Wapato Creek Fish Passage Restoration: The Final 300 Feet

Project Narrative

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The Port of Tacoma and Northwest Seaport Alliance have set up a website for this application:

https://www.nwseaportalliance.com/2022-aop-culvert-grant

Wapato Creek Fish Passage Restoration: The Final 300 Feet

I. Project Description

The Port of Tacoma and Northwest Seaport Alliance are seeking support for design and permitting a solution to a failing culvert that limits aquatic connectivity and threatens operations of a busy international container terminal. The culvert replacement at the heart of this application is part of the most complicated 300-foot corridor within the greater Port of Tacoma area and presents multiple technical challenges. Planning, design, and permitting will have to consider a variety of conditions and stakeholder needs.

The Wapato Creek Culvert (WCC) conveys creek and tidal waters beneath Pierce County Terminal (PCT) to an outlet on the Blair Waterway of Puget Sound's Commencement Bay. Fish passage through the WCC is possible only during high tides, which restricts anadromous salmonids' access to upstream habitat. Chum and Coho salmon have been confirmed in Wapato Creek, and according to the Washington Department of Fish and Wildlife (WDFW), other potential fish species in Wapato Creek include Pink and Chinook salmon, Steelhead, Coastal Searun Cutthroat, and resident trout. Upstream, the Puyallup Tribe of Indians (PTOI) seed the creek with spawner Chinooks. The WDFW classifies the WCC as a fish barrier with an "unknown" percent passable. The "dogleg" shape of the culvert significantly restricts light in the system, which further impedes fish migration.

The Lower Wapato Creek Habitat site (LWCH) is located .48 miles upstream from the WCC. The LWCH was constructed by the Port of Tacoma in partnership with the PTOI and re-establishes stream and wetland habitat on approximately 20 acres of tidally influenced estuary and fish bearing stream. This type of habitat is limited within Commencement Bay and is a high priority for restoration as the PTOI is working to reintroduce ESA-listed salmonids into the Wapato Creek system.

Four fish passages are located upstream between the WCC and the LWCH. Three of the four fish passages were undersized culverts, and one is a free-span bridge on the northbound lanes of State Route 509. The Port worked with the PTOI, city governments, and other permitting agencies to replace two of the undersized culverts with free-span bridges. The remaining undersized culvert is being addressed by the Washington State Department of Transportation as part of their State Route 167 Completion Project. The WCC is the final barrier to improve fish passage and hydrologic connectivity between Puget Sound and the Wapato Creek estuary.

Increasing fish passage at the WCC is logistically challenging because the culvert is situated beneath an active port freight road and rail corridor. Underground utilities in the area include a gas line and water main. Utilities overhead include high voltage (115kV) electrical and

communication transmission lines. A 2022 structural analysis indicated that the culvert is at the end of its service life and must be repaired, replaced, or upgraded to maintain safe operations and avoid disruptions to terminal operations. Since 2020, the Port has incurred $472,557 in assessing and repairing the WCC. Addressing the Wapato Creek culvert and outfall at the Pierce County Terminal will improve aquatic connectivity for an important Puget Sound habitat, expanding on recent restoration work on Lower Wapato Creek; reduce the risk of localized flooding; and protect safe and resilient terminal operations.

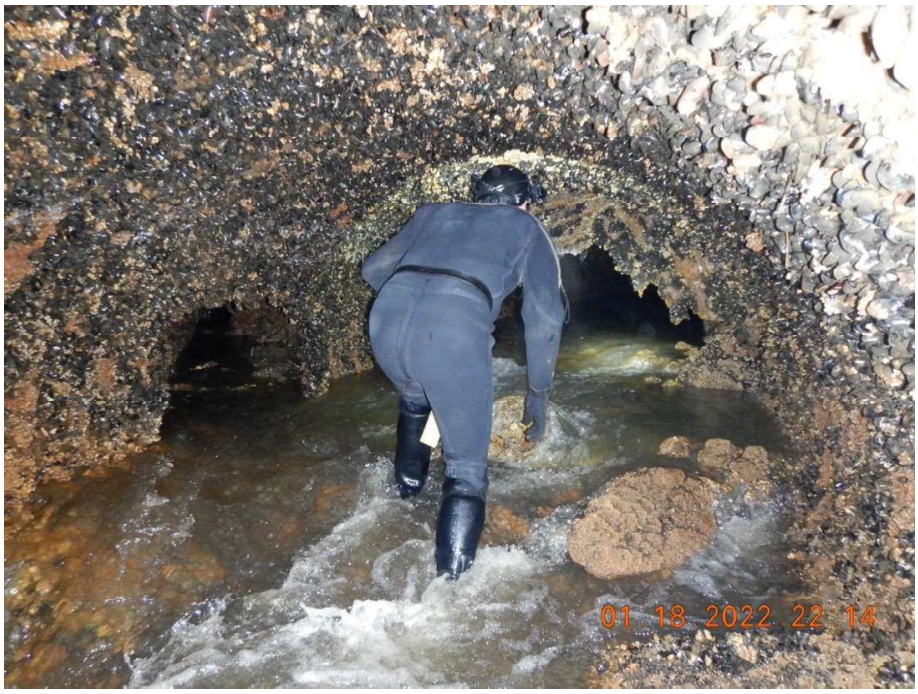


Figure 1: Current condition of WCC



Figure 2: An example of work successfully completed upstream of the WCC

Location:
The project is located at 47.253676°N latitude and -122.372935° W longitude in the Puyallup-White watershed, Water Resource Inventory Area 10. The WCC is situated in the southeast end of the Blair Waterway beneath East Alexander Avenue.

a) The project is not located within the bounds of a 2020 census-designated Urbanized area.

b) The Project is not located in one of four ferally designated community development zones.

Parties:
This application to the National Culvert Removal, Replacement, and Restoration Grant program is made jointly by the Port of Tacoma and the Northwest Seaport Alliance (NWSA). The NWSA is a port development authority and marine cargo operating partnership between the Port of Seattle and the Port of Tacoma. The NWSA is governed by the two home ports as equal members, with each port acting through its elected commissioners, who establish policy for their port and for the NWSA. The ports remain separate organizations that retain ownership of their respective assets. Past work analyzing and assessing the WCC was funded by the Port of Tacoma as the property owner. The nearby terminal that will be affected by future work on the culvert is licensed and operated by the NWSA. The NWSA has direct experience with DOT PIDP, BUILD and TIGER grants and has overseen the construction of more than $500 million in NWSA improvements since 2015. Port of Tacoma staff will manage the work associated with the proposed project.

The Project team has experience working with a range of federal agencies, including the U.S. Department of Transportation, Maritime Administration, U.S. Army Corps of Engineers, U.S. Coast Guard, Federal Emergency Management Administration, and the Federal Aviation Administration. Partnerships with these and other federal agencies have resulted in direct funding of critical infrastructure projects, knowledge sharing and development of best practices, regional readiness planning for disasters, early compliance with forthcoming rules and regulations, and preparing for future economic and community growth.

II. Grant Funds, Sources and Uses of all Project Funding

Federal Funds:
For this design and permitting project, the only Federal funds requested are the $2,000,000 requested of the Federal Highway Administration through this application. The local match will be in the form of the Northwest Seaport Alliance's Capital Improvement Program budget.

Detailed Budget:
Total project costs for design and permitting the solution to the WCC outfall are estimated to be $2,662,000, broken down as follows:

Culvert AOP Program Federal funds requested: $2,000,000
Non-Federal/Matching: $662,000 (Port of Tacoma and/or NWSA capital funds)

No additional Federal funds are requested as part of this application.

The basis for the cost estimate and schedule presented in this application is a recently completed project upstream of the WCC. In 2020 and 2021, the Port of Tacoma removed another failing culvert in the same creek 1,000 feet upstream from the WCC. The primary construction activities for this project included:

- Construction of a new precast voided slab girder bridge with a 65-foot-long span
- Dewatering/bypass of Wapato Creek for in-water work
- Demolition and removal of 100 feet of deteriorated culvert, including embankments
- Channel and embankment restoration within the project footprint

The installed bridge, inclusive of all peripheral work, cost the Port of Tacoma $75,000 per foot of bridged creek alignment. For the proposed project, given the operational, transportation, and utility complexity of the area, a contingency of 100% has been applied, resulting in an estimated cost of $150,000 per foot of bridged creek alignment. Within the terminal approximately 215 feet of creek alignment would be spanned. The working estimate for spanning the creek with a bridge structure within the terminal is $30 to $35 million.

Design Category (Consulting and Port Staff Labor)	30% PS&E	60% PS&E	90% PS&E and Final	Total
Project Management •Team coordination, meetings, communications, invoicing, grant assistance	$93,000	$60,000	$78,000	$240,000
Stake Holder Engagement and Management •Port team, consultant team, Terminal Operator, City of Tacoma, Puyallup Tribe of Indians, Tacoma Public Utilities, Tacoma Rail, Puget Sound Energy, ILWU	$27,000	$34,000	$31,000	$100,000
Structural •Foundation, span, retaining, seismic, load rating	$193,000	$268,000	$155,000	$620,000
Geotechnical •Testing, reporting, foundation design, excavation design	$155,000	$56,000	$16,000	$230,000
Hydraulic/Hydrologic •Data collection, analysis, modeling, flood evaluation, channel design	$129,000	$45,000	$16,000	$190,000
Civil Engineering •Survey, utilities, paving, rail, traffic, drainage, grading	$116,000	$101,000	$139,000	$360,000
Construction Engineering •Phasing, constructability analysis, scheduling, cost estimating, work zoning	$69,000	$30,000	$72,000	$180,000
Environmental and Regulatory •Project management, agency coordination, meetings, communications, permit applications •Stakeholder engagement and management: Puyallup Tribe of Indians, Washington Department of Fish and Wildlife, USACE, NMFS,	$ 250,000	$ 125,000	$ 125,000	$ 500,000
			Subtotal	$2,420,000
			Contingency at 10%	$242,000
			Design Total	$2,662,000

Figure 3: Project budget

In the 2022 budget cycle the Port of Tacoma allocated $550,000 to complete an alternatives analysis to identify costs, benefits, impacts and major considerations for the Wapato Creek culvert outfall project. As part of the budgeting process, Port staff provided Port leadership justification for replacing the functionally and structurally deficient culvert as well as anticipated replacement alternatives and costs. Staff presented the four following scenarios:

- Repair/Rehabilitate: $3-5 million
- Replace: $15-25 million
- Replace and upgrade channel passage: $20-30 million
- Replace with bridge and restore channel passage: $25-35 million

The repair/rehabilitate option does not appear feasible from a regulatory approach. Replacing the existing culvert with a similar structure is also not likely feasible due to regulatory requirements. The Port and NWSA have institutional awareness that a major capital investment will be required at this culvert and crossing to keep one of the Port's primary container handling terminals operational. Neither the Port nor the NWSA have currently obligated or budgeted funds for design of the culvert replacement or construction. Project costs are estimated based on judgement considering recent projects and project construction cost of approximately $30 million dollars.

III. Project Selection Criteria

Criterion 1: Conservation Benefits to Anadromous Fish

(1) the anadromous species the project will benefit:

Numerous species of anadromous fish are known to utilize the Blair Waterway and Wapato Creek. Documented anadromous species that currently utilize Wapato Creek include Chinook Salmon[1] (*Oncorhynchus tshawytscha,* Federal Status: Puget Sound ESU-Threatened), Coho (*O. kisutch*) and fall chum (*O. keta*) salmon, and Coastal Cutthroat Trout (*O. clarki clarki* State Status: species of Special Concern). In addition to the previously listed anadromous species, the proposed culvert removal and restoration project are likely to benefit Puget Sound Steelhead (*O. mykiss* – Puget Sound DPS-Threatened) and Bull Trout (*Salvelinus confluentus* – Federal Status: Threatened, State status: Candidate).

(2) if the proposed project contributes to the recovery or sustainability of federally protected or at-risk anadromous species and habitats, anadromous species that represent an important resource for other federally protected species, or contributes to ecological resilience for species that are vulnerable to climate change or extreme weather events:

Challenges to the recovery or sustainability of federally protected or at-risk anadromous species and habitats in the Puget Sound region, including for the Puyallup-White watersheds, include the increased urbanized environment, which often brings decreased water quality and quantity, construction of levees and channelization of waterways, development in floodplain and filling of off-channel areas and habitat, fish passage impediments, and severely impaired estuarine and nearshore areas. Wapato Creek has been impacted by a number of these factors over the past 150 years.

Currently, small numbers of anadromous fish are able to migrate through the existing culvert. According to the PTOI Environmental Department, chum, Chinook, coho and coastal cutthroat trout currently spawn in Wapato Creek, but PTOI fisheries staff often find pre-spawn dead anadromous fish. PTOI attributes anadromous fish mortality in this area to the existing culvert (Ladley 2023 pers. comm. 12 January).

The proposed culvert replacement project will have potential indirect benefits on federally protected anadromous species that are not likely to use Wapato Creek. Anadromous bull trout are well documented in the Puyallup River system, but no known occurrences have been documented in Wapato Creek. Although bull trout are unlikely to directly benefit from the culvert removal project, one of their key diet items, Chinook salmon, will. By increasing Chinook spawning and rearing opportunities, more Chinook smolts will enter the Puget Sound. Adult bull trout utilize the shoreline of the Puget Sound for foraging and migration back to spawning streams. By producing additional Chinook salmon, the Port of Tacoma/NWSA will be increasing an important dietary resource for federally protected anadromous bull trout.

[1] Planted by PTOI when LWCH opened.

Similarly, although the Blair Waterway and Wapato Creek do not offer direct habitat benefits to Southern Resident Orca, increasing the spawning and rearing habitat for Chinook will increase critical food source for this vulnerable population. According to the PTOI, Wapato Creek had a historic run of anadromous smelt. Smelt and other forage fish are an important diet item for federal listed Marbled Murrelet (*Brachyramphus marmoratus*). Removing the culvert at the mouth of Wapato Creek and reestablishing an anadromous spawning run of smelt would increase prey to Threatened Marbled Murrelets and other species that rely on forage fish.

The existing culvert inhibits at-risk anadromous species recovery by obstructing fish passage to upstream habitat, increasing water velocities, degrading water quality, impairing critical shoreline and nearshore habitat, and limiting climate resiliency. The proposed project will design and permit a fish-friendly structure to replace the existing culvert. These proposed actions will contribute to listed species recovery by reestablishing unimpeded fish access to critical upstream habitat, resulting in a substantial effective increase in estuarine habitat areas. Additionally, the proposed actions will improve water quality and restore critical shoreline and nearshore habitat by installing native riparian vegetation, which will filter and allow infiltration of surface water. Native vegetation will increase habitat complexity, improve nearshore edge habitat, provide organic input, and support the prey species that anadromous fish feed upon. Finally, widening this section of Wapato Creek and reconnecting it to the Puget Sound will reduce water velocities, improve water flow and climate resiliency, and provide greater tidal influence of the channelized stream.

The project will significantly contribute to the recovery and sustainability of federally protected, state species of concern, non-protected anadromous fish species, as well as anadromous species that represent an important resource for other federally protected species within Wapato Creek, the Puyallup Watershed and the Puget Sound.

> (3) if the proposed project conforms with a written recovery, management, or State wildlife action plan:

There are numerous written recovery, management and state action plans for anadromous species that would benefit from the proposed culvert replacement project. A small subset of these include:

- Watershed Restoration and Enhancement Plan, WRIA 10 – Puyallup-White Watershed (Washington Department of Ecology; https://apps.ecology.wa.gov/publications/SummaryPages/2111010.html);
- Ecosystem Recovery Plan (Puyallup White River Local Integrating Organization; https://puyallupwatershed.org/wp-content/uploads/2022/09/PWRLIO_ERP_September_2021_FINAL_1.pdf);
- Salmon Habitat Limiting Factors in Washington State (Washington State Conservation Commission; https://rco.wa.gov/wp-content/uploads/2019/10/GSRO-LimitingFactorReport.pdf);
- Factors Limiting Progress in Salmon Recovery (Puget Sound Partnership; https://snohomishcountywa.gov/DocumentCenter/View/81540/08a_SSAGWhitePaper_Attachment-1);

- Salmon Habitat Protection and Restoration Strategy for Puyallup and Chambers Watersheds (Puyallup and Chambers Watershed Salmon Recovery Lead Entity; https://www.piercecountywa.gov/DocumentCenter/View/104024/2018-Final-Puyallup-Chambers-Strategy_FinalUpdate);
- Pierce County Comprehensive Plan (https://www.piercecountywa.gov/950/Comprehensive-Plan);
- Port-Wide Mitigation Report (Port of Tacoma; https://www.portoftacoma.com/environment/habitat-restoration); and
- Port-Wide Habitat Mitigation Strategy (Port of Tacoma; https://vecportal.blob.core.windows.net/portoftacoma/Documents/35544db444cedb4aec1ab6a6532aceac/7C-ATTCH-Strategy%20Doc%20DRAFT.pdf).

The proposed project will conform to local, state, and federal action plans by generally increasing productive habitats, protecting existing habitats and allowing increased access to restoration areas that will significantly benefit spawning and juvenile rearing life stages of anadromous species in Wapato Creek. Specifically, the proposed project will improve fish passage, improve floodplain connectivity and condition, reduce impacts of industrial development and reduce early marine mortality and predation by providing access to habitat for rearing and osmoregulation.

(4) the magnitude of the potential benefit of the proposed project to anadromous fish:

The existing culvert is located at mouth of Wapato Creek, where it discharges to the Blair Waterway and into the Puget Sound. This culvert is located at the most critical location of the Wapato Creek watershed, because it obstructs 100% of the upstream habitat. No other single location has a greater magnitude of impact on the watershed; therefore, the magnitude of potential benefits provided by proposed culvert removal project are substantial for anadromous fish within the Wapato Creek watershed. Improvements to such a substantial area will provide a significant benefit to anadromous fish recovery throughout the greater Puyallup Watershed and the Puget Sound.

There are currently six species of anadromous fish known to utilize the Blair Waterway and Wapato Creek. Of these species, three are Federally protected and one is a state species of concern. Because of the existing restrictive culverts, all anadromous species are impacted to some extent. Replacing this fish passage barrier presents a unique opportunity to restore unrestricted passage to approximately 14 miles of stream. In addition, removing this culvert will not only restore 0.45 miles of stream directly, but will also provide access to and increase the habitat value of 82.95 acres of previously restored habitat at 13 restoration areas along upstream reaches of Wapato Creek. As stated by the PTOI Environmental Director, correcting the Wapato Creek outfall culvert is a key piece of the restoration process, as every returning adult and every out-migrating fry/smolt is dependent upon this structure for a smooth and safe habitat transition. Corrective action at this location adds further value to all the other restoration projects upstream (Ladley 2023 pers. comm. 12 January).

(5) the significance of the expected impact on the project's target species, including length of spawning, rearing, and migratory habitats to be made accessible to anadromous fish, and the quality of accessible habitat:

The proposed project will have a significant impact on the following anadromous fish: Chinook Salmon, Coho, fall chum, coastal cutthroat trout, Puget Sound Steelhead, Bull Trout, Pacific lamprey, and Starry flounder. In addition to these known species, Pink salmon may also benefit from removing the culvert. Currently, the culvert is not passible to certain anadromous species and limiting to others. It acts as a bottleneck at the most critical location, which impacts the entire Wapato Creek watershed adversely. Removing the existing fish passage barrier benefits 100% of Wapato Creek habitat, and more specifically will open up known spawning habitat in the vicinity of 90th St and Simons Creek and between 70th and Freeman Road. It will also allow unobstructed access to the newly restored Port of Tacoma's LWCH. LWCH includes nearly 20 acres of restored marine influenced habitat, which will benefit from this culvert removal. Other LWCH habitat improvements that will be enhanced by this culvert removal include the replacement of two upstream fish-barrier culverts with a full span bridge. In 2021 the Port removed an additional fish-barrier culvert and replaced it with a full span bridge nearly 900-feet upstream of the proposed project and downstream of the LWCH. The Washington Department of Transportation (WSDOT) is currently planning on improving another fish-barrier culvert approximately 2,000-feet (0.38 mi) upstream of the proposed project and downstream of the LWCH with completion of the work anticipated in the next two to eight years. In total, the proposed culvert removal project will complement the existing fish passage and habitat improvement projects and enhance access to approximately 14 miles of spawning, rearing and migratory habitat for anadromous fish on Wapato Creek.

Criterion 2: Regional and Watershed Context

(1) if the proposal contributes to a holistic watershed strategy:

The proposed project follows a holistic watershed approach as outlined in 33 CFR 332.3(c) (https://www.ecfr.gov/current/title-33/chapter-II/part-332/section-332.3#p-332.3332.3(c)) and Ecology's guidance Selecting Wetland Mitigation Sites Using a Watershed Approach (Ecology 2009; https://apps.ecology.wa.gov/publications/documents/0906032.pdf). Successful implementation of this project and ultimate construction will benefit the entire Wapato Creek watershed and enhance the ecological value of every current and future upstream habitat restoration project.

(2) if there is a regional or watershed plan or prioritization established by a Federal, State, local or Tribal fish and wildlife agency:

The proposed project follows existing regional and watershed plans and prioritization including:

- Watershed Restoration and Enhancement Plan, WRIA 10 – Puyallup-White Watershed (Washington Department of Ecology; https://apps.ecology.wa.gov/publications/SummaryPages/2111010.html);

- Ecosystem Recovery Plan (Puyallup White River Local Integrating Organization; https://puyallupwatershed.org/wp-content/uploads/2022/09/PWRLIO_ERP_September_2021_FINAL_1.pdf);
- Salmon Habitat Protection and Restoration Strategy for Puyallup and Chambers Watersheds (Puyallup and Chambers Watershed Salmon Recovery Lead Entity; https://www.piercecountywa.gov/DocumentCenter/View/104024/2018-Final-Puyallup-Chambers-Strategy_FinalUpdate);
- Salmon Habitat Limiting Factors Report for the Puyallup River Basin – Water Resource Inventory Area 10 (Washington Conservation Commission; https://your.kingcounty.gov/dnrp/library/archive-documents/wlr/wrias/10/salmon-habitat-limiting-factors/pdf/wria-10-salmon-habitat-limiting-factors.pdf);
- Commencement Bay Natural Resource Damage Assessment (CB/NRDA) Restoration Plan and Final Programmatic Environmental Impact Statement (RP/FEIS) (Commencement Bay Natural Resource Trustees; https://books.google.com/books?id=73E5AQAAMAAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false).
- Commencement Bay Natural Resource Damage Assessment: Clear Creek Final Restoration Plan and NEPA Evaluation (US Department of Interior; https://pub-data.diver.orr.noaa.gov/admin-record/6605/Commencement%20Bay%20NRDA%20Clear%20Creek%20Final%20Restoration%20Plan%20and%20NEPA%20Evaluation.pdf);
- Puyallup Tribal Fisheries Annual Salmon, Steelhead and Bull Trout Report: Puyallup/White River Watershed—Water Resource Inventory Area 10 (Puyallup Tribal Fisheries; https://share.puyalluptribe-nsn.gov/nextcloud/index.php/s/o7w9DPPHWBtYExC)
- 2020 State of Our Watersheds Report, Puyallup River Basin (Puyallup Tribe of Indians; https://nwifc.org/publications/state-of-our-watersheds/);

See also Criterion 1 (3).

(3) if applicable, what the proposed project's priority is within the watershed or plan:

The proposed project's priorities follow the limiting factors identified in the above referenced Puyallup Watershed plans. According to the watershed plans, the Puyallup Watershed limiting factors generally include the following:

- Loss of floodplain habitat, wetlands, and connectivity to hyporheic zone.
- Loss of off-channel and side-channel habitat.
- Loss of natural habitat-forming flow regimes.
- Loss of upstream, downstream, and lateral fish passage.
- Loss of riparian corridors, including marine riparian, and floodplain forests.
- Loss of instream habitat complexity and connectivity.
- Loss of large wood.
- Increase in river channelization.
- Loss of spawning and rearing habitat.

- Loss of estuarine and nearshore habitat, including bluffs.
- Loss of good water quality, including appropriate temperature.
- Increase in contamination of water, sediment, and prey resources.

The proposed project will directly and indirectly meet these watershed plans' priority goals and priorities. Replacing the fish passage barrier WCC with a fish-friendly structure, restoring the stream channel, and planting native riparian vegetation will provide fish passage to the entire Wapato Creek watershed (floodplain habitat, wetlands, spawning habitat), restore natural habitat-forming processes, increase riparian corridors, improve large wood retention and creation, decrease stream channelization, enhance access to spawning and rearing habitat, improve water quality, and increase prey resources.

Criterion 3: Ecosystem Benefits

> (1) the extent the proposed project would provide benefits to ecosystem processes and biodiversity (e.g., ecological connectivity);

Wapato Creek has been heavily impacted from industrial, agricultural and residential land uses. Historical dredging, transportation infrastructure, dike and ditch construction, farming and housing development, and other land use have had adverse impacts on ecosystem processes and biodiversity. The proposed culvert removal and restoration project will greatly improve ecosystem level benefits by improving physical, chemical, and biological processes that effect species diversity and complexity.

Currently, the area surrounding the WCC consists of simplified habitat and impervious surfaces with low biodiversity. Although marine waters influence the lower stretch of Wapato Creek, that exchange is restricted to the current ditch-like channel. While several habitat and watershed improvement projects have been completed upstream of the proposed Wapato Creek culvert removal, access to anadromous fish species remains impaired by the existing culvert. The ecosystem benefits of the proposed project cannot be overstated, because removal of this fish passage barrier improves connectivity of the Puget Sound to the entire Wapato Creek watershed. Every current and future ecosystem improvement within this watershed will be enhanced substantially by the proposed habitat improvements at such a critical location.

Within the immediate project location, ecosystem processes and biodiversity will be improved because natural water velocities and tidal influence will be restored, water quality will improve, native riparian vegetation will provide edge habitat and increase prey resources, and overall habitat complexity will increase as a net result of these habitat improvements.

> (2) how the project would benefit the physical, chemical, and biological processes that sustain river and floodplain ecosystems (examples of the processes to consider include erosion and sediment transport, storage and routing of water, plant growth and successional processes, movement of nutrients and thermal energy, and nutrient cycling in the aquatic food web):

The Port of Tacoma is proposing a process-based restoration of the mouth of the Wapato Creek that focuses on correcting an anthropogenic disruption (i.e., habitat conversion and fish passage issues) to physical, chemical, and biological processes that sustain river and floodplain ecosystems. The proposed project will target the root causes of the degradation in the lower reaches of Wapato Creek. In this case, the existing fish passage blockage culvert, channelized stream, and lack of floodplain. Under existing conditions, the local potential of the restored stream reach is limited by industrial land uses adjacent to the site.

The reach of Wapato Creek that is being restored is adjacent to the busiest industrial waterway at the Port of Tacoma. It is unrealistic to design a restoration site that attempts to mimic the historic mudflat and estuarine conditions. However, the Port proposes to implement local site improvements that are consistent with the altered physical and biological potential, which also improve connections to all current and future watershed improvements. The net result is to enhance physical, chemical, and biological processes throughout the entire Wapato Creek riparian and floodplain ecosystem. In turn, these improvements sustain and enhance the greater Puyallup River watershed ecosystem, which directly support anadromous fish recovery both locally and throughout the Puget Sound.

Increasing the width of the stream channel and creating a native riparian corridor between the Blair Waterway and the LWCHP will improve sediment transport, routing of water, plant growth and successional processes in the built environment. More specifically, these proposed site improvements will: reduce erosional processes and improve natural sediment transport processes by restoring natural water velocities and tidal influence; and improve water quality, address nutrient and aquatic food web disruptions, and enhance plant growth and successional processes by installing native riparian vegetation and improving connectivity to upstream habitat.

> (3) how the project may benefit other native aquatic and terrestrial species, and how the project would enhance ecosystem resilience:

In addition to the anadromous fish species, other native aquatic and terrestrial species, including non-anadromous fish species, mammals, avians, and insects, will benefit from the removal of the culvert and stream restoration project. Marine fish and other aquatic species will benefit from improved access to upstream Wapato Creek habitat beyond the existing culvert. Construction dewatering during a prior culvert replacement in 2021 encountered sculpin, stickleback, crawfish, shrimp, lamprey, starry flounder, cutthroat trout, and coho, suggesting that each of these species will benefit from the proposed Wapato Creek culvert removal. Mammals like the river otter (*Lutra canadensis*) will no longer be restricted by the 96” culvert, while beavers will benefit from additional habitat and foraging areas. Avian species will have access to increased natural habitat and food sources. Southern Resident Orca will directly benefit from recovery of a critical food source.

These benefits to non-anadromous native aquatic and terrestrial species have been demonstrated at other Port of Tacoma restoration and mitigation sites. Place of Circling Waters is a nearly 30-acre, tidally influenced mitigation site at the mouth of Hylebos Creek. Place of Circling Waters provides habitat to migratory and resident avian species as well as a host of other native wildlife.

The proposed project will enhance ecosystem resilience by removing an anthropomorphic structure that limits nature's ability to absorb, persist, and adapt to unpredictable climate variability. Currently, the culvert restricts the free movement of aquatic and some terrestrial species. Removing the fish passage culvert, restoring the channelized stream, and planting native riparian vegetation will allow unrestricted movement for native aquatic and terrestrial species that utilize estuarine habitat. These improvements at such a critical location magnify the benefits all current and future upstream habitat improvements provide for native aquatic and terrestrial species. The project also enhances ecosystem resilience by improving tidal inundation of floodplain habitat and providing increased flood conveyance and additional flood storage capacity. Finally, planting native riparian species also benefits habitat and enhances ecosystem resilience by lowering water temperatures due to shading, improving edge habitat, providing detrital input to aquatic invertebrates, and increasing prey resources for native aquatic and terrestrial species.

Criterion 4: Project Design and Delivery Methods

The Wapato Creek Culvert at the Pierce County Terminal is at, or very near, the end of its service life. Given the culvert's age and condition, the first project objective is to restore operational capacity and eliminate commercial risks associated with any type of failure. Addressing physical safety concerns related to the structure is also an opportunity to improve the natural environment. These objectives and their associated methodologies, technical feasibility and other associated project goals are discussed as follows.

The considered culvert segment transects a paved corridor about 170 feet wide. Within this corridor there are 5 commercial truck lanes and 2 terminal traffic lanes for straddle carriers. The lanes are primarily used by commercial trucks and equipment handlers but also support a wide variety of personal and lighter duty commercial vehicles that move off and on the secured terminal proper, as well as terminal administration and employee parking areas. The primary objective of the culvert replacement or upgrade is to secure this transportation corridor. Any loss of service due to load restrictions or scour would have a huge impact on terminal operations as well as the greater logistics and freight distribution network in the region. Safe and reliable transportation must be maintained within the corridor. Any new structure will likely be governed by container handling equipment or rail loading. At a minimum, the following standards will be applied to ensure safety and service-life performance:

- AASHTO LRFD Bridge Design Specification, 9th Edition (2020)
- AASHTO Guide Specifications for LRFD Seismic Bridge Design, 2nd Edition
- WSDOT Standard Specification Latest Edition
- WSDOT Bridge Design Manual
- ASCE 24 – Flood Resistant Design and Construction
- 2014 AASHTO Seismic Guide Specifications Abutments and Pile Foundations

The project will face a host of technical challenges. However, the Port team recently completed the demolition and removal of 90 feet of similarly embedded culvert approximately 800 feet

upstream of the proposed culvert replacement. This completed project included an emergency temporary bridge and a new bridge with a 65-foot span. The new bridge safely supports the transit of thousands of trucks on a weekly basis. The new bridge is also low maintenance. This related project is a testament to the Port's capacity to deliver a modern, code-compliant, technically sound, safe, fish friendly and low maintenance replacement at this final passage location.

Ongoing revitalization and restoration of Wapato Creek within or adjacent to Port owned lands is a major source of pride to Port staff and community. Many Port projects and facilities are burdened by legacy contamination or infrastructure. New projects and developments provide an opportunity to fix or mitigate past mistakes. Replacing or upgrading the old culvert to facilitate fish passage is a major project objective and an opportunity for the Port to establish a positive legacy. Deign goals and specific fish passage design considerations include:

- Ensuring access and connectivity to existing restored habitat
- Modifications to the outlet system (box and chute) will need to consider protection of migrating fish during low tide levels and connectivity though rock revetment
- Alignment, straight water crossing preferred over bends
- Hydraulic Code Criteria: develop project specific criteria for the unique combination of fluvial and tidal hydrodynamic conditions that will define type, size and alignment of the new stream crossing
- RCW 77.57.030 – Washington law on 90% passage as applied to tidally influenced considered areas
- Hydraulics of the fish passage will be evaluated based on the criteria set within the WDFW Water Crossing Design Guidelines, Appendix D Tidally Influenced Crossing (2013)
- Incorporate data from 2d Hydrodynamic models such as MIKE21 to model culverts and tidal and fluvial hydraulics including sea level rise
- USACE HEC-RAS River Analysis System

Criterion 5: Project Monitoring and Evaluation

The proposed project is for the permitting and design stage. Data collection for pre-project implementation/construction will include a cultural resources assessment and monitoring to determine the appropriate level of cultural resources monitoring during construction. Pre-project data collection will also include collecting data necessary to inform the design and construction such as geotechnical data, soil and groundwater quality, groundwater levels, tide levels, stream flows, hydraulic and hydrologic modelling, or other data needs identified during planning and design. The permit application documents will include a mitigation plan which may include the requirement for a post-construction as-built report and post-construction monitoring of any re-vegetated areas, slope stability, and/or fish passage as applicable to the final design and as required by the permitting agencies. It is anticipated that at least 5 years of performance monitoring will be conducted for any revegetated areas. All monitoring and applicable reports will be completed in accordance with the appropriate agency guidance. Cultural resources monitoring will be conducted during construction as determined by the Cultural Resources

Assessment and in consultation with applicable Tribes and the Washington State Department of Archaeology and Historic Preservation.

Criterion 6: Climate Change, Sustainability, and Resilience

Repair, replacement, and upgrade alternatives are being collectively assessed to identify a preferred path forward for future design, permitting, and construction work. The project will improve fish passage and safety at the culvert and position the Port of Tacoma and NWSA for future stages of work, ensuring the integration of fish passage, climate resilience, and operational safety into investigation, planning, and design for the selected path forward.

Design will consider a multitude of user needs, including ensuring the solution's long-term viability in the face of climate change. Design will consider how this area is affected by both sea level rise and changing precipitation patterns in the region, and how to design for future fish passage, terminal operations, and protection of the floodway. A major benefit of addressing the WCC will be reducing the risk of localized flooding in the nearby City of Fife, while likely also improving hydrology and reducing the risk of upstream flooding along Wapato Creek.

Criterion 7: Equity and Barriers to Opportunity

For over three decades the relationship between the Port of Tacoma and the Puyallup Tribe of Indians (PTOI) has been governed by the Puyallup Land Claims Settlement (Civil Action NO. C94-5648) as well as multiple other agreements. Those agreements, totaling hundreds of pages of text, boil down to two fundamental concepts: 1) When the Port builds habitat for mitigation for the purposes of development, the goal of that mitigation is to focus on restoring and improving local fisheries, particularly salmonids; and 2) The Port and PTOI share similar goals for their respective properties on the Blair Waterway in terms of economic development and providing high paying jobs to the local community.

Guided by these two concepts, the Port has created over two hundred acres of prime salmon habitat over the years as it has mitigated for project impacts. The Port has built habitat projects on the Puyallup River main stem (the Gog Le Hi Te complex), Hylebos Creek (Place of Circling Waters) and Clear Creek (lower and upper Clear Creek projects). On Clear Creek in particular, the PTOI has measured significant improvements in Chinook returns, recording numbers not seen since the late 1970’s.

The Port’s most recent habitat project was building a 20-acre estuarine marsh complex on Wapato Creek. That marsh complements the PTOI’s recently constructed mitigation site upstream on Wapato Creek. The PTOI’s site provides the breeding grounds and the Port’s site provides the rearing grounds for salmonid use of the creek. The Port’s site is across the street from a Tribal neighborhood and never could have been built without a significant partnership with the PTOI.

Replacing the WCC with a fish friendly, structurally sound structure will also allow the Pierce County Terminal to continue unfettered operations. Terminal operations support thousands of jobs locally, most of which are unionized, family-wage jobs which do not require college degrees. PCT, and the other international terminals of the gateway, support tens of thousands of jobs in agriculture (as export facilities), transportation, logistics, machine repair, retail etc. Addressing the final 300 feet of Wapato Creek flowing underneath the PCT is critical both for improving fisheries within the creek and in keeping a busy port, and the high wage jobs the port supports, moving.

(1) Benefits to fish species that are culturally important to Tribes or underserved communities:

The Tideflats through which Wapato Creek flows are the ancestral lands of the PTOI. Chinook Salmon are important culturally to the PTOI and most Northwest coastal tribes, and the Tribe has planted Chinook fry in Wapato Creek in hopes of restoring a natural run to the creek. Wapato Creek currently supports Chum and Coho salmon in very limited numbers, both of which are also important species to the PTOI and other coastal tribes. The Port and the PTOI have worked together to greatly improve the habitat along Wapato Creek; however, a significant remaining impediment to fish migration is the culvert running under PCT that carries Wapato Creek. As noted above, replacing this culvert with a fish friendly structure will greatly improve the movement of fish up into Wapato Creek's freshly restored habitat. The proposed project will build upon substantial work previously completed by the Port in partnership with the PTOI, including:

- Relocation of Wapato Creek from a ditched system to a longer, meandering stream channel and associated wetlands, including a variety of associated estuarine/freshwater habitats and a densely vegetated forested upland buffer to provide an increase in the quantity and quality of fish and wildlife habitat, wetlands, and flood capacity
- Replacement of two fish-barrier culverts that conveyed Wapato Creek under 12th Street East with a fish-passable full-span bridge

(2) contributions to the physical sustenance of or economic benefits to Tribes or underserved communities

While the project is in an industrial area and is part of a FEMA-regulated floodway, many of the residential developments upstream of the culvert are homes of PTOI members. Future implementation of the selected alternative is expected to have a positive impact on environmental justice issues and on flood risk reduction for upstream residences. While these residences aren't shown as located in the floodplain on the FEMA firm map, these properties could flood in the event of a culvert failure. The culvert in place today is deteriorating, and heavy industrial users pass over it daily. Culvert failure would severely disrupt operations at the PCT,

but could also disrupt the Wapato Creek floodway and cause flooding on the terminal and at upstream residences, including those of tribal members. Lastly, if the existing culvert were to fail, the truck gate would be cut off from the rest of the terminal area, which would negatively impact trucks' ability to get in and out of the terminal. This would be an economic as well as an equity issue, as many of the truckers are immigrants whose livelihoods depend on safe and reliable terminal access. Preventing flooding in this area is a substantial project benefit to Tribal and other underserved communities near the Port of Tacoma.

The NWSA and Port of Tacoma will continue this project with robust engagement with the PTOI. Tony Warfield, Senior Project Manager at the Port of Tacoma, serves as primary liaison to the PTOI. Port Environmental Project Managers Kristin Evered, Mark Rettmann, and Stanley Sasser attend coordination meetings with Tribal staff. Port Executive Director Eric Johnson is also active in nurturing the relationship between the two organizations.

> (3) A commitment to good-paying jobs with free and fair choice to join a union and strong labor standards in project construction and in on-going operations and maintenance through the use of, for example, project labor agreements, registered apprenticeship programs, and joint labor-management training programs

The Port of Tacoma (created in 1918) and the Port of Seattle (created in 1911) formed The Northwest Seaport Alliance (NWSA) in 2015 to unify management of marine cargo facilities and strengthen the competitiveness of the Puget Sound gateway to attract more marine cargo and related jobs. The NWSA is one of the largest marine cargo gateways in North America. Marine cargo operations through the NWSA provide significant jobs and revenue to Washington State, where 40% of jobs are tied to trade. Based on a 2019 marine economic impact study (Community Attributes, Inc., 2019) utilizing 2017 data (most recent data available for the study), the NWSA imported or exported $75.3 billion worth of cargo—27.6 million metric tons—to and from 166 countries. The total 2017 Washington State tax contribution of the NWSA was $136 million which helps support local and state finances. The NWSA supported 58,400 jobs across Washington State, including 20,100 direct jobs, 14,700 supplier jobs, and 23,600 other jobs. The NWSA serves as one of only three U.S. West Coast container gateway seaports and is the closest U.S. gateway to north Asia. Exports from NWSA harbors touch virtually every corner of the globe and help sustain jobs in Pierce County and throughout the state.

IV. Project Readiness and Environmental Review and Permitting Risk

Technical Feasibility:

In Q1 of 2023 a team of consultants and the Port will start developing an alternatives analysis for repair or replacement concepts for the Wapato Creek Culvert (WCC). The alternatives analysis starts the technical program for culvert replacement. The objective of the alternatives analysis is

to provide the information necessary for project stakeholders to pick a preferred alternative or concept to carry into design. The intent of this application request is to secure support for executing the design of the selected alternative. Given the current regulatory environment and the extent to which the existing culvert restricts flows, the scope of the replacement will likely be considerable, both in terms of the dollar amount of the selected alternative and in the number and complexity of stakeholder needs and permitting concerns.

Engineering studies and design efforts that will be started under the alternatives analysis and continued through design include the following:

- Hydraulic and hydrologic reporting and design
- Geotechnical reporting and design
- Structural engineering design
- Civil engineering design (paving, utilities, storm)
- Rail design
- Overhead utility and coordination
- Port and traffic operations and phasing
- Cost Estimating and scheduling

The following design criteria will applied:

- AASHTO LRFD Bridge Design Specification, 9th Edition (2020)
- AASHTO Guide Specifications for LRFD Seismic Bridge Design, 2nd Edition
- WSDOT Standard Specification Latest Edition
- WSDOT Bridge Design Manual
- ASCE 24 – Flood Resistant Design and Construction
- 2014 AASHTO Seismic Guide Specifications Abutments and Pile Foundations
- INSERT ENVRIONMENTAL CODES

The basis for the cost estimate presented in this application is a recently completed project upstream of the WCC. In 2020 and 2021 the Port of Tacoma removed another failing culvert in the same creek 800 feet upstream from the WCC. The primary construction activities for this project included:

- Construction of a new precast voided slab girder bridge with a 65-foot-long span
- Dewatering/bypass of Wapato Creek for in-water work
- Demolition and removal of 100 feet of deteriorated culvert, including embankments
- Channel and embankment restoration within the project footprint

The installed bridge, inclusive of all peripheral work, cost $75,000 per foot of bridged creek alignment. For the proposed project, given the operational, transportation, and utility complexity of the area, a contingency of 100% has been applied, resulting in an estimated cost of $150,000 per foot of bridged creek alignment. Within the terminal, approximately 215 feet of creek alignment would be spanned. The working estimate for spanning the creek with a bridge structure within the terminal is $30 to $35 million.

Specific scope, schedule, and budget risk-mitigation measures have not been currently implemented at this project stage. One of the largest risks to any project's scope, schedule and budget is encountering unknowns. As currently envisioned, the culvert replacement project will have a robust investigation, analysis and documentation approach, starting at project conception with the alternatives analysis and continuing through design. With thorough investigation and site characterization, our team will mitigate the scope, schedule, and budget impacts of unknowns. An uninformed or unidentified stakeholder can also be a major source of scope, schedule, and budget risk. Involved agencies and stakeholders generally strictly adhere to policies and process. With policies and process, realizing cohesive or nimble reactions can be difficult. To mitigate this project risk, our project team will place a specific emphasis on open and transparent communication. Our team will rely heavily on SharePoint, project component specific websites, and digital notifications to keep all stakeholders informed of project schedule and developments.

With regards to technical and engineering aspects of the project, the proposed culvert replacement is in the most complicated 300-foot corridor within the greater port area. Planning, design, and permitting will have to consider a variety of conditions and stakeholder needs. The WCC is approximately 260 feet long and transects a critical transportation corridor along the soon-to-be vacated alignment of Alexander Avenue East.

There are multiple concerns working within this corridor. First and foremost, the corridor connects Wapato Creek to the Puget Sound. The creek is tidally influenced and subject to mixed diurnal tides. Any proposed work within or around the creek would be required to accommodate tidal and creek flows. Tidal water management and creek flow maintenance for continuous fish passage limits options. Creek flows and tidal cycles are also seasonally influenced, meaning any proposed work in and around the creek would likely be confined to summer months when stream flows are lower and peak low tides occur during the day to improve visibility.

The existing culvert is undersized and inhospitable to fish. Furthermore, the downstream end of the culvert daylights into an artificially constructed box on an armored shoreline that was installed to assist with fish passage. At lower tides a chute from the box provides connectivity between the Puget Sound and the culvert. To fully restore fish passage, the outfall must be more naturally integrated into the shoreline for more natural connectivity during the tidal cycle. Complete natural integration is complicated by the presence of the terminal shipping wharf, a mooring dolphin and the berthing basin for docked ships.

Operationally, the corridor supports five lanes of truck traffic and two lanes of heavy container handling equipment traffic. This mix of traffic must be maintained during terminal operational hours to keep one of the NWSA's largest container handling facilities operational. Traffic management and work phasing will be a critical component of the pursued upgrade. Foundations and structural load bearing elements will be designed to support heavy truck traffic at a minimum. Much of the upgraded structure will be designed to container terminal standard, which is similar to standards for aircraft loading. High-capacity lift trucks can operate on tires with 145 psi inflation pressure and 220,000lb axle weights.

Tacoma Rail tracks connect industrial areas along the water to the main rail yards in the Tideflats. Tacoma Rail, a publicly owned Class III shortline railroad that is an operating division

of Tacoma Public Utilities (TPU), maintains an easement through the terminal that transects the existing and future culvert alignment. All proposed culvert improvements will maintain rail access. Additional foundations or strengthening elements will likely be required to support Cooper E80 loading to simulate the live load from a train. Alternate tracks exist for rerouting trains around the culvert during construction, but the detour adds significant travel times and creates greater vehicle traffic impacts within the Tideflats. Work zone phasing will be a critical project technical challenge for minimizing impacts to rail operations.

Underground utilities, including a high-pressure gas transmission line and a water main, provide utility connections to industrial users in the area. These transmission lines and their service will be maintained during culvert removal and replacement. Accommodating the lines and staging their replacement and temporary routing adds to project technical challenges.

Overhead utilities pass through the area including the Northeast Nisqually 115kV transmission lines, other lower voltage power lines (all owned by Tacoma Power, a division of TPU), and communication lines (owned by TPU and other communication providers). The 115kV lines are elevated and mounted on towers but pass directly over the culvert alignment and work zone. Any work around these regional lines must be coordinated with TPU and construction equipment is limited by transmission stand-off requirements.

Project Schedule:

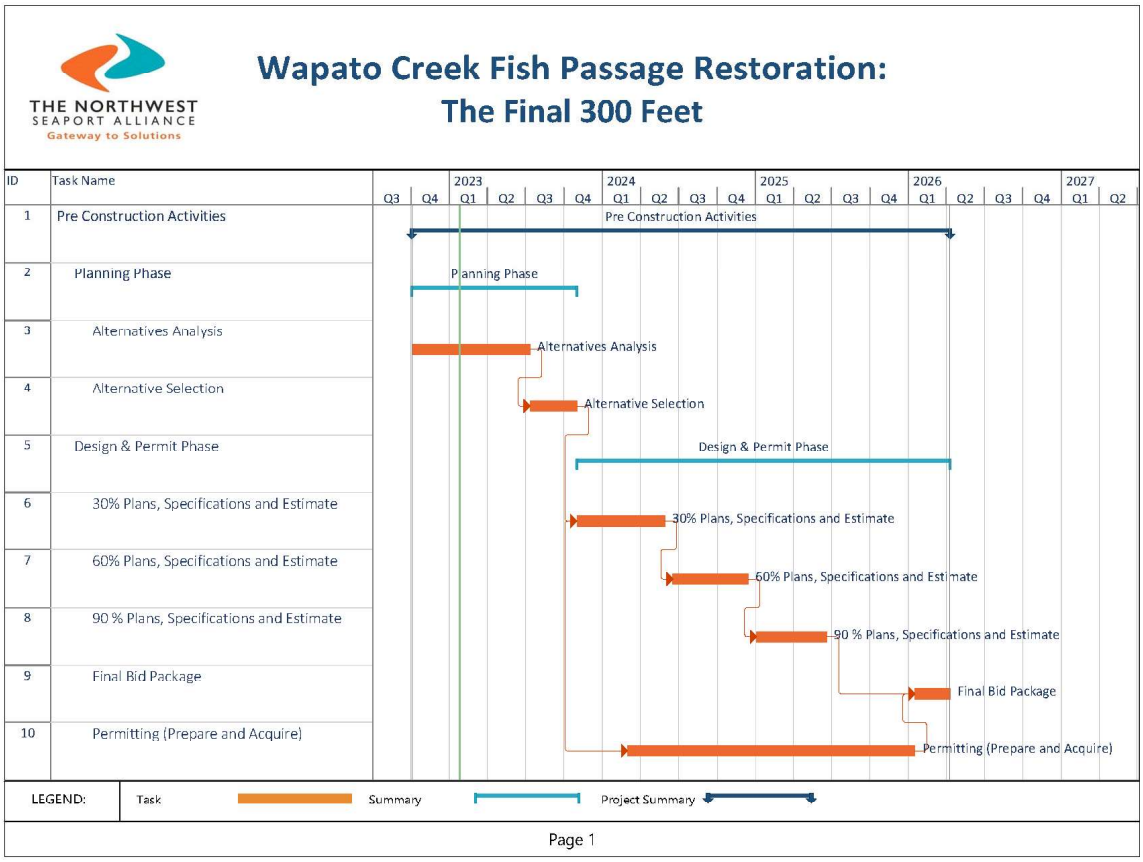


Figure 4: Project schedule

No right of way acquisition required for the project. When the larger WCC project proceeds and reaches the construction stage, City of Tacoma permits will be required in order to work within the right of way, and the time needed to obtain those permits is included in our project schedule. Permits will also be required from Tacoma Rail and TPU.

Necessary prior to the proposed design and permitting project:

Alternatives Analysis: 10/3/22 – 7/11/23
Alternatives Selection: 7/12/23 – 10/31/23

Design and Permitting (Coordination): 10/31/23 – 4/9/26

30% plans, specifications, and estimate: 10/31/23 – 5/27/24
60% plans, specifications, and estimate: 6/17/24 – 12/13/24
90% plans, specifications, and estimate: 1/3/25 – 6/19/25
Final bid package: 1/16/26 – 4/9/26
Permitting, preparation and acquisition: 3/1/24 – 1/15/26

Required Approvals:

Permitting is included in this application's scope. Required environmental permits include:

- Environmental review under the National and State Environmental Policy Acts (NEPA and SEPA)
- Clean Water Act Section 404/Rivers and Harbors Act Section 10 permit from the Department of the Army (issued jointly). This will include ESA Section 7 consultation as well as Historic Preservation Act Section 106 consultation.
- Clean Water Act Section 401 Water Quality Certification from the Washington State Department of Ecology
- Hydraulic Project Approval (HPA) from the Washington State Department of Fish and Wildlife.
- Shoreline Substantial Development (SSDP/CAPO permit) and Critical Area Protection permits from the City of Tacoma (issued jointly)

City of Tacoma approvals will include:

- City of Tacoma Work Order Permit (custom larger site and project specific permit issued by Site Development Group)
- Right of Way permit or potential street vacation of Alexander Ave from 509 to at least the site area
- Rail ROW work permit from Tacoma Rail
- Work permits from Tacoma Public Utilities (electrical) and the City of Tacoma (sewer and storm drainage, possibly power)

Environmental Permits and Reviews

Table 1: Required Approvals and Schedule

Approval	**Duration***	**Notes**
NEPA Review	18 months	Corps will combine with permitting process as combined review.
SEPA	2 months	Can begin at approximately
Corps Permits	18 months	Includes NMFS ESA consultation and Sec 106 review
401 Certification	13 months	
HPA	45 days	
SSD/CAPO	4 months	

* Duration begins at 30% design or as otherwise noted.

State and Local Approvals:

The scope for this grant application is to design and permit a culvert replacement. As such, no permits are in hand. The required permits and their anticipated schedule from 30% design are listed in Table 1.

Assessment of Project Risks and Mitigation Strategies:

Table 2: Project Design and Permitting Risks and Mitigation Measures

Risk	Likelihood	Impact	Mitigation Measures
Designing structure given local soils	High	Medium	Thorough geotechnical study will be required to determine appropriate support elements.
Federal permit delay due to National Marine Fisheries Service ESA Consultation	High	High	The Port of Tacoma/NWSA has hired a liaison to work exclusively on projects for the ports of Tacoma and Seattle. This project will be high priority.
Inadvertent Discovery of Cultural Resources.	Low	High	The Port works closely on ground disturbing projects with the Puyallup Tribe of Indians. The Port will have cultural resource observers present for geotechnical boring activities and will work with the Tribe to determine what other physical survey is necessary.

Scalable Project Options:

The proposed project is design and permitting for a selected alternative to address the WCC and thus is not scalable; if less funding is awarded than requested, the Port and/or NWSA would have to increase its local match from the organization's Capital Improvement Project budget.