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

NMFS Tracking No.:
WCR-2016-4931

August 25, 2016

Daniel M Mathis
Federal Highway Administration
Suite 501, Evergreen Plaza
711 South Capitol Way
Olympia, Washington 98501-1284

Re: Reinitiation of the Endangered Species Act Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the State Route 520 Bridge Replacement Project, King County, Washington (HUC 171100120302, Lake Washington)

Dear Mr. Mathis:

Thank you for your letter of June 6, 2016, requesting reinitiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to Section 7 of the Endangered Species Act of 1973 for the State Route (SR) 520 Bridge Replacement Project in King County, Washington. On May 20, 2011, the NMFS completed formal consultation on this project and issued a biological opinion (opinion) (refer to NMFS Tracking Number: NWR-2010-5723) concluding that the proposed action would not jeopardize the continued existence of the Puget Sound (PS) Chinook salmon (*Oncorhynchus tshawytscha*) Evolutionarily Significant Unit (ESU) and the PS Distinct Population Segment (DPS) of steelhead (*O. mykiss*) and is not likely to destroy or adversely modify PS Chinook critical habitat. This action is funded in part by the Federal Highway Administration (FHWA), and is being carried out by the Washington State Department of Transportation (WSDOT).

The NMFS has completed five previous reinitiations for this project (NMFS Tracking Numbers NWR-2011-5917, NWR-2012-9537, NWR-2013-10358, WCR-2014-1665, and WCR-2015-3817). On June 6, 2016, the FHWA submitted a letter to the NMFS requesting an additional reinitiation of the consultation to address changes to the proposed action that could bear on the amount or extent of anticipated take. The attached opinion analyzes the effects of the proposed changes, concludes that the project changes will not jeopardize the continued existence PS Chinook salmon or PS steelhead and is not likely to destroy or adversely modify PS Chinook salmon critical habitat, and reissues the incidental take statement.

This concludes the NMFS reinitiation of consultation for the proposed changes to the project. If you have questions regarding this consultation, please contact Michael Grady at (206) 526-4645 or by email at Michael.Grady@noaa.gov.

Sincerely,

William W. Stelle, Jr.
Regional Administrator

Reinitiation of Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation

for the

State Route 520 Bridge Replacement Project
King County, Washington (HUC 171100120302, Lake Washington)

NMFS Tracking Number: WCR-2016-4931

Action Agency: Federal Highway Administration

Affected Species and Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species or Critical Habitat?	Is Action Likely To Jeopardize the Species?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Puget Sound steelhead (*Oncorhynchus mykiss*)	Threatened	Yes	No	N/A
Puget Sound Chinook salmon (*O. tshawytscha*)	Threatened	Yes	No	No

Fishery Management Plan That Describes EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	Yes

Consultation Conducted By: National Marine Fisheries Service
West Coast Region

Issued By:

for William W. Stelle, Jr.
Regional Administrator

Date: August 25, 2016

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1. INTRODUCTION

This 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 this biological opinion and incidental take statement 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 C.F.R. 402. The opinion and incidental take statement comply with the Data Quality Act (44 U.S.C. 3504(d)(1) *et seq.*) and underwent pre-dissemination review.

This opinion incorporates by reference, and is intended to be attached to and read in conjunction with, the May 20, 2011 biological opinion for the SR 520 Bridge Replacement Project, NMFS Consultation Number 2010-05723 (original opinion), as supplemented by five previous reinitiations of this consultation: NMFS Consultation Numbers 2011-05917, NWR-2012-09537, NWR-2013-10358, WCR-2014-1665, and WCR-2015-3817. Consultation number WCR-2014-1665, completed on May 7, 2015, superseded the original opinion and the three subsequent reinitiation opinions, which are no longer in effect. However, NMFS has determined that portions of the text from the original opinion remain valid and are incorporated by reference here rather than reproduced.

1.2 Consultation History

On May 20, 2011, we completed formal consultation on this project and issued the original opinion, which concluded that the proposed action would not jeopardize the continued existence of the Puget Sound (PS) Chinook salmon (*Oncorhynchus tshawytscha*) Evolutionarily Significant Unit (ESU) or the PS Distinct Population Segment (DPS) of steelhead (*O. mykiss*), and is not likely to destroy or adversely modify PS Chinook critical habitat. The proposed action is funded in part by the Federal Highway Administration (FHWA), and is being carried out by the Washington State Department of Transportation (WSDOT).

We have completed five previous reinitiations for this project:

- East approach and the floating bridge and landings (FB&L) portions of the project (2011-05917):
- West connection bridge (WCB) and the west staging area (NWR 2012-9537),
- West approach bridge north (WABN) phase (NWR 2013-10358).
- A fourth reinitiation (WCR-2014-1665) that superseded the original opinion and three subsequent reinitiation opinions.
- A fifth reinitiation to address additional changes to the WABN phase (WCR-2015-3817)

On June 9, 2016, the FHWA requested an additional reinitiation of the consultation to update the design of the West Approach Montlake Lid (WAML) phase of the project, including construction sequence changes and changes in stormwater management. This opinion analyzes

the effects of these changes. A complete record of this consultation is on file at the Oregon/Washington Coastal Office in Lacey, Washington.

1.3 Proposed Action and Changes to the Proposed Action

The Proposed Action sections of the original opinion and reinitiation opinions are incorporated by reference here, except to the extent that they are inconsistent with the changes described below, in which case the description of the changes prevail.

1.3.1 WAML Design Changes

The FHWA is proposing design and construction schedule changes to the West Approach and Montlake Lid phase of the SR520 project. During this phase, WSDOT will construct the West Approach Bridge South (WABS), which is the eastbound bridge lanes; the Montlake Lid; and eastbound and westbound HOV lanes extending from the Montlake Lid to bridge (Figure 1). The WABS alignment has been shifted to the north compared to the original design, and the bridge abutment has been moved 50 feet to the west. The Montlake Lid has been shortened from 1,400 to 800 feet and a 70-foot wide land bridge for a regional shared use path has been added east of the lid near the west approach bridge abutments. Stormwater facilities have been expanded to accommodate new PGIS exposed by shortening the Montlake Lid.

The WAML phase includes construction of a westbound HOV direct access ramp to the Montlake Lid and an eastbound HOV direct access ramp from the Montlake Lid. The access ramps were originally designed to be separate structures from WABN and WABS. The shortened lid configuration has eliminated the need for the access ramps to meet a tall lid portal, allowing the ramps to be more integrated with WABN and WABS and reducing the bridge footprint. The design revision reduces overwater cover by approximately 0.8 acre, and reduces the number of drilled shafts and columns needed to support the WABS (Table 1).

The WABS will require construction of work bridges adjacent to the existing bridge. The work bridges will allow construction and demolition in shallower waters that will not support barges. Isolated work platforms are proposed to support drilled shaft and column construction.

Table 1. Changes to the West Approach Bridge South Design

Project Element	BA Design	Current Design
Schedule	2013 – 2017	2018 - 2022
Work bridge piles	1,100	1,021
Work bridge area	7.2 acres	7.3 acres
Drilled shaft (no.)	111 (98 in water)	87 (78 in water)
Drilled shaft (area)	79 sq. ft. ea.	79 to 113 sq. ft. ea.
Bridge deck area	7.8 acres	7.0 acres

Figure 1. Proposed Design of the West Approach/Montlake Lid

1.3.2 Construction Sequence

Construction activities for this phase of the project were originally scheduled for 2013-2017, and take associated with various activities was calculated for each year. Construction activities are now scheduled to occur between 2018 and 2022. No construction on the WAML phase is anticipated prior to 2017, when the WABN phase is completed. Traffic will then be shifted from the existing west approach span onto the new structure, allowing the existing bridge to be demolished and WABS to be constructed in its place.

Construction Year 1 – 2018
Beginning in the fall of 2018, work bridges and finger piers will be constructed along the existing Union Bay Bridge and Lake Washington Blvd eastbound on-ramp during the approved in-water work windows. Pile-driving activities are expected to continue into 2019. Work bridges will be in place for all five years to facilitate construction and demolition activities. Once the work bridges are complete, the existing west approach span will be demolished. The existing bridge substructure will be removed first, followed by the remaining columns. Columns will be cut below the mudline with an underwater wire saw or hydraulic concrete shear.

Construction Years 2 - 4 – 2019 - 2021
In-water drilled shaft casings will be installed in early 2019 following bridge demolition. Cast-in- place columns will be constructed on top of the drilled shafts, and the bridge superstructure will then be placed on top of the columns. These over-water work activities are anticipated to take place during the spring of 2021.

Construction Year 5 – 2022
Removal of the work bridges and the in-water piles will begin in October of 2021 and continue into the early part of 2022. The HOV direct access ramps to and from the Montlake Lid will be completed during this time, in addition to lighting, signage, fire protection and barriers. The final stage of construction will consist of site cleanup and demobilization. The WABS is scheduled to be open to eastbound traffic in November 2021.

1.3.3 Stormwater Management

Shortening the Montlake Lid creates 3.1 acres of additional PGIS by exposing more roadway surface to stormwater runoff. The stormwater facility M (referred to as WR-PR in the original BA) has been expanded to accommodate the additional stormwater runoff. Facility M now consists of two separate facilities, one on the north side of SR520 (M-North) and one on the south (M South) (Figure 2). A portion of TDA 12 that was previously identified as discharging to the city of Seattle's combined sewer system (CSS) will now be routed to the proposed Seattle S5-North treatment facility. This change results in an additional 2.45 acres discharging to Lake Washington after receiving basic water quality treatment.

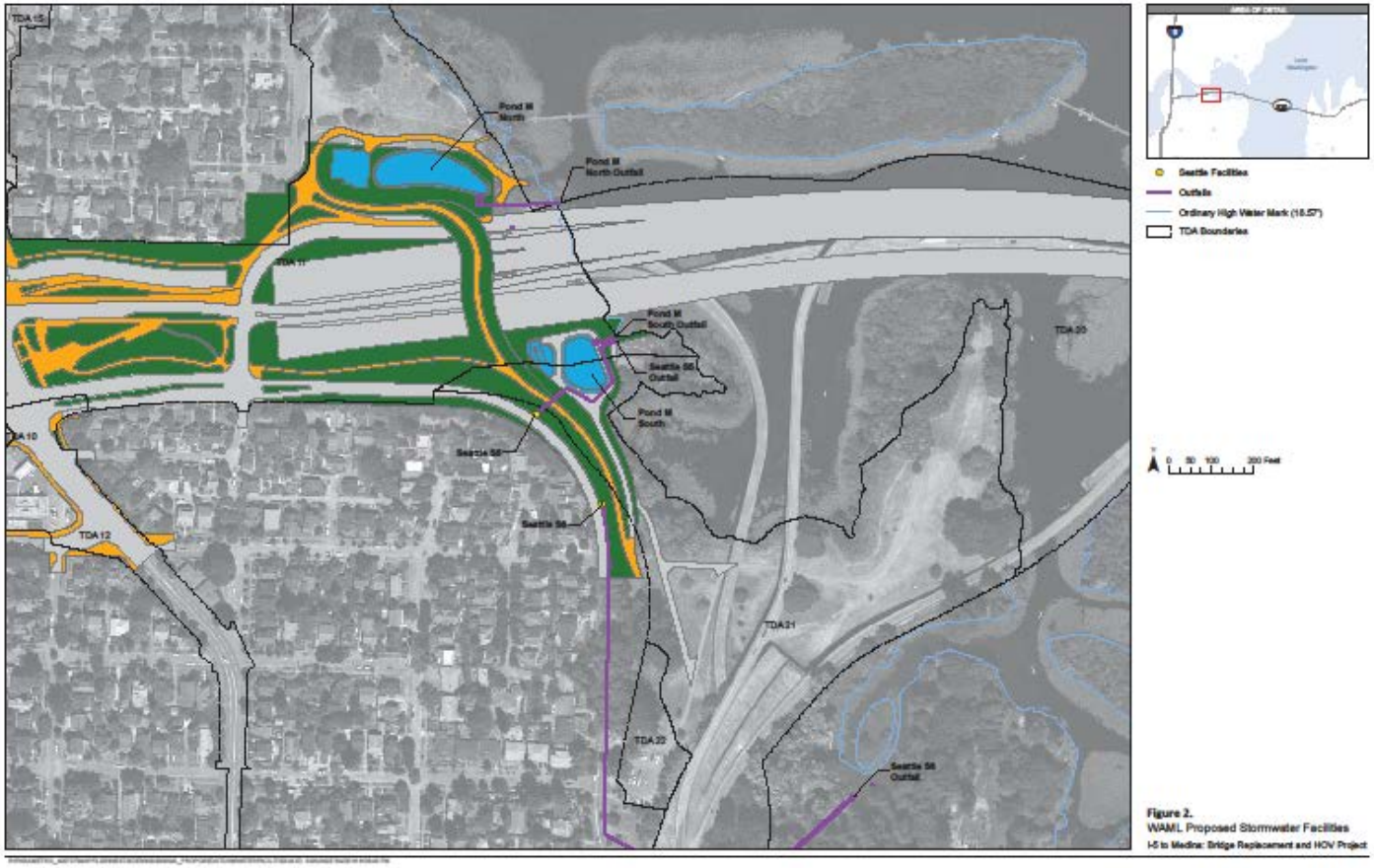

Figure 2. WAML Proposed Stormwater Facilities

The WAML project will affect outfalls identified as SEA-M2, WS-PR (SEA-M3), WS-E, and RWB-F in the original BA (Figure 3). The changes to these facilities are as follows:

- WS-PR from the BA Design (which coincides with the existing SEA-M3 location) is a proposed outfall that is now known as WSDOT M-North and will be constructed as part of the WABN phase. The outfall will be approximately 30 feet landward of the Ordinary High Water Mark (OHWM) and discharge to a rounded-rock-lined ditch extending down to the low water elevation. The stormwater treatment facility discharging at this location is slightly smaller, and now provides enhanced treatment for 18.63 acres of PGIS (down from 21.31 acres identified in the initial consultation), in part because some stormwater cannot be routed there due to design changes affecting the Montlake Lid.
- WS-E is an existing stormwater outfall that will be abandoned. The portion of the pipe extending below the OHWM will be removed and the remainder plugged landward of the OHWM. Disturbance to the shoreline or lakebed will be restored to match surrounding grades. Two new outfalls not previously described will be built in the immediate vicinity of this outfall, WSDOT M-South and City S5-North (Figure 2).
- WSDOT M-South will discharge water from an enhanced water quality treatment pond south of the Montlake Lid. A total of 3.66 acres of PGIS will be treated at this outfall, which will discharge through a 2-foot diameter pipe onto a riprap pad approximately 0.95 feet above the OHWM.
- City S5-North will discharge immediately south of WSDOT M-South. The design of this outfall is identical to WSDOT M-South. Runoff from a total of 2.45 acres of PGIS from city streets that was previously proposed to go the city of Seattle CSS will now be directed to this outfall. Runoff receive basic treatment using a media filtration system prior to discharge.
- RWB-F is an existing outfall for city streets that is now known as City S5-South. This outfall currently discharges water from approximately 0.61 acres of PGIS. The WAML project will reduce this area to 0.21 acres of PGIS treated to a basic stormwater standard using a media filtration system prior to discharge.
- Stormwater from roughly 0.06 acres of PGIS will discharge into the City of Seattle CSS. Discharges to the CSS are discussed in Section 6.3.4 and Appendix J of the Project BA.

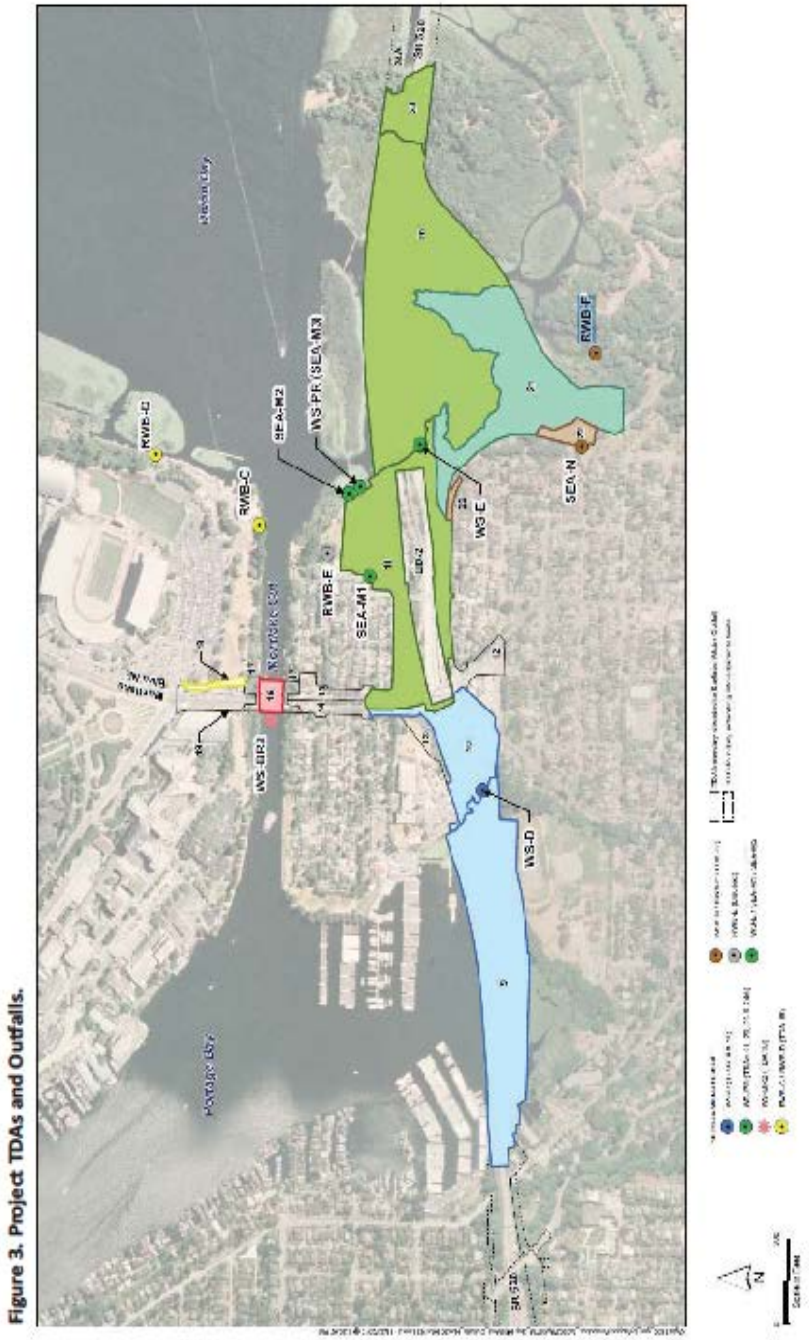

Figure 3. Project TDAs and Outfalls.

Changes to outfalls and PGIS are summarized in Table 2.

Table 2. Existing and Proposed Conditions of TDAs Discharging to Surface Water Outfalls

Original Design				Proposed Design			
Previous Discharge Point	**Receiving Waterbody**	**Existing PGIS (acres)**	**Proposed PGIS (acres)**	**Proposed Discharge Point**	**Receiving Waterbody**	**Existing PGIS (acres)**	**Proposed PGIS (acres)**
WS-E	Union Bay	1.28	0.13	City S5-North	Union Bay	1.28	2.45
WS-PR and WS-E	Union Bay	19.67	21.31	WSDOT M-North	Union Bay	19.67	18.63
				WSDOT M-South			3.66
RWB-F	Union Bay	0.61	0.40	City S5-South	Union Bay	0.61	0.21
SEA-G CSO (TDA 12)	Puget Sound	0	0.06	Combined Sewer Basin	Puget Sound	0 [2]	0.06
Total		**21.56**	**21.90**	**Total**		**21.56**	**25.00**

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 sections of the original opinion and reinitiation opinions are incorporated by reference here. The proposed changes described in this opinion do not affect the extent of the action area defined in the original opinion and subsequent reinitiation opinions.

2. ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

2.1 Approach to the Analysis

The Approach to the Analysis section of the original opinion is incorporated by reference here.

2.2 Range-wide Status of the Species and Critical Habitat

The range-wide status of the species and critical habitat section of the original opinion and updates in the subsequent reinitiations are incorporated by reference here.

2.3 Environmental Baseline

The Environmental Baseline section of the original opinion and subsequent reinitiation opinions is incorporated by reference here.

2.4 Changes to the Effects of the Proposed Action

The Effects of the Action sections of the original opinion and reinitiation opinions are incorporated by reference here, except to the extent that they are inconsistent with the changes described below, in which case the description of the changes prevail.

2.4.1 Effects on Species

Suspended Sediment
Turbidity will be caused by pile- driving for work bridges and trestles, column demolition, installation of drilled shafts, and pile removal. The original opinion quantified the area that would be subjected to elevated suspended sediment from the proposed action and allocated take by construction year. Due largely to project schedule revisions, under the current design episodic localized turbidity plumes will increase in the west approach between 2016 and 2019, as well as in 2022, compared to the original BA (Table 3). The anticipated extent of turbidity is shown in Figure 4.

Figure 4. Spatial Extent of Turbidity for WAML Demolition and Construction Activities

The West Approach east of Foster Island is the primary migration corridor for anadromous fish from the Cedar River. Juvenile Chinook salmon also rear in this area. The south Union Bay area east of Foster Island has shallow, narrow waterways with dense aquatic vegetation that likely supports high populations of largemouth and smallmouth bass. PS Chinook and PS steelhead are unlikely to be found in this habitat; however, given the proximity of this area to the only migratory corridor into and out of Lake Washington, the NMFS cannot discount the possibility of adults and juveniles of both species moving through this area. Juvenile Chinook salmon in particular are likely to be present in small numbers in May and June during the peak of their out-migration. The in-water work window closes on April 15 in the West Approach, and April 30 in Union Bay, further minimizing the risk of exposure.

Table 3. Changes in Acreage Exposed to Suspended Sediment per Construction Year in the West Approach Area.

Design	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Union Bay										
Original Design	19.5	17.3	25.6	0	19.5	22.4	0	0	0	0
Current Design	0	19.1	24.3	24.9	20.3	22.5	20.1	0	0	22.5
Net Difference	**-19.5**	**+1.8**	**-1.3**	**+24.9**	**+0.8**	**+0.1**	**+20.1**	**0**	**0**	**+22.5**
West Approach										
Original Design	25.8	31.6	39.7	0	25.8	23.2	0	0	0	0
Current Design	9.3	2.5	29.7	10.5	31.6	43.8	29.4	0	0	31.5
Net difference	**-16.5**	**-29.1**	**-10.0**	**+10.5**	**+5.8**	**+20.6**	**+29.4**	**0**	**0**	**+31.5**

The effects of turbidity will be episodic during construction. Adults and larger juveniles would be expected to avoid localized turbidity plumes. Adults and larger fish can tolerate short-term increases in suspended sediment and are not likely to be harmed by brief exposure (Bjornn and Reiser 1991). Smaller juveniles may experience sublethal effects such as displacement and physiological stress (see page 37 from the original opinion). Because this area contains physical and biological features (PBFs)[1] #2 and #3 (freshwater rearing and migration) of PS Chinook salmon critical habitat, temporary increases of suspended sediment also increase the magnitude of the temporary effects to these PBFs.

Impact Pile- Driving

Underwater noise will be generated during installation of steel piles to support work bridges. Work in this area was anticipated to end in 2016, but due to delays will extend seasonally into 2017 and 2018. As many as 1,021 piles will be driven in water, slightly less than the 1,100 piles estimated in the original BA (Table 1). Sound levels of 183 dB_{SEL} could extend as far as 117

[1] Physical and biological features were previously known primary constituent elements (PBFs). The terminology was changed in a final rule that became effective on March 14, 2016, but the components of critical habitat remain the same.

meters from the source, and sound levels of 150 dBRMS could extend as far as 631 meters from the source (Table 4; Figure 5).

Table 4. Total Area (Acres) Exposed to Cumulative Sound Exposure Levels Greater than 183dB per Construction Year.

Area	**Noise Level**	**Peak Values per Construction Year**					
		2013	**2014**	**2015**	**2016**	**2017**	**2018**
Union Bay	183/187 dB_{SEL}	0	28.0	0	29.0	29.0	32.1
	150 dB_{RMS}	0	122.1	0	128.1	128.1	72.0
West Approach	183/187 dB_{SEL}	13.4	52.8	0	43.0	0	71.0
	150 dB_{RMS}	356.6	271.0	0	364.6	0	292.2

Figure 5. Pile Driving Noise Limits for WABS Work Trestle and Platforms

Adult and juvenile Chinook salmon could be in the ensonified area during construction and exposed to injurious levels of underwater sound. Juvenile Chinook could be injured and perhaps killed, whereas adult Chinook would more likely experience sublethal effects such as temporary threshold shifts. Due to low numbers of steelhead in Lake Washington, steelhead are unlikely to occur in the ensonified area during construction and any steelhead nearby would likely avoid the affected area.

Because this area contains PBFs 2 and 3 (freshwater rearing and migration) of PS Chinook salmon critical habitat, increases in underwater sound levels would cause temporary effects to these PBFs.

Overwater and In-Water Structures
Design modifications slightly increase the amount overwater cover between 2019 and 2022 compared to the original BA, but the total area of overwater cover will decrease by 1.7 acres overall (Table 5). The primary effect of shading is delays to migration of juvenile salmonids; a reduction in the area of overwater structure will reduce the effects of shading on juvenile Chinook migration from those considered in the original opinion and reduce effects of shading on PBF 3 of Chinook critical habitat.

The number of vertical structures (in-water columns and piles) has also changed since the original consultation, decreasing in some years and increasing in others. Overall, design changes result in 29 fewer in-water structures in Union Bay and 27 fewer in the West Approach than what was described in the original BA (Table 6).

On page 48 (section 2.4.1.4) of the May 20, 2011 opinion, the NMFS established that juvenile Chinook salmon within five feet of in-water piles or columns could be subjected to higher rates of predation by smallmouth bass. The revised WABS design will create a minor increase in smallmouth bass habitat in Union Bay that could result in slightly higher predation rates on juvenile salmonids (Table 7). This increase is due to larger drilled shaft column diameters proposed under the new design.

Table 5. Changes in Overwater Cover (Acres) per Construction Year

Union Bay	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**Final**
Original Design	9.2	12.3	16.6	16.0	12.7	12.7	8.4	8.4	8.4	8.4	**8.4**
Current Design	5.9	7.6	7.6	13.4	12.2	12.0	11.2	11.2	11.2	11.2	**7.7**
Net change	**-3.3**	**-4.7**	**-9.0**	**-2.6**	**-0.5**	**-0.8**	**2.8**	**2.8**	**2.8**	**2.8**	**-0.7**
West Approach											
Original Design	8.3	15.8	19.1	17.4	13.9	13.9	10.6	10.6	10.6	10.6	10.6
Current Design	4.8	6.2	14.8	14.8	12.9	13.7	10.8	13.3	13.3	13.3	9.6
Net Change	**-3.5**	**-9.6**	**-4.3**	**-2.6**	**-1.0**	**-0.2**	**+0.2**	**+2.7**	**+2.7**	**+2.7**	**-1.0**

Table 6. Changes in the Number of Vertical Structures per Construction Year

Union Bay	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**Final**
Original Design	**746**	**649**	**1293**	**704**	**704**	**704**	**104**	**104**	**104**	**104**	**104**
Current Design	**193**	**448**	**448**	**721**	**632**	**628**	**581**	**581**	**581**	**581**	**75**
Net change	**-553**	**-201**	**-845**	**+17**	**-72**	**-76**	**+477**	**+477**	**+477**	**+477**	**-29**
West Approach											
Original Design	702	774	1316	1227	629	629	129	129	129	129	129
Current Design	279	278	714	716	660	810	665	665	665	665	102
Net Change	**-423**	**-496**	**-602**	**-511**	**+31**	**+181**	**+536**	**+536**	**+536**	**+536**	**-27**

Table 7. Changes in Area of Predator Habitat (Acres) by Construction Year

Union Bay	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**Final**
Original Design	2.16	1.97	3.81	2.01	2.01	2.01	0.27	0.27	0.27	0.27	0.27
Current Design	0.71	1.28	1.28	1.97	1.65	1.64	1.55	1.55	1.55	1.55	0.43
Net change	**-1.45**	**-0.69**	**-2.53**	**-0.04**	**-0.36**	**-0.37**	**+1.28**	**+1.28**	**+1.28**	**+1.28**	**+0.16**
West Approach											
Original Design	2.21	2.56	4.28	3.97	2.07	2.07	0.62	0.62	0.62	0.62	0.62
Current Design	1.02	1.10	2.22	2.23	2.01	2.31	1.80	1.80	1.80	1.80	0.59
Net Change	**-1.19**	**-1.46**	**-2.06**	**-1.74**	**-0.06**	**+0.24**	**+1.18**	**+1.18**	**+1.18**	**+1.18**	**-0.03**

Stormwater Management

The WAML phase of the project will discharge runoff from PGIS to five outfalls. Stormwater pollutant loads and concentrations for pollutants of concern (TSS, total copper, dissolved copper, total zinc, and dissolved zinc) were assessed using the HI-RUN model (WSDOT 2009). Results indicate that loading of TSS and total metals will decrease at every outfall. There is no difference in modeled dissolved zinc concentrations at outfalls WS M-North and WS-M South, and only a slight increase at City S5-North. Dissolved zinc loading decreases at the City-S5-South outfall. Dissolved copper increases at every outfall except the City S-5-South and CSS (Table 8).

Dilution zones were calculated for the three outfalls that had a P(exceed) value above 0.45: WS M-North, WS M-South, and City-S5-North. Dilution zones for dissolved copper range from four to seven feet, and from 20-33 feet for dissolved zinc (Table 9). Chinook and steelhead could be exposed to elevated levels of stormwater pollutants within these dilution zones. Because they are shoreline oriented and spend a greater amount of time in the action area, juvenile PS Chinook salmon will have the greatest exposure to stormwater discharges and will likely experience increased physiological stress, reduced feeding, impaired ability to detect predators, and behavior alterations. However, discharge locations are in south Union Bay west of Foster Island in habitat

that is not preferred by Chinook and steelhead. Also, the highest numbers of juvenile Chinook will occur in May and June during the peak of their outmigration, whereas most stormwater discharges will occur in the fall and winter. Because this area contains PBFs 2 and 3 of PS Chinook salmon critical habitat, increases of stormwater pollutants will also affects these PBFs.

Table 8. Modeling Results of Hi-Run Receiving Water End of Pipe Loading for Project Outfalls.

Threshold Discharge Area	Existing/Proposed	TSS	Total Copper	Dissolved Copper	Total Zinc	Dissolved Zinc
WS M-North	Existing	4755	1.21	0.28	7.38	2.1
	Proposed	776	0.67	0.41	3.2	2.1
Net Difference		**-3979**	**-0.54**	**0.13**	**-4.18**	**0**
WS M-South	Existing	956	0.24	0.06	1.48	0.42
	Proposed	152	0.13	0.08	0.63	0.42
Net Difference		**-804**	**-0.11**	**0.02**	**-0.85**	**0**
City-S5-North	Existing	579	0.15	0.03	0.9	0.26
	Proposed	102	0.09	0.05	0.42	0.28
Net Difference		**-477**	**-0.06**	**0.02**	**-0.48**	**0.02**
City-S5-South	Existing	277	0.07	0.02	0.43	0.12
	Proposed	8.8	0.01	0.01	0.04	0.02
Net Difference		**-268.2**	**-0.06**	**-0.01**	**-0.39**	**-0.1**
Combined Sewer System	Existing	215	0.19	0.13	0.93	0.64
	Proposed	226	0.2	0.13	0.98	0.67
Net Difference		**11**	**0.01**	**0**	**0.05**	**0.03**

Table 9. Summary of Stormwater Dilution Modeling Results for Project Outfalls

Outfall	PGIS (Acres)	Receiving Water Body	Dilution Distance	
			Dissolved Copper (feet)	Dissolved Zinc (feet)
WSDOT M-North	18.63	Lake Washington (Union Bay)	6	33
WSDOT M-South	3.66	Lake Washington (Union Bay)	7	29
City-S5-South	2.45	Lake Washington (Union Bay)	4	20

2.4.2 Changes to the Effects on Critical Habitat

Freshwater Spawning Sites (PBF 1)
The only spawning habitat in the action area of the project is at the Cedar River habitat restoration site (RM 5.3). The project changes described in this opinion will not affect this PBF in any way.

Freshwater Rearing Sites and Freshwater Migration Corridors (PBF 2 and PBF 3)
Project changes will cause additional effects to rearing and migration habitat compared to the original opinion. Turbidity and noise will extend longer than anticipated, and the presence of work bridges will cause a temporary increase in overwater cover – all temporary, short-term impacts. In-water structures will cause a permanent minor increase in potential predator habitat, and increased pollutant loading will reduce water quality during stormwater discharges. However, these impacts are minor and will not reduce the conservation function of these two PBFs in the action area.

2.5 Cumulative Effects

The Cumulative Effects section of the original opinion is incorporated by reference here.

2.6 Revised Integration and Synthesis

2.6.1 Puget Sound Chinook Salmon ESU

Changes in the project design will generate turbidity and elevated underwater sound levels, and overwater cover longer than originally anticipated. Minor increases in predator habitat and pollutant loading will reduce habitat quality. However, impacts will occur in an area with little fish use. The most likely species/life stage affected are juvenile Chinook. Adult Chinook and are not likely to be exposed to effect of project changes described here. These changes to the levels of effects and small changes in habitat impacts will not have an observable effect on the spatial structure, productivity, long-term abundance, or diversity of the Lake Washington populations or the PS ESU as a whole.

2.6.2 Puget Sound Steelhead DPS

Lake Washington Basin steelhead are virtually extirpated (see section 2.6.2 from the original opinion). The changes in the levels of the sublethal impacts to small numbers of individuals described above will not affect the abundance, productivity, spatial structure, or diversity of the Lake Washington Basin steelhead population or the PS DPS as a whole because the low chance of exposure from the proposed stressors to any one individual.

2.6.3 Puget Sound Chinook Salmon Critical Habitat

The proposed design changes will cause minor increases to the effects of the proposed action on critical habitat but will also decrease some permanent effects compared to the original opinion, such as the area of overwater cover and the number of piles driven. These small changes do not

alter NMFS' determination from the original opinion that critical habitat will remain functional and retain the current ability for PBFs to serve the intended conservation role for the species. Therefore, the proposed action will not significantly reduce the conservation value of critical habitat at the ESU scale.

2.7 Conclusion

Project design changes slightly increase the likelihood of injury to PS Chinook salmon and PS steelhead by exposing them to stressors for an additional amount of time. The area of habitat exposed to elevated levels of pollutants in stormwater will also increase. Although the changes to the proposed design increase impacts from those evaluated in the original opinion, they do not alter NMFS' opinion that the proposed action is not likely to jeopardize the continued existence of PS Chinook salmon or PS steelhead or destroy or adversely modify PS Chinook salmon designated critical habitat.

2.8 Changes to the Incidental Take Statement

2.8.1 Amount or Extent of Take

Section 2.8.1 of the May 7, 2015 opinion describes the amount and extent of take exempted for the proposed action. The following are changes based on the project design updates described above:

- Take from elevated suspended sediment, measured as five or more NTUs over background turbidity levels, is exempted for areas shown in Table 3.
- Take from elevated sound levels generated during construction (cumulative SEL greater than 187dB) is exempted for the areas shown in Table 4.
- Take from increased shading from over-water structures is exempted for the areas shown in Table 5.
- Take from increased predatory fish habitat from over-water structures is exempted for the areas shown in Table 7.
- Take from stormwater discharges (dissolved zinc 5.6 mg/l over background concentrations and dissolved copper at 2.0 mg/l over background concentrations) is exempted for the areas shown in Table 9.

2.8.2 Effect of the Take

The effect of the take on PS Chinook salmon and PS steelhead is described in the May 20, 2011 opinion.

2.8.3 Changes to Terms and Conditions

The proposed revisions do not represent new mechanisms of effect not previously considered during previous consultations. The scale of impacts to listed species resulting from changes in the project design are consistent with previous analyses. The NMFS is therefore not revising the existing terms and conditions.

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 Conservation Recommendations Effects section of the original opinion is incorporated by reference here.

2.10 Reinitiation of Consultation

This concludes formal consultation for the State Route 520 Bridge Replacement Project. As stated in 50 CFR 402.16, reinitiation of formal consultation is required 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 incidental take statement 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 agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this 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 CONSULTATION

Section 3 of the original opinion is incorporated by reference here, with the following changes:

- The amount of EFH that will be adversely affected by elevated suspended for the action area is detailed in Table 2.
- The amount of EFH that will be adversely affected by shading from over-water structures is shown in Table 4.
- The amount of EFH that will be adversely affected by increased predator habitat is listed in Table 6.
- The amount of EFH that will be adversely affected by increased pollutant loading is shown in Table 7.

The NMFS does not propose any additional EFH Conservation Recommendations.

4. LITERATURE CITED

Bjornn, T.C. and D.W. Reiser. 1991. Habitat requirements of salmonids in streams. American Fisheries Society Special Publication 19: 83-138.