DRAFT FINDING OF NO SIGNIFICANT IMPACT (FONSI)
Hiram M. Chittenden Locks Large Lock Center Gate Project
King County, Washington

The U.S. Army Corps of Engineers, Seattle District (USACE) has conducted an environmental analysis in accordance with the National Environmental Policy Act (NEPA) of 1969, as amended. The draft Environmental Assessment (EA) dated January 2022 for the Hiram M. Chittenden Locks (Locks) Large Lock Center Gate Project addresses efficient navigation through the large lock and routine visual maintenance inspections of the large lock center gate (LLCG) at the Locks in Seattle, King County, Washington.

The draft EA, incorporated herein by reference, evaluated various alternatives to maintain efficient navigation through the large lock and facilitate safe routine visual maintenance inspections of the LLCG. There is one Federal action analyzed in the EA summarized below.

Proposed Action: The preferred alternative is Alternative 3, Replace LLCG, which replaces the LLCG with a single-skin miter gate that meets current safety design standards and allows visual inspections without requiring entry into confined spaces.

Alternatives: In addition to a "no action" plan, two alternatives were evaluated. The alternatives included rehabilitate the LLCG (Section 2.2) and replace the LLCG (Section 2.3). The rehabilitate the LLCG alternative did not meet the purpose and need because it does not meet current safety standards and was not carried forward for detailed analysis. For all alternatives, the potential effects were evaluated, as appropriate. A summary assessment of the potential effects of the recommended plan are listed in Table 1:

Table 1: Summary of Potential Effects of the Proposed Action

	Insignificant effects	Insignificant effects as a result of mitigation	Resource unaffected by action
Aesthetics	☒	☐	☐
Air quality	☒	☐	☐
Aquatic resources/wetlands	☒	☐	☐
Invasive species	☐	☐	☒
Fish and wildlife habitat	☒	☐	☐
Threatened/Endangered species/critical habitat	☐	☒	☐
Historic properties	☐	☒	☐
Other cultural resources	☒	☐	☐
Floodplains	☐	☐	☒
Hazardous, toxic and radioactive waste	☐	☐	☒

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	Insignificant effects	Insignificant effects as a result of mitigation	Resource unaffected by action
Hydrology and geomorphology	☐	☐	☒
Land use	☐	☐	☒
Navigation	☐	☒	☐
Noise levels	☒	☐	☐
Public infrastructure	☒	☐	☐
Recreation	☐	☒	☐
Socioeconomics	☒	☐	☐
Environmental justice	☐	☐	☒
Soils	☐	☐	☒
Tribal trust resources	☒	☐	☐
Water quality	☐	☒	☐
Climate change	☐	☐	☒

Impact Minimization: All practicable and appropriate means to avoid or minimize adverse environmental effects were analyzed and incorporated into the recommended plan. Best management practices (BMPs) as detailed in the EA will be implemented, if appropriate, to minimize impacts. Sections 2.3.3 and 2.3.4 of the draft EA lists BMPs and conservation measures related to Endangered Species Act (ESA)-listed species and water quality. This includes scheduling the in-water work window between 15 October and 15 February to avoid migrating ESA-listed salmon and monitoring for turbidity and pH changes during construction. The USACE will require the contractor to submit a spill prevention and countermeasures plan to prevent deleterious materials from entering the water. Further, the scheduling of the large lock closure (Section 2.3.2) considers the importance of minimizing disruption to navigation such that each lock closure within the in-water work window will be limited to 30 days with a navigation period of at least 15 consecutive days. Impact to recreation is mitigated by keeping the small lock open and maintaining public access across the Locks.

Mitigation: The recommended plan will result in unavoidable adverse impacts to the Lake Washington Ship Canal (LWSC) Historic District as there would be 100 percent loss of the original LLCG. To mitigate for these unavoidable adverse impacts, the USACE is developing a memorandum of agreement that documents the adverse effect (Sections 3.7 and 7.7 of the draft EA).

Public Review: Public review of the draft EA and FONSI will be completed February 2022. All comments submitted during the public review period will be responded to in the Final EA and FONSI.

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Treaty Tribes: The Muckleshoot Indian Tribe and the Suquamish Indian Tribe were contacted regarding the LLCG project and the USACE will continue to coordinate throughout the project to meet Tribal trust obligations. The Suquamish Indian Tribe expressed concerns with the in-water work window overlapping with the Tribal coho salmon fishery that takes place annually as early as mid-September and could extend to early November. It is expected that up to 10,000 adult coho salmon will pass the Locks on their annual migration. The USACE will supply additional project information and discuss construction logistics with the Suquamish Indian Tribe to avoid and minimize effects to the coho salmon fishery. Further coordination and consultation with both Tribes will occur throughout the construction effort.

Compliance:

a. Endangered Species Act:

The National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS), and the U.S. Fish and Wildlife Service (USFWS) are responsible for implementing the ESA of 1973. The USACE evaluated potential effects to endangered species in a Biological Assessment (BA) and determined that the proposed action would have minor and discountable effects from in-water noise and disturbance, lock dewatering, and potentially degraded water quality, in a limited area. Coordination with the USFWS and NMFS was initiated through the submission of the BA on 15 December 2021.

b. Manguson-Stevens Fishery Conservation and Management Act:

The BA also contained the USACEs' determination that the proposed action will not adversely affect Essential Fish Habitat for federally managed fish species in Washington waters.

c. Coastal Zone Management Act:

The USACE has determined that the proposed project is consistent to the maximum extent practicable with the enforceable policies of the Washington State Coastal Zone Management Program. The USACE prepared a Coastal Zone Management Act (CZMA) Consistency Determination outlining this determination for concurrence of the Washington Department of Ecology.

d. Clean Water Act:

Pursuant to both Section 404 of the CWA (33 USC 1344(f)(1)(b)) and Federal Regulations 33 CFR 323.4(a)(2), the USACE has determined that the proposed project falls within an exemption since the activity falls within the parameters of maintenance. Therefore, the repair does not require a Section 404(b)(1) evaluation or Section 401 certification.

e. National Historic Preservation Act:

On 12 May 2021, the USACE initiated consultation with the State Historic Preservation Officer (SHPO) and affected tribes with an area of potential effect (APE) letter. On 14 May 2021, the State Historic Preservation Office (SHPO) concurred with the APE. On 21 May 2021, the USACE sent the determination and findings letter to

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the SHPO, documenting the USACE finding of adverse effect to the LWSC Historic District by the demolition and replacement of the original center gate of the large lock. On 27 May 2021, USACE and SHPO staff had a teleconference to discuss the project. SHPO staff requested additional information regarding the APE, location of center gate in relation to the large lock and the demolition plan for the concrete surrounding the center gate on either side of the large lock. On 15 June 2021, the USACE sent a letter with the revised APE, and provided the additional information as requested. On 22 June 2021, the SHPO concurred with the revised APE and the USACE determination that the demolition and replacement of the original LLCG is an adverse effect. On 14 June 2021, letters were sent to the following identified consulting parties: City of Seattle Historic Preservation Program, Friends of the Ballard Locks, King County Historic Preservation Program, Historic Seattle, Muckleshoot Indian Tribe, and the Suquamish Indian Tribe. All consulting parties have declined to participate in the development of the Memorandum of Agreement (MOA). An MOA was signed 11 November 2021 for the mitigation of the adverse effect this project will have on the LWSC Historic District.

f. Other Significant Environmental Compliance:

All applicable environmental laws have been considered and coordination with appropriate agencies and officials has been completed.

Finding: All applicable laws, executive orders, regulations, and local government plans were considered in evaluation of alternatives. Based on the analysis presented in the EA, which has incorporated or referenced the best information available; the reviews by other Federal, State and local agencies, Tribes; input of the public; and the review by my staff, it is my determination that the recommended plan will not cause significant effects on the quality of the human environment. Therefore, preparation of an Environmental Impact Statement is not required.

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Date ALEXANDER “XANDER” L. BULLOCK
COL, Corps of Engineers
Commanding

DRAFT Environmental Assessment

Hiram M. Chittenden Locks Large Lock Center Gate Project

Lake Washington Ship Canal, King County, Washington

January 2022

US Army Corps of Engineers®
Seattle District

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Hiram M. Chittenden Locks Large Lock Center Gate Project

Draft Environmental Assessment

January 2022

Responsible Agency: The responsible agency for this maintenance project is the Seattle District, U.S. Army Corps of Engineers (USACE).

Abstract:

In accordance with the National Environmental Policy Act, this Environmental Assessment (EA) evaluates the impacts of the proposed large lock center gate (LLCG) replacement at the Hiram M. Chittenden Locks (Locks). The USACE operates and maintains the Lake Washington Ship Canal (LWSC) project, an eight-mile-long navigation channel located within the city of Seattle that extends from deep water in Puget Sound through Shilshole Bay, the Locks, Salmon Bay, Lake Union, Portage Bay and Union Bay to deep water in Lake Washington. The LWSC project includes the Locks, a navigation channel (often referred to as the LWSC or ship canal), and a reservoir that includes two natural lakes, Lake Washington and Lake Union. The reservoir is regulated for navigation and fish passage. The LLCG, commissioned in 1917, is over 100 years old. The LLCG has two leaves that swing out from the walls and meet in the center of the lock. The gate's design does not meet current safety standards and has exceeded its functional lifespan. Recent inspection shows the gate has excessive corrosion and wear and is dangerous to inspect due to confined spaces within the gate. The purpose of this project is to maintain efficient navigation through the large lock and facilitate safe routine visual maintenance inspections of the LLCG.

The recommended plan consists of replacing the LLCG with a single skin horizontally framed gate, which would maintain the functional integrity of the LLCG by replacing and modernizing the LLCG and associated components connecting the gate to the lock walls. This plan meets the purpose and need by maintaining reliable and efficient navigation through the large lock, meeting current safety standards, and allowing visual inspections without requiring entry into confined spaces.

The LLCG project would take up to four years to complete and could begin as early as 2022. All in-water work would occur during the established in-water work window between October 15 and February 15, which coincides with up to three potential navigation closures up to 30 days and/or vessel width and timing restrictions annually. Based on the analysis in the EA, the proposed project would not constitute a major Federal action significantly affecting the quality of the human environment, thus preparation of an environmental impact statement is not required.

THE OFFICIAL COMMENT PERIOD FOR THE DRAFT EA IS FROM January 12, 2022 TO February 11, 2022.

This document is available online at:
https://www.nws.usace.army.mil/Missions/Environmental/Environmental-Documents/

under "Hiram M. Chittenden Locks Large Lock Center Gate Project".

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Acronyms and Abbreviations

BA	Biological Assessment
BiOp	Biological Opinion
BMPs	Best Management Practices
CAA	Clean Air Act
CWA	Clean Water Act
dB	Decibels
DO	dissolved oxygen
EA	Environmental Assessment
Ecology	Washington State Department of Ecology
ECS	Emergency Closure System
EFH	Essential Fish Habitat
EO	Executive Order
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FONSI	Finding of No Significant Impact
GHG	Greenhouse Gas
LLCG	Large Lock Center Gate
Locks	Hiram M. Chittenden Locks
LWSC	Lake Washington Ship Canal
MIT	Muckleshoot Indian Tribe
MLLW	Mean Lower Low Water
MOA	Memorandum of Agreement
NAAQS	National Ambient Air Quality Standards
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRHP	National Register of Historic Places
PM	Particulate Matter
PN	Public Notice
RL	Received Level
SEL	Sound Exposure Level
SHPO	State Historic Preservation Office/Officer
SPCC	Spill Prevention Control and Countermeasures
SWPPP	Stormwater Pollution Prevention Plan
TTS	Temporary Threshold Shift
USACE	U.S. Army Corps of Engineers, Seattle District
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington State Department of Natural Resources

1 PROPOSAL FOR FEDERAL ACTION

This Draft Environmental Assessment (EA) evaluates the environmental effects of the proposed large lock center gate (LLCG) replacement at the Hiram M. Chittenden Locks (Locks).

1.1 Location of the Proposed Action

The Lake Washington Ship Canal (LWSC) project is located at 3015 NW 54th St., Seattle, King County, Washington, at Range 3 East, Township 25 North, Section 11. USACE operates and maintains the LWSC project, an eight-mile-long navigation channel located within the city of Seattle that extends from deep water in Puget Sound through Shilshole Bay, the Locks, Salmon Bay, Lake Union, Portage Bay and Union Bay to deep water in Lake Washington (**Error! Reference source not found.**). The LWSC project includes the Locks, a navigation channel (often referred to as the LWSC or ship canal), and a reservoir that includes two natural lakes, Lake Washington and Lake Union. The operation of the Locks allows commercial navigation and connectivity of the saltwater of Puget Sound to the freshwater of Lakes Union and Washington.

The Locks also allow the passage of recreational vessels and anadromous fish species. For years, logs and coal traversed the over 100-year-old locks. Today, it is smaller recreational boats that make the Locks the busiest lock in the nation in terms of vessel traffic. More than 40,000 boats typically pass through the Locks each year. Fish have also been navigating the Locks for as long as the Locks have been operating. In addition to the missions of navigation and environmental stewardship, the LWSC project is authorized for recreation, receiving approximately one million pedestrian visitors each year. The reservoir is regulated for navigation and fish passage.

The project area encompasses the large lock and area immediately upstream and downstream shown in Figure 1..

1.2 Project Authority

The LWSC project was initially authorized for construction by the Rivers and Harbors Act (RHA) of 1910 in accordance with House Document No 953 of the 60th Congress, first session, for the purpose of facilitating commercial navigation between Puget Sound and Lake Washington. This included construction of a dam, two locks, and the necessary accessory works at the entrance to Salmon Bay including a fish ladder. Construction occurred between 1911 and 1916 by the USACE.

Figure 1. Overview of the LLCG location at the Locks (yellow box) with an inset map to show location relative to Seattle. Other landmarks are labelled.

1.3 Project Purpose and Need

The purpose of this project is to maintain efficient navigation through the large lock and facilitate safe routine visual maintenance inspections of the LLCG. Over 40,000 vessels use the Locks annually, about 15,000 of which using the large lock, making the Locks the busiest in the nation (McDowell Group 2017). The large lock is 825 feet long with three miter gates: one gate at the upstream end, one in the center, and one at downstream end of the large lock chamber. The LLCG is referred to as a miter gate because it has two leaves that swing out from the walls and meet in the center of the lock at an angle (miter). The LLCG is used to divide the large lock chamber into two smaller chambers. This configuration allows for quicker and more water-efficient lockings, and provides redundancy for the large lock by allowing vessel transit in half the lock if either the upstream or downstream gates were to malfunction. The LLCG is also used by pedestrians and staff to cross the large lock chamber, as it is the quickest route across the facility.

The LLCG, commissioned in 1917, is over 100 years old. The need arises from the fact that the gate's design does not meet current safety standards and has exceeded its functional lifespan (i.e., the time the gate operates before extensive maintenance is required or design standards change). Recent inspection shows the gate has excessive corrosion and wear. In addition, the two leaves of the LLCG are a double skin design with internal buoyancy chambers. The double skin design presents a major challenge for inspections because the interior components of the gate cannot be visually inspected without staff entering the chambers, which are considered a confined space and a high hazard workspace. Activities such as welding to repair portions of the gate cannot be done safely in a confined space due to the potential for a fire in the buoyancy chamber that could jeopardize lives of the workers. The non-compliance with updated safety standards, that in turn results in the inability of maintenance staff to inspect the condition of the gate and the difficulty of performing maintenance safely and thoroughly within the inner chambers, creates a potential for gate failure without advance warning. Depending on the type of failure**,** loss of LLCG function could have negative consequences to navigation, and the upstream communities that rely on the large lock for transportation through unexpected and potentially indefinite large lock closures or delays.

2 PROPOSED ACTION AND ALTERNATIVES

2.1 Alternative 1 – No Action

Under this alternative, there would be no repair to the gate or associated components; wear, corrosion, and deterioration of the system would continue unchecked on the LLCG which is beyond its functional lifespan. Should the gate or its components fail, and the gate leaves cannot be moved to the side of the lock chamber into recesses on each wall, then the large lock would be closed indefinitely until repairs could be made or the LLCG removed from the lock. A lock outage duration for emergency repairs or gate removal is unknown, but it is anticipated that the required mobilization and repair time could severely disrupt navigation and the maritime industry in Seattle. In circumstances where the gates can be moved, extended delays in operations and additional wear on lock systems would occur from the need to only conduct full lockages. In addition, the current gate design does not allow inspection and maintenance within the confined spaces of the buoyancy chambers and increases the risk of losing the redundancy of the large lock gates. This alternative does not meet the purpose and need because it does not reliably or efficiently maintain navigation and the LLCG would remain difficult to visually inspect; therefore, this is not an acceptable alternative. Nevertheless, the no-action alternative is carried forward for the sole purpose of comparative evaluation against the preferred alternative.

2.2 Alternative 2 – Rehabilitate LLCG

Under Alternative 2, rehabilitation of the gates and associated components would be performed to fix components that are currently experiencing deterioration. The two LLCG leaves would be removed and taken to an offsite facility for rehabilitation. Upon completion, the leaves would be returned to the lock and reinstalled.

Construction at the Locks for Alternative 2 would be limited because the LLCG rehabilitation would take place offsite. The large lock would be closed for about 15 days during the established in-water work window (October 15-February 15) to modify the existing center miter gates by installing hardware connections to allow removal of the gates, as necessary, so the gate leaves can be removed. A fender system would be installed in both gate leaf recesses to protect the concrete.

Removal of the LLCG is assumed to occur prior to work on the adjacent lock walls. Market research indicates there is limited availability of barge mounted cranes in the Seattle area that can fit in the lock chamber, so a gantry crane anchored across the chamber may be required. A gantry crane is a specialized crane that straddles a workspace—in this case, the crane would straddle the large lock. The crane is expected to be at least a 250-ton crane so that it can lift the gate from a stand-alone barge, and place into the gate recess. It is not anticipated that a land-based crane would be used as the boom height required to place the gate leaf on the southern chamber wall would push the crane size beyond accessibility limits (i.e., the crane would not reach the opposite side of the lock safely) and lock wall stability limits. If a crane were not used to remove the gate leaves from the large lock chamber, then the gate leaves would be floated off the connection points or transported via barge to a dry dock or other facility for transport. Rehabilitation of the LLCG would be performed at an off-site location, and could take approximately two years. During rehabilitation, the full large lock chamber would be used for navigation while pedestrian and bicyclist traffic would be routed over the remaining upper and lower large lock gates. Reinstallation of new miter gates via crane is one the last scheduled activities, so there is potential that a crane may be necessary at the start and end of the construction period. Similar to LLCG removal, the installation would take about 15 days during the in-water work window. The fender system would be removed from the gate recesses before the gate leaves are installed.

Rehabilitation would be difficult for several reasons. First, the metallurgy of the gates is unclear and all components that have not already been replaced are experiencing wear requiring replacement. Second, the delaminated, riveted steel is susceptible to grease penetration which prevents quality welds and bonds so typical rehabilitation techniques are impractical. Third, from a lifecycle engineering perspective, disassembly and rebuilding the majority of the LLCG would approach the cost of building new gates. Finally, repairing the gate may lead to poor design elements being carried forward as historic geometry constraints from the original design require replacement in kind.

During repairs, the gate would have to be handled in a way that puts loads onto the gate structure it was not designed to carry (e.g., torsion while lifting the gate) resulting in damage to the gate. Retrofitting the gate structure to carry these loads would be complex and costly. A rehabilitated gate would only have a 40-year life expectancy, compared with a 100-year lifespan of a new gate, while nearing the cost of a full replacement; therefore, it is not cost-effective to rehabilitate the gate. Retaining the original double skin gate design with buoyancy chambers would not solve maintenance or safety issues. This alternative does not meet the purpose and need because it does not meet current safety standards. It is therefore not an acceptable alternative and has not been carried forward in the analysis.

2.3 Alternative 3 – Replace LLCG (Preferred Alternative)

This alternative replaces the LLCG and associated components with modern equipment designed to have a lifespan of 100 years or more. This gate design is a single-skinned, horizontally framed miter gate (Figure 2). This alternative would require redesign and replacement components that hold the gate in

place such as the pintle bearing, quoin blocks, and gate anchorages. Modification of the existing concrete along the lock wall would also be necessary to accommodate the new gate design. A contractor would be used to finalize the design details, exact construction methods, and the construction schedule. The construction methods and schedule presented below are the range of potential options available to the contractor. Construction at the Locks for Alternative 3 would be limited to the established in-water work window (October 15-February 15).

2.3.1 Design and Construction Elements

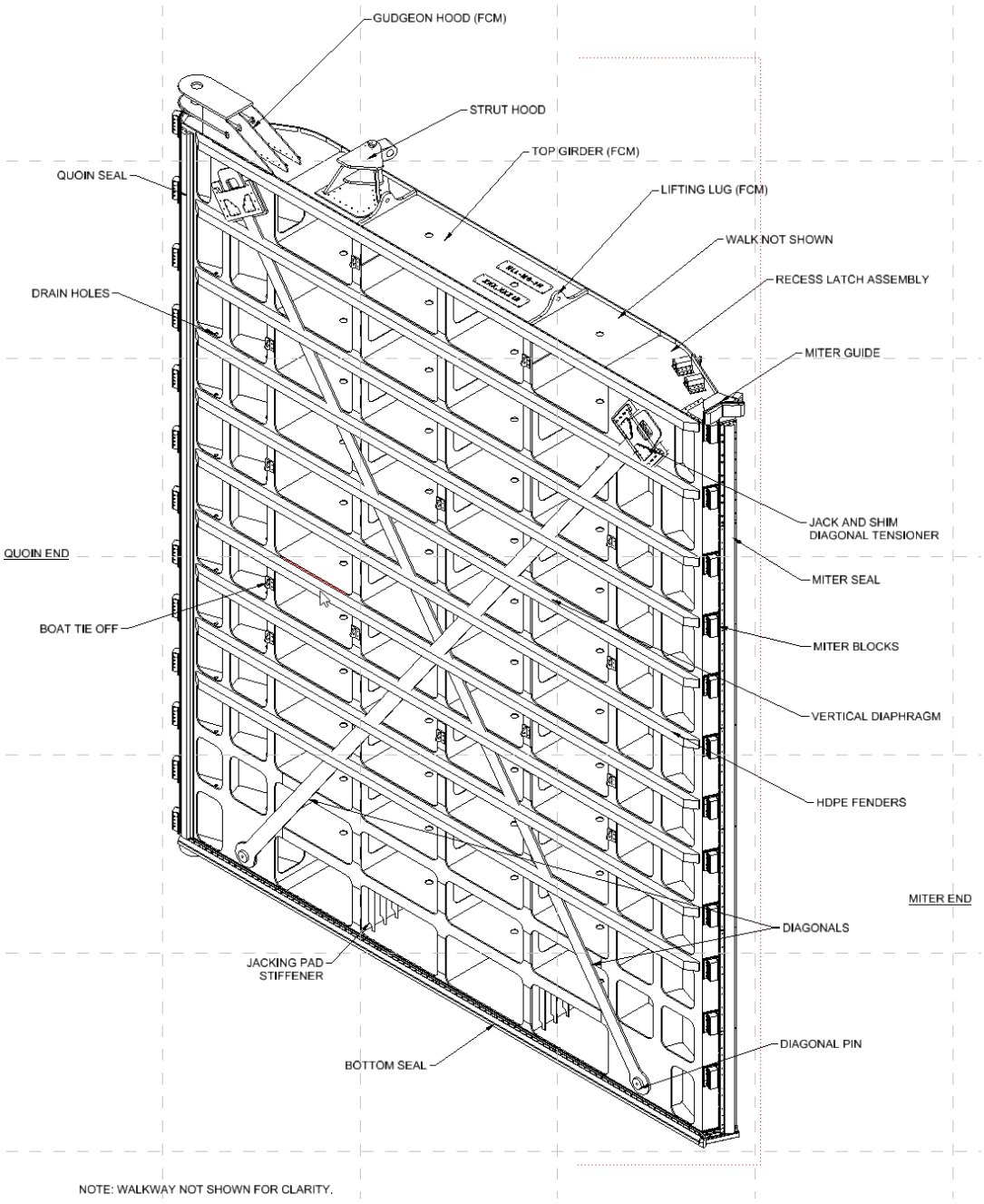
The new LLCG would be the same dimensions as the existing LLCG. The single sided skin plate design would allow access to all members for inspection and potential maintenance (Figure 2). The number and design of the horizontal girders was selected to reduce the overall weight of the gate and help reduce labor needed to adjust them. The structural steel for the miter gates is a fracture-resistant steel and incorporates stress and fatigue resistant details such as smooth transitions between steel of different thicknesses and weld locations moved to low stress areas.

Designs from other locks and dams were used to develop the design of a new LLCG, in conjunction with data specific to this gate and innovative techniques used successfully for other projects. Other gate types from the double-skinned gate design were considered. Following project research and modelling during design, a single-skinned, horizontally-framed miter gate was selected due to several factors: gate weight, complexity of constructing a new gate, long-term maintenance, safety, and cost (**Error! Reference source not found.**).

Gate replacement would necessitate redesign of the associated LLCG components that connect the LLCG to the lock walls, like the pintle bearing and gate anchorages. The existing pintle base, where the gate leaf sits and is able to pivot for opening and closing, and surrounding concrete would be completely removed and replaced within the same footprint. A new gate pintle ball that sits in the pintle base would have self-lubricating bearing materials (i.e., only an ultra-smooth surface) that do not require petroleum grease. The LLCG is operated by direct acting hydraulic cylinders that are attached to a connection point on the top of the gate. The operating machinery would be disconnected from the decommissioned gate and reconnected to the new gate. The stainless bushing would be replaced with a self-lubricated bushing, which would eliminate greasing requirements.

Performing certain types of repairs, such as pintle ball replacement, may require the gate to be jacked (i.e., lifted and held) in place to allow access to gate components. The miter gate leaf has areas on the bottom to place jacks and support or lift the gate. However, the existing gate recess at the bottom of the lock has a sloped concrete surface that prevents the jacking cylinder from being located under the center of gravity of the miter gate. This sloped concrete would be removed in the areas of the jack locations to provide a stable surface and adequate gate support. Fabricated components required to both jack and provide stability of the gate would be provided to USACE for future maintenance.

There is a recess at the bottom of the lock that has a sill for the gate leaves to seal against. A new sill seal, which is bolted to the sill of the recess, would be a stainless-steel sealing plate that is filled in with grout. Stainless-steel is expected to be more durable than the previously used High Density Polyethylene or oak timber material.



The new miter gate walkway would match the existing walkway dimensions, and configuration (Figure 3). However, the material of the new walkway plate would be aluminum instead of matching the existing steel plate. This would make the new plate lightweight so it can be removed and allow for maintenance and inspection. The new walkway would be bolted onto the gate instead of welded to facilitate removal of the walkway, if necessary.

The existing anchorage connection casting that connects the gate leaves to the lock walls would be replaced (Figure 4). The contractor would remove concrete around the connection casting to replace the connection, then install new concrete. Concrete debris would not be allowed to enter the water during removal.

The LLCG leaves sit in recesses in the lock walls when the LLCG is fully open. After the LLCG leaves are removed, vessel traffic would eventually be able to pass the area of the recess. With the LLCG leaves out of the recesses, the concrete at the ends would be susceptible to damage from passing traffic. A fender system that would likely consist of steel beams to act as guides when a cofferdam is not in place would likely be used to make the LLCG leaf recesses continuous with the wall and to avoid damage from vessel traffic.

Alternative 3 meets the purpose and need by maintaining reliable and efficient navigation through the large lock and meeting current safety standards which allow visual inspections without requiring entry into confined spaces.

2.3.2 Scheduling and Potential Methods

Construction duration would depend on construction methods selected by the contractor, but construction is expected to take place while the large lock is dewatered, within a localized cofferdam, or a combination of both. Requirements for lock outages and cofferdams would be articulated in contracting documents. The exact construction methods and associated schedule are not known until a contractor is chosen. However, timing of construction considers the importance of minimizing disruption to navigation. Once finalized, a notice to mariners would be published alerting vessel operators to large lock closures and restrictions, in addition to other public communications on the USACE website, Locks Facebook page, and stakeholder meetings. Furthermore, construction would have the following to facilitate navigation:

- One to three large lock dewatering outages between October 15 and February 15 each year, with each outage lasting as long as 30 days.
- Between each dewatering, there would be a navigation period of at least 15 consecutive days.
- Up to 90 consecutive days of temporary cofferdam use on either side of the large lock chamber between October 15 and February 15 each year.
- Only one approximately 15-foot-wide cofferdam would be used at a time, which restricts the available large lock width to about 65 feet wide for vessel passage.
- Vessels 60 feet wide or narrower could still use the large lock when workers are not in the cofferdam (i.e., 6:00 pm to 6:00 am).

Depending on when a contract is awarded, the earliest that construction could begin is the fall of 2022. Given in-water work window constraints and gate fabrication time frames, the total project duration is estimated to take about four years to complete. Construction and inspections would occur intermittently over this duration to accommodate in-water work windows and navigation. To minimize impacts of potentially multiple dewaterings, the large lock routine annual maintenance dewatering event would be part of a dewatering outage each year. This period includes time for USACE to perform the dewatering (approximately three days) and rewatering (approximately two days) of the large lock.

Construction activities for the use of cofferdams and dewatering events are divided into several work periods. This allows the large lock to remain open to navigation during certain construction events when it is safe to do so and to minimize impacts to navigation (Table 1). These work periods are classified as:

- Navigation **Restriction** Periods: Navigation use of the lock chamber would be prohibited while workers are inside the cofferdam to allow safe work inside a temporary cofferdam. At a minimum, vessels would be allowed to transit the lock chamber from 6:00 pm to 6:00 am. Vessels 60 feet wide or narrower can use the large lock during the width restriction of 65 feet in place to avoid potential collision with the temporary cofferdam.
- Navigation **Closure** Periods: No vessels may use the large lock chamber. At this time, the total duration of any given closure would not exceed 30 days, with at least 15 days between closures. Generally, navigation closure periods would be longer, up to 30 days, if cofferdams and navigation restriction periods are not used. The final duration would be determined by USACE based on feedback from the Maritime community and the public, and contractor proposals.
- Navigation **Passage** Periods: Normal navigation is allowed.

Table 1. Example schedule with the greatest potential number of large lock closures, restrictions, and unrestricted navigation passage periods. All durations are approximate, and 2022 is the earliest potential first year of construction.

Date	**Greatest potential number of large lock closures, restrictions, and unrestricted navigation passage periods**
Navigation **Closure** and/or **Restriction** 2022 October 15, 2022 through February 15, 2023	A combination of the following closures and/or restrictions may be needed: Up to three 30-day dewaterings with at least 15 days of navigation in between each outage Up to 90 days of work behind a temporary cofferdam
Navigation **Passage** 2023 February 16, 2022 through October 14, 2023	No width restrictions or scheduled dewaterings
Navigation **Closure** and/or **Restriction** 2023 October 15, 2023 through February 15, 2024	A combination of the following closures and/or restrictions may be needed: Up to three 30-day dewaterings with at least 15 days of navigation in between each outage Up to 90 days of work behind a temporary cofferdam (if used)
Navigation **Passage** Period 2024 February 16, 2024 through October 14, 2025	No width restrictions or scheduled dewaterings
Navigation **Closure** and/or **Restriction** 2024 October 15, 2024 through 15 February 2025	Up to three 30-day dewaterings with at least 15 days of navigation in between each outage Up to 90 days of work behind a temporary cofferdam (if used)
Navigation **Passage** 2025 February 16, 2024 through October 14, 2025	No width restrictions or scheduled dewaterings
Navigation **Closure** 2025 October 15, 2025 through February 15, 2026	Up to three 30-day dewaterings with at least 15 days of navigation in between each outage Up to 90 days of work behind a temporary cofferdam (if used)

Construction activities to replace the concrete and gate appurtenances may involve drilling, sawing, grinding, hammering, compressed air or water, and power tool use, but are not limited to these methods. Any of the available methods might generate loud noise, percussive noise, concrete dust, sparks, and a small amount of contained water laden with concrete particles. Discharge of water that may contain materials such as concrete would be managed to comply with water quality requirements. To replace the LLCG anchorage connection castings at the top of the wall, concrete would be removed and replaced using similar techniques but can be performed from the top of the wall. Areas needing new concrete may have a form placed to contain and shape the concrete as it cures. The concrete would be fully cured before contacting water. During concrete work, uncured concrete would not be allowed to enter the water and monitoring would occur to avoid impacts to water quality.

One of the first construction activities would be to erect a heavy lift crane over the large lock, if necessary, and remove the existing LLCG leaves. To allow removal of the LLCG leaves, the existing center

miter gates would be modified by installing hardware connections, if necessary. The crane would likely be disassembled and removed from the site unless needed for removal and installation of the LLCG. Once the gate leaves are removed, the work would occur in a fully dewatered lock chamber, within a localized cofferdam, or a combination of both.

If used, a temporary cofferdam would be placed in the large lock, secured to the lock wall, dewatered with pumps, and then construction activities performed in the dry (Figure 5). Divers may assist with installation if it occurs in the water. If cofferdams are not used, Navigation Restriction Periods would not be needed except for removal and installation of the LLCG. If temporary cofferdams are used, design, fabrication, dewatering, and removal of the cofferdam would be the responsibility of the contractor with approval of USACE, but there are general cofferdam characteristics to expect (Figure 5). A typical localized cofferdam would be a three-sided, open bottom cofferdam that would bolt to the lock wall, similar to the example in Figure 5. Highly compressible neoprene seals would slow flow between the cofferdam and the wall, allowing maintenance pumping to maintain the area in the dry. Because the cofferdam would be in the large lock with vessels going past at times, safety requirements include reflective tape around the top perimeter of the cofferdam, flashing beacon lights at the corners or the cofferdam, and lighting of the cofferdam area.

Fender systems would be provided, installed, maintained, and removed by the contractor. The contractor would install fenders in the LLCG leaf recesses at the end of the in-water work period to reduce the risk of damage to new or existing features during navigation passage until the following in-water work period. The fender system can be installed in the wet or the dry and may require dive operations if installed in the wet. The fender system would be removed from the miter gate recesses, likely by crane, when construction is needed. After completion of the work within localized cofferdams, but prior to the installation of the new gate leaves, fender systems would be installed in both gate recesses.

Figure 5. (A) Localized cofferdam example. (B) Example of an installed localized cofferdam. (C) Example of the inside of a localized cofferdam.

After the LLCG is fabricated and construction elements (Section 2.3.1) are completed, the LLCG would be delivered. For installation of the LLCG, a heavy lift crane would be erected, and fenders would be removed from the LLCG recesses in each wall. The LLCG leaves and the gate anchorages and machinery connections to the leaves would be installed without dewatering the large lock. After installation, the lock chamber would be dewatered to perform miter gate sill work and adjust/commission the LLCG. The heavy lift crane would be removed from service to prepare the lock chamber for rewatering and normal customary use of the lock. All equipment would be removed from the large lock and the chamber would be rewatered. All testing (e.g., fit and function of the LLCG and controls) associated with LLCG would be completed during this period.

To complete the work within required in-water work period (October 15 to February 15), minimize impacts to navigation, and assure the large lock ready for customary use, multiple work shifts may be required, including 24-hours a day, as well as seven days per week. All construction activities would comply with local noise and light ordinances and noise variances would be obtained as needed. An example construction schedule appears below incorporating either a combination of closures/coffer dams or just closures (Table 1).

2.3.3 Best Management Practices

No compensatory environmental mitigation is proposed for this action as no loss of wetlands, no jeopardy to ESA-listed species, and no appreciable impacts to commercially important species are anticipated to occur based on the analyses in this document. Mitigation for an adverse effect to the LWSC Historic District is described in Section 3.7. USACE would implement several avoidance and minimization measures to ensure environmental impacts are no greater than minimal, short-term effects. The primary measures to avoid and minimize impacts are the timing of in-water work, conservation measures, and best management practices (BMPs).

BMPs include the following:

- The contractor would be required to submit a spill prevention control and countermeasures (SPCC) plan prior to the commencement of any construction activities, including spills of concrete. The SPCC plan would identify and recognize potential spill sources at the site, outline BMPs and secondary containment, delineate responsive actions in the event of a spill or release, and include notification and reporting procedures. Implementation of the SPCC plan would minimize the effect of construction activities on the quality of surrounding waters including, but not limited to, the following measures:
    1. A spill containment kit, including oil-absorbent materials would be kept on-site during construction and would be deployed for any spill or if any oil product is observed in the water. The contractor must be trained in its use. If a spill were to occur, work would be stopped immediately, steps would be taken to contain the material, and appropriate agency notifications would be made.
    2. Secondary containment would be used for all equipment on land and on boats or barges. This includes mechanical equipment, hydraulic concrete or grout pumping or mixing equipment, etc.
    3. The contractor would regularly check fuel hoses, oil drums, oil or fuel transfer valves, fittings, etc. for leaks, and would maintain and store materials properly to prevent spills, and a schedule for these checks would be provided.
    4. Equipment that enters the surface water would be maintained to prevent any visible sheen from petroleum products appearing on the water.

5. The contractor would regularly check all equipment from the source of concrete to placement locations, including hoses, hose clamps, drums, secondary containment berms, pans, and other containment, transfer valves, fittings, forms, grout bags, etc. for leaks, and would maintain and store materials properly to prevent spills. A schedule for these checks would be provided.
6. Equipment would be cleaned prior to construction so that it is free of external petroleum-based products while used around the waters of the state. Accumulation of soils or debris would be removed from the drive mechanisms (wheels, tires, tracks, etc.) and the undercarriage of equipment prior to its use.

- There would be no discharge of oil, fuels, or chemicals to surface waters, or onto land where there is a potential for reentry into surface waters.
- Environmentally-friendly fuel, oils and grease oil would be used in machinery stationed on a boat or barge.
- Refueling of equipment such as generators and forklifts would not occur in the project area (i.e., the lock chamber) and spill containment trays would be used during refueling. Vessels would be refueled offsite in accordance with applicable regulations.
- The contractor would prevent any petroleum products, chemicals, or other toxic or deleterious materials from construction equipment and vehicles from entering the water.
- Wash water resulting from wash down of heavy equipment or work areas would be contained for proper disposal, and shall not be discharged into state waters unless authorized through a state discharge permit.
- No cleaning solvents or chemicals used for tools or equipment cleaning would be discharged to ground or surface waters.
- The contractor would be required to submit a stormwater pollution prevention plan (SWPPP) prior to construction using BMPs pursuant to DR 16-2009, Construction Stormwater Control Technical Requirements, to control stormwater impacts during construction.
- In the event of a discharge of oil, fuel, or chemicals into state waters, or onto land with a potential for entry into state waters, containment and cleanup efforts shall begin immediately and be completed as soon as possible, taking precedence over normal work. Cleanup shall include proper disposal of any spilled material and used cleanup materials. The Locks Environmental Compliance Coordinator (ECC) is responsible for spill reporting and response.
    1. Immediately notify Ecology's Regional Spill Response Office at 425-649-7000 and the Washington Department of Fish and Wildlife (WDFW) with the nature and details of the problem, any actions taken to correct the problem, and any proposed changes in operation to prevent further problems.
    2. Immediately notify the National Response Center at 1-800-424-8802, for actual spills to water only.
    3. Notify Ecology's Regional Spill Response Office at 425-649-7000 immediately if chemical containers (e.g., drums) are discovered on-site or any conditions present indicating disposal or burial of chemicals on-site that may impact surface water or ground water.
- Work causing distressed or dying fish, discharges of oil, fuel, or chemicals into state waters or onto land with a potential for entry into state waters, is prohibited. If such work, conditions, or

discharges occur, the contractor shall notify Ecology and the Locks ECC and immediately take the following actions:

1. Cease operations at the location of the non-compliance.
2. Assess the cause of the water quality problem and take appropriate measures to correct the problem and/or prevent further environmental damage.

- Workers would monitor for visual turbidity plumes and discharge during in-water work. If turbidity was identified, turbidity monitoring and pH monitoring locations would be adjusted to capture the plume.
- All concrete washout locations would be identified by the contractor. Washout on-site would not be allowed to enter water, be dumped on land, and would not be within 50 feet of storm drains, open ditches, or water bodies. Washout would be contained in leak-proof containers for proper recycling, treatment, and/or disposal. If washout is disposed of at a municipal wastewater treatment plant, the plant would be contacted by the contractor so that any pretreatment requirements can be followed.
- Concrete process water and waste materials would be captured and contained by the contractor. Discharge of concrete process water or waste materials to the ground or surface waters is not allowed.
- Any new concrete installed would be texture and color matched to the surrounding existing concrete.
- The contractor would retrieve any debris generated during construction with a skiff and net. Retrieval would occur at slack tide or when current velocity is low.

2.3.4 Conservation Measures

Implementation of the following conservation measures is dependent on the final work period and on the contractor's evaluation of what are feasible and infeasible actions.

- Schedule in-water work for October 15 through February 15, to avoid migrating salmon.
- Turbidity and pH would be monitored to ensure construction activities are in conformance with the protocols and criteria in the water quality monitoring plan (Appendix A). Work would be slowed or halted if turbidity exceeded required thresholds until measurements returned to background levels. BMPs would be implemented if pH exceeded required thresholds until measurements returned to background levels.
- Regular briefings would be held with USACE construction oversight team on environmental conditions and expected work. The briefings would include review of BMP effectiveness for turbidity control, fish behavior, pH control, spill prevention, water quality monitoring, and any planned changes in activities or new activities that could impact fish migration.
- Construction is expected to occur during daylight hours, but if work occurs at night then lighting for safety of workers would be required and would be minimized to the extent feasible to conduct the work safely. Directional lighting would be used to focus light on the work area and minimize illuminating surrounding areas consistent with any relevant shoreline management plan with the city of Seattle.

3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section evaluates impacts to various resources by the different alternatives carried forward for evaluation. Table 2 identifies the resources evaluated for detailed analysis with a rationale for inclusion or exclusion. Resources are excluded from detailed analysis if they are not potentially affected by the alternatives or have no material bearing on the decision-making process.

Table 2. List of resources considered for detailed effects analysis and rationale for inclusion or exclusion.

Resource	Included in Detailed Analysis (Y/N)	Rationale for inclusion or exclusion
Navigation and Socioeconomic Conditions	Y	The purpose of the project is to maintain structures associated with the large lock, which passes over 40,000 vessels annually.
Hydrology and Geomorphology	N	Replacement or rehabilitation of the LLCG would not change water management (hydrology). The project takes place within the large lock chamber, a concrete structure, so there would be no effect to geomorphology.
Groundwater	N	The proposed action is limited to the subtidal environment. No groundwater would be affected.
Water Quality	Y	Analysis is required to determine the intensity of potential changes to turbidity and pH during the proposed action's construction phase.
Air Quality	Y	The air-pollutant concentrations in the project area have consistently been below the National Ambient Air Quality Standards; however, an analysis of pollutants emissions from the proposed construction is necessary to disclose to the public.
Greenhouse Gas Emissions	Y	Emissions that would occur during the proposed construction would be analyzed and disclosed to the public.
Underwater Noise	Y	The proposed action has the potential to impact sensitive noise receptors during construction, including fish and wildlife. Analysis is required to determine the intensity of effects. Noise impacts to fish and wildlife would be evaluated under the fish and wildlife sections (Sections 3.4 and 3.5).
Airborne Noise	N	Airborne noise from the action would be attenuated by distance from the source to any sensitive receptors and would not be audible above ambient noise of Locks activities. Wildlife species in the project area are assumed to be habituated to noise of the Locks. Noise from construction adhere to the city of Seattle noise ordinances and variances (if needed).
Hazardous, Toxic, and Radiological Waste	N	There are no known or suspected contaminants in the concrete of the large lock.
Benthic Organisms	N	The project is located within an engineered concrete basin that lacks natural substrate. Contact with the walls and floor of the large lock would be minimal and would not affect the benthic macroinvertebrate populations in the large lock, which consist of barnacles and mussels attached to the concrete.

Resource	Included in Detailed Analysis (Y/N)	Rationale for inclusion or exclusion
Fish	Y	Many different fish species may be present. Analysis is required to determine which species would be present, the intensity of effects, and how to avoid or minimize effects (Section 3.5).
Wildlife (birds and mammals)	Y	Wildlife species may be present. Analysis is required to determine which species would be present, the intensity of effects, and how to avoid or minimize effects (Section 3.4).
Vegetation	N	There is no aquatic vegetation on the concrete infrastructure or in nearby waters. Impacts to aquatic vegetation is not anticipated.
Threatened and Endangered Species	Y	The proposed action may affect protected species in the project area. Analysis is required to determine the impacts of effects (Section 3.6).
Invasive Species	N	This project has no effect to the risk for introduction of invasive species. Standard measures to prevent the introduction of invasive species from outside sources on maintenance equipment would be used for construction, and introduction of invasive species is not anticipated.
Cultural Resources	Y	Analysis is required to determine the extent of any effects the proposed project would have on the LWSC Historic District that is listed on the National Register of Historic Places (NRHP; Section 3.7).
Indian Trust Assets	Y	The project area is within treaty-reserved fishing areas, called Usual and Accustomed areas. No substantial negative effects are anticipated, but analysis and coordination are required to avoid and minimize effects (Section 7.122).
Aesthetics	Y	The proposed action would permanently affect the appearance of the LLCG, a historic structure. Analysis is required to determine the extent of potential effects (Cultural Resources; Section 3.7).
Recreation Resources	Y	Public access to land-based recreation within the project area would not be impacted during construction. Boat traffic is analyzed under Recreation (Section 3.8). Analysis is required to determine the impacts of effects.
Public Services and Utilities	N	The proposed action would have no substantial effect on electricity, water, wastewater and stormwater collection, sewer and solid waste, natural gas, oil/petroleum, or telecommunications services.
Public Health and Safety	N	No impacts to public health or safety are anticipated because emergency vessel navigation through the small lock would not be affected.

3.1 Navigation and Socioeconomic Conditions

Typical socioeconomic analysis considerations include employment, population, income, economic growth, and public infrastructure. The Northwest Marine Trade Association estimated there are 200 businesses that directly or indirectly depend on the Locks. These include marine services and manufacturing, fishing fleets that access marine services and moor in fresh water, Tribal fisheries, shipping companies, passenger cruise companies, and recreational and scientific vessels (McDowell Group 2017). Approximately 82 percent of vessels are recreational. Of the 18 percent non-recreational vessels, most are towboats (46 percent), followed by commercial fishing vessels (21 percent), passenger

boats/ferries (15 percent), government vessels (8 percent), and cargo vessels/crew boats (8 percent; McDowell Group 2017).

The Locks provide services and recreational opportunities to the public such as emergency vehicle access, maintenance of public infrastructure like the Washington Route 520 and I-90 bridges, and movement of equipment and materials for infrastructure projects (McDowell Group 2017). Visitor spending in the area is estimated to be over $25 million. This number represents the amount visitors spent in the surrounding 30 miles from the Locks.

The reservoir shoreline has been extensively developed for residential and commercial purposes. The shoreline contains houseboats, private docks, marinas, and industrial facilities (McDowell Group 2017). There were 2,737 docks in Lake Washington in 2000 (Toft 2001). Moorage, marine services, and saltwater access made possible by the Locks support an estimated $41.2 billion in gross business sales annually.

Of the 2,190,200 residents in King County, the median household income is $78,000 and the top employment sectors are information/technology, admin (other services), and government/education (King County 2018). The Locks are located south of the Ballard neighborhood in Seattle, Washington, approximately one mile southeast of Shilshole Bay. The Locks are an important connection for pedestrian and bike commuters between the neighborhoods of Ballard and Magnolia, and between Puget Sound and Lake Washington.

3.1.1 Alternative 1 – No-Action Alternative

Under this alternative, there would be no repair to the gate or associated components; wear, corrosion, and deterioration of the system would continue unchecked on the LLCG which is beyond its functional lifespan. Should the gate or its components fail, and the gate leaves cannot be moved to the side of the lock chamber into recesses on each wall, the large lock would be closed indefinitely to navigation until repairs can be made or the LLCG removed from the lock. A lock outage duration for emergency repairs or gate removal is unknown, but it is anticipated that the required mobilization and repair time would disrupt navigation and the maritime industry in Seattle. Pedestrians and bikers would be unaffected because they could cross over the other two large lock gates. Some local businesses reported that unexpected closures of several days to weeks would affect their businesses, with closures over three months or during seasonal activities such as fishing potentially having a greater effect (McDowell Group 2017). Depending on the duration(s) and timing, unscheduled navigation outages could have a substantial effect on communities served by this transportation connection.

3.1.2 Alternative 3 – Replace LLCG (Preferred Alternative)

Alternative 3 would maintain navigation and socioeconomic conditions. The upper and lower large lock gates would remain available for pedestrian and bike commuters without interruption. During construction, the small lock would be available to vessels for navigation. The large lock would have scheduled closures and if a cofferdam is used may periodically restrict the large lock width to 65 feet wide to facilitate construction, which means only vessels 60 feet wide or less could use the lock during the 65-foot navigation restriction. According to historical commercial vessel data, use of a temporary cofferdam that creates a 65-foot width restriction could affect fewer than ten commercial vessels during the in-water work window, which represents less than one percent of the commercial traffic through the large locks from October 15 through February 15. Pedestrian and bike commuter traffic would continue as normal over the upper and lower large lock gates. Compared to the No-Action alternative, Alternative 3 has scheduled closures rather than unscheduled closures (Table 3).

Table 3. Comparison of large lock closures among alternatives.

Alternative	Large Lock Closure(s) and Restrictions
No Action	Unscheduled closure(s) for an undetermined amount of time in the event of center gate failure.
Alternative 3	Up to three 30-day closures between October 15 and February 15 annually for four years. Closures would have 15 days of navigation between them. A 65-foot width navigation restriction if a cofferdam is installed October 15-February 15 over four years. Vessels 60 feet wide or less could use the lock during non-construction hours while a cofferdam is installed.

To minimize effects to commercial vessels, a notice to mariners would be published alerting vessel operators to large lock closures and restrictions, in addition to other public communications on the USACE website, Locks Facebook page, and stakeholder meetings to collect input on how to minimize effects to commercial vessels. This would allow lock users to plan around the closures thereby minimizing the disruption to their business compared to an unplanned outage which would occur under Alternative 1 (No-Action). The continued operation of the large lock would allow the Locks to support its navigation function and mission. Effects of the proposed action to navigation would be temporary with a long-term benefit to the region.

3.2 Water Quality

Under the Clean Water Act (CWA), Washington State Department of Ecology (Ecology) establishes standards for physical parameters of water, such as temperature, pH level, dissolved oxygen (DO), and chemical concentrations. Waters that do not meet standards are considered “polluted waters.” Polluted waters are placed on a 303(d) list that Ecology regularly publishes (in reference to Section 303(d) of the CWA). Waters with signs of diminished health but still meet standards are “waters of concern” on the 303(d) list. Categories range from Category 1 (meets tested standards for clean waters) to Category 5 (polluted waters that require a water improvement project).

Ecology classifies the waters of Shilshole Bay as “Extraordinary Quality” (WAC 173-201A-612, Table 612). That means the project area contains extraordinary quality salmonid and other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning. From the current Environmental Protection Agency (EPA)-approved 2015 Ecology 303(d) list, water below the Locks starting near the railroad bridge and downstream is listed for dissolved oxygen (category 2) and bacteria (category 5). Salmon Bay above the Locks is on the 303(d) list for lead, pH (based on measurements upstream of the Locks near Lake Union), aldrin (a pesticide), and bacteria (all category 5).

Physical parameters of water are regulated because they relate to healthy habitats for fish, invertebrates, and aquatic plants. Turbidity refers to the clarity or clearness of the water. The greater the amount of total suspended solids in the water, the murkier it appears, and the higher the measured turbidity. Turbidity is regulated because it can affect the amount of sunlight, growth, and respiration. The pH measures how acidic or basic water is. A pH of 7 is considered neutral, while above 7 is basic and a pH below 7 is acidic. Like turbidity, pH is regulated because is influences growth and behavior of plants and animals that live in water.

3.2.1 Alternative 1 – No-Action Alternative

Under the No-Action Alternative, there would be no repair to the gate or associated components; wear, corrosion, and deterioration of the system would continue unchecked on the LLCG that is beyond its functional lifespan. This Alternative is unlikely to result in effects to water quality because failure of the gates would not result in turbidity or pH changes. Securing the gates to the side, gate removal, or an emergency repair would adhere to BMPs for water quality protection, such as those listed in Section 2.3.3. The saltwater drain, fish ladder, small lock, and spillway would continue to operate normally so salinity and temperature would not be affected. For these reasons, the No-Action Alternative would not have a substantial effect on water quality.

3.2.2 Alternative 3 – Replace LLCG (preferred alternative)

Short-term, localized project-related increases in background turbidity levels and pH may occur during concrete work that occurs behind a temporary cofferdam. Concrete flour (very finely ground concrete particles) produced during concrete drilling or sawing could increase the turbidity or pH of the water if it is present in high enough quantities in the cofferdam discharge water. The maximum allowable increase above naturally occurring turbidity and pH for waters designated as "Extraordinary Quality" (i.e., the designation of Shilshole Bay) is 5 nephelometric units and 0.2 units, respectively, under State law (WAC 173-201A-612, Table 612).

Turbidity and pH would be monitored at a background location that is not influenced by construction (likely to the northeast) and downstream of the project site during construction to capture changes to water quality. If turbidity or pH exceed state water quality standards, particulate-generating activities and concrete work would be slowed or halted, and construction methods would be changed until these standards are met. The contractor would check that all appropriate BMPs are in place to prevent concrete spills or leakage into the water, such as checking the concrete pipes, pipe connections, secondary containment, and transfer valves on land and in the water for leaks. Stopping work for a water quality exceedance would be coordinated with the contractor so that a stoppage can be done safely.

BMPs would be used to minimize turbidity and pH increases caused by any potential concrete entering the water (Section 2.3.3). Water quality at the Locks is within State standards, so impacts of the proposed action would be temporary and cumulative impacts would occur only if other construction activities occur at the same time as the proposed action. This is highly unlikely given there is no planned in-water construction activities in the large lock at this time, and the only other in-water presence is vessel traffic exiting the Locks and proceeding towards Puget Sound. Furthermore, no long-term impacts to water quality would be expected given the tidal flushing and currents in Shilshole Bay. The saltwater drain, fish ladder, small lock, and spillway would continue to operate normally so salinity and temperature would not be affected. Due to the expected minor and temporary nature of effects to pH and turbidity, the project would have a minimal effect, if at all, on water quality.

3.3 Air Quality and Greenhouse Gas Emissions

The Earth's atmosphere is changing, the climate system is warming, and the changes are due in part to human activities that produce greenhouse gases (GHGs). GHGs include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), ozone (O_3), and some hydrocarbons and chlorofluorocarbons. These compounds create a greenhouse effect when they accumulate in the Earth's atmosphere. They act as a layer of insulation, retaining some of the thermal radiation that originated from the sun within the Earth's atmosphere. GHGs can have natural and human sources from activities such as the combustion of fossil fuels and cement production. CO_2 is naturally absorbed during some physiochemical and biological processes, but human activities can affect these processes. Projections for future emissions vary greatly based on the assumptions made about trends in human activities related to CO_2 production

and absorption. However, the scientific community agrees without significant changes to current policies and practices, CO_2 concentrations in the atmosphere will continue to increase.

Agencies with jurisdiction over ambient air quality in the project area are the EPA, Ecology, and the Puget Sound Clean Air Agency. EPA is responsible for establishing the National Ambient Air Quality Standards (NAAQS). The NAAQS criteria pollutants of concern in the project area are carbon monoxide (CO), ozone, reactive organic gases (ROGs), volatile organic compounds (VOCs), lead, nitrogen oxides (NOx), sulfur oxides (SOx), and particulate matter (PM). PM is classified by size: PM10 refers to all PM 10 microns in diameter or smaller, and PM2.5 refers to all PM 2.5 microns in diameter or smaller.

Where air quality does not meet NAAQS, the area is designated as a Non-Attainment Area. The EPA sets limits for NAAQS emissions in non-attainment areas. Areas that do meet NAAQS are designated as Attainment Areas. At areas previously designated as Non-Attainment, and where air quality has improved above NAAQS, the area is designated as a Maintenance Area. Areas without sufficient data to designate are unclassifiable. The area was previously a non-attainment area for CO and PM10. The 20-year maintenance periods for CO and PM10 ended in 2016 and 2021, respectively (EPA 2021a).

The project area is residential and commercial within the city of Seattle. The Air Quality Index reported for King County, Washington in 2020 was rated as good 81 percent of the year, moderate for 15 percent of the year, and unhealthy for sensitive groups, unhealthy, or very unhealthy for 2 percent of the year or less each (PSCAA 2021). Motor vehicles, including vessels transiting the Locks, are the largest source of air pollutants. Particulates, sulfur dioxide, ozone, and carbon monoxide are the pollutants of concern. Human exposure to diesel exhaust (a component of this project) can contribute to an increased risk of negative health effects such as lung cancer, chronic respiratory problems, and cardiovascular disease. Diesel emissions are associated with impaired visibility, acid deposition, and climate change.

Concern regarding the implications of global climate change is increasing across the public and private sectors and within Federal, State, and local governments. The concern for Federal projects is the contribution of GHGs to the atmosphere in such large quantities to outweigh the benefit of executing the proposed action. The most common source of anthropogenic GHG emissions is the burning of fossil fuels either by vehicles/equipment or to generate heat and power for buildings. Statewide GHG emissions produced from fossil fuel combustion in Washington's transportation sector (cars, trucks, ships, trains, and planes) in 2018 were estimated at 44.73 million metric tons CO_2 equivalent (EPA 2021a). There are currently no Federal GHG emission thresholds. Among the alternatives, GHGs and NAAQS criteria pollutants would be generated by sources such as intermittent barge and crane use, power tools, compressors, and generators.

3.3.1 Alternative 1 No-Action Alternative

The No-Action Alternative would have no direct effect on air quality Emergency actions may be required to protect property in the event of failure of the LLCG that affects navigation or stability of large lock structures such as the monolith. These actions would likely have similar air emissions effects as the Alternative 3; therefore, effects to air quality would be minor and temporary.

3.3.2 Alternative 3 – Replace LLCG (Preferred Alternative)

During construction, vehicles and heavy equipment would temporarily generate diesel and gasoline fumes, which can include particulate matter and carbon monoxide. The impact to air quality would be anticipated to be minor due to the small area of construction (< 1 acre) and the type of equipment used (e.g., generators, power tools, intermittent crane and barge use). Although greenhouse gas emissions associated with this alternative are not expected to noticeably increase the rate of climate change and sea level rise, fuel consumption from construction activities are a part of world-wide cumulative contributions to change in climate by way of increases in greenhouse gas emissions. Emissions

generated by the construction activity would be expected to be minor, short-term, and well below the *de minimis* threshold of 100 tons per year of CO or PM10. GHG emissions and other air pollutants are cumulative by nature, but given the minor and temporary nature of the proposed action when combined with emissions from other sources surrounding the Locks, including vessel and aircraft traffic, long-term impacts would be minor. Therefore, effects of Alternative 3 to air quality or GHG emissions would not be substantial.

3.4 Wildlife

Many bird species are present in September and October at the Locks, including Canada goose, mallards, Heermann's gull, ring-billed gull, California gull, glaucous-winged gull, double-crested cormorant, great blue heron, and belted kingfisher. A heron colony is located to the south of the Locks, over 500 feet away from the project area. Otters have been observed near the fish ladder, and beavers are typically farther upstream but could be present at the Locks. Harbor seals and sea lions are present nearly year-round although greater numbers are seasonally present during adult and juvenile migration periods. There are no records of southern resident killer whales (SRKW) entering the area below the spillway and they are highly unlikely to be present during construction. This may be due to the high vessel traffic, disturbance, and noise associated with vessel traffic in the area.

3.4.1 Alternative 1 – No Action Alternative

There would be no direct impacts to wildlife associated with this alternative. The in-water work window avoids most sensitive wildlife activities, such as adult and juvenile salmon migrations that provide food for wildlife and great blue heron and migratory bird nesting seasons. If an emergency repair were necessary, it would have similar or greater impacts to the preferred alternative if the repair cannot wait until the in-water work window begins (October 15).

3.4.2 Alternative 3 – Replace LLCG (Preferred Alternative)

The proposed project area is entirely within the large lock, and previously developed land or nearby piers would be used for staging areas. Removal of shrub or tree vegetation would not occur so there would be no loss of cover, perching, foraging, or nesting habitat. There would likely be minor and temporary displacement of wildlife on the adjacent shoreline due to construction noise and intermittent large lock closures that could limit wildlife movement to foraging areas around the locks, although the small lock would still be open for passage. This disturbance would not be appreciable because human activity is common due to the popularity of the Locks as a tourist attraction, and similar vegetation and habitat in adjacent areas for displaced animals is available.

There may be temporary disturbance to birds in the vicinity of the project during construction. However, construction of the project (October 15-February 15) would mainly occur outside the great blue heron nesting season (February 1–August 31) and outside the general breeding season for migratory birds (April 16–August 15). Construction noise, when added to other noise from vessels, visitors, and water over the spillway that birds are likely accustomed to, would not substantially elevate noise over normal conditions. Therefore, impacts to nesting birds, including herons, would be minimal.

Work behind a temporary cofferdam would generate underwater noise and potential effects to water quality. Diving birds are anticipated to avoid the work area and forage nearby where there is no disturbance, including Shilshole Bay. Little is known about how underwater noise affects diving birds. Diving birds near regular sources of noise may be habituated to the sounds; diving birds near the Locks show no effects or alternations in behavior (University of Maryland 2000). The first measurements of underwater auditory thresholds for diving birds were measured on long-tailed ducks. They responded to high intensity stimuli greater than 117 dB (Therrien 2014). For marbled murrelets, the U.S. Fish and Wildlife Service (USFWS) uses 150 dB $_{RMS}$ as a "guideline" for where to consider exposure to continuous

sounds and the potential behavioral responses that exposure within that area would cause (E. Teachout, USFWS, pers. comm.). Given the differences in physiology and behavior of diving birds, it is hard to draw conclusions from the limited data. However, the most likely consequences of the construction noise, which is mainly from vessels in the water or work behind a dewatered cofferdam, would be avoidance of the limited area initially with the potential return of birds to regular behavior as they become accustomed to the noise.

The most likely impact to marine mammals from this alternative is due to the underwater noise generated during construction. Most noise would be generated by vessels in the water or work behind a dewatered cofferdam. Vessels are very common around the Locks, and not substantially different from what marine mammals typically experience around the project area. In addition to underwater noise generated by construction directly affecting marine mammals, noise may also cause the displacement of food sources, such as fish, that are avoiding the work area. Marine mammals are anticipated to avoid the work area, and any impacts are likely to be temporary with normal behaviors resuming once the project is completed. No long-term substantial impacts to marine mammal or wildlife populations are anticipated.

3.5 Fish

Multiple fish species migrate through or use the large lock. Based on previous closures, estuarine fish common to the large lock includes starry flounder and shiner surfperch. However, it is mostly anadromous fish species using the large lock for migration. Juvenile salmon typically migrate through the Locks during the months of May, June, and July (R2 2017) and adult salmon migrate through the Locks starting in June and continuing through to October. Therefore, this section focuses primarily on adult salmonid passage, as the proposed in-water work would occur between October 15 and February 15 of any construction year, when juveniles are absent. Descriptions of Endangered Species Act (ESA)-listed fish (Chinook salmon, steelhead, and bull trout) and discussion of effects appear in Section 3.6.

Adult salmon migrate through the fish ladder and the large lock. Based on counts of Chinook salmon using the fish ladder and the large lock, 72 percent (53-95 percent range) of Chinook salmon migrated through the ladder from 1997-2005 (USACE and SPU 2008). In recent years, the split has been more even (Figure 6). In 2017, it was estimated 47 percent of the total used the ladder with the remainder passing through the large lock, and in 2018, the estimate was 46 percent using the ladder (Schaffler 2017; Mahovlich unpublished data 2018). The counts in the large lock are likely subject to significant error given the difficulty in visually seeing the fish and the high probability of individual fish being counted multiple times because they travel both directions through the lock and can remain in the lock over multiple lockages (Timko et al. 2002). Sockeye and coho salmon follow similar migration patterns.

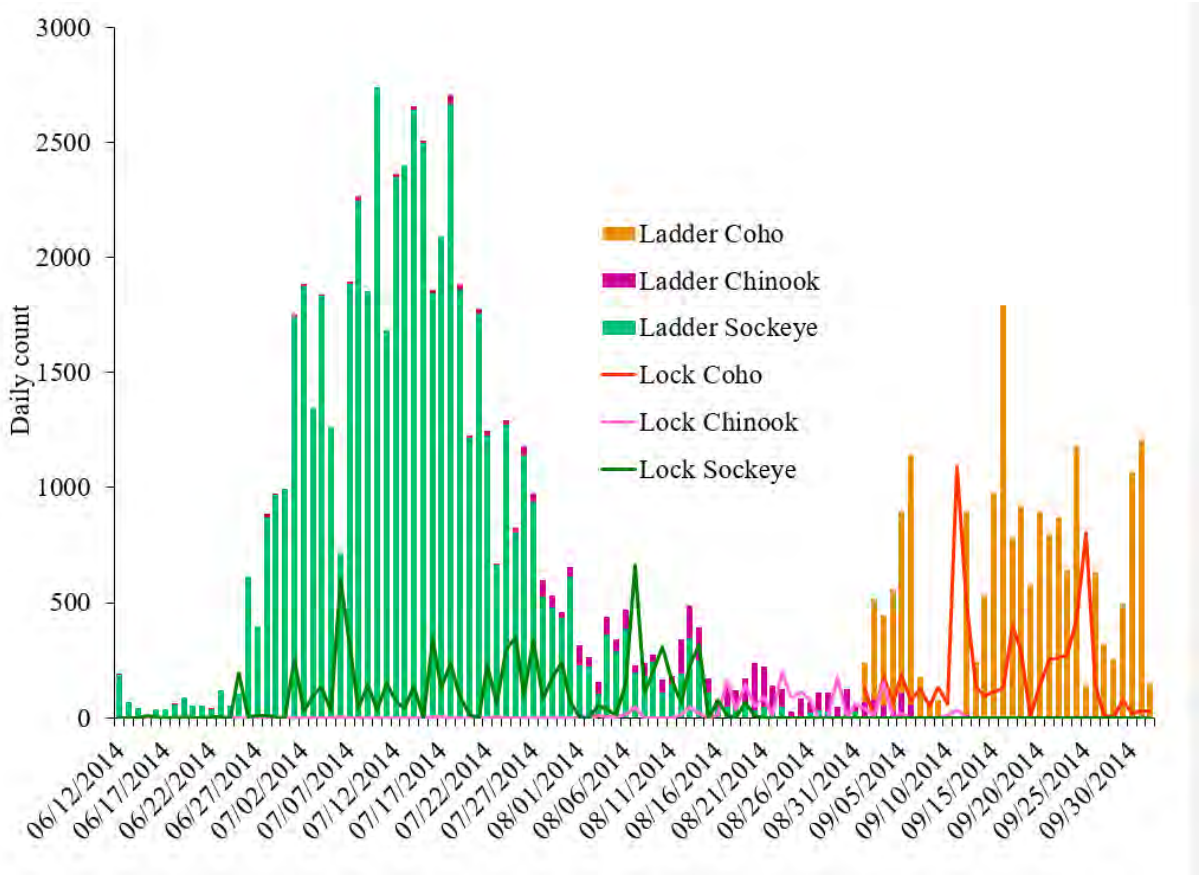


Figure 6. Fish passage through the ladder (bars) compared to the large lock (lines) by species (B. Footen, unpublished data).

The large lock does not contain quality fish habitat and is mainly used by fish to move upstream or downstream of the Locks. The concrete walls and floor lack sediment for benthic invertebrates, and mainly barnacles and mussels are present. Complex habitat such as overhanging vegetation, side channels, or in-water structures such as woody debris is not present in the large lock. These qualities mean fish are less likely to remain in the large lock for extended periods of time. Nevertheless, non-ESA listed species such as shiner perch, starry flounder, and sculpins are often trapped in the large lock after dewatering and may die if they are not removed. To prevent this, the USACE tries to scare fish out of the large lock prior to dewatering by pulling curtains of strobe lights from one end of the large lock to the other to crowd fish out before closing the gates. Fish crowding and removal actions target ESA-listed species, but these actions benefit non-ESA listed species as well.

3.5.1 Alternative 1 – No-Action Alternative

The No-Action Alternative would have little to no effect on fish if an emergency repair is not needed outside of the in-water work window (October 15). If the structural integrity of the LLCG is compromised, it could temporarily impede upstream migration of adult fish through the large lock. The fish ladder would likely be available for fish passage if the large lock is closed due to LLCG failure. An emergency repair would have similar or greater effects than Alternative 3 if the repair cannot wait until the in-water work window begins (October 15). The in-water work window avoids most of the juvenile and adult salmonid migration periods when fish are sensitive to disturbances.

3.5.2 Alternative 3 – Replace LLCG (Preferred Alternative)

Aspects of LLCG replacement that could affect fish are the removal and reinstallation of the gate leaves, dewaterings, changes to water quality, and disturbances from work behind any cofferdam that is used. The large lock would be temporarily closed, then the gate leaves would likely be moved via crane or by floating them in or out, which could startle fish in the vicinity of the gate leaves moving through the water. This would not be substantially different from boats moving through the water and barges are frequently in the large lock, so noise from the tug engine is a common underwater noise. If adult coho salmon are migrating upstream, this could cause a minor delay and possibly increase the risk of marine mammal predation as they search for another passage such as the small lock or fish ladder. Moving the LLCG would occur during the established in-water work window (October 15-February 15) when the coho salmon migration period is past the peak and would be a brief disturbance (up to several days), and only during removal and installation of the gate leaves.

The work for Alternative 3 would be on a small scale within the large lock, such as work within temporary cofferdams or to remove the LLCG. Any turbidity plume would be limited in size (150 feet or less), which is allowable under state standards. The concentrations of total suspended sediments would be too low to cause anything more than temporary, non-injurious behavioral effects such as mild avoidance of the plume and mild gill flaring that would not affect the fitness or meaningfully affect normal behaviors in any salmon that may be exposed to the turbidity. Altered pH would be brief and undetectable within a few feet downstream of the work, and too small to cause anything more than temporary, non-injurious behavioral effects such as mild avoidance of the area immediately downstream of the cofferdam discharge, if used, that would not affect the fitness or meaningfully affect normal behaviors in salmon that may be exposed to the project area. It is highly unlikely that the amount of turbidity generated would affect temperature or dissolved oxygen of the water due to separation of construction by a temporary cofferdam, if used, or dewatering if not.

Elevated in-water noise and in-water activities capable of causing detectable effects in exposed fish would be caused by use of equipment behind a temporary cofferdam such as hand tools and tugboat operations in the large lock. Less in-water noise would be propagated as a result of machinery and power tool use in a dewatered large lock during periods of navigation closure, as compared with work behind a cofferdam. The National Marine Fisheries Service (NMFS) uses two metrics to estimate the onset of injury for fish exposed to high intensity impulsive sounds. The metrics are based on exposure to peak sound level and sound exposure level (SEL), respectively. Both are expressed in decibels (dB). The metrics are: 1) exposure to 206 dB_{peak}; and 2) exposure to 187 dB SEL_{cum} for fish 2 grams or larger, or 183 dB SEL_{cum} for fish under 2 grams. Any received level (RL) below 150 dB_{SEL} is considered "Effective Quiet," which would not produce temporary hearing damage (temporary threshold shift or TTS) or prevent recovery from a TTS.

The effects of fishes' exposure to noise vary with the hearing characteristics of the exposed fish, the frequency, intensity, and duration of the exposure, and the context under which the exposure occurs. At low levels, effects may include the onset of behavioral disturbances such as acoustic masking (Codarin et al. 2009), startle responses and altered swimming (Neo et al. 2014), abandonment or avoidance of the area of acoustic effect (Mueller 1980; Picciulin et al. 2010; Sebastianutto et al. 2011; Xie et al. 2008) and increased vulnerability to predators (Simpson et al. 2016). At higher intensities and/or longer exposure durations, the effects may rise to include temporary hearing damage (TTS; Scholik and Yan 2002) and increased stress (Graham and Cooke 2008). At even higher levels, exposure may lead to physical injury that can range from the onset of permanent hearing damage (permanent threshold shift or PTS) and mortality. The best available information about the auditory capabilities of salmonids suggest that their hearing capabilities are limited to frequencies below 1,500 Hz, with peak sensitivity between about 200 and 300 Hz (Hastings and Popper 2005; Picciulin et al. 2010; Scholik and Yan 2002; Xie et al. 2008).

The greatest source of underwater noise would come from any temporary cofferdam present on one side of the lock at a time. Based on information from a previous project at the Locks, noise levels above the 150 dB_{SEL} threshold could extend to about 72 feet around tugboats and barges, and about 52 feet around in-water operation of power tools such as concrete chippers or similar equipment (NMFS 2020). Fish that are beyond the 150 dB_{SEL} isopleth for any of these sources would likely be unaffected by the noise. However, fish within the 150 dB_{SEL} isopleth are likely to experience a range of behavioral disturbance, such as acoustic masking, startle responses, altered swimming patterns, avoidance, and increased risk of predation. Tugboat operations would likely be infrequent for the proposed action and tugboats are common in the large lock throughout the year. However, the operation of barge-mounted equipment such as generators, pump motors, and potentially a crane could be intermittently operated. The noise levels from that equipment would likely be similar to that of tugboat operations, and it would transfer into the water via the barge's hull.

The planned work window occurs during the end of the adult coho salmon run (Figure 6). The proposed work would not create injurious sound levels. However, the project-related noise would likely cause behavioral disturbance for late-arriving fish, such as avoidance of the area around the temporary cofferdam, which could increase their risk of predation by marine mammals and cause a migration delay to upstream spawning habitat. This would be a minimal delay on one side of the lock at a time because the large lock is 80 feet wide, 28 feet wider than the expected extent of noise from power tools. Salmon would have room to avoid project-related noise or could use the fish ladder for migration. Tugboats are frequently present in the large lock and assumed to be part of the background noise that is characteristic of the Locks.

Up to three dewatering events per in-water work window carries a minor risk of entrainment, and therefore, migration delays for anadromous species present October 15-February 15. The USACE attempts to remove fish from the lock as part of the dewatering process. The process has evolved over time and continues to evolve to more effectively remove fish. The USACE crowds fish from the lock immediately before closing the downstream gate for dewatering, and conducts a fish rescue by collecting individual fish from the substantially dewatered lock. The crowder system consisted of off-the-shelf flashing strobe lights (70,000 peak candlepower brightness) on lines weighted with heavy chain to create noise along the lock floor. The lines are attached to floating booms and spaced across the width of the lock. The lines with attached chains are pulled from the closed end of the lock (upstream end) to the open end. As the crowder exits the lock, the service gate is closed and dewatering initiated. Fish that collect in the filling culverts and large lock sumps are removed by nets and buckets to the degree feasible and transported to Puget Sound. Adult salmonids caught in the large lock during a dewatering would be generally unaffected by the activity and released unharmed as part of the fish rescue activities.

To minimize impacts to salmonids in the area, USACE proposes to work during the in-water work window, within temporary cofferdams if the large lock chamber is not completely dewatered, to monitor water quality, and ensure the small lock and fish ladder are available for migrating salmonids during construction. The full list of BMPs and conservation measures appears in Section 2.3.3. By implementing the proposed BMPs and conservation measures to prevent changes to water quality and avoid migrating fish as much as possible, the project would not substantially affect fish.

3.6 Threatened and Endangered Species

By accessing the USFWS Information for Planning and Consultation (IPaC) on June 14, 2021, and after reviewing previous consultation documents for the Locks, 11 species listed under the ESA were identified that could potentially be present in the project area. After further review, it was determined that only four listed species, shown in Table 4, have the potential to be present during the proposed repair operations and are the focus of the analysis. Marbled murrelet, streaked horned lark, yellow-

billed cuckoo, bocaccio, and yelloweye rockfish are not expected to occur within the project area because their particular specialized habitat requirements are absent, and/or the species have a lack of tolerance for human development. Green sturgeon and Pacific eulachon are considered uncommon in Central Puget Sound and extremely unlikely to occur within the action area due to lack of preferred habitat or typical spawning areas; therefore, there would be no effect to these species. Consequently, these species will not be considered further in this analysis because they are likely absent from the project area during the proposed work window.

Table 4. ESA listed species potentially located within the project area during the proposed action.

Species (Common Name and Scientific Name)	Distinct Population Segment (DPS)	Federal Listing	Year	Critical Habitat in Project Area	Potential Occurrence
Fish					
Chinook salmon (*Oncorhynchus tshawytscha*)	Puget Sound Evolutionarily Significant Unit (ESU)	Threatened Critical Habitat Designated	1999 2005	Yes	Unlikely
Steelhead (*O. mykiss*)	Puget Sound ESU	Threatened Critical Habitat Designated	2007 2016	No	Unlikely
Bull trout (*Salvelinus confluentus*)	Coastal/Puget Sound DPS	Threatened Critical Habitat Designated	1998 2010	Yes	Unlikely
Mammals					
Killer whale (*Orcinus orca*)	Southern Resident DPS	Endangered Critical Habitat Designated	2005 2021	Includes all waters in Puget Sound deeper than 20 feet; prey species	Extremely unlikely

Chinook salmon are well-studied in the watershed. It is unlikely for Chinook salmon to be present after October 15 when the in-water work window begins. The WDFW and Muckleshoot Indian Tribe (MIT) have counted adult salmon at the Locks for several decades. An estimated 84 percent of Chinook salmon passing the Locks were hatchery fish and 16 percent were wild fish for years 2013-2016 (WDFW 2016, 2017, 2020a). The multi-year count data (2009-2017) allowed calculation of the average daily number and proportion of fish passing through the project. The proportion of Chinook salmon run is 97 percent complete by September 15, and 99 percent complete by September 21.

Based on monitoring from 1980 to the mid-1990s, the general timing of adult steelhead migration through the Locks was from January to April, with most fish passing in March and April. Juvenile steelhead outmigration occurs in April and May. Lake Washington steelhead have been considered functionally extinct in the basin since the late 1990s. Fewer than 10 adults from the North Lake Washington and Lake Sammamish population returned to the watershed between 1994 and 1999 when the last WDFW survey was done. Similarly, 50 adults from the Cedar River population have returned to the watershed since 2000, with 10 or fewer returning annually since 2007 (WDFW 2020b). The small steelhead population makes the presence of adults during the in-water work window (February 15-October 15) unlikely.

Bull trout are not well documented in the action area but based on available information their presence is considered uncommon (R2 2014). Bull trout present near the Locks are most likely transient fish using the surrounding area for foraging or as a migration corridor to other foraging habitats. Bull trout have been observed in the fish ladder in late spring (E. Warner, MIT, pers. comm.), captured below the Locks in spring and early summer by seining (Brian Footen, MIT and USACE unpublished data) and tracked in Shilshole Bay with acoustic tags (Goetz et al. 2004). The acoustic tagged fish were from the Snohomish and Skagit Rivers. Very few bull trout are found in the marine environment from October to February and most fish that are there are moving from one river to another and not remaining in the marine areas (Goetz 2016). The October 15-February 15 timeframe does not coincide with juvenile salmonid outmigration that could attract bull trout to forage, and it is a time when very few bull trout enter the marine environment. In addition, the large lock does not offer complex habitat that would draw bull trout prey items.

The SRKW has a wide range and inhabit different regions seasonally. The species is known to visit coastal sites off Washington and Vancouver Island (Ford et al. 2000), and to travel as far south as central California and as far north as the Queen Charlotte Islands (NMFS 2008; Hanson et al. 2013; Carretta et al. 2017). Satellite-tagging, opportunistic sightings, and acoustic recording data suggest that the SRKW spend nearly all their time on the continental shelf, within about 21 miles of shore in water less than 656 feet deep (Hanson et al. 2013; 2017). Details of their winter range from satellite-tagging reveal the whales use the entire Salish Sea (northern end of the Strait of Georgia and Puget Sound) in addition to coastal waters from the central west coast of Vancouver Island, British Columbia to Point Reyes in northern California (Hanson et al. 2017). The SRKW critical habitat includes prey species such as Chinook salmon, which they are dependent upon as a food source more so than any other (NOAA 2018). According to Hanson et al. (2021), the contribution of Chinook salmon to SRKW diet ranges from approximately 50 percent in fall, 70-80 percent in mid-winter, and almost 100 percent in spring. Chum and coho salmon supplement SRKW diet mostly in fall and early winter in Puget Sound (Hanson et al. 2021).

3.6.1 Alternative 1 – No-Action Alternative

The No-Action Alternative would have no direct effect on any threatened or endangered species if an emergency repair is not needed outside of the in-water work window (October 15). Wear of the LLCG would continue that could lead to failure of LLCG. If an emergency repair were necessary, it could cause migration delays for ESA-listed fish and impacts to other ESA-listed species from noise and water quality effects as described for Alternative 3 if the repair cannot wait until the in-water work window begins (October 15). The in-water work window avoids most of the juvenile and adult salmonid migration periods when fish are sensitive to disturbances.

3.6.2 Alternative 3 – Replace LLCG (Preferred Alternative)

During construction, the small lock and fish ladder would remain available for passage. The most protective measure to implement to avoid effects to ESA-listed species is timing of the proposed action during the in-water work window. Although unlikely, if ESA-listed fish are present during construction, the primary effects would be due to in-water noise and disturbance, lock dewatering, and potentially degraded water quality as described in Section 3.2. Although construction in the dewatered large lock without the use of cofferdams would likely prolong the navigation closure periods to up to three periods of 30-day closures each year, separated by 15-day intervals of unrestricted navigation and fish passage, these closure periods would be confined to the in-water work window. Either construction methodology would commence no earlier than October 15 and thus late-arriving migrating adult Chinook salmon would not be further adversely affected by a construction approach that used no cofferdams.

Impacts to the SRKW would be minimal and the same as those described in Section 3.4 for marine mammals, including unlikely exposure to water quality impacts, noise, in-water activity, and negligible impacts to prey resources (adult salmon). There are no records of SRKW within the project area. Potential water quality effects are limited to within 150 feet downstream of the LLCG, and the whales are not known to venture into the vicinity of the Locks. This may be due to the high vessel traffic and all the disturbance and noise associated with vessel traffic in the action area. Therefore, it is unlikely that any SRKW would be directly exposed to construction-related stressors. In addition, data on Chinook salmon stocks (i.e., the Cedar River and Sammamish River stocks) returning to the watershed to spawn show that these runs represent about three to five percent of the total Puget Sound Chinook salmon abundance. Further, the proposed action would start well after the two Chinook runs, so only a miniscule amount of the fish in these runs have the potential to be affected by the construction. Salmon that use the large lock may spend time searching for passage through the fish ladder and this could leave them vulnerable to predation by seals and sea lions; it is extremely unlikely that the SRKW would be near the project area to take advantage of any confused Chinook salmon. The proposed action would affect far too few Puget Sound Chinook salmon or coho salmon to cause any detectable effects on SRKW.

Impacts to ESA-listed species are expected to be minor and discountable. USACE has prepared a biological assessment (BA) pursuant to Sec. 7(a)(2) of the ESA for consultation with the NMFS and USFWS. USACE's determinations from the BA are summarized in Table 5.

Table 5. Summary of Endangered Species Act determinations of effect.

Species	**ESA Status**	**Determination of effect on species**	**Determination of effect on designated or proposed critical habitat**
Puget Sound Chinook Salmon	Threatened	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Steelhead	Threatened	May affect, not likely to adversely affect	No critical habitat present
Bull Trout	Threatened	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Southern Resident Killer Whale	Endangered	No effect	May affect, not likely to adversely affect

3.7 Cultural and Historic Properties

The Chittenden (Hiram M.) Locks and Related Features of the Lake Washington Ship Canal (LWSC Historic District) is listed on the National Register of Historic Places (NRHP), under Criteria A as a significant major engineering achievement completed under government auspices that created a navigable waterway joining Puget Sound to Lake Union and Lake Washington; under Criteria B as it is associated with significant individuals: Major Hiram M. Chittenden, the Seattle District Engineer who developed and promoted the plan for the canal; Colonel James B. Cavanaugh, who supervised the construction of the project; and Bebb and Gould, the architectural firm who designed the layout and complex of concrete buildings around the Locks; and Criteria C as the original eleven accessory concrete buildings were designed and constructed in the classical style and were designed by the architectural firm Bebb and Gould. The LLCG is a part of the large lock which is a contributing resource to the LWSC Historic District.

The USACE has coordinated its review of impacts on cultural resources for NEPA with its responsibilities to take into account effects on historic properties[1] as required by Section 106 of the National Historic Preservation Act (NHPA). See section 7.7 that documents USACE compliance under the NHPA. In consultation with the State Historic Preservation Officer and consulting parties the USACE determined that the proposed project would have an adverse effect on the LWSC Historic District as there would be 100 percent loss of the original LLCG. A memorandum of agreement (MOA) was signed on November 11, 2021 between the SHPO and USACE. The MOA documents the adverse effect and the mitigation the USACE would undertake to resolve for the adverse effect (Appendix B). The mitigation to address the adverse effect includes: (1) completely revising and updating the 1978 National Register of Historic Places Inventory Nomination form; (2) completing a historic property inventory form (HPIF); and (3) updating the LWSC Historic Property Management Plan (HPMP). All changes that have occurred to the LWSC historic district would be documented and all existing buildings and structures would be reviewed to determine if they are still contributing resources to the Historic District. Any buildings that were not 50 years of age in 1978 would be evaluated to determine if they are contributing resources or not. The updated nomination form would be forwarded to the Keeper of the NRHP. A HPIF would be completed at the intensive level in the Department of Archaeology and Historic Preservation Washington Information System for Architectural and Archaeological Records Data system. The LWSC HPMP would be updated with any new information obtained from the nomination form update and revision that is not currently in the HPMP.

3.7.1 Alternative 1 – No-Action Alternative

The No-Action Alternative would have no adverse effect on the LWSC Historic District as there would be no repair to the gate or associated components. Wear of the LLCG would continue which could lead to failure of LLCG. If failure occurred and an emergency repair were necessary, there would likely be an adverse effect to the LWSC Historic District depending on what the emergency repair entails.

3.7.2 Alternative 3 – Replace LLCG (Preferred Alternative)

The USACE has determined that the removal and replacement of the LLCG would have an adverse effect of the LWSC Historic District as there would be 100 percent loss of the original LLCG. The LLCG is a component of the large lock which is a contributing resource to the LWSC Historic District.

3.8 Recreation

The Locks are authorized for recreation, receiving approximately one million pedestrian visitors each year. The fish ladder contains a large viewing window to the south of the large lock that is a popular tourist attraction, and visitors use the LLCG to cross the large lock. The upper and lower large lock gates are also used to cross the large lock. Commodore Park is a popular park to the south with views of the Locks.

Lockage frequency varies depending on the time of year and time of day. Typically, the large lock is used for larger vessels or during periods of high traffic. The small lock is used to transport smaller vessels. During certain times of the year, such as during the opening of boating season, the large and small locks have very high rates of lockages for a short period (e.g., one to three days). Large lock lockages typically occur throughout the day. The number of lockages vary over the course of the day with the peak number of lockages occurring in the early afternoon and the low in the early morning hours. On an average daily basis in the large lock, there are about 3 up and 3 down lockages (6 total) per day during

[1] A historic property is any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion on, the National Register of Historic Places, including artifacts, records, and material remains related to such a property or resource.

the winter and 6-8 up and down daily lockages (12-16 total) during the summer. Individual days such as summer weekends and holidays may see more lockages than this average.

3.8.1 Alternative 1 – No-Action Alternative

Continued wear could compromise the structural integrity of the LLCG, which is part of the Locks—a popular tourist attraction. Visitors would have to use the other two large lock gates to cross the large lock if the LLCG was closed, creating crowded conditions and possibly minor delays. In addition, LLCG closure would compromise the ability to provide fish passage and could create long-term closures without public access, which could prevent continued educational and recreational opportunities.

3.8.2 Alternative 3 – Replace LLCG (Preferred Alternative)

Potential navigation restriction periods and closures associated with potential temporary cofferdam use and large lock dewaterings during the in-water work window (October 15-February 15) would occur for up to four years. During construction, including large lock closures for vessels, pedestrians and bicyclists would use the other gates to cross the large lock and would not lose access across the large lock to travel between the Ballard and Magnolia neighborhoods. The remainder of the Locks (including the adjoining gardens) would be accessible to the public during construction.

Effects to recreational vessels are the same as effects to navigation (Section 3.1). Compared to the No-Action Alternative that has an undetermined number of unscheduled closures, Alternative 3 would schedule closures and width restrictions of the large lock in advance (Table 1). Closures during the in-water work window (October 15-February 15) would temporarily prevent passage for recreational vessels that cannot use the small lock. During the in-water work period (October 15-February 15), width restrictions would temporarily prevent passage for recreational vessels that cannot use the small lock or fit in the 65-foot restricted width of the large lock (i.e., vessels over 60 feet wide would not fit). To minimize effects to recreational vessels, once the construction schedule is finalized, a notice to mariners would be published alerting vessel operators to large lock closures and restrictions. Other public communications on the USACE website, Locks Facebook page, and stakeholder meetings would be provided as construction details become available. Effects of the proposed action to recreation (i.e., recreational vessels) would be temporary with a long-term benefit. The continued operation of the large lock would allow the Locks to support its navigation function and mission. It is unlikely that other construction activities would occur at the same time that would also affect recreation.

4 COORDINATION

A draft EA for the proposed LLCG project was issued January 12, 2022, for a 30-day public review and comment period, and distributed to the following agencies and entities for public review and comment:

- National Marine Fisheries Service
- U.S. Fish and Wildlife Service
- Washington Department of Ecology
- Washington Department of Fish and Wildlife
- Washington Department of Natural Resources
- Muckleshoot Indian Tribe
- Suquamish Indian Tribe
- Water Resource Inventory Area (WRIA) 8 Technical Committee

Any public comments received will appear in Appendix C of the final EA with responses. Additional coordination measures have been developed to minimize disruption during construction:

- USACE would coordinate with the local Indian Tribes that have usual and accustomed fishing rights in the project area.
- USACE would coordinate and consult with the Suquamish Indian Tribe for their situational awareness in planning and executing fisheries below the locks. Their usual fishing period for coho salmon typically begins mid-September and may extend to early November.

Once the construction schedule is developed, a notice to mariners would be published alerting vessel operators to large lock closures and restrictions, in addition to other public communications on the USACE website, Locks Facebook page, and stakeholder meetings.

5 UNAVOIDABLE ADVERSE EFFECTS OF THE PREFERRED ALTERNATIVE

Unavoidable adverse effects associated with the preferred alternative at each site would be: (1) temporary and localized increases in noise, activity, and emissions which may affect fish and wildlife in the area; (2) temporary and localized disruption of local traffic and navigation by construction activity and vehicles; (3) irretrievable commitment of fuels and other materials for repairs; and (4) 100 percent loss of the original LLCG.

6 COMPENSATORY MITIGATION

No compensatory environmental mitigation is proposed for this action as no loss of wetlands, no jeopardy to ESA-listed species, and no appreciable impacts to commercially important species are anticipated to occur based on the analyses in this document. Mitigation for an adverse effect to the LWSC Historic District is described in Section 3.7. USACE would implement several avoidance and minimization measures (Section 2.3.3) to ensure environmental impacts are minimal, short-term effects as described in Section 3.

7 ENVIRONMENTAL COMPLIANCE

USACE has analyzed the environmental effects of the alternatives and the following sections describe how the preferred alternative complies with pertinent environmental laws and executive orders.

7.1 National Environmental Policy Act (NEPA) (42 U.S.C.§ 4321 et seq.)

The NEPA (42 U.S.C. § 4321 et seq.) commits Federal agencies to considering, documenting, and publicly disclosing the environmental effects of their actions. It requires that an Environmental Impact Statement (EIS) be included in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment. The EIS must provide detailed information regarding the proposed action and alternatives, the environmental effects of the alternatives, appropriate mitigation measures, and any adverse environmental effects that cannot be avoided if the proposal is implemented. Agencies are required to demonstrate that decision makers have considered these factors prior to undertaking actions. Major Federal actions determined not to have a significant effect on the quality of the human environment may be evaluated through an EA.

This EA has been prepared pursuant to NEPA. Effects on the quality of the human environment as a result of the proposed LLCG repair are anticipated to be less than significant. The EA has incorporated any necessary and applicable modifications to the scope and/or nature of the project, any effects to the human environment resulting from these modifications, the procedures and practices used to implement the project, and/or the type and extent of compensatory mitigation associated with the project.

This draft EA/FONSI is made available for public review and comment. USACE invites submission of comments on the environmental impact of the proposed action. USACE will consider all submissions received during the comment period. The nature or scope of the proposal may be changed upon consideration of the comments received and this EA updated. If significant effects on the quality of the human environment are identified and cannot be mitigated for, USACE would initiate an EIS and afford all the appropriate public participation opportunities attendant to an EIS. The draft Finding of no Significant Impact (FONSI) is in Appendix D.

7.2 Endangered Species Act of 1973, as Amended (16 U.S.C.§§ 1531-1544)

In accordance with Section 7(a)(2) of the ESA of 1973, as amended, (16 U.S.C. §§ 1531-1544) federally funded, constructed, permitted, or licensed projects must take into consideration effects to federally listed or proposed threatened or endangered species. USACE submitted a BA for the LLCG replacement to NMFS and USFWS. Final consultation documents will appear in Appendix E of the final EA, which will also incorporate the applicable requirements of terms and conditions of any Reasonable and Prudent Measure(s) associated with an Incidental Take Statement contained in a final Biological Opinion.

7.3 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act requires Federal agencies to consult with NMFS regarding actions that may adversely affect Essential Fish Habitat (EFH) for groundfish, coastal pelagic species, and three species of Pacific salmon. An EFH determination for the LLCG replacement was included in the BA submitted to NMFS. USACE determined the LLCG project would not adversely affect EFH, because the LLCG replacement would result in minor and temporary water quality impacts by possibly generating turbidity and altering pH.

7.4 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (16 USC 661 et seq.) requires that wildlife conservation receive equal consideration and be coordinated with other features of water resource development projects. USFWS coordination is not required for maintenance work such as the proposed action.

7.5 Clean Water Act, as Amended (33 U.S.C. §1251 et seq.)

The purpose of the Federal Water Pollution Control Act (33 U.S.C § 1252 et seq.), commonly referred to as the Clean Water Act (CWA), is to restore and maintain the chemical, physical, and biological integrity of the nation's waters by preventing point and nonpoint pollution sources, providing assistance to publicly-owned treatment works for the improvement of wastewater treatment, and maintaining the integrity of wetlands.

The sections of the CWA that apply to the proposed Federal action are 401, regarding discharges to waterways, and 404, regarding fill material in waters and wetlands. USACE is the regulatory agency that provides individual and general Section 404 permit decisions. Even though the USACE does not issue Section 404 permits to itself for its Civil Works activities, the USACE must comply with the substantive requirements of Section 404 and 401 under the CWA. Pursuant to both Section 404 of the CWA (33 USC 1344(f)(1)(b)) and Federal Regulations 33 CFR 323.4(a)(2), the proposed activity falls within an exemption since the activity falls within the parameters of maintenance. Therefore, the repair does not require a Section 404(b)(1) evaluation or Section 401 certification.

The LLCG replacement is limited to maintenance of an existing serviceable dam and does not propose to change the scope, character, or size of the original fill design, so the discharge of fill material into Waters of the United States is exempt from regulation under Section 404. This is because 33 USC 1344(f)(1)(B) provides that discharge of material “for the purpose of maintenance, including urgent reconstruction of recently damaged parts, of currently serviceable structures such as dikes, dams, levees, groins, riprap, breakwaters, causeways, and bridge abutments or approaches, and transportation structures” is exempt

from regulation as fill. In addition, use of materials such as concrete that do not contain toxic pollutants as listed under Section 307 of the CWA is consistent with the maintenance described in the exemption.

The LLCG replacement will be conducted within the existing footprint of the large lock as constructed in 1916. The components of the work include replacing infill concrete from 1916 in the lock wall and replacing the LLCG and associated components connected to the lock wall. To facilitate the work that is wholly inside the lock chamber, the repair may use a cofferdam with sandbags or other material inside to prevent leaks. This work will not change the character, scope, or size of the structure from the original fill design. New fill will conform to the original configuration and size of the original fill of the lock wall. Only as much concrete necessary for an adequate repair will be applied and overfilling will be avoided to maintain a similar profile to the surrounding structure. USACE considers modern concrete formulations as analogous to the 1916 concrete used in the initial construction of the large lock chamber.

The National Pollutant Discharge Elimination System (NPDES) stormwater program addresses water pollution during activities such as construction by regulating point sources that discharge pollutants to waters of the United States. “Stormwater” means stormwater runoff, snow melt runoff, and surface runoff and drainage. Discharge of stormwater associated with construction activities such as clearing, grading, and excavating, with greater than one acre of ground disturbance, requires compliance with the NPDES Stormwater Program. Section 402 of the CWA is not applicable to this project because the construction site is less than one acre of ground disturbance and no NPDES General Permit is required for construction. The contractor would prepare a stormwater pollution and prevention plan to control stormwater impacts during construction.

7.6 Coastal Zone Management Act (16 U.S.C. §§1451-1465)

The CZMA of 1972 as amended (16 U.S.C. §§ 1451-1465) requires Federal agencies to carry out their activities in a manner that is consistent to the maximum extent practicable with the enforceable policies of the approved Washington Coastal Zone Management Program. USACE prepared a CZMA Consistency Determination and will submit this document to Ecology for their review and concurrence.

7.7 National Historic Preservation Act (16 U.S.C. § 470 et seq.,)

Section 106 of the NHPA requires that a federally assisted or federally permitted project account for the potential effects on sites, districts, buildings, structures, or objects that are included in or eligible for inclusion in the National Register of Historic Places. On May 12, 2021, the USACE sent the area of potential effects (APE) letter to the Washington State Historic Preservation Officer describing the project and the APE. The USACE notified the MIT and the Suquamish Indian Tribe via letter on May 21, 2021 and asked the Tribes to identify any concerns and sought information about properties of religious or cultural significance that might be affected by the project. The Tribes did not identify any resources within the APE. On May 14, 2021, the State Historic Preservation Office (SHPO) concurred with the APE. On May 21, 2021, the USACE sent the determination and findings letter to the SHPO, documenting the USACE finding of adverse effect to the LWSC Historic District by the demolition and replacement of the original center gate of the large lock. On May 27, 2021, USACE and SHPO staff had a teleconference to discuss the project. SHPO staff requested additional information regarding the APE, location of center gate in relation to the large lock and the demolition plan for the concrete surrounding the center gate on either side of the large lock. On June 15, 2021, the USACE sent a letter with the revised APE, and provided the additional information as requested. On June 22, 2021, the SHPO concurred with the revised APE and the USACE determination that the demolition and replacement of the original LLCG is an adverse effect. On June 14, 2021, letters were sent to the following identified consulting parties: city of Seattle Historic Perseveration Program, Friends of the Ballard Locks, King County Historic Preservation Program, Historic Seattle, MIT, and the Suquamish Indian Tribe. All consulting parties have declined to participate in the development of the MOA. A MOA was signed on November 11, 2021 between the

SHPO and USACE. The MOA documents the mitigation that USACE will complete to resolve the adverse effect of removing the original center gate would have on the LWSC Historic District.

7.8 Clean Air Act as Amended (42 U.S.C. § 7401, et seq.)

The Clean Air Act (CAA) as amended (42 U.S.C. §7401, et seq.) prohibits Federal agencies from approving or conducting any action that does not conform to an approved state, Tribal, or Federal implementation plan. Under 40 CFR 93.153(c)(2)(iv), conformity determinations are not required for Federal maintenance and repair activities where the increase in emissions associated with the activity falls below the *de minimis* level. The impact to air quality is anticipated to be minor due to the small area of construction (< 1 acre) and the type of equipment used (e.g., generators, power tools, intermittent crane and barge use). The small area of construction and the nature of the work would limit the impact to air quality, which is expected to be well below the *de minimis* threshold of 100 tons per year of CO or PM10.

7.9 Marine Mammal Protection Act (16 U.S.C. §§ 1361-1407)

The Marine Mammal Protection Act of 1972 (MMPA), as amended, prohibits the taking of marine mammals by citizens of the U.S. except under certain conditions (16 U.S.C. 1361). Marine mammals can be found in Shilshole Bay and the adjacent waters. USACE has determined that the preferred alternative would not substantially disturb any marine mammal behavioral patterns (harassment or cause any harm), and thus it is not necessary to pursue an incidental harassment authorization under the MMPA. The rationale for this determination is the following:

1. Marine mammals can avoid the area while underwater, and seals and sea lions can haul out in areas nearby to avoid the limited area of elevated underwater construction noise within the large lock. The small lock would be available during large lock closures for marine mammal passage through the Locks.

2. Ambient underwater noise level in the LWSC and Locks area is higher than unconfined and undeveloped marine areas due to boat traffic. Marine mammals are likely acclimated to these disturbances.

3. The noise generated by construction is similar to conditions already present around the Locks and in Shilshole Bay.

7.10 Migratory Bird Treaty Act and Migratory Bird Conservation Act (16 USC 701-715)

The Migratory Bird Treaty Act (16 U.S.C. §703-712) as amended protects over 800 bird species and their habitat, and commits that the U.S. would take measures to protect identified ecosystems of special importance to migratory birds against pollution, detrimental alterations, and other environmental degradations. Executive Order (EO) 13186 directs Federal agencies to evaluate the effects of their actions on migratory birds, with emphasis on species of concern, and inform the USFWS of potential negative effects to migratory birds. USACE would not remove any vegetation that could affect migratory birds to ensure compliance with the Migratory Bird Treaty Act. Implementation of the preferred alternative would not have any direct and deliberate negative effects to migratory birds. The proposed construction is to occur during the in-water work window (October 15-February 15), which is outside the general breeding season for migratory birds (April 16–August 15). There would be no adverse effect on habitat and the project would only have minor and temporary effects to a small number of individual birds that may be present in the project area.

7.11 Executive Order 12898, Environmental Justice, and Executive Order 14008, Tackling the Climate Crisis at Home and Abroad

EO 12898 directs Federal agencies to take the appropriate steps to identify and address any disproportionately high and adverse human health or environmental effects of Federal programs, policies, and activities on minority and low-income populations. Minority populations are those persons who identify themselves as Black, Hispanic, Asian American, American Indian/Alaskan Native, and Pacific Islander. A minority population exists where the percentage of minorities in an affected area either exceeds 50 percent or is meaningfully greater than in the general population. EO 14008 updates EO 12898 and has expanded Federal agencies' responsibilities for assessing environmental justice consequences of their actions to include the impact of climate change on the health of the American people.

An analysis of demographic data was conducted to derive information on the approximate locations of low-income and minority populations in the community of concern. Since the analysis considers disproportionate impacts, three areas were defined to compare the area affected by the project and a larger regional area that serves as a basis for comparison and includes the area affected. The larger regional area is defined as the smallest political unit that includes the affected area and is called the community of comparison. For purposes of the analysis, the affected area is approximately a five-mile radius around the project area, and the city of Seattle, Washington, is the community of comparison. Demographic information was also compared against the state of Washington for reference. The EPA's "EJScreen" tool was used to obtain the study area demographics (EPA 2021b).

As shown in Table 6, the aggregate minority population is estimated at 28 percent in the affected area, 35 percent in the city of Seattle, and 29 percent in the State of Washington. The aggregate population percentage in the affected area does not exceed 50 percent and is not more than the state average. The EO does not provide criteria to determine if an affected area consists of a low-income population. For purposes of the assessment, the Council on Environmental Quality criterion for defining low-income population was adapted to identify whether the population in an affected area constitutes a low-income population. An affected geographic area is considered to consist of a low-income population (i.e., below the poverty level, for purposes of this analysis) where the percentage of low-income persons: 1) is greater than 50 percent, or 2) is meaningfully greater than the low-income population percentage in the general population or other appropriate unit of geographic analysis. The U.S. Census Bureau poverty assessment weighs income before taxes and excludes capital gains and non-cash benefits (such as public housing, Medicaid, and food stamps). Table 6 provides a summary of the income and poverty status for the study area. As shown in the table, 20 percent of the individuals in the affected area are considered low-income. This percentage in the affected area does not exceed 50 percent. In addition, the affected area low-income population percentage is roughly equivalent to the low-income population in the city of Seattle (22 percent) and is less than the percentage of the state (31 percent). The affected area is not considered to have a high concentration of low-income population.

Table 6. Environmental Justice Demographic and Income Statistics (EPA 2021b).

Demographic Affected	Affected Area	City of Seattle	Washington State
Minority Population	28 percent	35 percent	29 percent
Low-Income Population	20 percent	22 percent	31 percent

The preferred alternative does not involve a facility siting decision and would not disproportionately affect disadvantaged minority or low-income populations including through any adverse human health impacts. The project maintains navigation for the affected area, and the preferred alternative of large

lock center gate replacement would provide a universal benefit to persons, including disadvantaged minority, low-income, and tribal communities, residing in the area of analysis. No interaction with other projects would result in any such disproportionate impacts. No cumulative impacts to environmental justice are expected from interaction of the proposed LLCG replacement with other past, present, and reasonably foreseeable projects. Further, Tribal governments that are also environmental justice communities in the project area have been engaged and informed about the proposed action.

7.12 Native American Trust Resources

In the mid-1850s, the U.S. entered into treaties with nearly all of the Native American tribes in the territory that would become Washington State. These treaties guaranteed the signatory tribes the right to "take fish at usual and accustomed grounds and stations . . . in common with all citizens of the territory" (*U.S. v. Washington*, 384 F. Supp. 312 at 332 [WDWA 1974]). In *U.S. v. Washington*, 384 F. Supp. 312 at 343 - 344, the court resolved that the Treaty tribes had the right to take up to 50 percent of the harvestable anadromous fish runs passing through those grounds, as needed to provide them with a moderate standard of living (Fair Share). Over the years, the courts have held that this right comprehends certain subsidiary rights, such as access to their "usual and accustomed" fishing grounds. More than *de minimis* effects to access to usual and accustomed fishing area may violate this treaty right (*Northwest Sea Farms v. Wynn*, F. Supp. 931 F. Supp. 1515 at 1522 [WDWA1996]). In *U.S. v. Washington*, 759 F.2d 1353 (9th Circuit 1985) the court indicated that the obligation to prevent degradation of the fish habitat would be determined on a case-by-case basis. The Ninth Circuit has held that this right encompasses the right to take shellfish (*U.S. v. Washington*, 135 F.3d 618 [9th Cir 1998]).

The Federal government must consider the effects its actions may have on American Indian trust resources, traditions, and cultural practices. The Federal basis of a tribe's legal status rests within the context of U.S. Constitutional provisions for Federal government's powers for treaty making with other sovereign nations, and American Indian tribes' inherent sovereignty. Numerous tribes in the Puget Sound area are parties to treaties with the U.S., which reserve lands and rights to the tribes. One of the treaty-reserved rights is the ability to take fish at all places where the tribe fished at treaty time, commonly referred to as "Usual and Accustomed" (U&A) locations. Tribal fisheries are central to the cultural and economic existence of tribes and their members. Treaty terms and the rights arising from them cannot be rescinded or canceled without explicit Congressional consent. Federal agencies, including the USACE, have a legal obligation to abide by treaty terms and to avoid interference with treaty-reserved fishing rights. The following tribes have U&A fishing rights in the project area:

- Muckleshoot Indian Tribe (MIT)
- Suquamish Indian Tribe

USACE notified the MIT and Suquamish Indian Tribe in writing of the proposed action and solicited comments and concerns by emailing early coordination letters (Appendix G) on October 13, 2021, and will be sent the draft EA during the public review period, to solicit comments and identify potential conflicts with fishing practices. USACE briefed biologists from the MIT and Suquamish Indian Tribe on the proposed project at the annual co-manager meeting conference call on May 27, 2021. The Suquamish Indian Tribe expressed concerns with the in-water work window overlapping with the Tribal coho salmon fishery that takes place annually as early as mid-September and potentially extending to early-November. Specifically, the Tribe is concerned about the potential for increased barge or large vessel traffic, vessel traffic through the small lock while the large lock is closed, and construction access points interfering with their fishing effort. USACE met with the Suquamish Indian Tribe in January 2022 to supply additional project information and discuss construction logistics with the Tribe to avoid and minimize effects to the coho salmon fishery. Further coordination and consultation with both Tribes is planned to take place throughout the construction period.

8 CONCLUSION

The proposed Federal action under the preferred alternative of Replace LLCG (Alternative 3) would not constitute a major Federal action significantly affecting the quality of the human environment, and therefore does not require preparation of an EIS. Conservation measures, BMPs, and coordination with Federal, State, and Tribal natural resource departments, and limiting work to the designated project footprints is sufficient to avoid significant impacts to natural resources.

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Appendix E – ESA Section 7 Consultation Documentation

ESA consultation is ongoing. Consultation documents from National Marine Fisheries Service and U.S. Fish and Wildlife Service will be added here for the final EA.