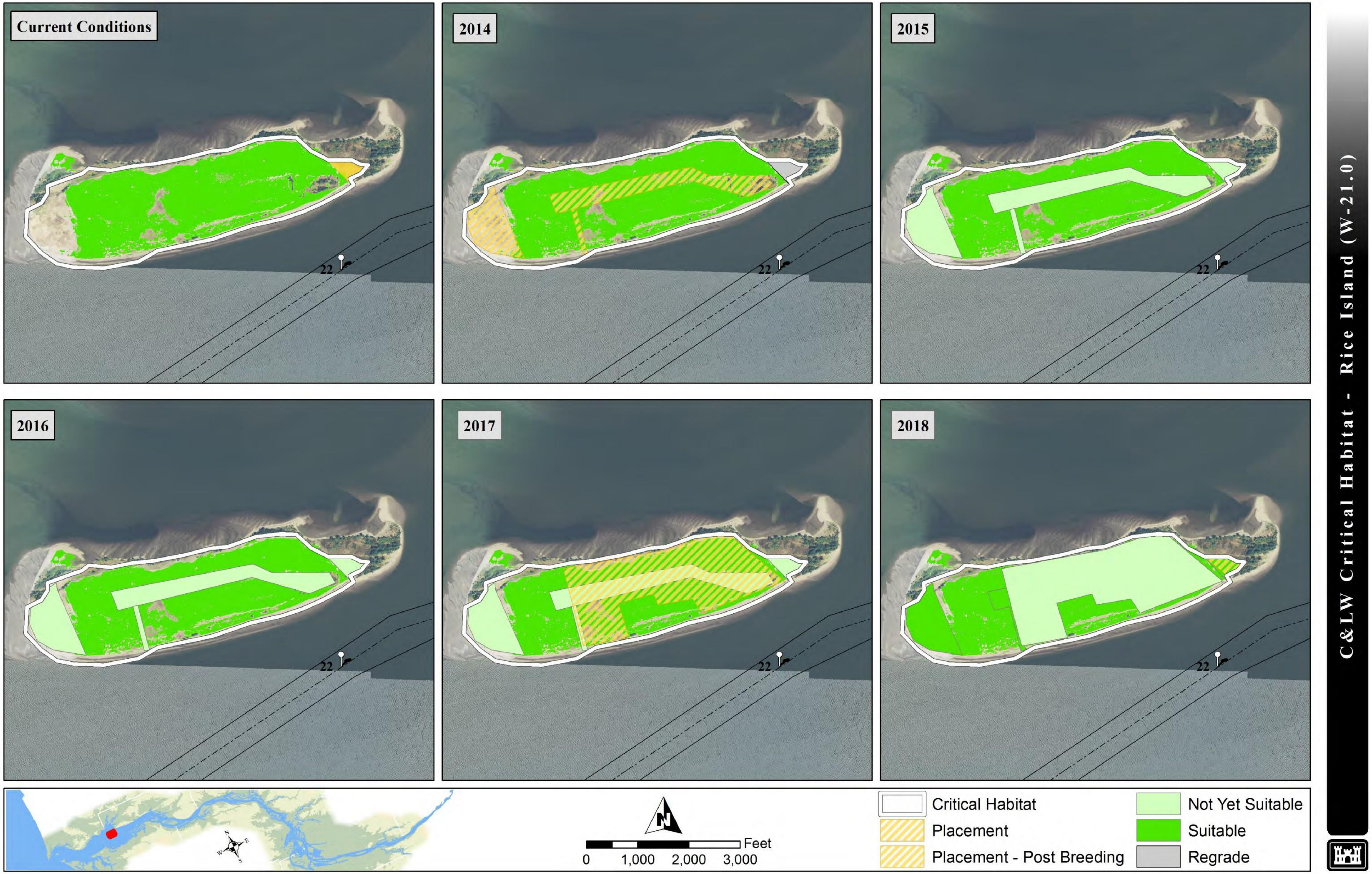
Suitable Streaked Horned Lark Nesting Habitat 2014-2018



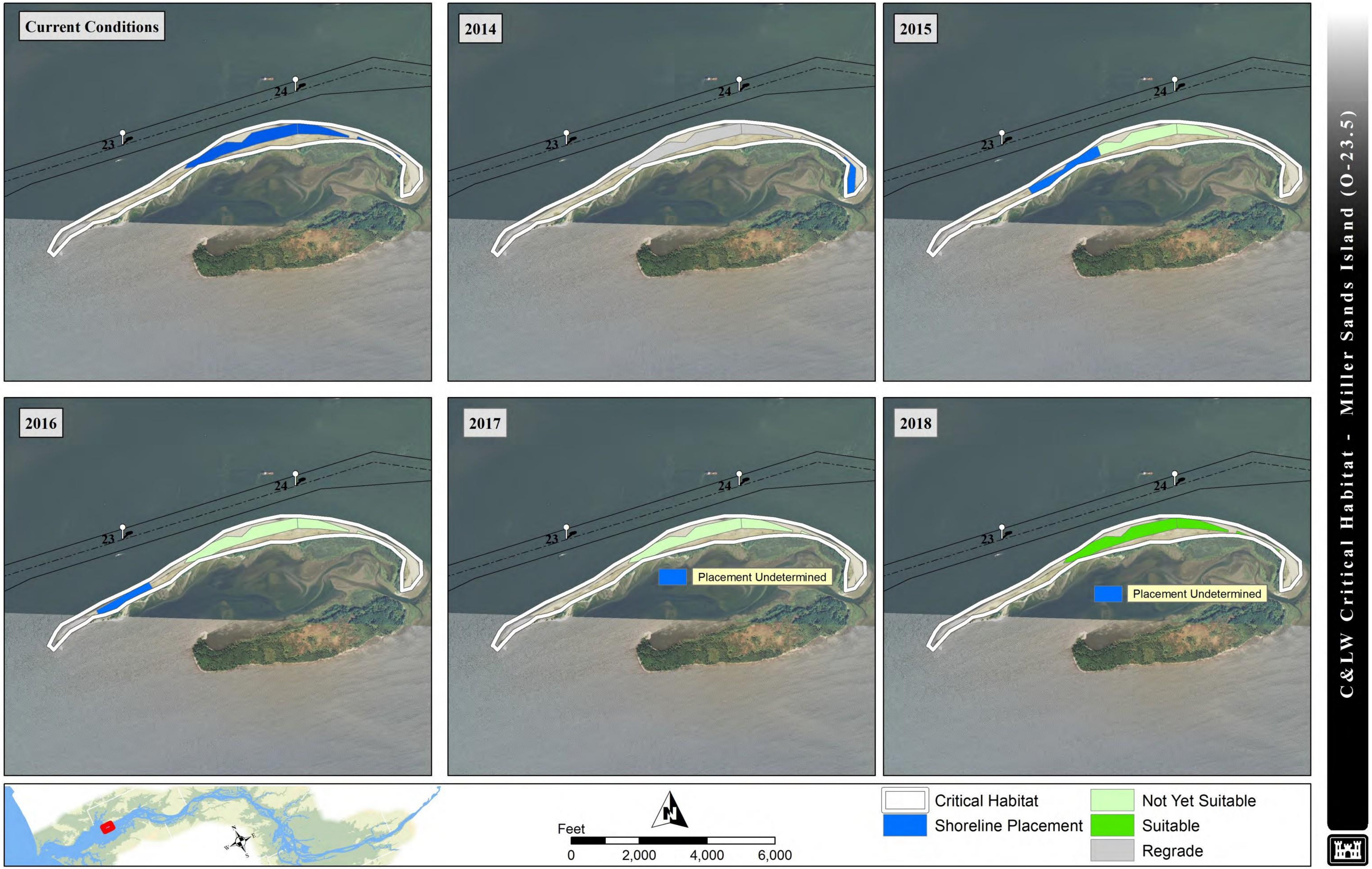
Streaked Horned Lark Critical Habitat 2014-2018 Figures



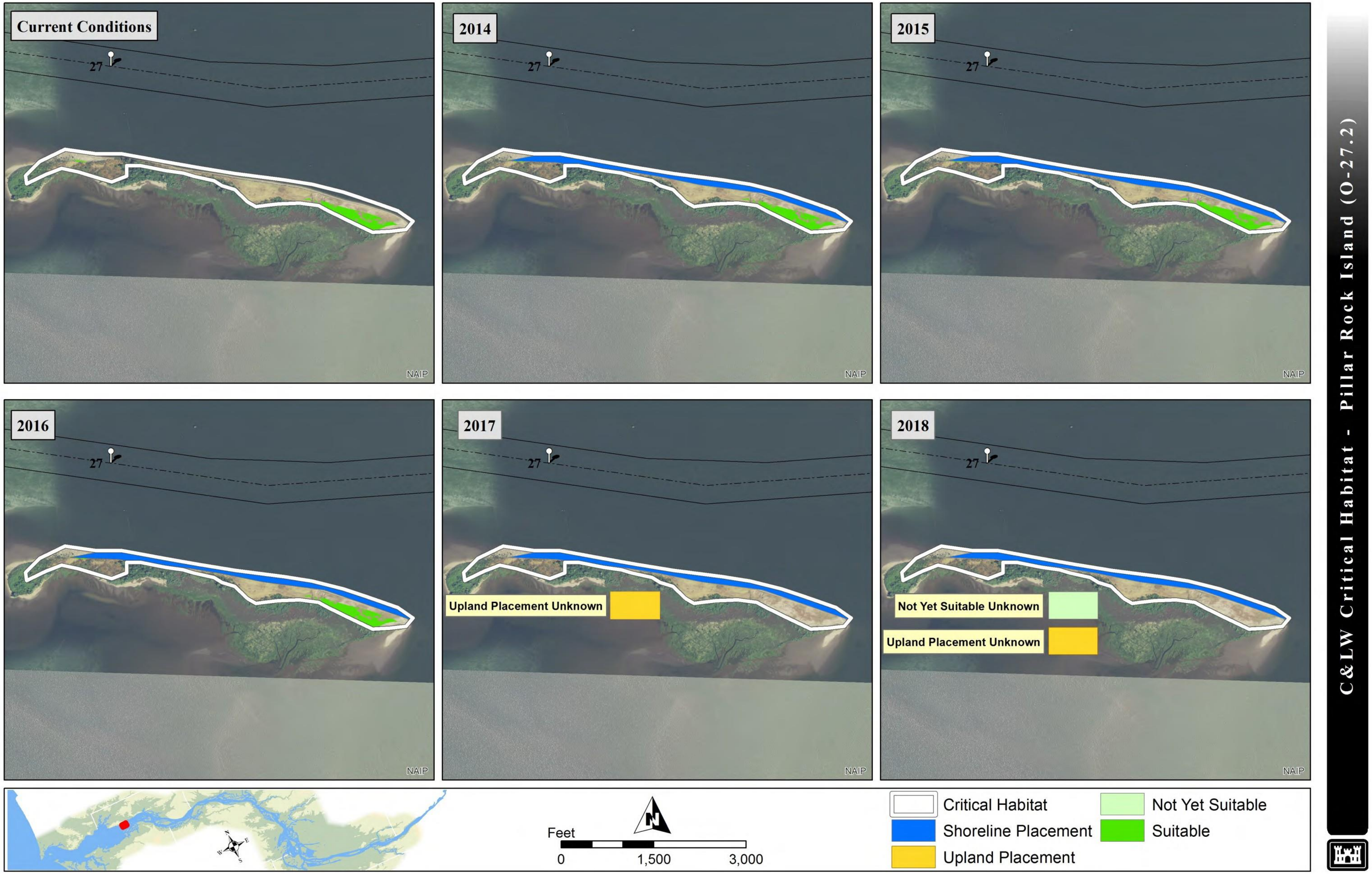
Streaked Horned Lark Critical Habitat 2014-2018 Figures



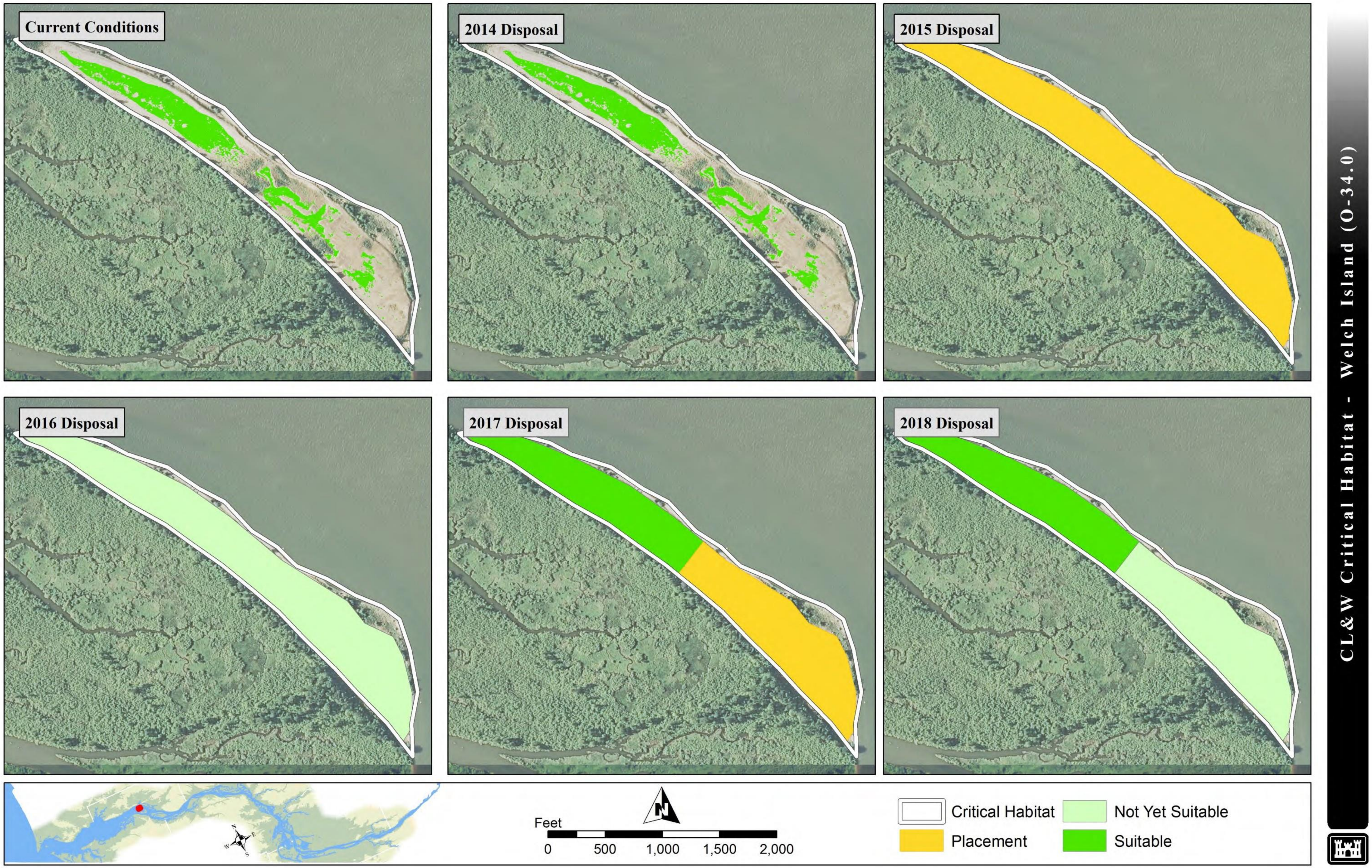
Streaked Horned Lark Critical Habitat 2014-2018 Figures



Streaked Horned Lark Critical Habitat 2014-2018 Figures

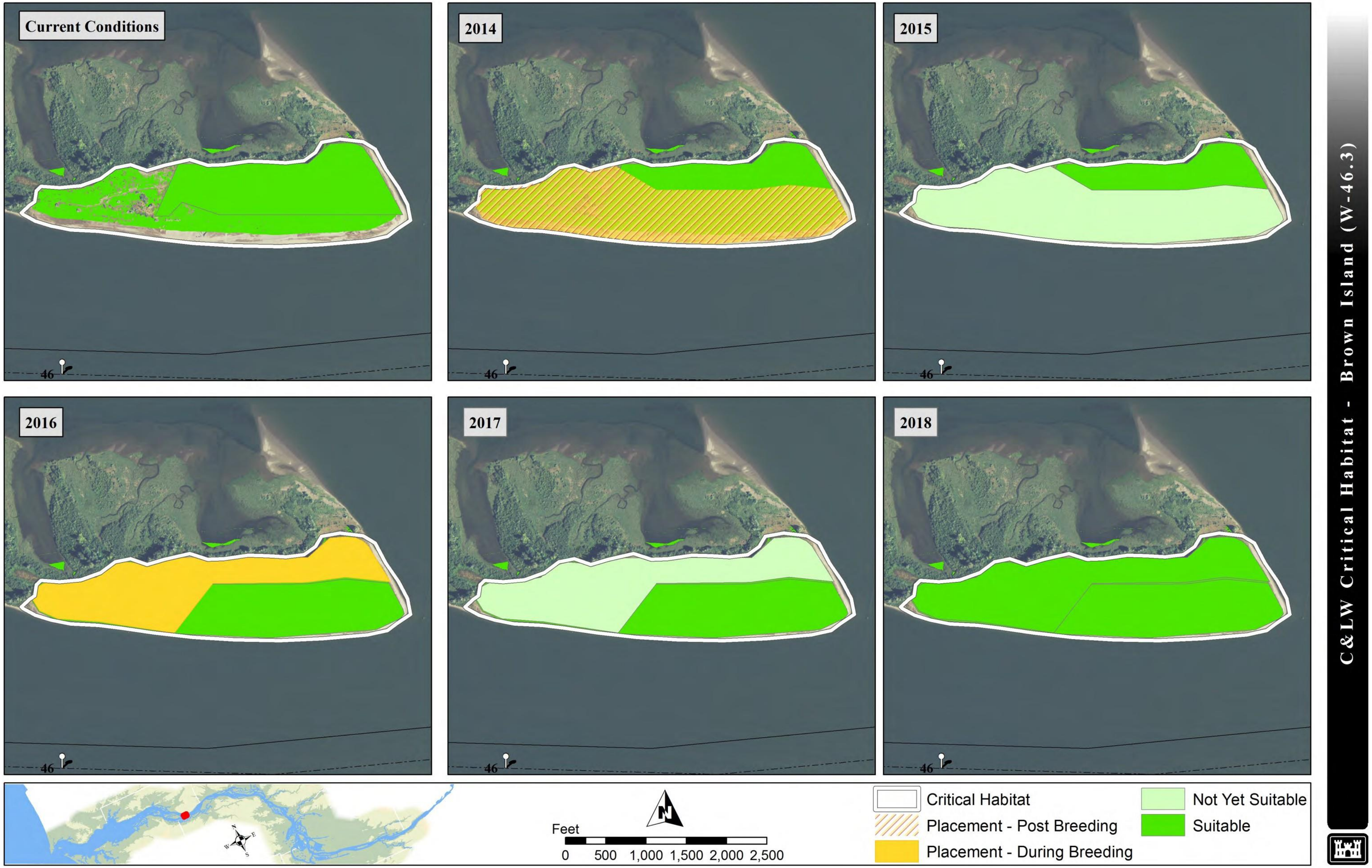


Streaked Horned Lark Critical Habitat 2014-2018 Figures

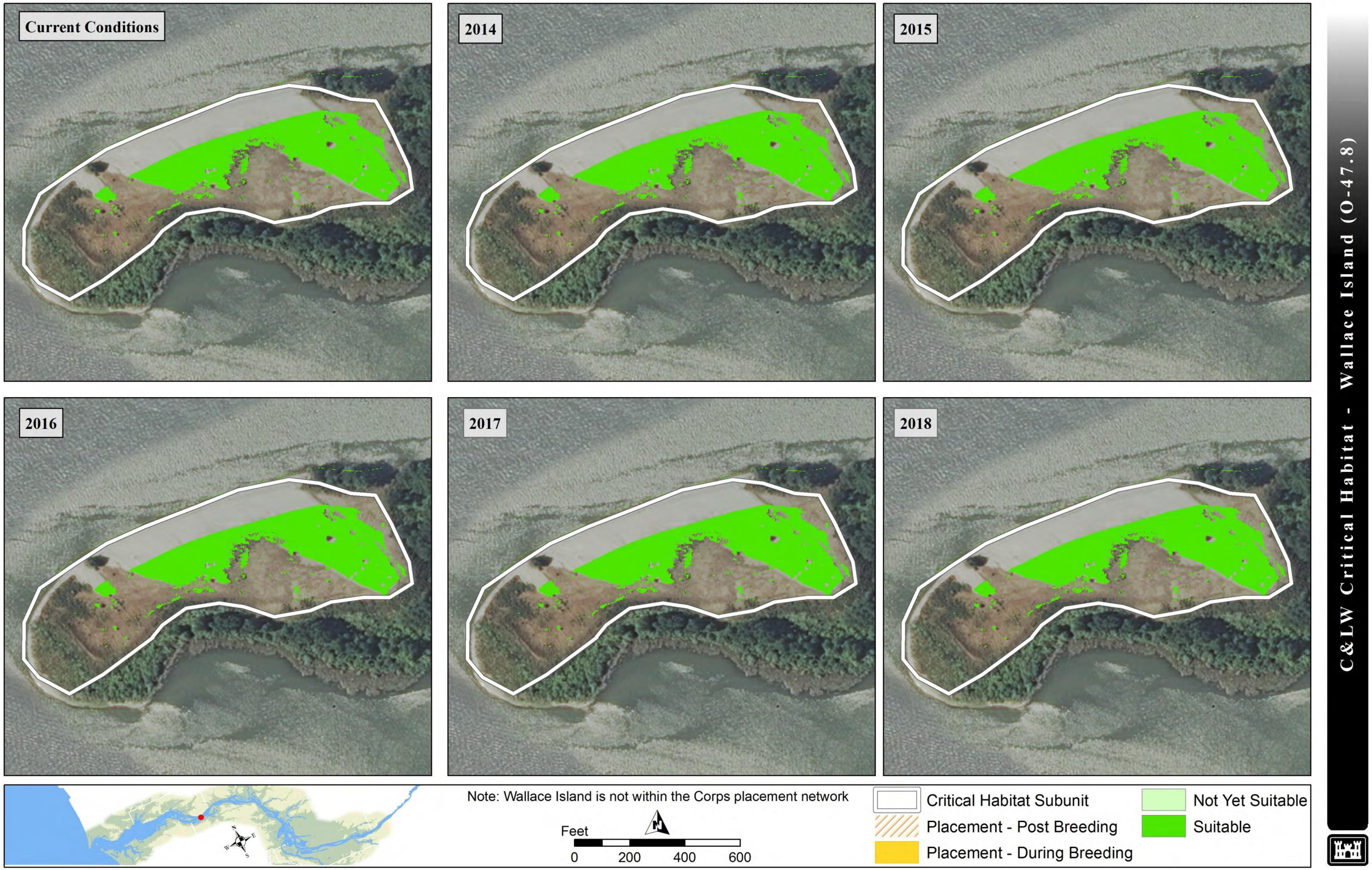


Streaked Horned Lark Critical Habitat 2014-2018 Figures

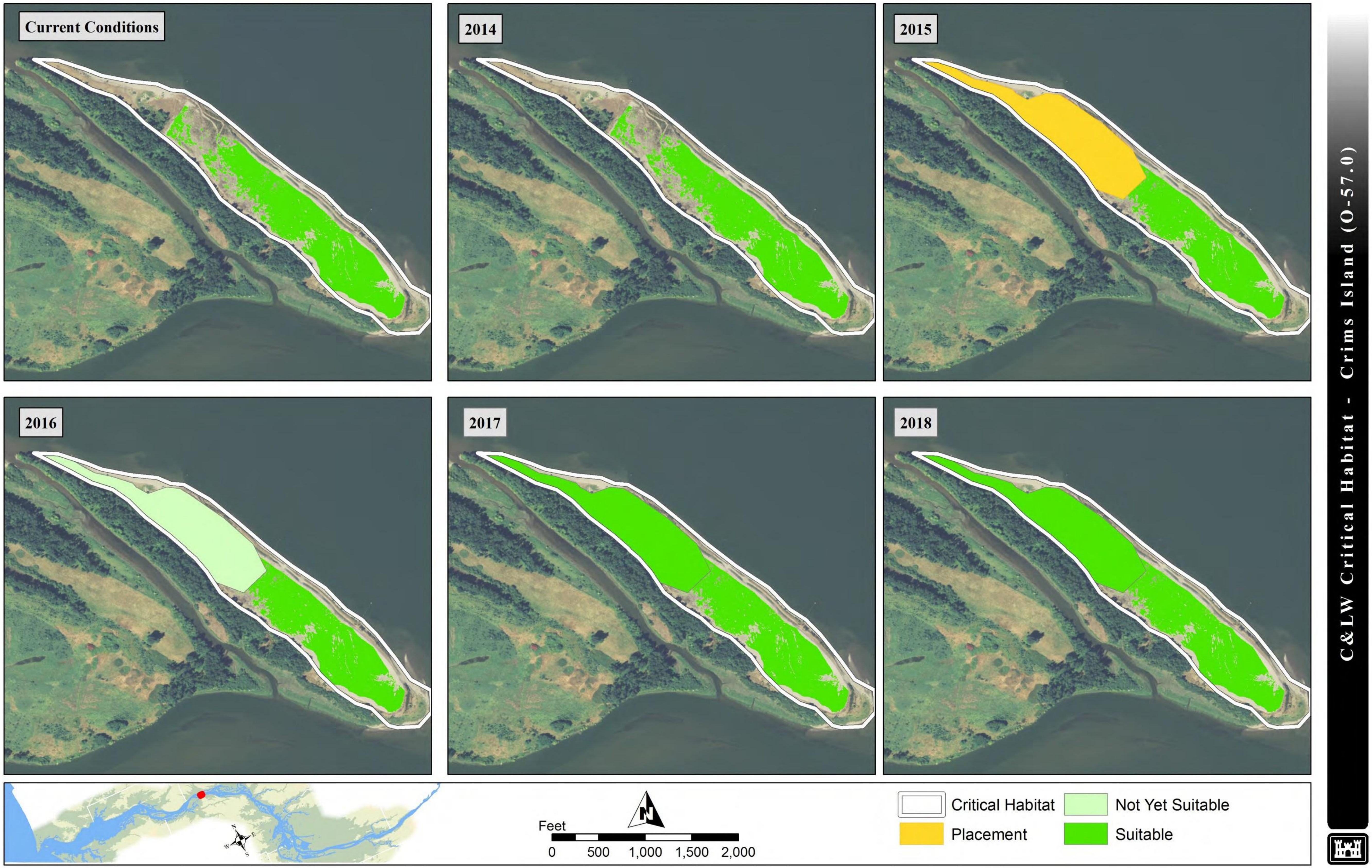
Streaked Horned Lark Critical Habitat 2014-2018 Figures



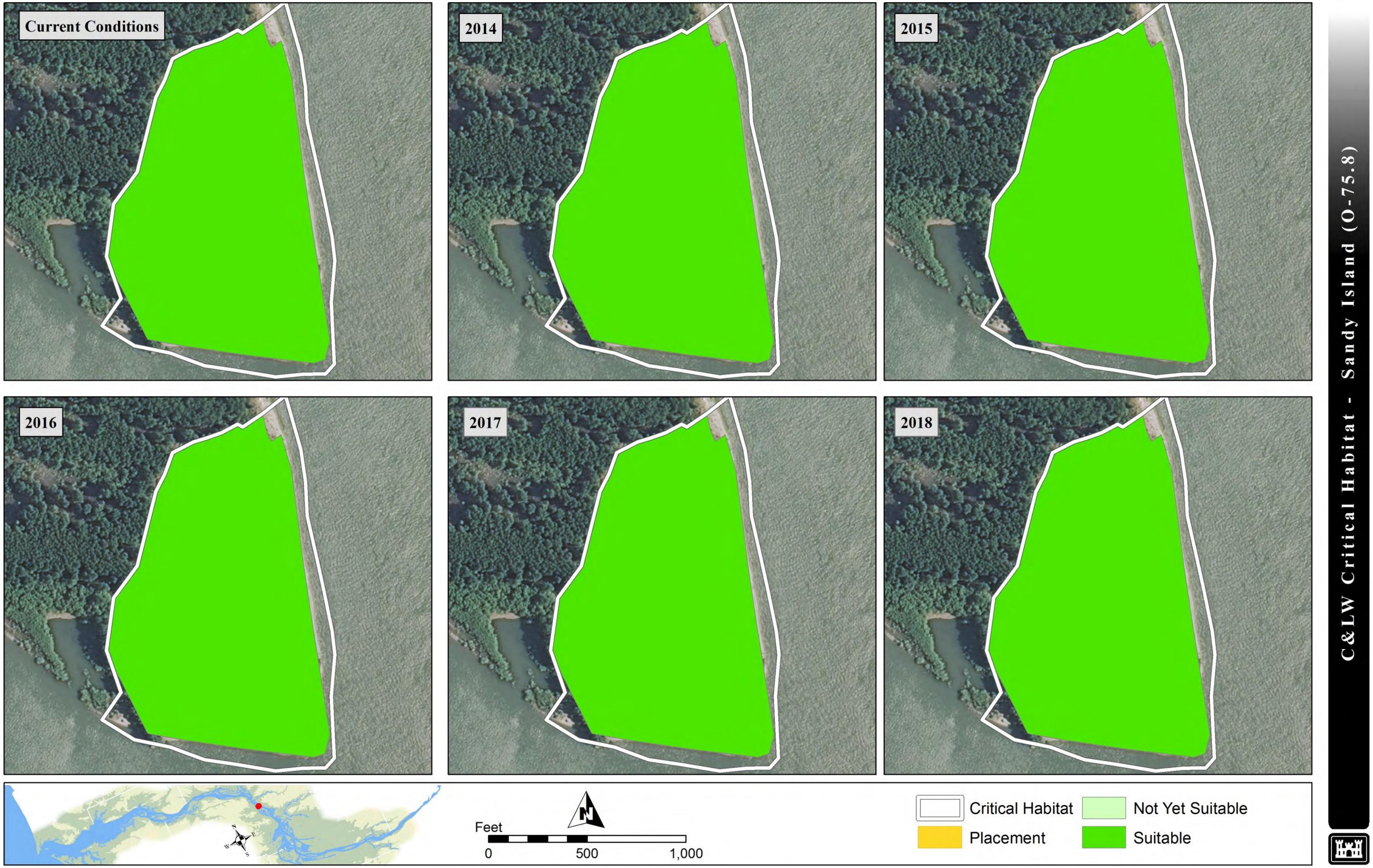
Streaked Horned Lark Critical Habitat 2014-2018 Figures



Streaked Horned Lark Critical Habitat 2014-2018 Figures



Streaked Horned Lark Critical Habitat 2014-2018 Figures



Washington Department of FISH and WILDLIFE

PROPOSED METHODS FOR WILDLIFE DATA COLLECTION "FORM B"

(Consult instructions before completing this form)

This form should be attached to "Form A" when completed

Submitted by:____________________________________Date:_________

Mailing Address:

Brief description of proposed activity (copy from Form A):	Conduct surveys to detect presence and acquire indices of abundance of the Streaked Horned Lark (*Eremophila alpestris*) by visual and/or auditory detection during the breeding season on known occupied habitat.
1. Species:	**Streaked Horned Lark (*Eremophila alpestris*)**
2. Objectives:	■ Confirm the presence of Streaked horned larks by conducting line transect surveys throughout occupied habitat at Joint Base McChord-Ft Lewis -- airfields, artillery impact area, 13th Division Prairie, Ranges 74/76/51; Olympia Airport; Shelton Airport, outer WA coast; Columbia R islands. □ Acquire estimates of abundance □ Provide a non-invasive method of inventory □ Provide an efficient and repeatable survey design □ Provide consistency among surveyors □ Provide standardized protocol for survey and management

3. Describe in detail the methods that will be used to complete the above activity (Or attach description to this form)**:**

Surveys to detect presence: Streaked horned larks are migrant, ground-dwelling passerines that have adapted to nesting on open grasslands, sparsely vegetated beaches and dredge spoil islands (Stinson 2005). They prefer bare ground and vegetation no more than several inches tall (Beason 1995, Altman 1999, Rogers 2000, Pearson and Hopey 2005). Streaked horned larks are loosely colonial nesters, with both males and females detectable during the breeding season, which occurs roughly from March through August. Survey timing is designed to coincide with clutch initiation curves – first clutches are initiated at the end of April at all sites and taper off dramatically in the Puget Sound area in early July; later on the coast and Columbia River (Pearson et at. 2005). Mates are socially monogamous for the breeding season. Males are easier to detect because they sing on the ground and also perform aerial courtship displays.

Methods: Surveys should begin within ½ hour of sunrise and end by 12:00 noon on days when wind is less than 20 mph with little to no precipitation (light drizzle and brief showers are fine). Surveys should end by 11:00 a.m. or earlier on days when the predicted maximum temperature is 80 F or higher. Four surveys per location should be conducted between 19 April and the first week of July in the Puget lowlands and between 19 April and mid-July for the outer coast and Columbia River as follows:

Survey 1: last two weeks of April **Survey 2:** mid two weeks of May **Survey 3:** mid two weeks of June
Survey 4: first week of July (Puget lowlands) through second week of July (outer coast and Columbia River). At sites where access is limited, priority should be given to May – July surveys.

Line transects – observers should be positioned 75 m from the survey boundary and 150 m apart (to avoid double-counting and to maximize detection ability) on predetermined transects/routes and should maintain a slow-moderate pace. Observers should stop every 150 m for approximately 1 minute to listen and scan for larks. Pausing to confirm a detection is allowed, however all observers should remain parallel. Transects should cover as much suitable habitat as possible in the allowed time window. Surveyors should familiarize themselves with vocalizations of male streaked horned larks, flight display behavior, and differentiating larks by sex and age. Young of the year birds look markedly different from adult birds. Every effort should be made to cover all areas with suitable habitat, preferably each time an area is surveyed. However, varying the area surveyed during each of the four surveys is acceptable for large expanses to ensure complete coverage. Observers should rotate between sites/transects and walk the survey route in the opposite direction on subsequent surveys.

Observers will independently record the approximate detection location of each bird on an area orthographic map, as well as the corresponding bird number from the field form. Environmental conditions, age, sex and behavior (see below). Observers may communicate with each other by radio or mobile if necessary. Waypoints should be verified at the beginning, end, and intermediate locations for each transect to verify observers remain on transect. Observers may briefly leave a line to avoid flushing birds or disturbing nests.

Data Recording: (field form attached)

- To avoid confusion between American (month/day/year) vs European (day/month/year) methods of writing dates with Arabic numbers, date should be written with a two-digit numeric for day first, the month using a three-letter abbreviation (e.g., Feb, Mar) second, and the year as a four-digit number last (ex. 26FEB2008).
- The lead observer should record surveyors' full names (not just initials), cloud cover, wind, precipitation, and air temperature at the beginning and end of the survey.
- Record the survey start/stop times. Time should be recorded on a 24-hour clock to avoid confusion with differentiating AM versus PM (e.g., 5:00 PM is 17:00).
- Each observer will receive an ortho map of the survey area, containing transect lines or routes and reference waypoints.
- Each observer will receive a data sheet for recording detections.
- Data to record for each detection include:
  AGE – AD (adult), YOY (young of the year), U (unknown)

  SEX – M (male), F (female), U (unknown and young of the year)

  BEHAVIOR (when first observed; can use more than one code) **–** S = Song, C = call, F = Foraging, FD = flight display, FL = flight, A = agonistic behavior, Al = alert posture (**standing erect with neck extended and appearing vigilant but not singing or calling)**, FC = food carry, CO = copulation, NM = carrying nest material.

- Record any incidental nests found (mark location on ortho, coordinates and contents on data form in Notes section).

Streaked Horned Lark Field Survey Form

SITE:______________________________________ Month:_______Day:____________Year: ______

	Full Name	Affiliation/Ph#
Observer 1		
Observer 2		
Observer 3		
Observer 4		

	start	stop
Cloud cover (%)		
Wind (ave mph)		
Temp (F)		
Precip.		

Cloud Cover: 0=0%, 1=33%, 2=66%, 3=100%

Precip: N=None, R=Rain, F=Fog, D=Drizzle

Start time		24 hr
End time		24 hr
Total	[redacted]	

W. meadowlarks	
Killdeer	
Crows	
Ravens	
Unknown corvid	[redacted]
N. Harrier	

Record est. abundance of negatively impacting bird species

Bird number	Age	Sex	Perp. Distance (m)	Behavior	Notes	Bird number	Age	Sex	Perp. Distance (m)	Behavior	Notes
1						23					
2						24					
3						25					
4						26					
5						27					
6						28					
7						29					
8						30					
9						31					
10						32					
11						33					
12						34					
13						35					
14						36					
15						37					
16						38					
17						39					
18						40					
19						41					
20						42					
21						43					
22						44					

Age: A = Adult, YOY = young of the year, U = unknown **Sex**: M = Male, F = Female, U = unknown and YOY

Behavior (only when first observed; can use more than one code): A= agonistic behavior (chase or aggressive contact), Al = alert posture (standing erect w/ neck extended and appearing viligent but not singing or calling), C = call, CO = copulation, F = Foraging, FC = food carry, FD = flight display, FL = flight, FS = flushed, NM = carrying nest material, R = resting, S = Song

City Commission Agenda Memo

Meeting Date: February 11, 2025
From: Esther Moberg, City Manager
Subject: Deeding the Former Hammond Library to VFW

Summary:

As approved by the voters in a double majority on the November 2024 ballot, the title for the VFW building is ready for approval of transfer of deed to the local VFW chapter. Total cost of $1 is charged to VFW with a reversionary clause back to the City of Warrenton should the VFW no longer be in existence as a local chapter. The City will keep the parklet next door.

Recommendation/Suggested Motion:

I move to approve Resolution No. 2699; a Resolution Approving the Sale of Certain Real Property to Fort Stevens VFW Post/Auxiliary 10580.

Alternative:

Other action as deemed appropriate by the City Commission

OR

None recommended

Fiscal Impact:

The City will no longer be responsible for maintenance of this building.

Attachments:

(All supporting documentation, i.e., maps, exhibits, etc., must be attached to this memorandum.)

- XXXX

Approved by City Manager: Esther Moberg

RESOLUTION NO. 2699

Introduced by All Commissioners

A RESOLUTION APPROVING THE SALE OF CERTAIN REAL PROPERTY TO FORT STEVENS VFW Post/Auxiliary #10580 (VFW)

WHEREAS, the City of Warrenton owns Lots 23 and 24, Block 22, New Astoria, Warrenton, Clatsop County, Oregon, commonly known as 861 Pacific Drive, Warrenton, OR 97121 (the Property); and

WHEREAS, the Property has been leased by the VFW since December 15, 2022; and

WHEREAS, ORS 221.725 sets forth certain requirements for a city desiring to sell real property, including public notice, a public hearing, and certain disclosures; and

WHEREAS, notice of the proposed sale and public hearing was published in The Astorian on February 1, 2025, consistent with ORS 221.725; and

WHEREAS, the City Commission held a public hearing on this proposed sale on February 11, 2025, at which any resident of the city was given an opportunity to present written or oral testimony, consistent with ORS 221.725; and

WHEREAS, the nature of the proposed sale and the general terms thereof, and evidence of the market value of the Property, are described in this resolution and have been disclosed as required by ORS 221.725; and

WHEREAS, ORS 271.310 sets forth certain additional provisions relating to sale by a city of real property, including those relating to consideration being in the form of cash or real property, and a finding that the public interest may be furthered by the sale; and

WHEREAS, the consideration for the proposed sale is cash, consistent with ORS 271.310; and

WHEREAS, it appears to the City Commission that selling said Property to VFW is necessary or convenient in order to transfer ownership and responsibility for repairs and maintenance of the property to VFW, rather than continue City ownership of land that has been leased by the City since December 15, 2022; and

WHEREAS, after considering all of the information and testimony presented at the public hearing, it appears to the City Commission that the public interest may be furthered by the proposed sale; and

WHEREAS, ORS 271.330(2) permits the City to relinquish title to any of its property to a qualifying nonprofit corporation for the purpose of social services, as defined by ORS 271.330(2); and

WHEREAS, the VFW is a qualifying nonprofit corporation because it is a corporation exempt from federal income taxes under section 501(c)(3) of the Internal Revenue Code and the VFW provides social services because it provides services that include, but are not limited to, education, training, counseling, health and mental health services, and the administrative services to support those social services; and

WHEREAS, on the November 5, 2024, election, pursuant to and in satisfaction of the requirements of the Warrenton City Charter Chapter XI, at least fifty percent of all registered voters within the City cast ballots on the question of whether to convey the Property to the VFW and the majority of those casting a ballot voted yes.

NOW, THEREFORE, BE IT RESOLVED by the City Commission of the City of Warrenton that:

City Manager Esther Moberg is hereby authorized to act on behalf of the City Commission and the City of Warrenton to execute a deed and take all other steps necessary and appropriate to effectuate a sale of the property described in Exhibit A, attached hereto and incorporated herein by reference, for consideration of cash in the amount of $1 (one dollar), subject to a reversionary clause for the benefit of the City in the event the Property is no longer used as a VFW facility.

Adopted by the City Commission of the City of Warrenton this _____ day of ____________2025.

This resolution shall take effect immediately upon its passage.

APPROVED

____

Henry A. Balensifer III, Mayor

ATTEST

____

Dawne Shaw, CMC, City Recorder

THIS SPACE RESERVED FOR RECORDER'S USE

After recording, return to:

City of Warrenton
Attn: City Manager
225 S. Main
Warrenton, OR 97146

COVER SHEET FOR RECORDED INSTRUMENT

Recording Information Required by ORS 205.234

1. Name of Document: Quitclaim Deed

2. Names of Parties:

   Grantor: City of Warrenton, an Oregon municipal corporation

   Grantee: Fort Stevens VFW Post/Auxiliary #10580, a 501(c)(19)

3. Return Documents To:

   City of Warrenton
   Attn: City Manager
   225 S. Main/PO Box 250
   Warrenton, OR 97146

4. True and Actual Consideration: $1.00

5. Mail Tax Statements To:
   Ft. Stevens VFW Post 10580
   PO Box 233
   Warrenton, OR 97146

6. Information Required by ORS 205.125: N/A

The City of Warrenton, an Oregon municipal corporation, hereinafter Grantor, releases and quitclaims to VFW/Auxiliary #10580, hereinafter Grantee, all right, title and interest in and to the following described real property situated in the County of Clatsop, State of Oregon (hereinafter, the Property), to wit:

LOTS 23 AND 24, BLOCK 22, NEW ASTORIA, IN THE CITY OF WARRENTON, COUNTY OF CLATSOP, STATE OF OREGON.
CLATSOP COUNTY ASSESSOR'S ACCOUNT NO.: 28632

CLATSOP COUNTY TAXMAP NO.: 81005DC03300

This conveyance is made solely for the specific purposes of operating a VFW facility. If the Property shall cease to be used for such purpose, the Property shall revert and become vested in the City of Warrenton without the performance of any act whatsoever on the part of said Grantor.

TO HAVE AND TO HOLD the same unto Grantee, its heirs, successors, and assigns so long as it is utilized for the purpose herein described.

The true consideration for this conveyance is one dollar ($1.00), the receipt and sufficiency of which is hereby acknowledged.

BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON TRANSFERRING FEE TITLE SHOULD INQUIRE ABOUT THE PERSON'S RIGHTS, IF ANY, UNDER ORS 195.300, 195.301 AND 195.305 TO 195.336 AND SECTIONS 5 TO 11, CHAPTER 424, OREGON LAWS 2007, SECTIONS 2 TO 9 AND 17, CHAPTER 855, OREGON LAWS 2009, AND SECTIONS 2 TO 7, CHAPTER 8, OREGON LAWS 2010. THIS INSTRUMENT DOES NOT ALLOW USE OF THE PROPERTY DESCRIBED IN THIS INSTRUMENT IN VIOLATION OF APPLICABLE LAND USE LAWS AND REGULATIONS. BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON ACQUIRING FEE TITLE TO THE PROPERTY SHOULD CHECK WITH THE APPROPRIATE CITY OR COUNTY PLANNING DEPARTMENT TO VERIFY THAT THE UNIT OF LAND BEING TRANSFERRED IS A LAWFULLY ESTABLISHED LOT OR PARCEL, AS DEFINED IN ORS 92.010 OR 215.010, TO VERIFY THE APPROVED USES OF THE LOT OR PARCEL, TO DETERMINE ANY LIMITS ON LAWSUITS AGAINST FARMING OR FOREST PRACTICES, AS DEFINED IN ORS 30.930, AND TO INQUIRE ABOUT THE RIGHTS OF NEIGHBORING PROPERTY OWNERS, IF ANY, UNDER ORS 195.300, 195.301 AND 195.305 TO 195.336 AND SECTIONS 5 TO 11, CHAPTER 424, OREGON LAWS 2007, SECTIONS 2 TO 9 AND 17, CHAPTER 855, OREGON LAWS 2009, AND SECTIONS 2 TO 7, CHAPTER 8, OREGON LAWS 2010.

______________________________ ______________

GRANTOR DATE

STATE OF OREGON)
) ss:
COUNTY OF CLATSOP)

On the ______day of __________________, 2025, personally appeared the above-named Esther Moberg, who being duly sworn, did say that she is the City Manager for the City of Warrenton, an Oregon Municipal Corporation, and said instrument was signed and sealed on behalf of said corporation and she acknowledged said instrument to be its voluntary act and deed. Before me:

____

Notary Public for Oregon ______________________

My Commission Expires:______________________

____ _______________

GRANTEE DATE

STATE OF OREGON)
) ss:
COUNTY OF ______________)

On the ______day of ____________________, 2025, personally appeared the above-named _______________________, who being duly sworn, did say that he/she is the ______________________________ for ____________________________________, and said instrument was signed and sealed on behalf of said corporation and he/she acknowledged said instrument to be its voluntary act and deed. Before me:

____

Notary Public for Oregon ______________________

My Commission Expires:______________________

City of Warrenton, OR
Interior Drainage Analysis

In Support of Levee Accreditation and Certification for the USACE and FEMA

WEST CONSULTANTS
WATER | ENVIRONMENTAL | SEDIMENTATION | TECHNOLOGY

Introduction

- James Heyen, PE
- Project Manager and Senior Engineer
- WEST Consultants provides specialized water resources engineering services, offering expertise in hydrology, hydraulics, and sediment transport
- We are recognized as innovative computer modeling experts with over 35 years of experience

WEST CONSULTANTS
WATER | ENVIRONMENTAL | SEDIMENTATION | TECHNOLOGY

Levee Certification/Accreditation

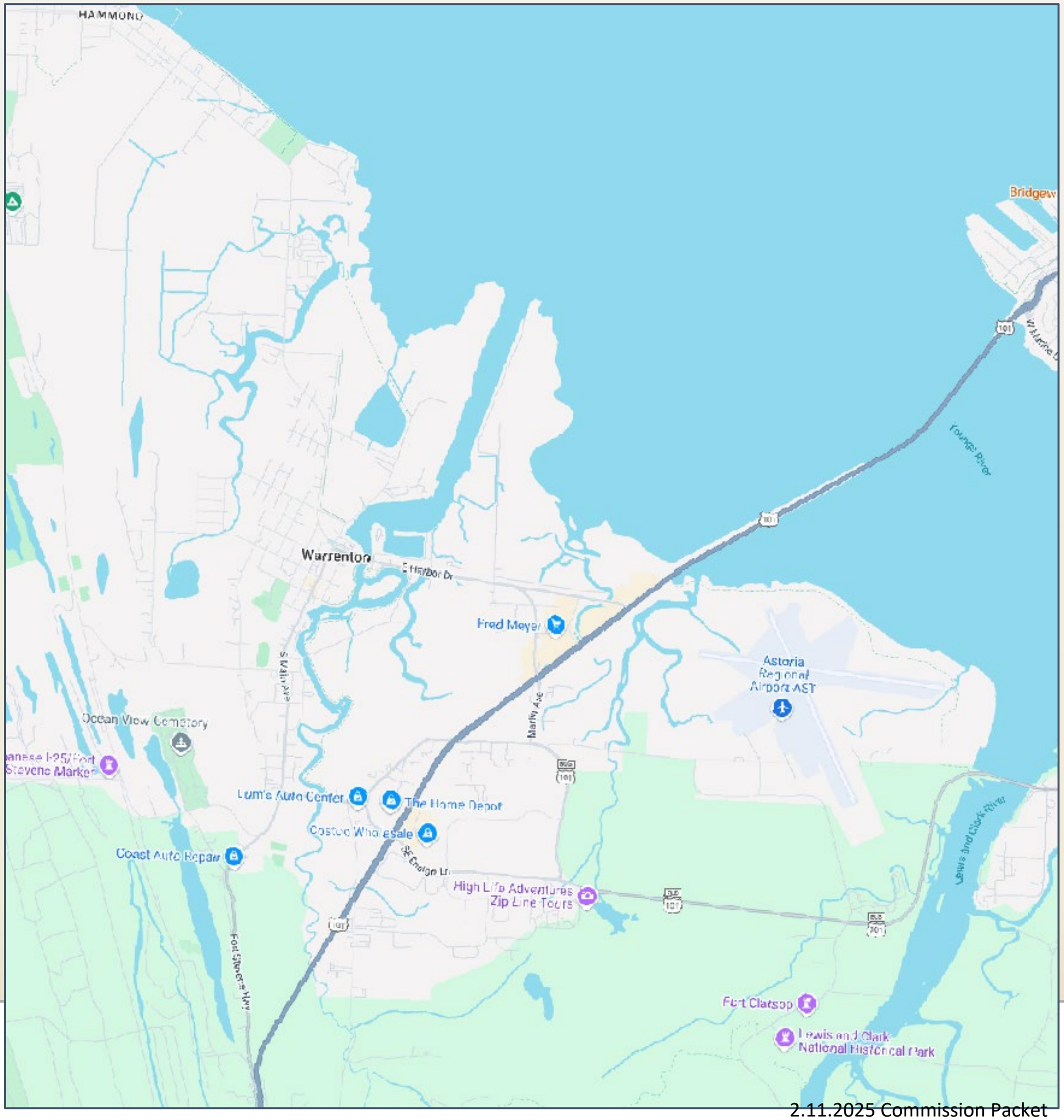
- Certification by the US Army Corps of Engineers
- Accreditation by Dept. of Homeland Security FEMA
- Required by 44 CFR Section 65.10
  - Freeboard Analysis
  - Embankment Protection Analysis
  - Interior Drainage Analysis
  - Geotechnical Stability
  - Operations & Maintenance

WEST CONSULTANTS
WATER | ENVIRONMENTAL | SEDIMENTATION | TECHNOLOGY

Levee System/Study Area

Study Area Characteristics and Key Features

- Topographically flat and drained by low-gradient sloughs
- Limited system of ditches and stormwater infrastructure
- Two pump stations (Storm 1 and Storm 2)
- Skipanon River is main feature
- West side is mostly low-density residential
- East side is mostly commercial and industrial development

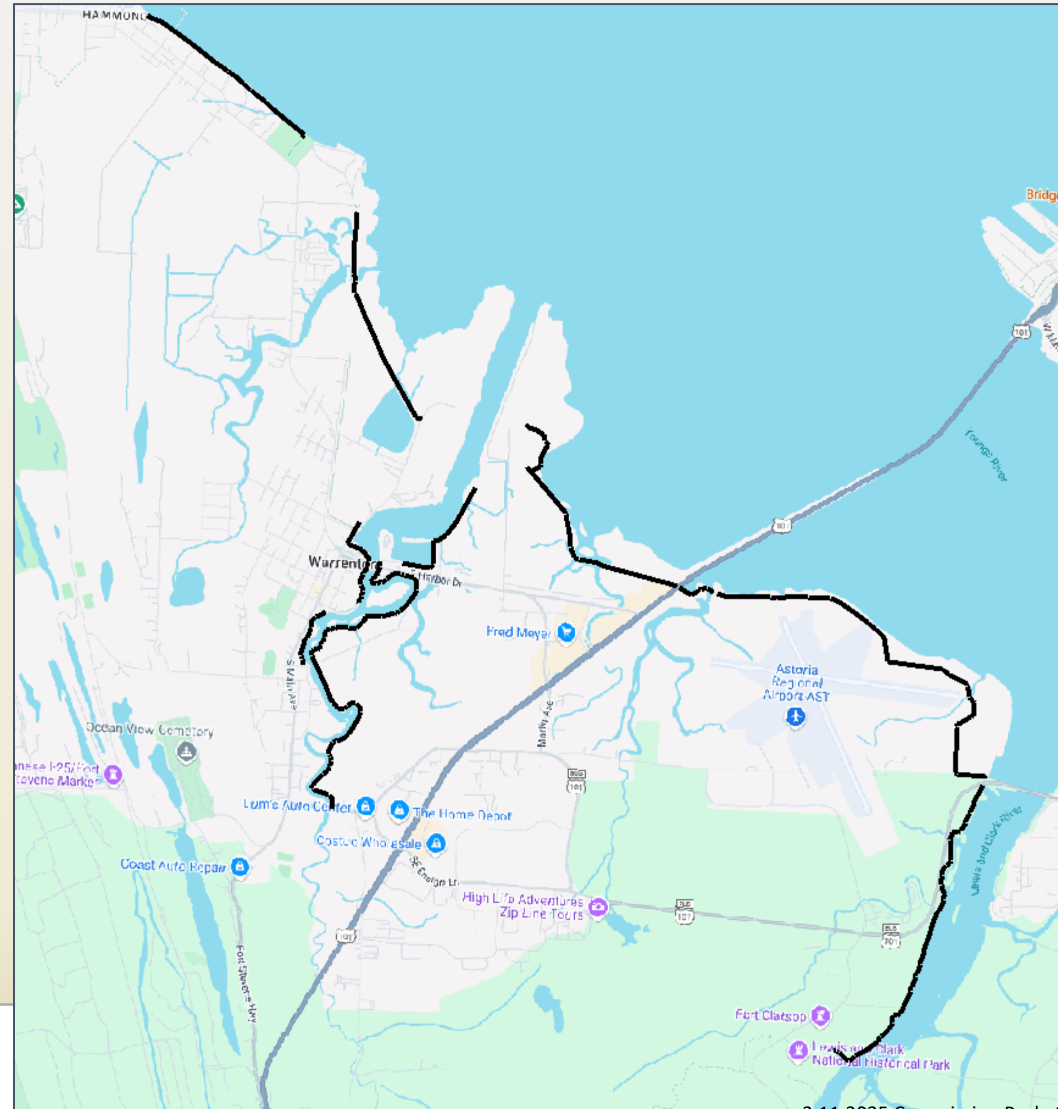


WEST CONSULTANTS
WATER | ENVIRONMENTAL | SEDIMENTATION | TECHNOLOGY

Levee System/Study Area

Study Area Characteristics and Key Features

- Topographically flat and drained by low-gradient sloughs
- Limited system of ditches and stormwater infrastructure
- Two pump stations (Storm 1 and Storm 2)
- Skipanon River is main feature
- West side is mostly low-density residential
- East side is mostly commercial and industrial development

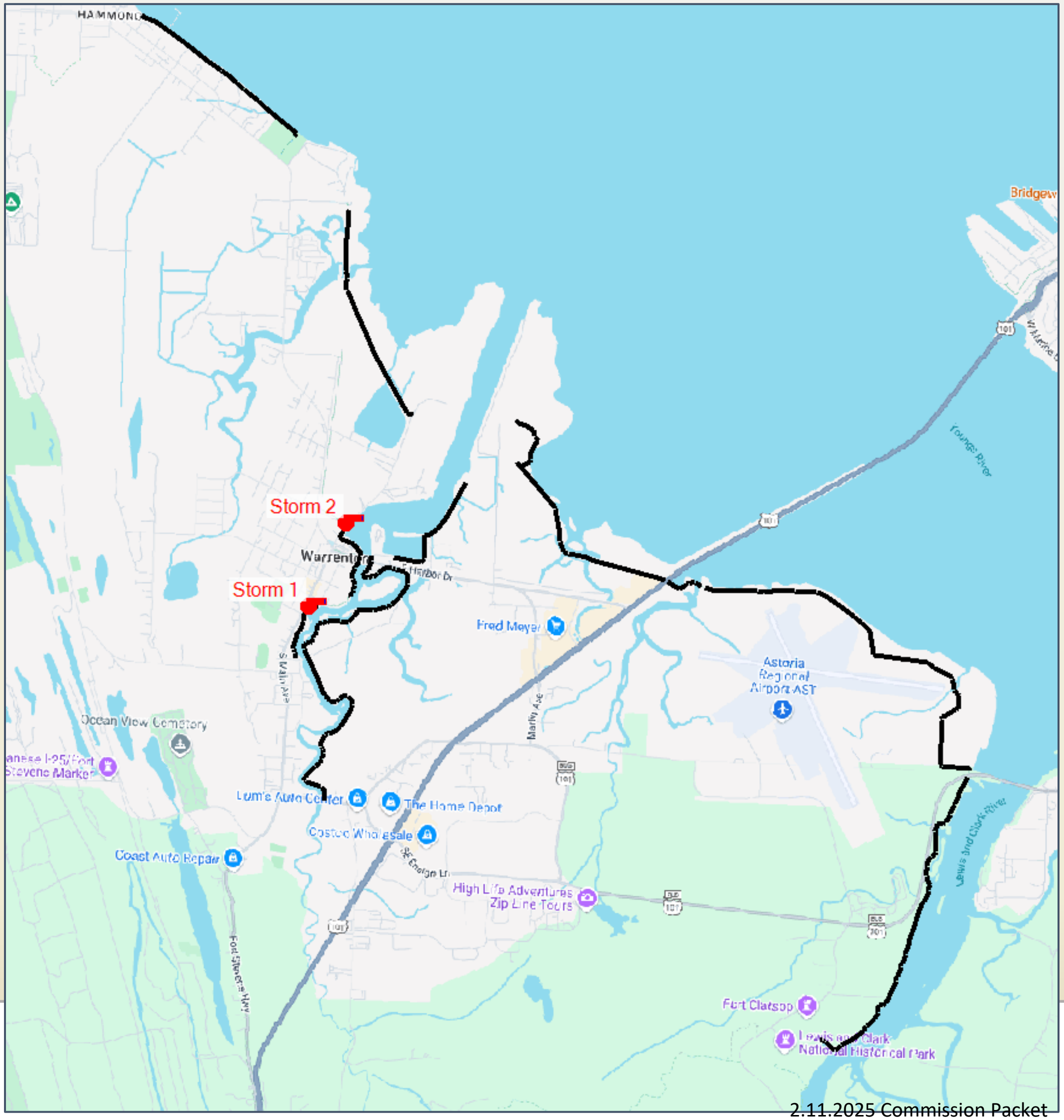


WEST CONSULTANTS
WATER | ENVIRONMENTAL | SEDIMENTATION | TECHNOLOGY

Levee System/Study Area

Study Area Characteristics and Key Features

- Topographically flat and drained by low-gradient sloughs
- Limited system of ditches and stormwater infrastructure
- Two pump stations (Storm 1 and Storm 2)
- Skipanon River is main feature
- West side is mostly low-density residential
- East side is mostly commercial and industrial development

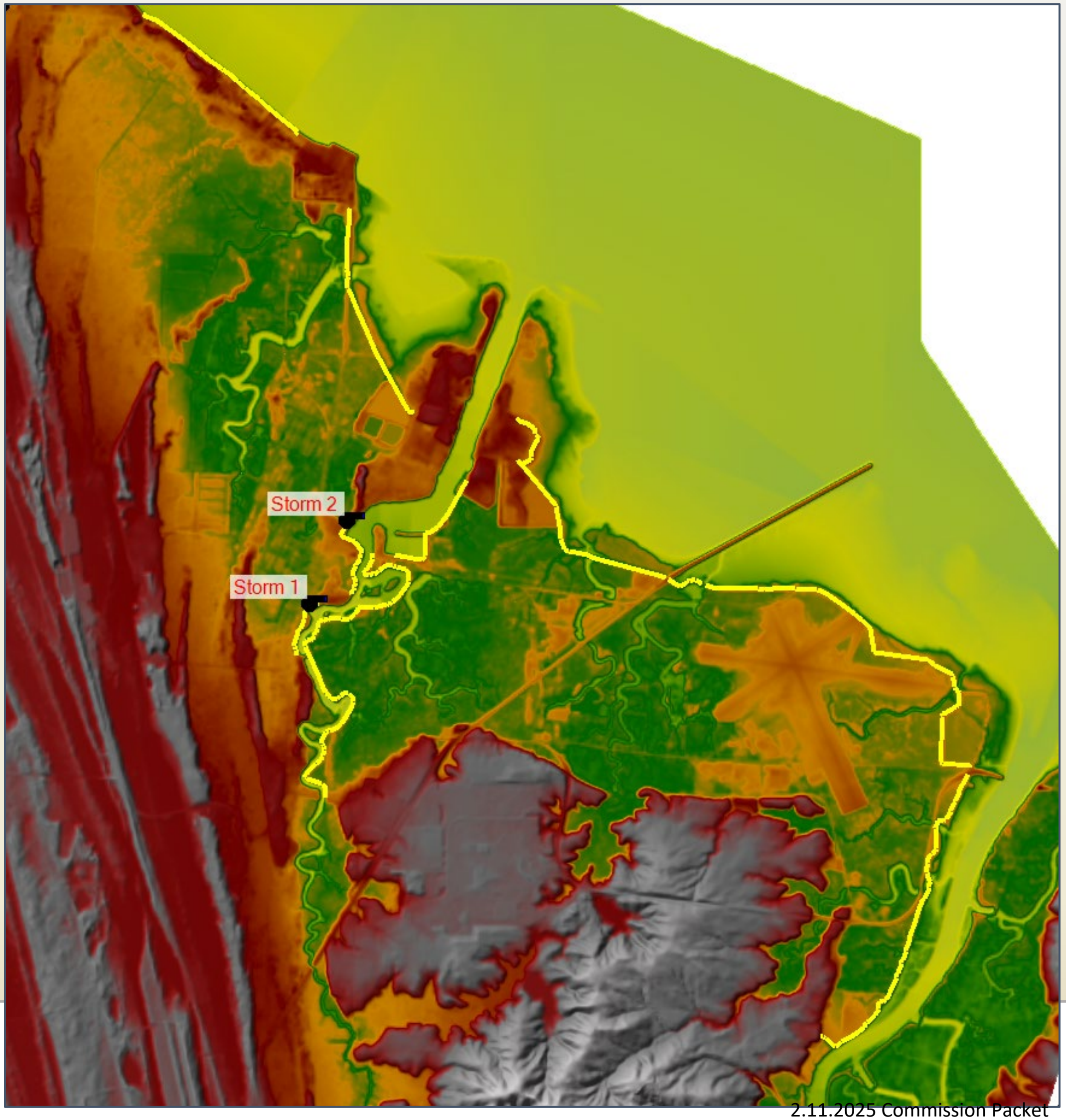


WEST CONSULTANTS
WATER | ENVIRONMENTAL | SEDIMENTATION | TECHNOLOGY

Levee System/Study Area

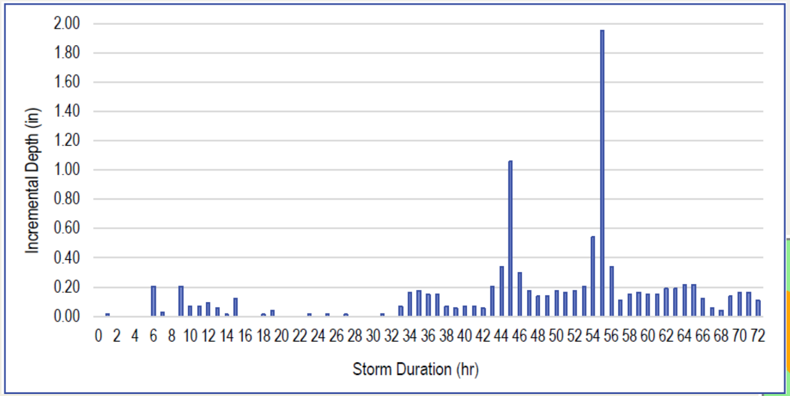
Topographic Map

- Lowest areas are light green/yellow
- Highest areas are gray
- Topography (LiDAR) Sources:
  - USACE 2010
  - PSLC 2005



WEST CONSULTANTS
WATER | ENVIRONMENTAL | SEDIMENTATION | TECHNOLOGY

Precipitation/Hydrology

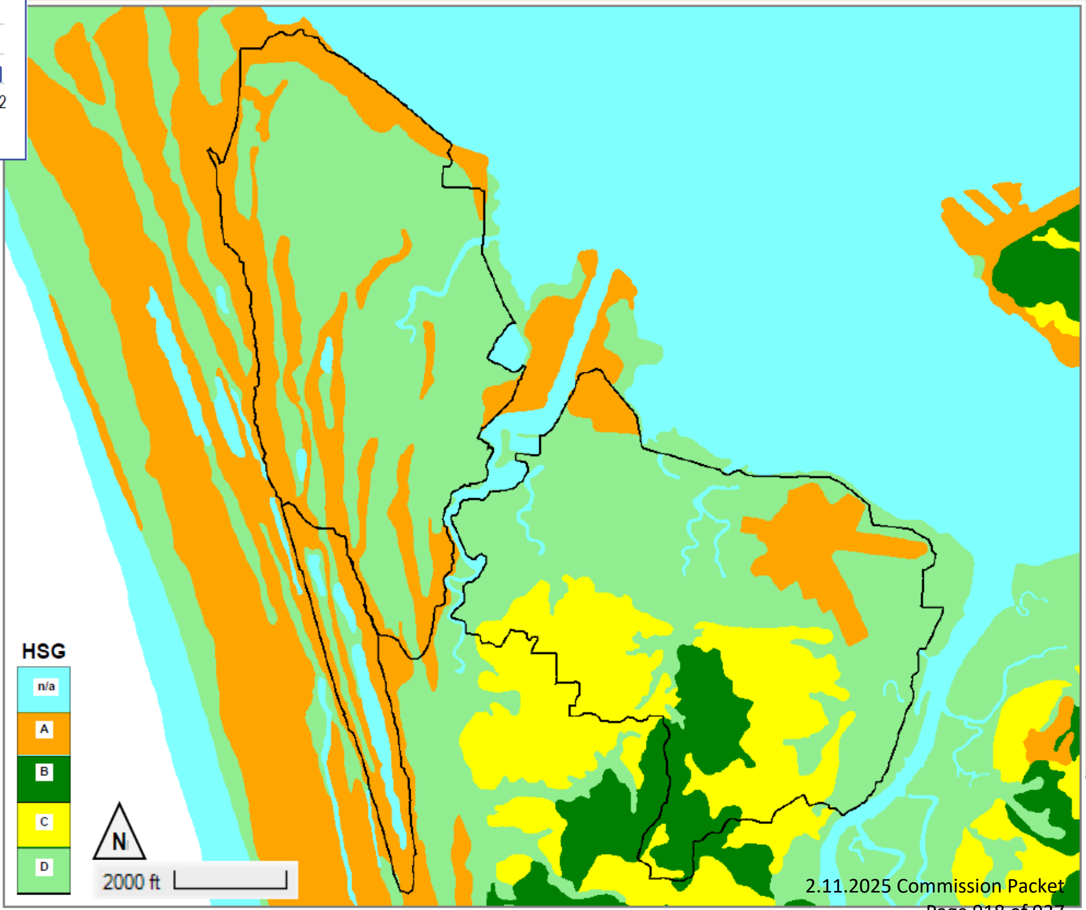


Precipitation

- 72-hour, 100-year rainfall event
- Total cumulative depth 10.2”

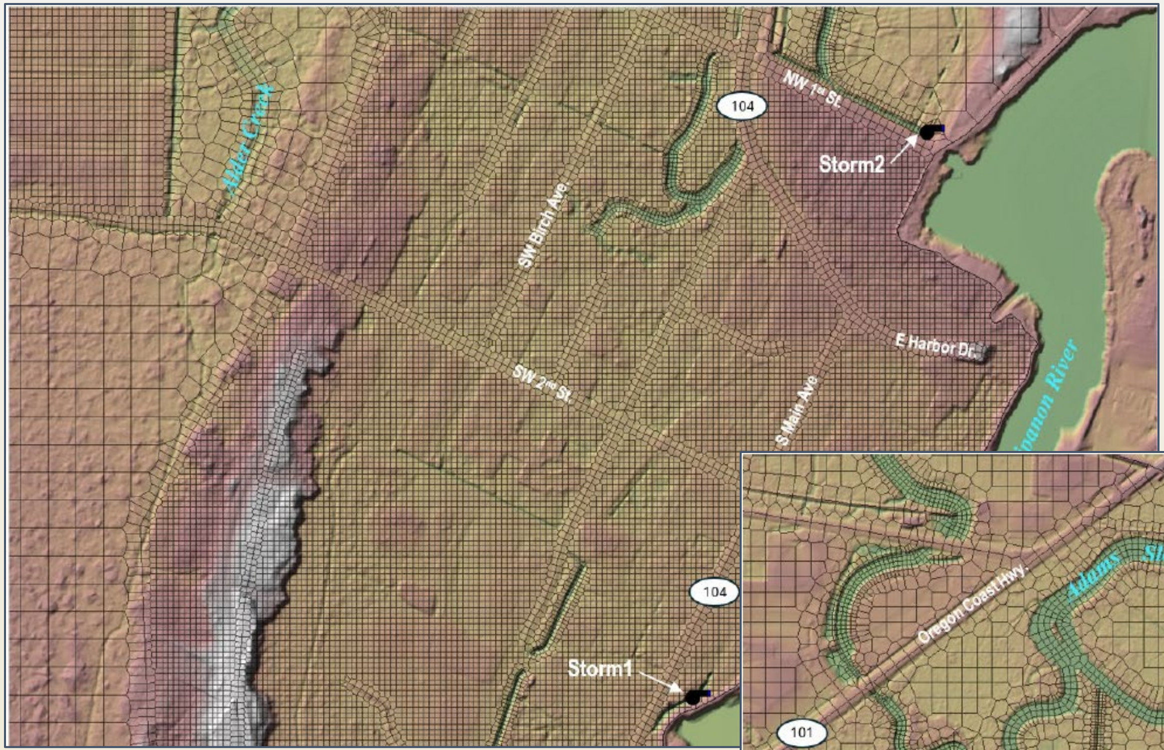
Infiltration

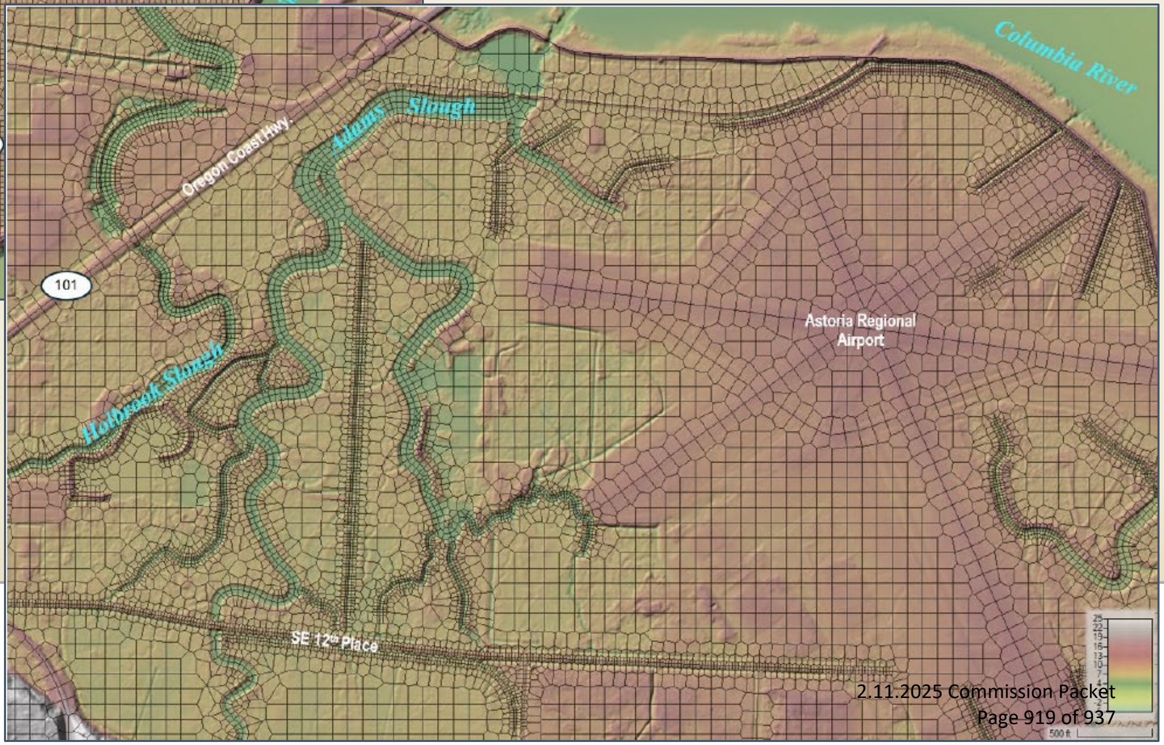
- NRCS Curve Number Method
- Depends on soil types
  - Group A – high infiltration
  - Group B – moderate infiltration
  - Group C – low infiltration
  - Group D – very low infiltration



WEST CONSULTANTS
WATER | ENVIRONMENTAL | SEDIMENTATION | TECHNOLOGY

Hydraulics – Model Mesh





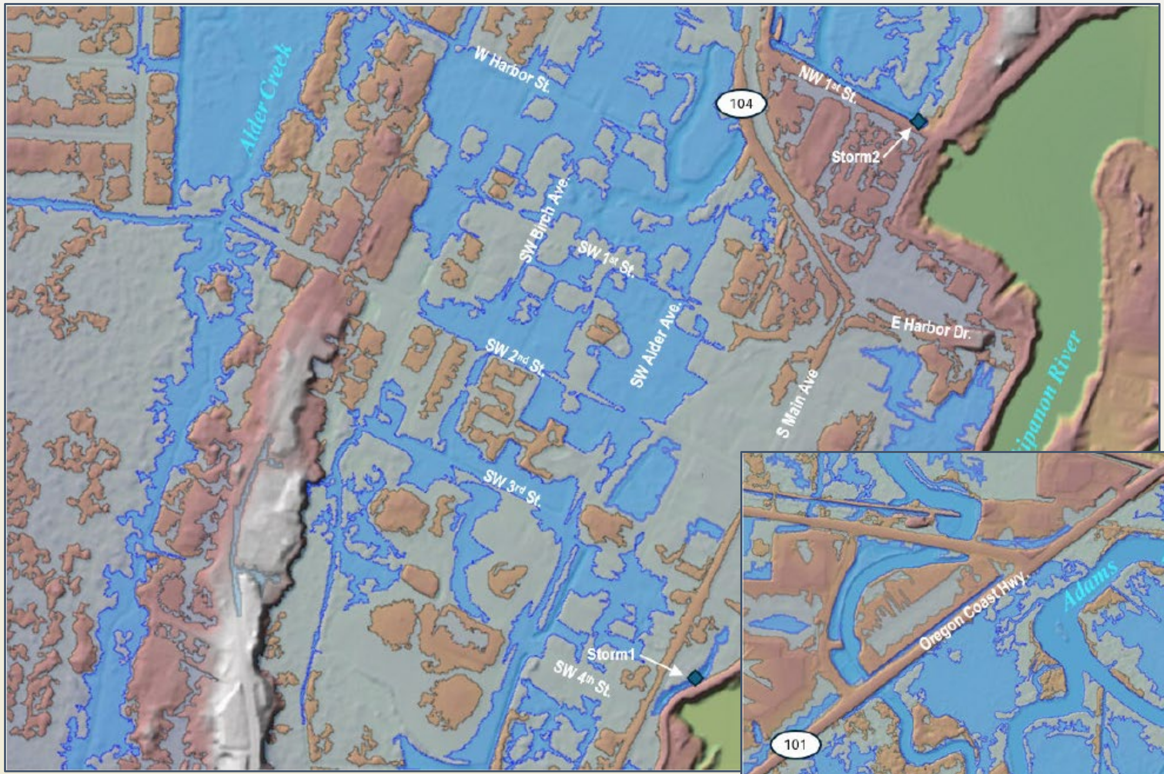
85,200 cells

30 sec. Computation Interval

Simulation runs ~ 54 min.

WEST CONSULTANTS
WATER | ENVIRONMENTAL | SEDIMENTATION | TECHNOLOGY

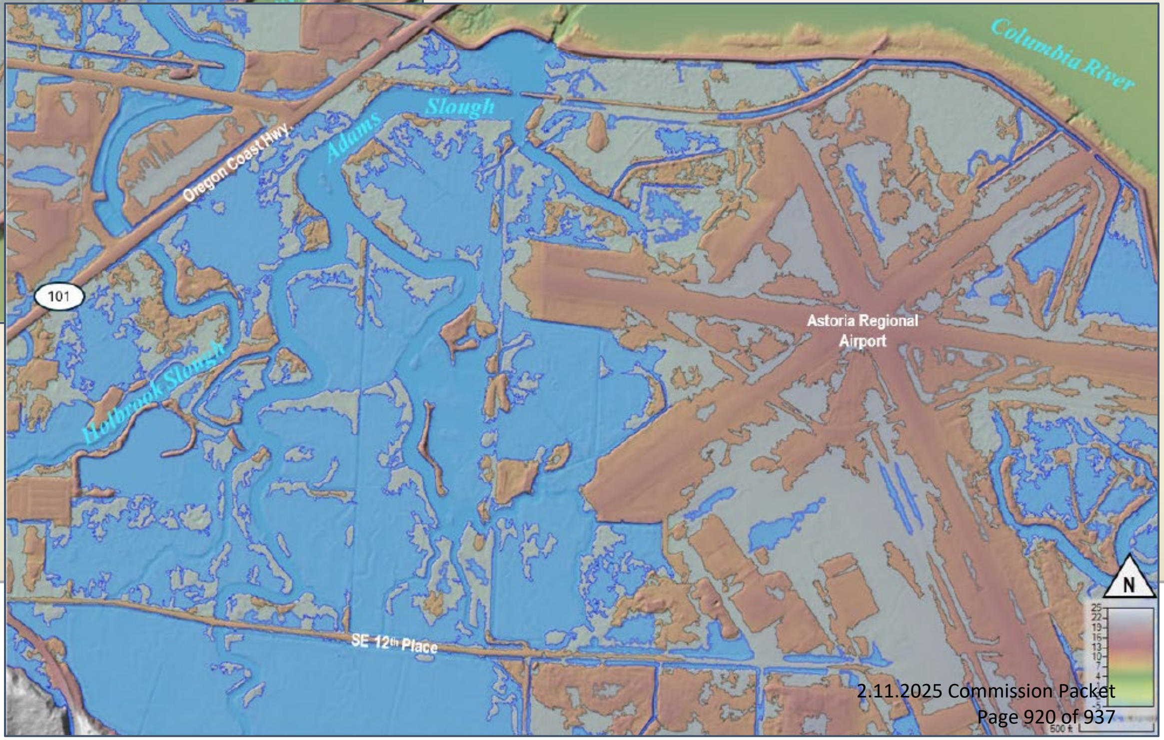
Hydraulics – Inundation Results



Dark Blue – 100-year

Light Blue – 500-year

(Only areas with depth > 1 ft.)



WEST CONSULTANTS
WATER | ENVIRONMENTAL | SEDIMENTATION | TECHNOLOGY

Capital Improvements

Partnered with Consor Engineers (Joshua Owens) in Portland

Two General Types of Improvements:

<u>Pump Station & Drainage Improvements</u>

CIP-1: Tide Gate 2 Pump Station & Drainage Improvements.

- *Area south of Pacific Drive near Iredale Street and 8th Avenue*
- *Could reduce flood elevations by ~0.6 feet*

CIP-6: Tide Gate 6 Drainage Improvements

- *Northern portion of downtown Warrenton*
- *Minimal (<0.1 feet) reduction in flood elevations*

CIP-7: Tide Gate 9 Drainage Improvements

- *Central downtown Warrenton*
- *Minimal (<0.1 feet) reduction in flood elevations*

<u>Neighborhood/Creek Drainage/Master Plans</u>

CIP-2: Tide Gate 3 Neighborhood Plan

CIP-3: North Tansy Creek Neighborhood Plan

CIP-4: Tansy Creek Master Plan

CIP-5: Alder Creek Master Plan

CIP-8: Skipanon Slough Master Plan

CIP-9: Adams Slough Neighborhood Plan

Generally, these are planning level studies that would evaluate the potential benefit from future CIP improvements to: drainage and pump systems, grading, fill, and wetland mitigation.

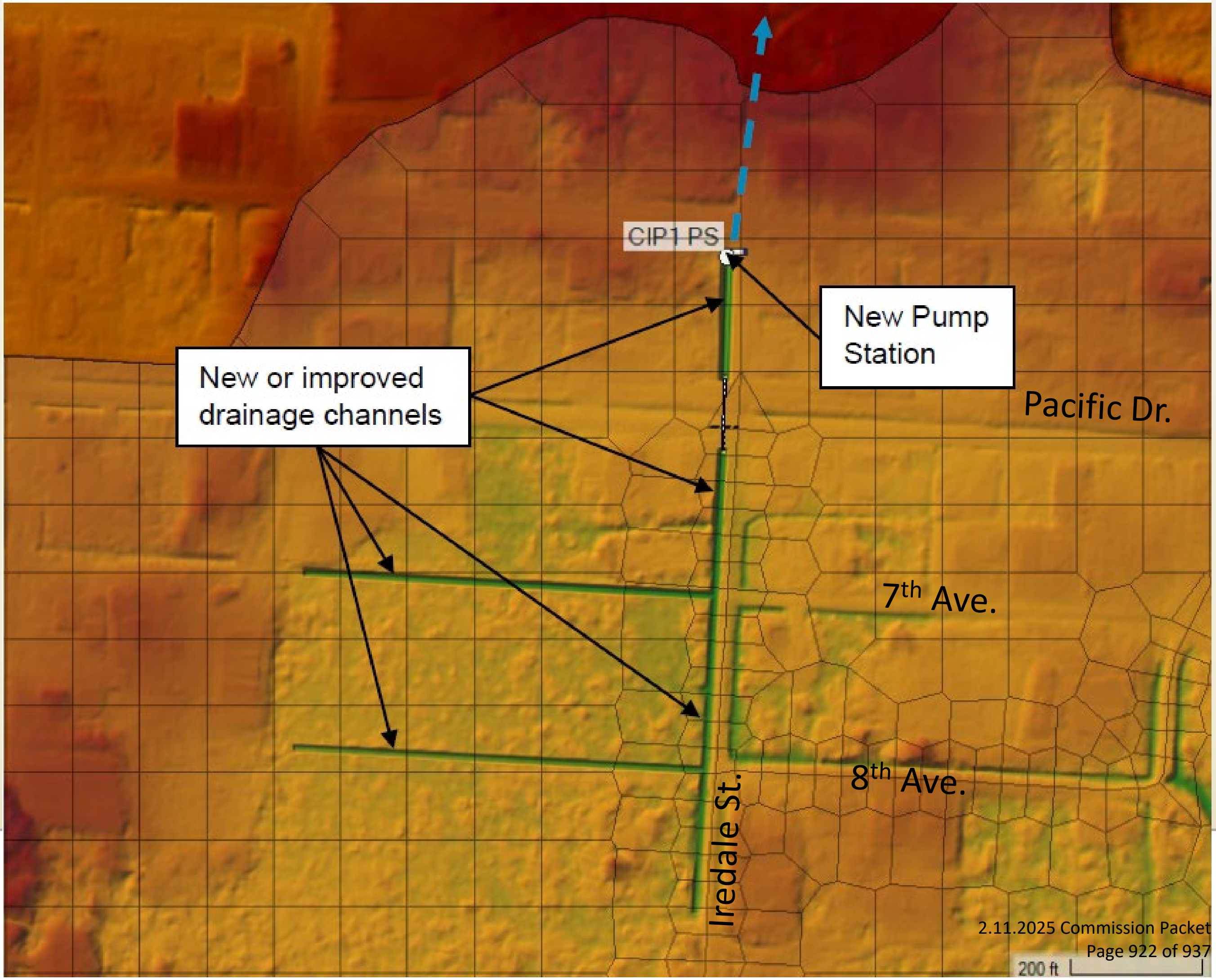
WEST CONSULTANTS
WATER | ENVIRONMENTAL | SEDIMENTATION | TECHNOLOGY

CIP Example 1

CIP 1 – Tide Gate 2 Pump Station and Drainage Improvements

Benefits area south of Pacific Drive near Iredale Street

New pump station and new/improved drainage channels



WEST CONSULTANTS
WATER | ENVIRONMENTAL | SEDIMENTATION | TECHNOLOGY

CIP Example 1

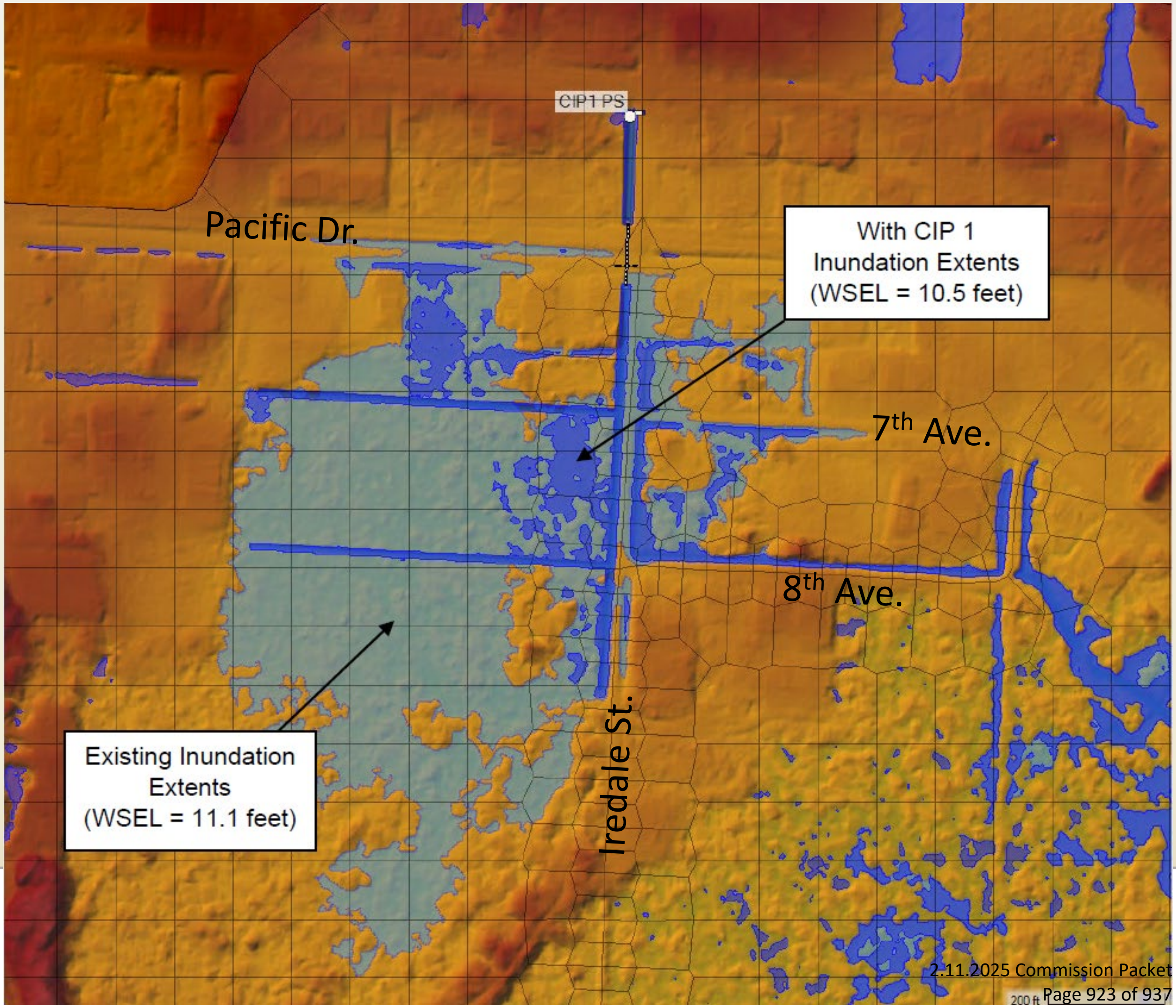
CIP 1 – Tide Gate 2 Pump Station and Drainage Improvements

Benefits area south of Pacific Drive near Iredale Street

New pump station and new/improved drainage channels

Could reduce flood inundation by ~0.6 feet, shrinking flooded area by ~7 acres

Estimated cost $3.5M



WEST CONSULTANTS
WATER | ENVIRONMENTAL | SEDIMENTATION | TECHNOLOGY

CIP Cost Estimates

CIP No.	CIP Name	Cost
1	Tide Gate 2 Pump Station and Drainage Improvements	$ 3,547,500
2	Tide Gate 3 Neighborhood Plan	$ 665,000
3	North Tansy Creek Neighborhood Plan	$ 484,000
4	Tansy Creek Master Plan	$ 1,000,000
5	Alder Creek Master Plan	$ 1,030,000
6	Tide Gate 6 Drainage Improvements	$ 616,250
7	Tide Gate 9 Drainage Improvements	$ 1,130,000
8	Skipanon Slough Master Plan	$ 1,030,000
9	Adams Slough Neighborhood Plan	$ 201,400
	Total Cost	$ 9,704,150

Concept-level estimates with expected accuracy -50% to +100%

WEST CONSULTANTS
WATER | ENVIRONMENTAL | SEDIMENTATION | TECHNOLOGY

City Commission Agenda Memo

Meeting Date: February 11th, 2025
From: Dale McDowell, Interim Public Works Director
Subject: Project Update- Safe Routes to School Phase 2

Summary:

The City of Warrenton, in collaboration with ODOT, is advancing Phase 2 of the Safe Routes to School project, a key effort to enhance pedestrian accessibility and safety along this vital corridor. ODOT survey crews have been actively working from the Phase 1 terminus at 10th Street to Warrenton High School to assess necessary enhancements.

This phase of the project builds upon prior improvements and aims to provide safer, more accessible pathways for students and residents. Key elements under consideration include:

- Constructing a sidewalk on one side of Main Avenue/OR 104
- Completing ADA curb ramp upgrades
- Enhancing signage, striping, and lighting
- Installing improved pedestrian crosswalks at key locations

We are currently evaluating project scope and costs, with design efforts continuing through 2025. The City and ODOT have strategically combined Federal Earmark funding with state funding to maximize resources and deliver an effective solution.

For this update, we are pleased to have representatives from the Oregon Department of Transportation (ODOT) in attendance:

- **Charlotte Berghoffer**, ODOT Transportation Project Manager
- **Bill Jablonski**, ODOT Area Manager

They will be available to provide insights and answer any questions related to the project. We appreciate your ongoing support and will continue to provide updates as we move forward with Safe Routes to School Phase 2.

Approved by City Manager: ______________________

City Commission Agenda Memo

Meeting Date: February 11th, 2025
From: Dale McDowell, Interim Public Works Director
Subject: Safe Drinking Water Revolving Loan Fund Financing Contract Amendment #3- Hammond Transmission Waterline

Summary:

On January 10, 2017, the City approved and signed the Safe Drinking Water Revolving Loan Fund agreement to secure funding for the Hammond Transmission Waterline Project. Since then, the City has worked closely with the Oregon Business Development Department to extend the project completion deadline. The City plans to go out to bid this spring for the construction of Phase 1 of the Hammond Waterline. All required permits are in place, and the Community Grant Application for additional construction funds has been reviewed and signed. The awarding process is expected to be completed by the end of the month, allowing the City to finalize a financing agreement and proceed with the bidding process. Phase 1 is anticipated to be completed by the end of 2025.
This amendment to the Safe Drinking Water Revolving Loan Fund extends the project completion deadline to December 31, 2025, providing the necessary timeframe to complete this important project.

Recommendation/Suggested Motion:

"I move to approve Amendment #3 to the Safe Drinking Water Revolving Loan Fund agreement, extending the project completion deadline for the Hammond Transmission Waterline Project to December 31, 2025."

Alternative:

Other action as deemed appropriate by the City Commission
OR
None recommended

Fiscal Impact:

The adopted 2024/2025 budget has $3,000,000 allocated to this project. This amendment will have no impact.

Attachments:

(All supporting documentation, i.e., maps, exhibits, etc., must be attached to this memorandum.)

- Safe Drinking Water Revolving Loan Fund Financing Contract - Amendment Number 03

Approved by City Manager: [signature]

Amendment Number 03

Project Name: NW Warrenton Drive Transmission Main Replacement

This amendment is made and entered into by and between the State of Oregon, acting by and through the Oregon Infrastructure Finance Authority of the Oregon Business Development Department ("IFA"), and the City of Warrenton ("Recipient"), and amends the Financing Contract between Recipient and IFA, Project Number S17012, dated 02 February 2017, (as amended, "Contract") for the above-named Project. Capitalized terms not defined in this amendment have the meanings assigned to them by the Contract.

Recital: The purpose of this amendment is to extend the Project Completion Deadline and update Exhibit E.

The parties agree as follows:

1. Amend the following Key Term in Section 1 of the Contract as follows (deletion in ~~strikethrough~~; addition in double underline):

   "Project Completion Deadline" means ~~31 December 2024~~ 31 December-2025.

2. Delete Exhibit E – Information Required by 2 CRF § 200.332(b)(1) in its entirety and replace it with the following:

EXHIBIT E - INFORMATION REQUIRED BY 2 CFR § 200.332(B)(1)

Federal Award Identification:

(i) Subrecipient* name (which must match registered name in SAM): WARRENTON, CITY OF

(ii) Subrecipient's Unique Entity Identifier (SAM): MXASVPL41FV3

(iii) Federal Award Identification Number (FAIN): 98009018

(iv) Federal Award Date: 19 September 2018

(v) Sub-award Period of Performance Start and End Date: 02 February 2017 to 31 December 2025

(vi) Sub-award Budget Period Start and End dates: 02 February 2017 to 31 December 2025

(vii) Amount of Federal Funds Obligated by this action by the pass-through entity to the subrecipient: $0

(viii) Total Amount** of Federal Funds Obligated to the subrecipient by the pass-through entity including the current financial obligation: $1,645,000

(ix) Total Amount** of the Federal Award committed to the subrecipient by the pass-through entity: $1,645,000

(x) Federal award project description as required to be responsive to the Federal Funding Accountability and Transparency Act (FFATA): Oregon's Drinking Water State Revolving Fund: This grant increases the capacity of Oregon to ensure that its public water systems continue to provide safe drinking water. This is done by (1) continuing loan financing to public water systems and support for newly proposed priority projects, (2) providing grant support for covering administrative expenses, small public water system technical assistance, State program management and local assistance, and (3) continuation of the loan fund to finance source water protection project initiatives, including acquiring conservation easements.

(xi) Name of Federal awarding agency, pass-through entity, and contact information for awarding official of the Pass-through entity:

(a) Name of Federal awarding agency: U.S. Environmental Protection Agency

(b) Name of pass-through entity: Oregon Business Development Department

(c) Contact information for awarding official of the pass-through entity: Edward Tabor, Infrastructure and Program Services Director, 503-949-3523

(xii) The Federal Assistance Listing (formerly CFDA) Number and Title: 66.468 Safe Drinking Water State Revolving Fund,
Amount: $1,645,000

(xiii) Is Award R&D? No

(xiv) Indirect cost rate for the Federal award: 10%

* For the purposes of this Exhibit E, "Subrecipient" refers to Recipient and "pass-through entity" refers to OBDD.

** The total amount of federal funds obligated or committed to the Subrecipient by the pass-through entity is the total amount of federal funds obligated or committed to the Subrecipient by the pass-through entity during the current state fiscal year, which runs from July 1 through June 30.

IFA will have no obligation under this amendment, unless within 60 days after receipt, the Recipient delivers to OBDD the following items, each in form and substance satisfactory to IFA and its Counsel:

(i) this amendment duly executed by an authorized officer of the Recipient; and

(ii) such other certificates, documents, opinions and information as OBDD may reasonably require.

SIGNATURE PAGE TO FOLLOW

Except as specifically provided above, this amendment does not modify the Contract, and the Contract shall remain in full force and effect during the term thereof. This amendment is effective on the date it is fully executed and approved as required by applicable law.

STATE OF OREGON
acting by and through its
Oregon Infrastructure Finance Authority
of the Oregon Business Development Department

By: ______________________________
Edward Tabor, Infrastructure & Program Services Director

Date: ______________________________

CITY OF WARRENTON

By: ______________________________
Esther Moberg, City Manager

Date: ______________________________

APPROVED AS TO LEGAL SUFFICIENCY IN ACCORDANCE WITH ORS 291.047:

/s/ John McCormick as per email dated 13 January 2025
John McCormick, Senior Assistant Attorney General

City Commission Agenda Memo

Meeting Date: February 11, 2025
From: Mathew J. Workman, Chief of Police
Subject: Ordinance 1290 2nd Reading

Summary:

On January 28, 2025, we had the first reading of Ord. 1290 and after discussion there as a small amendment to Section 10.16.030 (A)(5). This will be the 2nd reading with the amended language and adoption.

Recommendation/Suggested Motion:

"I move to conduct the second reading by title only of Ordinance No. 1290 amending section 10.16 of the City of Warrenton Municipal Code."

AND

"I move to adopt Ordinance No. 1290."

Alternative:

No alternative at this time; this code and ordinance must be amended to be enforceable.

Fiscal Impact:

None at this time, though there could be some impacts in the future if we start issuing citations for violation of this code and collecting the subsequent fines.

Attachments:

(All supporting documentation, i.e., maps, exhibits, etc., must be attached to this memorandum.)

- Proposed Ordinance No. 1290.

Approved by City Manager: Esther Moberg

ORDINANCE NO. 1290

Introduced by All Commissioners

AN ORDINANCE AMENDING CHAPTER 10.16 "RECREATIONAL VEHICLE PARKING" OF THE WARRENTON MUNICIPAL CODE

WHEREAS, the City last addressed Chapter 10.16 of the City's Municipal Code in 1993; and

WHEREAS, the language of the code needs to be updated to be consistent with current legal standards, current court rulings, and current vehicle law standards; and

WHEREAS, the City needs to be able to address and regulate activity involving recreational vehicles that occurs on our streets, public rights-of-way, and private property to promote health and safety;

NOW, THEREFORE, the City of Warrenton ordains as follows: (Key: **new**, ~~remove~~)

Section 1. Warrenton Municipal Code Chapter 10.16 Recreational Vehicle Parking is hereby amended to read as follows:

10.16.010 Findings

The Warrenton City Commission finds that camping or recreational trailers parked, except during daylight hours, for purposes of lodging or sleeping, in City-owned areas create a hazard to public safety.

10.16.020 Parking restrictions

~~No~~ **Recreational vehicles, campers, or trailers** ~~shall be~~ parked or stored upon **any** property ~~designated as marinas, City parks, or vacant land~~ within the City limits of Warrenton~~, for the purpose of lodging or sleeping therein, except during daylight hours~~ **shall comply with this Chapter as well as Chapter 10.04 and Chapter 12.28 of this code. Recreational vehicles, campers, or trailers will be parked only in designated areas within the marinas and other City-owned property**.

10.16.030 Temporary parking permits

A. **A permit to park a recreational vehicle shall be obtained from the City when the RV is used for camping or living purposes on either public or private property within the City. The City may revoke the permit immediately for failure to comply with any law, ordinance, policy, rule, or regulation, including but not limited to the provisions of this Chapter. Permits can be issued for the following:**

1. **Temporary Camping Program under the guidelines of Chapter 12.28.030;**
2. **Use of RV for Seasonal Businesses under the guidelines of Chapter 12.28.040;**
3. **Individuals involved in a City-Approved event at a City facility;**

4. **Individuals identified as "Park Hosts" for the City at a designated City Park or Marina; or**
5. **Individuals providing temporary site security or monitoring of a property designated as an Open Space and Institutional (OSI) District per Warrenton Municipal Code Chapter 16.52.**

B. Permits are free and are as follows:

1. **3-day (cannot exceed 14 days in any 60-day period);**
2. **7-day (cannot exceed 14 days in any 60-day period);**
3. **Park Host and Site Security (designated term by the City).**

C. Prohibited practices.

1. **Recreational vehicles shall not be used as:**

    a. **Homestay Lodging per Chapter 8.24.010;**
    b. **Vacation Rental Dwelling per Chapter 8.24.010;**
    c. **On-site employee housing such as dormitories, boarding rooms, or sleeping quarters.**

2. **No more than two recreational vehicles are allowed on a single site unless the site complies with Warrenton Municipal Code Chapter 16.176 (Recreational vehicle park design standards).**

3. **There can be no discharge of waste of any sort except into proper sewer or septic systems, and any connection to the City-owned system must be approved by the City prior to any connection.**

10.16.040 Camping facilities
Public camping facilities are available within a short distance of the City-owned property. (Ord. 915-A § 4, 1993)

10.16.050 Penalties
Any person who violates this Chapter ~~will~~ **can** be cited by the Warrenton Police Department and subject to ~~a fine of not more than $300.00.~~ **the following fine amounts.**

A. Failure to have a permit or violating the terms of an issued permit; up to $300/a day.

B. Improper discharge of waste or dumping of waste; up to $1,000/a day to include any additional cost to clean the site.

C. Over two recreational vehicles on a site or not meeting recreational vehicle park requirements; $500/a day.

Each day the violation occurs will be considered a separate offense.

Section 5. This Ordinance shall become effective immediately after its adoption.

First Reading: January 28, 2025

Second Reading: February 11, 2025

ADOPTED by the City Commission of the City of Warrenton, Oregon this 11th day of February 2025.

APPROVED

ATTEST

Henry A. Balensifer III, Mayor

Dawne Shaw, CMC, City Recorder

City Commission Agenda Memo

Meeting Date: February 11, 2025
From: Jessica McDonald, Harbormaster
Subject: Discussion of Annual Moorage Rate

Summary:

Resolution #2645 established a $2 per foot annual moorage rate increase for a three-year period, set to end in 2025. A recent staff review of annual moorage rates at neighboring ports shows that we are beginning to fall behind. Especially as those ports have access to additional federal funding and revenue sources that we do not.

To ensure we can continue essential dock repairs and maintain operations, we ask the commission to consider extending the annual moorage rate increases for the next three years and adjusting the increase to $3 per foot. With most of our slips being 30 feet in length, this would result in an approximate $90 annual increase for the majority of our customers. Implementing minor annual increases is essential to prevent the need for a significant rate hike in the future.

Over the past year, our staff has worked diligently to improve the docks, and maintaining a sustainable budget is critical to continuing these essential repairs and further enhancing the marina.

Fiscal Impact:

Our previous $2 per foot annual increases have not kept pace with inflation over the past three years. Without continued annual adjustments, we risk limiting our ability to operate effectively and complete essential dock repairs.

Attachments:

- Committee Recommendation
- Annual Moorage Rate Comparison for 2025

Approved by City Manager: Esther Moberg

Committee Recommendation:

Marinas Advisory Board January 27, 2025

Recommendation Title: Annual Moorage Rates

The advisory board made a motion to request the City Commission consider extending annual moorage rate increases in the amount of three dollars ($3.00) per foot for the next three years.

Vote Outcome 5/0 in favor

Opposition Statements? No

Recommendation Narrative:

1.In the current resolution #2645, the annual moorage increases by $2 per foot each year and is set to expire.

2. A 2025 rate comparison for annual moorage showed that the City of Warrenton has fallen behind the rates of other ports, which are already federally-subsidized. Historical lyrics, the marina has tried to keep rates at least as high as neighboring ports.

3.It's important to keep these small annual increases each year so we don't continue to fall behind in our rates and can avoid making large increases in the future.

4.A $3 per foot annual increase equates to $90 for the majority of our annual moorage slip holders.

Jennifer Fowler

Attach opposition statements and/ or additional narratives/info.

Consideration of extending annual moorage increases annually

Annual Moorage Rate Comparison

2025 Rates

1.City of Warrenton Marinas

- Commercial Annual Moorage $51 per foot
- Recreational Annual Moorage $48 per foot

2. Port of Astoria

- Commercial Annual Moorage $53 per foot
- Recreational Annual Moorage $49 per foot

3.Port of Newport

- Commercial Annual Moorage $77.27 per foot
- Recreational Annual Moorage $99.68 per foot

4.Port of Ilwaco

- Annual Moorage $37.45-$77.15 per foot +12.84% Tax

5.Skipanon Marina

- Annual Moorage $100 per foot

City Commission Agenda Memo

Meeting Date: February 11, 2025
From: Jessica McDonald, Harbormaster
Subject: Hammond Dredge Permitting

Summary:

The Army Corps of Engineers and the Department of State Lands have revised the dredging permit process and requirements since we last obtained a permit in 2018. As a result, we are no longer eligible to renew or use our existing permit. With regulations becoming stricter each year, staff felt it was critical to begin the process of obtaining new dredge permits for Hammond Marina before further changes make it even more costly and challenging.

Obtaining new dredge permits can take a year or longer, even under ideal conditions. Hammond Marina will likely require dredging in 2026, and staff are working to coordinate this effort with other key projects, such as pile replacement and the potential replacement of the center loading dock on the launch lanes if Oregon State Marina Board grant funding is awarded to us. Aligning these projects will significantly reduce mobilization costs and maximize efficiency.

All capital improvement projects for the Hammond Marina are currently underway and tracking under budget. As a result, funds will be available in this year's budget to complete sediment sampling and initiate the dredge permitting process.

Recommendation/Suggested Motion:

NA

Alternative:

Other action as deemed appropriate by the City Commission
OR
None recommended

Fiscal Impact:

After completing our 2024-2025 capital improvement projects, we have enough remaining funds to proceed with sediment sampling and a contract with Campbell Environmental to begin obtaining dredge permits starting winter 2026. The total cost of sampling and permitting is estimated to cost $39,998 and with contingencies not to exceed $49,368.

Attachments:

- NA

Approved by City Manager: [signature]