Draft Environmental Impact Statement

June 2021

CAPITOL LAKE — DESCHUTES ESTUARY
Long-Term Management Project Environmental Impact Statement
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June 30, 2021

To Affected Tribes, Interested Agencies, Organizations, and Members of the Public:

The Department of Enterprise Services (Enterprise Services) is pleased to issue the Draft Environmental Impact Statement (Draft EIS) for the Capitol Lake – Deschutes Estuary Long-Term Management Project.

Enterprise Services is seeking comments on the Draft EIS. Instructions for submitting comments are outlined in the Draft EIS Fact Sheet that follows, which also includes details of the public hearing scheduled for July 27, 2021. All comments are due by August 13, 2021.

Background

Enterprise Services is evaluating options for long-term management of the Capitol Lake – Deschutes Estuary. The purpose is to identify and implement an environmentally and economically sustainable long-term management approach that meets project goals to improve water quality, manage existing sediment accumulation and future deposition, improve ecological functions, and enhance community use of the resource. **Neither short-term actions nor a long-term management alternative can be implemented until an EIS is completed and a Preferred Alternative is selected.**

About the Draft EIS

As Lead Agency under the Washington State Environmental Policy Act, Enterprise Services has prepared this Draft EIS to evaluate a range of long-term management alternatives for their ability to meet project goals. The Draft EIS evaluates a “No Action” and three action alternatives – an Estuary, a Hybrid, and a Managed Lake Alternative. The Draft EIS does not identify a Preferred Alternative.

This Draft EIS describes the impacts and benefits of the alternatives over a 30-year time horizon, temporary impacts during construction, and potential mitigation measures.

The following elements of the environment were evaluated.

- Hydrodynamics & Sediment Transport
- Navigation
- Water Quality
- Aquatic Invasive Species
- Fish & Wildlife
- Wetlands
- Air Quality & Odor
- Land Use, Shorelines, & Recreation
- Cultural Resources
- Visual Resources
- Environmental Health
- Transportation
- Public Services & Utilities
- Economics
Next Steps

Comments received on the Draft EIS during the comment period will be compiled and reviewed. Substantive comments will be considered by Enterprise Services in the preparation of the Final EIS. A preferred alternative will also be identified in the Final EIS.

Thank you for your interest in the Capitol Lake – Deschutes Estuary Long-Term Management Project.

Sincerely,

William Frare

William J. Frare, P.E.
Assistant Director, Facility Professional Services (and SEPA Responsible Official)
Signed by Janet Jansen for William Frare 6/22/2021
**Project Title:** Capitol Lake – Deschutes Estuary Long-Term Management Project

**Project Description:**
The Capitol Lake – Deschutes Estuary includes the 260-acre waterbody, known as Capitol Lake, located on the Washington State Capitol Campus, adjacent to downtown Olympia, at the base of Puget Sound. Historically, freshwater from the Deschutes River would mix with saltwater from Budd Inlet over expansive tidal flats. Between 1949 and 1951, a dam was constructed at 5th Avenue and, without the tidal exchange, the area was transformed into a freshwater lake, fed primarily by the Deschutes River. The newly formed Capitol Lake began to experience a range of environmental impairments after construction of the 5th Avenue Dam, eventually leading to community-use restrictions that persist today. Neither short-term actions (e.g., dredging to remove accumulated sediment) nor construction of a long-term management alternative (Estuary, Hybrid, or Managed Lake) can be implemented until an Environmental Impact Statement (or EIS) is complete and a Preferred Alternative is selected. The Department of Enterprise Services, at the direction of the state Legislature, developed this Draft EIS. Enterprise Services is seeking public comment on the Draft EIS, which describes the project goals, long-term management alternatives, potential significant impacts and benefits, and ways to avoid or minimize impacts.

**Summary of Alternatives:**

**No Action:** A No Action Alternative is a required element in an EIS. It provides a baseline against which the impacts of the action alternatives (Managed Lake, Estuary, Hybrid) can be evaluated and compared. The No Action Alternative represents the most likely future in the absence of implementing a long-term management project. The No Action Alternative would retain the 5th Avenue Dam in its current configuration, with limited repair and maintenance activities, consistent with the scope and scale of those that have received funding and environmental approvals over the past 30 years.

**Managed Lake:** The Managed Lake Alternative would retain the 5th Avenue Dam in its existing configuration. Extensive repair and maintenance would be completed on the 5th Avenue Dam to significantly extend the serviceable life of the structure. The reflecting pool within the North Basin would be maintained, and active recreational use would be restored in this area. Sediment would be managed through initial construction dredging and recurring maintenance dredging in the North Basin only. Sediment from construction dredging would be used to create habitat areas in the Middle Basin to support improved ecological function, habitat complexity, and diversity.

**Estuary:** Under the Estuary Alternative, the 5th Avenue Dam would be removed, and an approximately 500-foot-wide (150-meter-wide) opening would be established in its place. This would reintroduce tidal flows to the Capitol Lake Basin, returning the area to estuarine conditions where saltwater from Budd Inlet would mix with freshwater from the Deschutes River. Sediment would be managed through initial construction dredging in the Capitol Lake Basin and recurring maintenance dredging within West Bay. Dredged materials from construction dredging would be used to create habitat areas in the Middle and North Basins to promote ecological diversity, though tide flats would be the predominant habitat type.
Hybrid: Under the Hybrid Alternative, the 5th Avenue Dam would be removed, and an approximately 500-foot-wide (150-meter-wide) opening would be established in its place. Tidal hydrology would be reintroduced to the western portion of the North Basin and to the Middle and South Basins. Within the North Basin, a curved and approximately 2,600-foot-long (790-meter-long) barrier wall with a walkway would be constructed to create an approximately 45-acre saltwater reflecting pool adjacent to Heritage Park. A freshwater (groundwater-fed) reflecting pool was also evaluated for this EIS. Construction and maintenance of this smaller reflecting pool, in addition to restored estuarine conditions in part of the Capitol Lake Basin, gives this alternative its classification as a hybrid.

All action alternatives include construction of boardwalks, a 5th Avenue Pedestrian Bridge, a dock, and a boat launch for community use.

Date of Issue of the Draft EIS:
June 30, 2021

Date Draft EIS Comments are Due:
August 13, 2021

Document Availability:
The Draft EIS is available online at: https://CapitolLakeDeschutesEstuaryEIS.org.

Printed copies of the Draft EIS and technical appendices are available for review for no cost at the following locations. Please call in advance due to COVID-19 restrictions.

Department of Enterprise Services, Visitor Services
Legislative Building, 416 Sid Snyder Ave SW, Olympia, WA 98501
360-902-8880

Washington State Library
6880 Capitol Blvd SE, Tumwater, WA 98501
360-704-5200

Lacey Timberland Library
500 College St SE, Lacey, WA 98503
360-491-3860

Olympia Timberland Library
313 8th Avenue SE, Olympia, WA, 98501-1307
360-352-0595

Tumwater Timberland Library
7023 New Market Street, Tumwater, WA, 98501-6563
360-943-7790

How to Submit Comments:
Via the project website: https://CapitolLakeDeschutesEstuaryEIS.org

Via email: comment@CapitolLakeDeschutesEstuaryEIS.org

In writing:
Department of Enterprise Services
Capitol Lake – Deschutes Estuary EIS
PO Box 41476
Olympia, WA 98504-1476
Public Hearing:
An online public hearing will be held July 27, 2021, 6:30 – 8:30 p.m. Enterprise Services staff and members of the EIS Project Team will attend to hear feedback and comments on the Draft EIS. Anyone interested in providing testimony that will be submitted as public comments will be asked to pre-register to ensure accommodations for all those who wish to speak. Those who wish to observe the hearing, do not need to register. Attendance is not required in order to provide comment. The hearing will be broadcast live via TVW.

Register at: https://clde.participate.online

Proponent:
Washington State Department of Enterprise Services
1500 Jefferson St SE
Olympia, WA 98501

Lead Agency and Responsible Official:
Washington State Department of Enterprise Services
William J. Frare, P.E.
Assistant Director, Facility Professional Services

Contact Person for Lead Agency:
Carrie Martin, Project Manager
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List of Permits and Approvals:
The List of Permits and Approvals that may be required for the project can be found in Chapter 9.0, Permits & Approvals.

Authors and Principal Contributors:
The List of Preparers can be found in Attachment 2 of this Draft EIS.

Anticipated Date of Final EIS:
Comments received on the Draft EIS during the comment period will be compiled and reviewed. Substantive comments will be considered by Enterprise Services in the preparation of the Final EIS. A Final EIS that includes updates to the environmental review and responses to comments received on this Draft EIS, is expected to be published by June 30, 2022, with a Preferred Alternative identified for long-term management.
Executive Summary

The Washington State Department of Enterprise Services (Enterprise Services) is conducting an environmental review process under the State Environmental Policy Act (SEPA) for the Capitol Lake – Deschutes Estuary Long-Term Management Project. This Executive Summary provides an overview of the Draft Environmental Impact Statement (EIS), including information on long-term management alternatives and key findings from the technical analyses.

WHAT IS THE CAPITOL LAKE – DESCHUTES ESTUARY?
Learn more in Chapter 1.0

Historically, what is now known as Capitol Lake was part of the Deschutes Estuary, where freshwater from the Deschutes River would mix with saltwater from Budd Inlet over expansive tidelwalls. The Deschutes Estuary has long-standing cultural and spiritual significance to local tribes, particularly the Squaxin Island Tribe.

Between 1949 and 1951, a dam was constructed at 5th Avenue, and without the tidal exchange, the area was transformed into a freshwater lake, fed primarily by the Deschutes River. The waterbody was renamed Capitol Lake. Capitol Lake is the 260-acre waterbody located on the Washington State Capitol Campus, adjacent to downtown Olympia, at the base of Puget Sound. Capitol Lake was designed as part of the Washington State Capitol Campus, and it quickly became an important visual and recreational resource to the community.

WHAT PROBLEM IS THIS PROJECT SEEKING TO RESOLVE?
Learn more in Section 1.2

An estimated 35,000 cubic yards of sediment are transported by the Deschutes River (and Percival Creek) into the Capitol Lake Basin each year, shallowing the lake and resulting in conditions that are visibly altered. Since construction of the 5th Avenue Dam in 1951, sediment accumulation has reached up to 13 feet thick in some areas. Water quality monitoring began in the 1970s in response to excessive growth of aquatic plants, dense algal mats, and reduced water clarity, which are caused by high nutrient levels in Capitol Lake. In 1985, the swimming beach in Capitol Lake was formally closed because of high bacteria levels, following years of intermittent closures due to water quality conditions. Beginning in the late 1980s, management strategies were implemented to address aquatic invasive species. There are now more than 15 different plant and animal aquatic invasive species in Capitol Lake. In 2009, the presence of the invasive New Zealand mudsnail resulted in official closure to all public uses.

Many of these environmental conditions persist today and active use of the waterbody continues to be restricted. The long-term management project would address the diminished beneficial uses of the waterbody, caused by accumulating sediment, historically poor water quality, algal blooms, and invasive plant and animal species.
DEVELOPMENT OF CAPITOL LAKE

Sources: (top left) Courtesy of the Brewmaster's House Collection, City of Tumwater. (bottom left) Photographer Western Ways, Inc., Washington State Archives. (bottom right) Photograph by Merle Junk, Commercial Photographer, Olympia, WA, The Susan Parish Collection of Photography.
WHAT ARE THE PROJECT GOALS?

Learn more in Section 2.1

In 2016, Enterprise Services, in coordination with the Squaxin Island Tribe, governmental and agency partners, and the community, identified four primary goals for long-term management of the Capitol Lake – Deschutes Estuary that should be satisfied by any long-term management alternative.

The goals were established during a collaborative process, referred to as Phase 1 of the Long-Term Management Project. There is broad agreement that a long-term management project must be implemented to achieve these goals and improve existing conditions in the Project Area.

The Capitol Lake – Deschutes Estuary Long-Term Management Project seeks to identify an environmentally and economically sustainable management alternative that will improve environmental conditions and enhance community use of the resource.
WHY IS AN EIS BEING PREPARED?

Learn more in Section 1.2

An EIS provides environmental information:

- That decision-makers should consider alongside economic, engineering, or other policy considerations.
- For agencies with permitting authority to consider as regulatory authorizations are developed.

Enterprise Services, as the lead agency under SEPA, determined that there were probable significant adverse impacts from construction and operation of a long-term management project. Thus, an EIS is required to evaluate potential significant environmental impacts (and benefits), and to inform decision-makers and the public of reasonable alternatives, including mitigation measures that would avoid or minimize adverse impacts or enhance environmental quality.

Neither short-term actions nor a long-term management alternative can be implemented until an EIS is completed and a Preferred Alternative is selected.

The Draft EIS provides an objective summary of long-term management alternatives, the impacts and benefits of the alternatives over a 30-year time horizon, short-term impacts during construction, and potential mitigation measures. It includes additional information that will be considered in the decision-making process, including planning-level costs, input from engaged governmental and agency partners, and permits and approvals that would be required to implement a Preferred Alternative.

WHAT LONG-TERM MANAGEMENT ALTERNATIVES ARE EVALUATED IN THE DRAFT EIS?

Learn more in Section 2.2

There are two general approaches for management of the Capitol Lake – Deschutes Estuary: keep the 5th Avenue Dam in place and maintain a freshwater lake, or remove the 5th Avenue Dam and restore tidal estuarine conditions.

Three long-term management alternatives (also referred to as action alternatives) have emerged from these two approaches, and are evaluated in the Draft EIS:

- **A Managed Lake**, which would be similar to the existing Capitol Lake but with additional actions to meet lake management objectives. The 5th Avenue Dam would be retained and overhauled to significantly extend the serviceable life of the structure.

- **An Estuary**, which would restore tidal flow to conditions similar to the historic Deschutes Estuary. The 5th Avenue Dam would be removed, and a 500-foot opening would be created to reconnect the Capitol Lake Basin with Budd Inlet.

- **A Hybrid**, which would restore tidal flow to conditions similar to the historic Deschutes Estuary. The 5th Avenue Dam would be removed, and a 500-foot-wide opening would be
created. A new barrier would be installed to create a smaller (approximately 45-acre) lake feature (or “reflecting pool”).

A No Action Alternative, which represents the most likely future expected in absence of implementing a long-term management project, is also evaluated. This is a required element of an EIS. It provides a baseline against which the benefits, impacts, and costs associated with the action alternatives can be compared.

The No Action Alternative does not meet project goals.

WHAT IS THE PROJECT AREA?

Learn more in Section 1.4

The Project Area includes the 260-acre Capitol Lake that is managed by Enterprise Services, and it extends to the northern point of West Bay of Budd Inlet. West Bay is not managed by Enterprise Services. However, project actions may occur in West Bay so it is included in the Project Area. The waterbody in this area is collectively referred to as the Capitol Lake – Deschutes Estuary.

Capitol Lake extends from the south end at Tumwater Falls in the City of Tumwater to the north end of the 5th Avenue Dam in the City of Olympia. There are three basins within this waterbody, referred to as the North Basin, Middle Basin, and South Basin.

The Project Area does not extend upstream of Tumwater Falls into the Deschutes River (south) because that area would not be directly affected by the Capitol Lake – Deschutes Estuary Long-Term Management Project. The Project Area is shown on Figure ES.1.
HOW WERE THE ACTION ALTERNATIVES DEVELOPED?

*Learn more in Section 2.1*

The action alternatives were developed through a Measurable Evaluation Process. The initial step in the Measurable Evaluation Process was to screen the range of known management strategies (including specific design and operational elements that could be implemented to manage environmental conditions) and alternative variations that had been identified in earlier planning processes and through scoping for the EIS. The EIS Project Team, including multidisciplinary technical and policy experts working with Enterprise Services, completed the screening using objective criteria that considered technical and regulatory feasibility as well as environmental and economic sustainability. The screening process provided an opportunity to screen management strategies and components of an alternative variation without eliminating an entire alternative variation because one or more of its components were not feasible or sustainable. Following this screening process, Enterprise Services developed optimized versions of the Managed Lake, Estuary, and Hybrid Alternatives that would best achieve project goals.

WHAT ARE THE PRIMARY COMPONENTS OF THE ACTION ALTERNATIVES?

*Learn more in Section 2.3*

The primary components of the Managed Lake, Estuary and Hybrid Alternatives are summarized in Table ES.1 on the following page. The No Action Alternative is not included in this table because no new action would be taken to improve water quality, manage sediment, improve ecological functions, or enhance community use.

Table ES.1 provides an overview of the primary components of the long-term management alternatives (Managed Lake, Estuary, and Hybrid). Figures ES.2 through ES.4 provide visual simulations of the three alternatives.

Figures ES.5 through ES.7 describe the primary components of the three action alternatives and are provided at the end of this Executive Summary and in Chapter 2.0 of the Draft EIS.
### Table ES.1 Primary Components of the Long-Term Management Alternatives

<table>
<thead>
<tr>
<th>Project Goal</th>
<th>Managed Lake</th>
<th>Estuary</th>
<th>Hybrid</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water Quality</strong></td>
<td>Implement an Adaptive Management Plan to meet lake management objectives, with particular focus on aquatic vegetation control.</td>
<td>Remove the 5th Avenue Dam and create a 500-foot-wide opening to restore estuarine conditions and water quality typical of South Puget Sound inlets.</td>
<td>Same as the Estuary Alternative. <em>Implement an Adaptive Management Plan to maintain water quality if a freshwater reflecting pool is selected over the recommended saltwater reflecting pool.</em></td>
</tr>
<tr>
<td><strong>Sediment Management</strong></td>
<td>Initial construction dredging in the North Basin to establish target depth for recreation, which also removes accumulated sediment. Recurring maintenance dredging in the North Basin on an approximately <strong>20-year frequency</strong> to maintain target depth for recreation.</td>
<td>Initial construction dredging in the <strong>Middle and North Basins</strong> to establish a main channel and secondary channels, which also removes accumulated sediment. Recurring maintenance dredging in <strong>West Bay</strong> on an approximately <strong>6-year frequency</strong> to avoid or minimize impacts to recreational and commercial navigation in West Bay.</td>
<td>Initial construction dredging is the same as the Estuary Alternative. Recurring maintenance dredging is the same as the Estuary Alternative, but with an approximately <strong>5-year frequency</strong>.</td>
</tr>
<tr>
<td><strong>Ecological Functions</strong></td>
<td>Establish shoreline habitat areas in the <strong>Middle Basin</strong> using sediment from construction dredging. Allow passive transition of the <strong>Middle and South Basins</strong> to freshwater wetlands. Implement a Habitat Enhancement Plan to maintain ecological functions, including invasive and nuisance species management.</td>
<td>Restore estuarine habitat with reintroduced tidal flow. Establish shoreline habitat areas in the <strong>Middle and North Basins</strong> using sediment from construction dredging. A Habitat Enhancement Plan would be implemented, just as with the Managed Lake Alternative, but specific to estuarine conditions.</td>
<td>Same as the Estuary Alternative.</td>
</tr>
<tr>
<td><strong>Community Use</strong></td>
<td>Restore fishing and reconstruct dock at the Interpretive Center. Restore nonmotorized boating in the North Basin and establish a hand-carried boat launch at Marathon Park. Build a new 5th Avenue Pedestrian Bridge in the North Basin, adjacent to 5th Avenue. Boardwalks in the Middle and South Basins.</td>
<td>Same as the Managed Lake Alternative.</td>
<td>Same as the Managed Lake and Estuary Alternatives; and also includes a new trail along the barrier wall of the reflecting pool.</td>
</tr>
</tbody>
</table>
Figure ES.2 Managed Lake Alternative Visual Simulation
Figure ES.3 Estuary Alternative Visual Simulation at Mean Tide
Figure ES.4 Hybrid Alternative Visual Simulation at High Tide
WHAT ARE THE EXISTING WATER QUALITY CONDITIONS IN THE PROJECT AREA?

Learn more in Section 3.3.3

What is the existing water quality in Capitol Lake?

Historically, Capitol Lake has suffered from a variety of water quality problems, as evidenced by aquatic weed infestations, algal blooms, closure of the swimming area due to bacteria concentrations, and restrictions on boating and other beneficial uses. There are a number of factors that affect the water quality and overall aquatic health of the Capitol Lake aquatic ecosystem.

Capitol Lake is profoundly affected by a complex and continually changing interaction between physical (e.g., temperature, river flow and tides, erosion, and sedimentation), chemical (e.g., nutrients, dissolved oxygen, and pH), and biological (e.g., algae, bacteria, aquatic plants, and animals) characteristics.

The Deschutes River, which is the predominant inflow source, flows through Capitol Lake at a rate that keeps the water well circulated compared to other lakes in the region. Most regional lakes become stratified in the summer with a warm layer at the surface and colder water below. Because of the river’s influence, the water in Capitol Lake is rapidly replaced and water quality conditions commonly associated with stratification (e.g., high temperatures in shallow waters, oxygen depletion in deeper waters, widely fluctuating pH, toxic algal blooms) are less pronounced than in other lakes in the region.

As part of the water quality analysis for the Draft EIS, the EIS Project Team evaluated monitoring data from 2004 to 2014 and also collected water quality samples in 2019 to compare current conditions against the historical dataset. Despite what has been perceived to be worsening conditions in Capitol Lake, monitoring data indicate that water quality conditions have actually been improving in the lake and are relatively good in terms of physical and chemical characteristics important to aquatic life. There are only occasional seasonal violations of water quality standards, primarily associated with slight changes in temperature and dissolved oxygen.

The interrelationship among all of the factors affecting the Capitol Lake aquatic ecosystem are important to consider in evaluating the water resources throughout the ecosystem. Perceptions of poor water quality and worsening conditions in Capitol Lake are likely based on historical impairments, the continued impacted aesthetics from aquatic plant growth, and the ongoing restrictions on recreational use, rather than on the water chemistry. These improving water quality trends reduce the level of management that would be needed under a Managed Lake Alternative to meet lake management objectives.
What is the existing water quality in Budd Inlet?

Portions of Budd Inlet have low dissolved oxygen concentrations, with the lowest concentrations occurring each year in the late summer and early fall. These low dissolved oxygen concentrations are typical of the long narrow inlets that comprise much of South Puget Sound. The seasonal periods of low dissolved oxygen do not meet state water quality standards. Dissolved oxygen is important for aquatic habitat, particularly for cold water fish like salmon. Budd Inlet, along with most inlets in South Puget Sound, frequently violate the water quality standard for dissolved oxygen. Budd Inlet has a relatively high maximum daily depletion of dissolved oxygen from human-caused sources compared to other South Puget Sound inlets, but the Deschutes River input moderates dissolved oxygen conditions.

How do the project alternatives support the project goal of improving water quality?

Learn more in Section 4.3

Under a Managed Lake Alternative, water quality in Capitol Lake would be improved by actions to meet specific lake management objectives. Given the relatively good water quality, these actions would primarily focus on removing aquatic plants to maintain a healthy aquatic plant community so recreation and aquatic life uses are not impaired. Capitol Lake would continue to experience summertime algal blooms, occasional violations of state standards for dissolved oxygen, pH, and temperature, and frequent violations of total dissolved gas. These types of conditions are consistent with other lowland lakes in the Puget Sound region, although they are not as severe in Capitol Lake. The general conditions for cold water fish in Capitol Lake would not substantively change. There would be no change to water quality in Budd Inlet.

Under the Estuary Alternative, water quality may be moderately improved due to removal of the 5th Avenue Dam. Budd Inlet would continue to experience summertime algal blooms, occasional exceedances of temperature and pH, and frequent exceedances of dissolved oxygen in the summer. These exceedances would be consistent with other narrow, shallow estuaries in South Puget Sound, and numeric water quality standards would continue to not be met under an Estuary Alternative. The modest improvements to dissolved oxygen would not result in substantive changes for cold water fish, though overall habitat conditions would improve.

Within the reflecting pool of the Hybrid Alternative, tidal water would be exchanged twice daily and that water would be cooler, with higher dissolved oxygen concentrations, and less algae than the estuarine water outside of the reflecting pool. It is possible that dissolved oxygen concentrations within the reflecting pool could meet numeric marine water quality standards. No active management of a saltwater reflecting pool is assumed. If a freshwater reflecting pool were chosen over a saltwater reflecting pool, it would require active management to avoid impacts to public health and visual quality. Water quality in the estuary portion of the Hybrid Alternative would be similar to the Estuary Alternative.

Seasonal and occasional violations of water quality standards would occur under all long-term management alternatives.
How were future changes to water flow, water levels, & sediment transport evaluated?

*Learn more in Section 3.1*

A state-of-the-art three-dimensional computer model, Delft3D, was used to predict the movement of water (hydrodynamics) and the movement of sediment in the study area under the project alternatives. The numerical model uses complex systems of physics-based equations to calculate how water and sediment move in response to tides, river inflow, the lake bed, and the sediment load input. The model predicted variations among the project alternatives using the same hydrologic and tidal inputs but varying project geometries.

The numerical model used historical and current bathymetry (underwater topography) data; streamflow, tide, weather and stream measurements both upstream and downstream of the dam; historical records of dam operations; flooding and climate change projections; and sediment measurements.

Numerical modeling of hydrodynamics and sediment transport allowed the EIS Project Team to evaluate potential changes across many of the environmental disciplines addressed in the Draft EIS. It projected average water levels under each alternative, and maximum water levels from extreme river flows or tidal events. This supported a review of potential overland flooding in adjacent parks, in downtown Olympia, and at the Port of Olympia. The numerical model and EIS incorporate climate change projections related to sea level rise and extreme river flows as part of the future conditions for all alternatives and affected resource areas. (In addition, the EIS incorporates qualitative consideration of other climate change trends [e.g., temperature] where appropriate.)

The numerical model also projected the rate of sediment accumulation within the Project Area, which allowed the EIS Project Team to estimate the frequency and extent of long-term maintenance dredging that would be needed to avoid or minimize impacts under the action alternatives.

The methodology, calibration/validation, and results of the numerical model were reviewed by independent third-party experts (refer to Attachment 5, Hydrodynamics and Sediment Transport Discipline Report).

How would the water levels change within the Capitol Lake – Deschutes Estuary under each action alternative?

*Learn more in Section 4.1*

Under the Managed Lake Alternative, the North Basin would be dredged to establish an average depth of 13 feet (for recreational boating). The Middle and South Basins would not be dredged, and average water depths would be 6 feet or less. Over time, as a result of sediment accumulation, the Middle and South Basins would become even more shallow and slowly transition to vegetated freshwater wetlands.

Under the Estuary and Hybrid Alternatives tidal conditions and water elevations in the Deschutes Estuary would be similar to Budd Inlet. An inundation curve, which represents a statistical analysis of
predicted tides in Budd Inlet, shows that the North Basin would have water in it approximately 80% of the time. Water depths would rise and fall with the tide, but there would be some amount of standing water in the North Basin for most of the day.

Under the Hybrid Alternative, the average water depth in the reflecting pool would be approximately 8 feet.

**How do the alternatives support the project goals of sediment management & can impacts from sediment accumulation be mitigated?**

*Learn more in Chapter 2.0 and Section 4.2*

Since 1949, when 5th Avenue Dam construction began, the largest area of sediment deposition has occurred in the South Basin, where sediment has accumulated up to 13 feet thick. Sediment accumulation in the Middle Basin averages approximately 6 feet, with some spots reaching up to approximately 13 feet. Most of the North Basin has a sediment accumulation averaging between 3 to 7 feet in total.

**Sediment Management During Construction**

All action alternatives include initial dredging during construction to remove some of the sediment that has accumulated within the Capitol Lake Basin over time. (There have been only two dredge events in Capitol Lake since 5th Avenue Dam construction.)

Under the Managed Lake Alternative, only the North Basin would be dredged during construction. Dredging would establish an average water depth of approximately 13 feet to support recreational boating. Under the Estuary and Hybrid Alternatives, dredging would occur in the Middle and North Basins in the area that would transition to the main channel of the estuary and Deschutes River, and in smaller secondary channels to develop conditions similar to the historic estuary.

Under all action alternatives, sediment dredged during construction would be beneficially reused within the Project Area to create new shoreline habitat areas. Beneficially reusing the material on-site to develop shoreline habitat would improve ecological function and habitat diversity for all action alternatives. It would also result in a significant cost savings for the project—it avoids or minimizes costs associated with hauling the material off-site for upland disposal. Notably, when the Capitol Lake Basin was last dredged in the 1980s, that sediment was placed in the area now referred to as the Interpretive Center and wetland habitat has developed over time.

**Long-Term Sediment Management**

The approach to long-term sediment management would vary across the alternatives. Under the Managed Lake Alternative, sediment would be managed to avoid recreational impacts. This means that the North Basin would be dredged before water depths became too shallow for use by nonmotorized boats and other watercraft. Long-term maintenance dredging is expected approximately 20 years after construction, and on an increasing frequency after that dredge event.
Under the Estuary and Hybrid Alternatives, sediment deposition would be 3 to 4 times higher in West Bay than under the Managed Lake and No Action Alternatives, because sediment transported by the Deschutes River would not be held back behind the 5th Avenue Dam. A long-term maintenance dredging program would be established to minimize impacts to commercial and recreational navigation. Maintenance dredging would occur along the eastern shore of West Bay, at the Olympia Yacht Club, private marinas, and areas of navigational access between these resources, and at the Port of Olympia. Maintenance dredging would not occur in the Capitol Lake Basin (though, the initial construction dredging in the Capitol Lake Basin would reduce impacts from sediment deposition by about 48% at the Olympia Yacht Club).

Sediment accumulation would be monitored annually in West Bay because the rate of sediment accumulation is highly dependent on river flow conditions. The numerical model predicts that spot-dredging would be needed every 5 years under the Hybrid Alternative, and on a 6-year frequency under the Estuary Alternative. When dredging occurs at the Port of Olympia and private marinas, some slips, piers, and boathouses may need to be temporarily relocated to other locations in West Bay.

**WHAT FACTORS ARE AFFECTING ECOLOGICAL FUNCTION IN THE PROJECT AREA?**

*Learn more in Sections 3.3 and 3.4*

Construction of the 5th Avenue Dam blocked the tidal exchange between the Deschutes River and Budd Inlet, substantially altering the lower river system.

In addition to changes in water quality and sediment transport, ecological functions have been impacted by a dense community of aquatic plants that have existed in Capitol Lake for several decades. In the past, saltwater flushing was used to control the aquatic plants, but this was discontinued due to concerns about adverse impacts to lake ecology. In 2004, the herbicide triclopyr was applied to Capitol Lake to control the infestation of Eurasian watermilfoil. At that time, it was estimated that the plants covered almost the entire lake surface and the Washington State Department of Ecology (Ecology) estimated the volume at 72 tons of dry weight. Two months following the treatment, the Eurasian watermilfoil was nearly eliminated; however, the native aquatic plant biomass had returned to a comparable density. The primary aquatic plant at that time was common waterweed; Capitol Lake is currently dominated by coontail, a native floating plant.

Fifteen different aquatic invasive species have been documented in Capitol Lake in recent survey efforts, including plants, invertebrates, fish, waterfowl, and aquatic mammals. There are only limited management strategies currently being implemented to address these nuisance and invasive species.

**How do the alternatives support project goals of improving ecological functions?**

*Learn more in Sections 4.4 through 4.6*

All action alternatives would improve ecological functions within the Project Area and include shoreline habitat areas developed with sediment dredged during construction. Implementation of a Habitat
Enhancement Plan with management strategies to meet performance standards and to address nuisance and invasive species is also included in all action alternatives.

Wetland habitat conditions under the Managed Lake Alternative would improve with a transition from deepwater to vegetated freshwater wetlands. This increase in habitat complexity would provide minor improvements in ecological function. Active lake management, focusing on aquatic plant removal, would have minor benefits to fish and other aquatic species, although fish and wildlife distribution and use patterns would remain similar to existing conditions. The Managed Lake Alternative would best support the foraging base for bats, which would be significantly impacted by the Estuary and Hybrid Alternatives.

Comparatively, the Estuary and Hybrid Alternatives would reestablish estuarine wetland and tideflat habitats that have been greatly diminished and degraded because of historical development patterns. While both vegetated freshwater wetlands and estuarine wetlands have experienced historical declines, the loss of estuarine wetlands in Puget Sound represents a dramatic change in the historical occurrence in these once-prominent nearshore ecosystems. Estuarine wetlands provide water quality, hydrologic, and habitat functions that are particular to their position in the landscape. The mixing of freshwater and saltwater in estuarine environments creates some of the most productive and valuable habitat on earth. The reestablishment of estuarine conditions by reintroducing saltwater and tidal influences to the Capitol Lake Basin would substantially improve ecological functions in the Project Area. In addition to supporting key ecological processes, estuarine conditions would provide productive habitat for shellfish, salmon, other anadromous species, and marine fish in the area, potentially including Endangered Species Act-listed Chinook salmon (non-hatchery) and steelhead trout. Shallow water habitats with salt marsh vegetation along the shoreline would provide preferred forage and rearing habitat for juvenile salmon. The freshwater aquatic plants that dominate the basin today would not persist.

Removal of the dam would provide a natural freshwater to saltwater salinity gradient that is physiologically favorable to salmon and is not available under the Managed Lake Alternative. Prior to construction of the 5th Avenue Dam, salmon and other anadromous fish species spawned in the Deschutes River downstream of Tumwater Falls. (Historically, Tumwater Falls was a natural barrier to anadromous fish, meaning that there is no naturally reproducing native salmon population in the Deschutes River because migrating adults were not able to pass Tumwater Falls.)

**WHAT IS IMPACTING RECREATION IN THE PROJECT AREA?**

*Learn more in Sections 3.4 and 3.8*

In 2009, the presence of the invasive New Zealand mudsnail resulted in official closure of the waterbody to all public uses. State agencies determined that closure of Capitol Lake was feasible, and doing so would be an effective method to prevent the spread of these highly invasive species into other waterbodies where they pose a risk of environmental and economic harm. Human activity is the primary way that New Zealand mudsnails are spread.
Before this closure, boating had been impacted by the density of aquatic plants and management strategies that were being implemented to control the aquatic plants. Water quality conditions had also resulted in intermittent closures of the historical swimming beach through the 1970s, and formal closure of the swimming beach in 1985.

**How would the action alternatives support the goal of enhanced recreational use?**

*Learn more in Section 4.8*

The approach to restoring recreation is similar across all of the action alternatives.

A hand-carried boat launch would be established at Marathon Park to restore nonmotorized boating. Under the Managed Lake Alternative, this could include small sailboats. Under the Estuary and Hybrid Alternatives, predominant use would likely be kayaks, paddleboards, or other shallow-draft vessels. Nonmotorized boating would be possible at all times under the Managed Lake Alternative and within the approximately 45-acre reflecting pool of the Hybrid Alternative. Under the Estuary and Hybrid Alternatives, tidal water level variations would influence when boating could occur, though it is estimated that there will be water in the North Basin most of the time. This is the primary difference in recreational opportunity across the alternatives. For all action alternatives, the existing dock at the southern point of the Interpretive Center would be rebuilt to support fishing.

Under all action alternatives, decontamination stations would be installed at the proposed boat launch in Marathon Park, the existing boat launch in Tumwater Historical Park, near the reconstructed fishing dock at the Interpretive Center, and if needed, at the existing boat launch in West Bay Park. Decontamination stations would provide hot water for recreationalists to power spray the exterior of vessels and gear before entering the waterbody and after exiting to reduce or avoid the spread of aquatic invasive species. This approach has been used in other recreational areas that have been affected by the New Zealand mudsnail. The New Zealand mudsnail is not expected to be eradicated entirely under any alternative, so decontamination stations are assumed for the Managed Lake, Estuary, and Hybrid Alternatives. There would be a greater population (density) of the New Zealand mudsnail under the Managed Lake Alternative, but distribution may be wider under the Estuary and Hybrid Alternatives.

Elevated boardwalks would be constructed along the west shoreline of the South and Middle Basins, and adjacent to the shoreline habitat areas. Pedestrian access would also be improved along the existing loop around the North Basin with a new 5th Avenue Pedestrian Bridge constructed just south of 5th Avenue. Under the Hybrid Alternative, an additional pathway would be constructed on top of the reflecting pool barrier wall.

**Would the old swimming beach be reconstructed?**

*Learn more in Section 2.3.4*

The swimming beach that existed in the North Basin of Capitol Lake from 1964 to 1985 was operated by the City of Olympia, not by the State of Washington. Operating formal swimming facilities is not in
alignment with the mission of Enterprise Services, and there are no known plans to introduce such services into the agency mission or scope of services. Additionally, during the Measurable Evaluation Process, the EIS Project Team concluded that formal swimming facilities would be more expensive to operate compared to other ways to enhance active community use of the resource, like boating and fishing.

This project does not preclude or prohibit swimming. A governmental or agency partner could negotiate a lease to operate formal swimming facilities in Capitol Lake, should water quality conditions be suitable, following separate environmental review.

**WHAT ARE THE IMPACTS AND BENEFITS OF THE PROJECT ALTERNATIVES?**

*Learn more in Chapter 4.0*

The potential long-term impacts and benefits of the project were analyzed across 14 environmental disciplines. Table ES.2 (provided at the end of the Executive Summary) provides key findings of the long-term environmental changes from the multidisciplinary impact analyses. A more complete summary of the findings is provided in the Draft EIS, with the full technical analyses provided in the discipline reports that are attached to the Draft EIS. The short-term impacts from project construction are discussed in the following table.

**WHAT ARE THE TEMPORARY IMPACTS FROM CONSTRUCTION OF THE ACTION ALTERNATIVES?**

*Learn more in Chapter 5.0*

Construction would result in temporary impacts to many of the environmental disciplines analyzed in the Draft EIS. The construction duration would range from 4 to 8 years, depending on the alternative. Many of the construction elements would occur under all action alternatives (e.g., dredging, habitat area formation, boardwalks, etc.). The primary difference in construction impact is the duration.

Table ES.3 (provided at the end of the Executive Summary) summarizes the primary impacts of project construction, beginning with impacts that are common to all action alternatives. Construction activities that would increase the magnitude, intensity, or type of impact specific to a particular alternative are also described. If there are no additional construction impacts beyond those common to all action alternatives, that cell is shaded gray. Under the No Action Alternative, the project would not be constructed; therefore, there are no construction impacts and the No Action Alternative is not included in this table.

**ARE THERE SOCIAL JUSTICE & EQUITY ISSUES ASSOCIATED WITH THE PROJECT?**

*Learn more in Section 4.14*

Tribal populations would experience disproportionately adverse impacts from the Managed Lake Alternative, raising environmental justice concerns. The Managed Lake Alternative would have a continued impact on Usual and Accustomed Fishing Grounds and Stations, and on the Deschutes
Estuary, both of which have cultural, religious, and economic significance. The Managed Lake Alternative would also perpetuate historic and continued loss of tribes’ and tribal members’ connection to the natural environment.

Removal of the 5th Avenue Dam under the Estuary Alternative (and the Hybrid Alternative, to a lesser extent) would have beneficial effects for ecological, cultural, heritage, spiritual, and educational value for tribes. Tribal populations would likely experience the beneficial effects of restoration of the Capitol Lake Basin to an estuarine system most significantly.

**CAN THE PROJECT ALTERNATIVES BE REFINED AFTER THE DRAFT EIS?**

*Learn more in Section 1.13*

Enterprise Services can refine the project alternatives further as a result of the technical analyses and/or public comments on the Draft EIS. If a project alternative is refined and the refinement only results in minor changes to the environmental impacts or benefits evaluated in the Draft EIS, and there is no new significant information that is relevant to the analysis, then the changes would be summarized in the Final EIS, rather than a supplementary environmental review. Should significant new information that substantively changes the conclusions about environmental impacts or benefits be introduced after the release of the Draft EIS, supplementary environmental review may be required.

**HOW WOULD THE PROJECT BE FUNDED?**

*Learn more in Section 7.2*

After the EIS, funding will be needed to design and permit the Preferred Alternative, to construct the Preferred Alternative, and for long-term management of the Preferred Alternative. The funding sources for these future phases have not yet been identified. However, as the party responsible for constructing the 5th Avenue Dam and as the resource manager, it is assumed the State of Washington would contribute significant funding in support of the Preferred Alternative.

Enterprise Services is facilitating a Funding and Governance Work Group to evaluate potential shared funding and governance for long-term management of the Capitol Lake – Deschutes Estuary. The Funding and Governance Work Group is made up of governmental partners with jurisdiction and/or taxing authority in the Project Area.

**Are planning-level cost estimates provided for the project alternatives?**

*Learn more in Section 7.2*

Planning-level cost estimates were developed for the project alternatives based on conceptual design components. The accuracy of the planning-level cost estimates is consistent with the conceptual level of design, and accuracy will increase as design is further developed following selection of a Preferred Alternative. The planning-level cost estimates reflect an accuracy variation of - (minus) 25% to + (plus) 35%. Planning-level costs are provided in the Draft EIS for construction and for long-term maintenance dredging. They assume 3.5% annual escalation with construction beginning in 2028.
Given the numerical modeling that was conducted for the Draft EIS, costs associated with sediment management can be estimated and represent the largest long-term maintenance cost. Costs associated with long-term maintenance dredging were estimated for a 30-year duration after construction. They assume that the dredged material would be trucked to an upland disposal site under the Managed Lake Alternative and would be taken by barge to an in-water disposal site under the Estuary and Hybrid Alternatives. Upland disposal via truck is significantly more expensive than in-water disposal via barge, resulting in higher dredging costs for the Managed Lake Alternative. Other long-term costs, such as those associated with future project permit conditions or alternative-specific Adaptive Management Plans, Habitat Enhancement Plans, and other operations and maintenance activities would be estimated during design and permitting of the Preferred Alternative, when those requirements are better understood.

Based on initial recommendations from the Funding and Governance Work Group, it is assumed that the State of Washington would be responsible for the construction costs associated with any alternative. The approaches to funding long-term maintenance are expected to vary by alternative and are included in Table ES.4.

Table ES.4 Planning-Level Costs Summary Table

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Estimated Construction Costs</th>
<th>Estimated Long-Term Maintenance Dredging Costs</th>
<th>Suggested Approach to Funding Long-Term Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Managed Lake Alternative</td>
<td>$89M to $160M</td>
<td>$248M to $447M</td>
<td>State of Washington</td>
</tr>
<tr>
<td>Estuary Alternative</td>
<td>$131M to $235M</td>
<td>$48M to $101M</td>
<td>Potential for shared funding across local jurisdictions</td>
</tr>
<tr>
<td>Hybrid Alternative</td>
<td>$177M to $319M</td>
<td>$90M to $162M</td>
<td>Potential for shared funding across local jurisdictions</td>
</tr>
</tbody>
</table>

Were the potential economic impacts of the project alternatives evaluated? *Learn more in Section 4.14*

Potential long-term economic impacts were assessed for this project based on the potential for the action alternatives to result in changes in economic activity or economic value in the region.

The economic analysis found that there is no clear evidence that implementing any action alternative would reduce demand for residential or commercial development in downtown Olympia. The City of Olympia’s plans for the redevelopment of downtown are long-range, and investment in residential and commercial development is projected to increase in intensity over the next decade. Effects of any of the action alternatives on development in downtown Olympia would be beneficial, as long as the Preferred Alternative is implemented in a way that is both attractive and accessible. This was a key finding in a series of project-specific interviews with municipal planners, economic development officials, private developers, and real estate experts. Overall, the economic analysis concludes that economic factors
other than Capitol Lake – Deschutes Estuary Long-Term Management Project would have more influence on market conditions for development.

The economic activity and changes in economic value would be similar in type among the action alternatives. There were four primary categories or topics that were evaluated in the economic analysis, including potential long-term economic impacts to downstream economic activity, downtown development, demand for and value of recreation, and demand for and value of ecosystem services.

The methodology for the economic analysis and the findings were reviewed by independent third-party experts (refer to Attachment 5, Hydrodynamics and Sediment Transport Discipline Report).

**HOW ARE GOVERNMENTAL AND AGENCY PARTNERS ENGAGED IN THE EIS PROCESS?**

*Learn more in Sections 8.1, 8.2, and 8.3*

Throughout the process to prepare this EIS, Enterprise Services has actively engaged governmental and agency partners that have jurisdiction or regulatory authority within the Project Area, including the City of Olympia, City of Tumwater, LOTT Clean Water Alliance (LOTT), Port of Olympia, Squaxin Island Tribe, Thurston County, Washington State Department of Archaeology and Historic Preservation, Ecology, Washington State Department of Fish and Wildlife (WDFW), and Washington State Department of Natural Resources. These entities have been studying and considering long-term management options for several decades.

Enterprise Services convened several work groups, including an Executive Work Group, Technical Work Group, and Funding and Governance Work Group to provide structured opportunities to engage in the EIS process and provide input on substantive project topics.

The project engagement approach is provided at the end of the Executive Summary. It reflects an understanding that the Capitol Lake – Deschutes Estuary is a shared resource, and long-term management planning should be a collaborative process that includes potential beneficiaries and key stakeholders, including the community.

This engagement process is showing on Figure ES.8 (provided at the end of the Executive Summary).

**HOW IS THE COMMUNITY ENGAGED IN THE EIS PROCESS?**

*Learn more in Section 8.4*

Enterprise Services convened a Community Sounding Board to participate throughout the EIS process, recognizing continued community interest in long-term management planning. A 25-member Community Sounding Board was selected through an application process that focused on assembling a group representing a wide range of community interest areas. To contribute to a robust and well-informed EIS process, Enterprise Services met with the Community Sounding Board six times between 2019 and 2021 to understand the concerns of the community, represented by the 25 members, values, and perspectives on specific topics of interest.
HOW DOES THIS PROJECT INTERSECT ECOLOGY’S WORK TO IMPROVE WATER QUALITY IN THE DESCHUTES RIVER & BUDD INLET?

In 2015, Ecology issued a Water Quality Improvement Report and Implementation Plan for the Deschutes River, Percival Creek, and Budd Inlet. In 2020, the U.S. Environmental Protection Agency (USEPA) revised some of the recommendations from Ecology and approved a total maximum daily load (TMDL) for the Deschutes River and its tributaries. Ecology is currently preparing a TMDL for Budd Inlet (and Capitol Lake), and that document is expected to be issued in 2022. A TMDL is the calculation of the maximum amount of a pollutant allowed to enter a waterbody so that the waterbody will meet and continue to meet water quality standards for that particular pollutant.

These studies and the subsequent actions to improve water quality by reducing pollutant loading in the Deschutes River and the Project Area are separate from the Capitol Lake – Deschutes Estuary Long-Term Management Project. However, water quality under all project alternatives would improve as the water quality improvement strategies required by the TMDL are implemented. For example, if the TMDL goal for total phosphorus in the Deschutes River is achieved, it would result in a substantive reduction in nutrients in the Project Area, which would reduce algal blooms and improve dissolved oxygen concentrations.

The work of Ecology and the USEPA focuses solely on water quality and numeric targets to achieve consistency with state water quality standards. In contrast, the Draft EIS considers a wide range of interrelated environmental impacts and benefits that would occur under each project alternative. The Draft EIS is intended to support a comparative analysis of the project alternatives relative to all four project goals, including, but not limited to, water quality.

The water quality analysis conducted for the Draft EIS was completed independently from the work of Ecology and the USEPA; it was also reviewed by an independent third-party expert (refer to Attachment 5, Hydrodynamics and Sediment Transport Discipline Report).

HOW DOES THIS PROJECT INTERSECT WITH THE OLYMPIA SEA LEVEL RISE RESPONSE PLAN?

To address flooding vulnerabilities of downtown Olympia and its combined sewer system, the City of Olympia, LOTT, and the Port of Olympia prepared an Olympia Sea Level Rise Response Plan. In the near term, the Olympia Sea Level Rise Response Plan calls for flooding to be managed through emergency response activities, installation of backflow prevention on key stormwater outfalls and pipes, and landscaping of low spots to reduce flood impacts. The Olympia Sea Level Rise Response Plan also includes future response strategies, such as construction of a berm within Heritage Park to increase flood protection.

The Olympia Sea Level Rise Response Plan is separate from the Capitol Lake – Deschutes Estuary Long-Term Management Project and is focused solely on increasing resiliency of the City of Olympia from the effects of rising sea levels.
The hydrodynamic and sediment transport numerical model used for the Draft EIS incorporated relative sea level rise projections consistent with those used in the Olympia Sea Level Rise Response Plan. Under the Managed Lake Alternative, flooding from extreme river flood events would not be mitigated by the Olympia Sea Level Rise Response Plan. Under the Estuary Alternative, the modeled flood elevations predicted in the Heritage Park area would be mitigated by the improvements planned under the Olympia Sea Level Rise Response Plan. The potential for flooding in Heritage Park under the Hybrid Alternative would be addressed by the protective presence of the barrier wall for the hybrid reflecting pool.

WHEN IS THE DRAFT EIS PUBLIC COMMENT PERIOD?


Comments on the Draft EIS can be submitted in several ways.

- **Project website.** Visit the website for additional information about the project and access to a comment submittal form. https://CapitolLakeDeschutesEstuaryEIS.org
- **Online open house.** Visit a website created to support the Draft EIS comment period; it also includes a comment submittal form. https://clde.participate.online
- **Via email.** Send an email to the email address listed here, with your comment on the Draft EIS. comment@CapitolLakeDeschutesEstuaryEIS.org
- **In writing.** Submit your Draft EIS comment letter through the mail.
  Department of Enterprise Services
  Capitol Lake – Deschutes Estuary EIS
  PO Box 41476
  Olympia, Washington 98504
- **Online public hearing.** Participate in an online public hearing to provide and listen to oral testimony, which will be transcribed by a court reporter. The online public hearing is scheduled for Tuesday, July 27, 2021, from 6:30 to 8:30 PM. Visit the project website for guidelines and registration https://CapitolLakeDeschutesEstuaryEIS.org.

WHAT HAPPENS AFTER THE DRAFT EIS & ITS COMMENT PERIOD?

*Learn more in Section 1.13*

Enterprise Services will review the comments received on the Draft EIS and evaluate whether additional technical analyses are required to ensure a complete evaluation and support informed decision-making. The EIS Project Team will prepare the Final EIS, which will include responses to public comments on the Draft EIS. The Final EIS is targeted for release in mid-2022, pending the extent of public comments received and additional technical analyses.
HOW & WHEN WILL A DECISION BE MADE ON THE PREFERRED ALTERNATIVE?

Learn more in Section 1.12

Enterprise Services developed a decision-making process for this project that will consider findings from the Draft EIS along with other factors that are critical to informed decision-making, such as cost, long-term management, and durability of the decision. In the process to identify a Preferred Alternative, Enterprise Services will evaluate the Managed Lake, Estuary, Hybrid, and No Action Alternatives against the following selection criteria.

- **Performance Against Project Goals.** The degree to which the long-term management alternatives would meet project goals.
- **Other Environmental Disciplines.** The potential significant impacts and benefits across the other environmental disciplines analyzed in this EIS but not directly associated with the project goals.
- **Environmental Sustainability.** The ability to provide net environmental benefits over a 30-year horizon, considering relative contribution to project goals; and the level of active management required to achieve the project goals.
- **Economic Sustainability.** Measured by the relative cost-effectiveness in constructing and operating the alternative in a way that would meet the project goals; and the severity of economic impacts if there is a lapse in long-term funding.
- **Construction Impacts.** The duration and magnitude of construction impacts.
- **Decision Durability.** Evaluated by the ability of an alternative to achieve long-term support from local tribes, stakeholders, and communities. Input on this selection criterion will be solicited from the engaged tribes, governmental and agency partners, the Community Sounding Board convened for this project, and the State Capitol Committee. These groups collectively represent the communities most likely to be affected by this decision.

These selection criteria were reviewed with the governmental and agency partners, the Community Sounding Board, and the State Capitol Committee. These entities also provided input to Enterprise Services on the relative importance of these criteria and how they may be weighted in the decision-making process. Enterprise Services has integrated opportunities within the decision-making process to solicit meaningful input from the key stakeholders.

A Preferred Alternative will be selected as part of the process to prepare the Final EIS, and the rationale for that decision will be included in the Final EIS, along with a description of the Preferred Alternative, including any changes made as a result of input to the Draft EIS. After the Final EIS is issued, Enterprise Services will submit a capital request to the Washington State Legislature for funding to design and permit the Preferred Alternative.
**Figure E5.5 Managed Lake Alternative Overview**

**New 5th Avenue Pedestrian Bridge**
Establishing a multimodal trail to connect the existing loop around the North Basin. This would enhance recreational use and connectivity within the project area.

**Adaptive Management Plan to Improve Water Quality**
An adaptive management plan would be implemented to achieve common lake management objectives and to support recreational use of Capitol Lake. Aquatic plant control is expected to be the primary component of the adaptive management plan given the improving water quality trends that have been documented in recent years.

**Restoration of Boating & Fishing**
Project actions to improve water quality and ecological functions, and to manage sediment, would restore the ability to boat and fish throughout Capitol Lake. Restoring the opportunities for water-based activities enhances community use of the resource beyond the range of existing recreational opportunities in the project area.

**Boardwalk Adjacent to Ecological Improvements in the South and Middle Basins**
Establishing a boardwalk in the South and Middle Basins increases opportunities for recreational use within the project area. It supports a community-held value of walking around Capitol Lake.

**Proposed Habitats & Elevations (ft NAVD 88)**
- upland: >15
- transitional: 13.5 - 16
- high marsh: 9 - 13.5
- tidal flat: 8 - 9
- submerged: 6 - 8
- 4 - 6
- 2 - 4
- 0 - 2
- 1 - 0
- < 0

**Habitat Enhancement Plan to Maintain Ecological Functions**
Habitat Enhancement Plan would be implemented to manage invasive and nuisance species, and to ensure that the habitat areas ecological improvements in the North and Middle Basins meet performance goals defined through the permitting process.

**Initial & Maintenance Dredging in North Basin Only**
Dredging in the North Basin only minimizes the extent and associated cost of dredging under the Managed Lake alternative, while still supporting project goals. The focused dredging would support recreational use of the North Basin and improved ecological function in the Middle and South Basins. Maintenance dredging is assumed at a 20-year frequency.

**5th Avenue Dam substantially repaired and maintained**

**Transition to Freshwater Wetlands in South & Middle Basins**
Establishing habitat areas in the South and Middle Basins and allowing those areas to transition over time to freshwater wetlands would promote ecological diversity within Capitol Lake. Freshwater wetlands would improve water quality goals and would reduce the extent of dredging required for the Managed Lake Alternative.
Figure ES.6 Estuary Alternative Overview

Under the Estuary Alternative, the North Basin would have visible water present approximately 80% of the time. The depth and time of day would vary with typical tidal fluctuation.

Removal of the 5th Avenue Dam to Improve Water Quality

The 5th Avenue Dam would be removed, and an approximately 300-foot opening would be established. This would enhance tidal flow to the basin, which may improve water quality relative to marine water quality standards. Water in Southern Puget Sound inlets is typically low in dissolved oxygen.

New 5th Avenue Pedestrian Bridge

Establishing a multimodal trail to connect the existing loop around the North Basin. This enhances recreational use and connectivity within the project area.

Restoration of Boating & Fishing

Project actions to improve water quality and ecological functions, and to manage sediment, would restore the ability to boat and fish throughout the system. Restoring the opportunities for water-based activities enhances community use of the resource beyond the range of existing recreational opportunities in the project area.

Boardwalk Adjacent to Ecological Improvements in the South & Middle Basins

Establishing a boardwalk in the South and Middle Basins increases opportunities for recreational use within the project area.

Maintenance Dredging to Remove Accumulated Sediment

Maintenance dredging would occur in impacted areas of West Bay to minimize effects of sediment accumulation on the marinas, Port of Olympia, and navigation. Maintenance dredging is assumed at a 6-year frequency.

0th Avenue Dam removed and 5th Avenue Bridge replaced

Initial Dredging in the Middle & North Basin Channels

Initial dredging would remove sediment that has accumulated within the Middle and North Basin main channel and secondary channels to reduce the amount of sediment that may be transported once the Fifth Avenue Dam is removed. The dredging plan would establish a main channel that would remain submerged under most tidal elevations.

Establish Habitat Areas within the Middle & North Basins

Establishing habitat areas along the shorelines of the Middle and North Basins would promote ecological diversity with low marsh, high marsh, transitional, and upland habitat zones. Removing the dam would restore tidelands throughout the basin; tidelands would be the predominant habitat type.

Proposed Habitats & Elevations (ft NAVD 88)

| Upland | > 14 |
|Transitional | 11.5 - 14 |
|High Marsh | 8.9 - 11.5 |
|Low Marsh | 6.6 - 8.9 |
|Tidelands | 4.6 |
|Tideflats | 2.4 |
|Subtidal | -2.0 |

Estuary Alternative at Low Water

Habitat Enhancement Plan to Maintain Ecological Functions

A Habitat Enhancement Plan would be implemented to manage invasive and nuisance species and to ensure that the habitat areas ecological improvements in the North and Middle Basins meet performance goals defined through the permitting process.
ES.7 Hybrid Alternative Overview

- **Under the Hybrid Alternative, the non-reflecting pool portion of the North Basin would have visible water present approximately 80% of the time. The depth and time of day would vary with typical tidal fluctuations.**

**Maintenance Dredging to Remove Accumulated Sediment**
- Maintenance dredging would occur in impacted areas of West Bay to minimize effects of sediment accumulation on the marinas, Port of Olympia, and navigation. Maintenance dredging is assumed at a 5-year frequency.

**New 5th Avenue Pedestrian Bridge**
- Establishing a multimodal trail to connect the existing loop around the North Basin. This enhances recreational use and connectivity within the project area.

**Adaptive Management Plan to Improve Water Quality in the Reflecting Pool**
- A saltwater reflecting pool is not expected to need an adaptive management plan. An adaptive management plan would be prepared for a freshwater reflecting pool to manage phosphorous concentrations and reduce eutrophic plant growth.

**Restoration of Boating & Fishing**
- Project actions to improve water quality and ecological functions, and to manage sediment, would restore the ability to boat and fish throughout the system, including in the reflecting pool. Restoring the opportunities for water-based activities enhances community use of the resource beyond the range of existing recreational opportunities in the project area.

**Boardwalk Adjacent to Ecological Improvements in the South & Middle Basins**
- Similar to the Estuary Alternative, establishing a boardwalk in the South and Middle Basins increases opportunities for recreational use within the project area.

- **Proposed Habitats & Elevations (ft NAVD 88)**
  - upland: > 14
  - transitional: 11.5 - 14
  - high marsh: 8.9 - 11.5
  - low marsh: 6.6 - 8.9
  - tideflat: 4.6 - 6.6
  - subtidal: 0 - 2
  - < 2
  - < 4
  - < 0.5

**Habitat Enhancement Plan to Maintain Ecological Functions**
- A Habitat Enhancement Plan would be implemented to manage invasive and nuisance species, and to ensure that the habitat areas ecological improvements in the North and Middle Basins meet performance goals defined through the permitting process.

**Initial Dredging in the Middle & North Basin Channels**
- Initial dredging would be similar to the Estuary Alternative, with initial dredging within the Middle and North Basin main channel and secondary channels to reduce the amount of sediment that may be transported once the 5th Avenue Dam is removed. The dredging plan would establish a main channel that would remain submerged under most tidal elevations. Initial dredging is not assumed within the footprint of the reflecting pool. Maintenance dredging in a saltwater reflecting pool would occur at a 15-year frequency.

**Multimodal Trail on the Retaining Wall at the Reflecting Pool**
- Developing a trail for pedestrians and bicycles would enhance recreational opportunities around the reflecting pool.

**Establish Habitats Areas within the Middle & North Basins**
- Similar to the Estuary Alternative, habitat areas would be established along the shorelines of the Middle and North Basins to promote ecological diversity with low marsh, high marsh, transitional, and upland habitat zones. Removing the dam and reintroducing tidal flow will restore tideflats throughout the basins, tideflats would be the predominant habitat type.
### Table ES.2 Summary of Key Findings – Long-Term Impacts, Benefits, And Proposed Mitigation

<table>
<thead>
<tr>
<th>Environmental Disciplines Analyzed in the Draft EIS</th>
<th>No Action Alternative</th>
<th>Managed Lake Alternative</th>
<th>Estuary Alternative</th>
<th>Hybrid Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hydrodynamics &amp; Sediment Transport (Draft EIS Section 4.2)</strong></td>
<td>Hydrodynamics Maximum water levels and extent of flooding during extreme river floods would be higher than the Estuary and Hybrid Alternatives, and comparable but slightly lower than the Managed Lake Alternative. <strong>Sediment Transport</strong> Sediment would continue to settle in the Capitol Lake Basin, though some suspended sediment would continue to pass through the 5th Avenue Dam and deposit in West Bay.</td>
<td>Hydrodynamics Highest maximum water levels and greatest extent of flooding during extreme river floods compared to other project alternatives. <strong>Sediment Transport</strong> Sediment would continue to settle in the Capitol Lake Basin. Compared to the No Action Alternative, more sediment would settle in the North Basin resulting in less suspended sediment passing through the 5th Avenue Dam and depositing in West Bay.</td>
<td>Hydrodynamics Maximum water levels would occur under major tidal floods (rather than river floods), though maximum water levels would be lower than the highest water levels of the No Action and Managed Lake Alternatives. <strong>Sediment Transport</strong> Sediment deposition in West Bay would be approximately 3 times more than under the No Action and Managed Lake Alternatives.</td>
<td>Hydrodynamics The long-term hydrodynamic conditions for the Hybrid Alternative would be similar to those of the Estuary Alternative. However, flooding in Heritage Park and along Powerhouse Road SW in the North Basin would be avoided due to the barrier wall that would define the westerly perimeter of the reflecting pool. <strong>Sediment Transport</strong> Sediment deposition in West Bay would be approximately 4 times more than under the No Action and Managed Lake Alternatives.</td>
</tr>
<tr>
<td><strong>Navigation (Draft EIS Section 4.2)</strong></td>
<td>No change to the navigational impact in West Bay; separate entities would continue to dredge for navigability. Impacts to navigation from ongoing sediment deposition would be less than significant but could become significant over time if dredging is delayed in the future, similar to existing conditions.</td>
<td>Same as No Action Alternative.</td>
<td>Navigational impacts from sediment deposition would be significant but could be reduced to less than significant if consistent funding is available for the long-term dredging program (with dredging estimated at a 6-year frequency), and with implementation of an annual sediment monitoring program to ensure that maintenance dredging is responsive to actual sediment deposition that is highly influenced by environmental conditions. <strong>Proposed Mitigation</strong> • Implementation of a sediment monitoring plan. Monitoring would be conducted regularly and used to modify the long-term dredging plan, as necessary. • As part of the maintenance dredging program, scheduling and phasing would be developed in coordination with the USACE, the Olympia Yacht Club, other private marinas, and the Port of Olympia.</td>
<td>Same as the Estuary Alternative (with dredging estimated at a 5-year frequency).</td>
</tr>
</tbody>
</table>
## Environmental Disciplines Analyzed in the Draft EIS

<table>
<thead>
<tr>
<th>Water Quality (Draft EIS Section 4.3)</th>
<th>No Action Alternative</th>
<th>Managed Lake Alternative</th>
<th>Estuary Alternative</th>
<th>Hybrid Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current and improving water quality conditions and trends in Capitol Lake would continue. Eventually, there would be a significant impact from increased density and areal extent of aquatic plants that violate water quality standards related to aesthetics. There would be no change to water quality in Budd Inlet.</td>
<td>There would be minor to moderate beneficial effects to already improving water quality in Capitol Lake from reduced algal blooms and reduced aquatic plants from implementation of an adaptive lake management plan; however, violations of water quality standards would still occur.</td>
<td>Estuarine conditions throughout the restored Capitol Lake Basin would have seasonally low dissolved oxygen and frequent algal blooms, as is typical for South Puget Sound estuaries. Compared to existing dissolved oxygen conditions in Capitol Lake, this seasonal/periodic reduction in dissolved oxygen would be a significant impact. However, estuarine water is inherently different than freshwater.</td>
<td>Same as the Estuary Alternative plus the following: The saltwater reflecting pool would have better dissolved oxygen and less algae than the estuary but would not consistently meet water quality standards. Under a freshwater reflecting pool, an adaptive management plan would need to be implemented to maintain water quality.</td>
<td></td>
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</table>

| Aquatic Invasive Species (Draft EIS Section 4.4) | Capitol Lake would remain closed to the public due to the New Zealand mudsnail, and there would be limited management of invasive and nuisance species. There would be low risk of aquatic invasive species spreading outside of the Capitol Lake Basin to otherwise non-invaded water bodies so there would be less than significant impacts. | Management of the lake would likely not substantially affect the abundance and distribution of aquatic invasive species. There would be less than significant impacts from changes in the population and distribution of aquatic invasive species. Decontamination stations would be installed to support reopening Capitol Lake to recreational watercraft; educational signage, and an adaptive management plan with monitoring, would also reduce the potential spread of invasive species. | Saltwater would have a substantial beneficial impact by reducing or eliminating freshwater aquatic invasive species. Tidal flow would move salt-tolerant aquatic invasive species into Budd Inlet, but these species are not expected to establish at high enough densities to significantly impact native species. Although there is uncertainty, there would be less than significant impacts related to potential changes in the population and distribution of aquatic invasive species, which may move into West Bay. Decontamination stations would be installed to support reopening Capitol Lake to recreational watercraft; educational signage, and an adaptive management plan with monitoring, would also reduce the potential spread of invasive species. Proposed mitigation is the same as the Managed Lake Alternative. | Same as the Estuary Alternative. |

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**Proposed Mitigation**
- **Water Quality**: Consider whether modifications could be made to limit the pulsed nature of the discharge through the 5th Avenue Dam (this influences dissolved oxygen conditions in West Bay).
- **Aquatic Invasive Species**: Best Management Practices (BMPs) and other conditions would be included in approved water quality permits for aquatic plant removal and other projects implemented under a lake management plan.
- **Aquatic Invasive Species**: Aquatic invasive species adaptive management plan would be developed and implemented. WDFW-approved BMPs would be implemented during long-term maintenance dredging.
- **Estuarine Conditions**: ESTUARINE conditions throughout the restored Capitol Lake Basin would have seasonally low dissolved oxygen and frequent algal blooms, as is typical for South Puget Sound estuaries. Compared to existing dissolved oxygen conditions in Capitol Lake, this seasonal/periodic reduction in dissolved oxygen would be a significant impact. However, estuarine water is inherently different than freshwater.

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**Proposed Mitigation**
- Aquatic invasive species adaptive management plan would be developed and implemented.
- WDFW-approved BMPs would be implemented during long-term maintenance dredging.
<table>
<thead>
<tr>
<th>Environmental Disciplines Analyzed in the Draft EIS</th>
<th>No Action Alternative</th>
<th>Managed Lake Alternative</th>
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<th>Hybrid Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish &amp; Wildlife (Draft EIS Section 4.5)</td>
<td>Habitat quality and use by some fish and other aquatic species would continue to be affected by the presence of the dam and lack of active lake management, though there would be less than significant impacts from the incremental changes.</td>
<td>Efforts to actively manage the lake would result in changes in lake bathymetry and habitation conditions that would have minor benefits to fish and other aquatic species, although fish and wildlife distribution and use patterns would remain similar to existing conditions. <strong>Less than significant impacts</strong> on fish and wildlife would be associated with additional permanent overwater and in-water structures, artificial lighting elements, buttressing berm, and maintenance dredging. <strong>Proposed Mitigation</strong>&lt;br&gt;• BMPs and other measures would be implemented to avoid and minimize impacts to fish and wildlife.&lt;br&gt;• A Habitat Enhancement Plan would be developed and implemented.</td>
<td>The estuary habitat conditions reestablished by dam removal would result in substantial beneficial effects for salmon, other anadromous species, and marine fish. Due to historical declines, estuary habitat is scarce and valued in the region compared to freshwater ponds and lakes, which remain relatively abundant. The removal of the dam and restoration of estuarine conditions would also improve migration and habitat for anadromous fish and wildlife, including shorebird and wading birds. Eliminating the existing lake would have significant impacts to freshwater fish species and the Woodard Bay bat colony. <strong>Less than significant impacts</strong> on fish and wildlife would be associated with additional permanent overwater and in-water structures, artificial lighting elements, and maintenance dredging. In addition to mitigation proposed under the Managed Lake Alternative, trees removed to realign Deschutes Parkway would be replaced based on City of Olympia’s tree protection ordinances and critical areas regulations.</td>
<td>Same as the Estuary Alternative plus the following: The saltwater reflecting pool would provide fair to moderate rearing habitat for salmonids, and resting deepwater habitat for diving and dabbling ducks when the estuary portion of the project is at low tide. A freshwater pool would not provide habitat for marine fish and would stress anadromous fish that go between the freshwater pool and the brackish water of the estuary, similar to existing conditions. A freshwater pool would provide some habitat for bats and would not support raptors and fish-eating birds well because of reduced productivity of the freshwater lake.</td>
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<tr>
<td>Wetlands (Draft EIS Section 4.6)</td>
<td>Wetland habitat conditions would improve incrementally over time as Capitol Lake transitions to a more diverse complex of freshwater wetlands through ongoing sediment deposition, resulting in a minor beneficial effect.</td>
<td>A transition from deep water to vegetated freshwater wetlands in the Middle and South Basins would increase habitat complexity and provide a minor beneficial effect. There would be less than significant impacts on wetlands associated with fill and indirect shade impacts associated with additional permanent overwater and in-water structures. <strong>Proposed Mitigation</strong>&lt;br&gt;• BMPs and other measures would be implemented to avoid and minimize impacts to wetlands.&lt;br&gt;• A Habitat Enhancement Plan would be developed and implemented.</td>
<td>Restablishment of estuarine wetlands by reintroducing saltwater and tidal influences to the restored Capitol Lake Basin would provide a substantial beneficial effect because estuarine wetlands are some of the most productive and valued habitats on earth. There would be less than significant impacts on wetlands associated with fill and indirect shade impacts associated with additional permanent overwater and in-water structures. Proposed mitigation is the same as the Managed Lake Alternative.</td>
<td>Same as the Estuary Alternative but with less estuarine wetlands given the presence of the reflecting pool.</td>
</tr>
<tr>
<td>Environmental Disciplines Analyzed in the Draft EIS</td>
<td>No Action Alternative</td>
<td>Managed Lake Alternative</td>
<td>Estuary Alternative</td>
<td>Hybrid Alternative</td>
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| **Air Quality & Odor** *(Draft EIS Section 4.7)*    | Odors due to continued algal growth and decay would change little from existing conditions where impacts are infrequent, short in duration, and with low intensity, resulting in less than significant impacts. | Less algal growth than under the No-Action Alternative would result in lower odor potential and less than significant impact from odor. Criteria pollutant and greenhouse gas emissions from long-term management activities are lower than state thresholds and, therefore, there would be less than significant impacts to air quality from post-construction activities. **Proposed Mitigation**  
• Compliance with air quality rules and implementation of BMPs for controlling dust and reducing emissions would reduce potential exposure of people to emissions during maintenance dredging. | The variability in personal perception of naturally occurring odors from tideflats makes an impact determination subjective. In consideration of the variable frequency and duration, and low intensity, there is expected to be less than significant impacts from odor. Criteria pollutant and greenhouse gas emissions from long-term management activities are lower than state thresholds and, therefore, there would be less than significant impacts to air quality from post-construction activities. Most opportunity for carbon sequestration and least methane emissions, comparatively. **Proposed mitigation** is the same as the Managed Lake Alternative. | Same as the Estuary Alternative. |
| **Land Use, Shorelines, & Recreation** *(Draft EIS Section 4.8)* | Increasing frequency and extent of flooding could result in displacement of existing uses, disinvestment, and economic blight in areas of downtown Olympia. Therefore, there is a risk of significant impact on land use from the No-Action Alternative. | There would be no substantial changes to land or shoreline uses and no conflict with plans and policies; therefore, there would be less than significant impacts. Increased flooding is expected and could impact downtown land uses and low-lying parks; the impacts would be most significant under the Managed Lake Alternative compared to the other action alternatives due to higher maximum river flood elevations. Improved water quality, sediment management, improved ecological functions, and increased opportunities for community use would have a substantial beneficial effect on recreation. **Proposed Mitigation**  
• Coordination with the Olympia Sea Level Rise Response Plan on design parameters for the flood protection design of the Heritage Park berm to account for extreme river flooding. | There would be no substantial changes to land or shoreline uses, and no conflict with plans and policies, therefore, there would be less than significant impacts. Increased flooding is expected and could impact downtown land uses and low-lying parks. Improved water quality, sediment management, improved ecological functions, and increased opportunities for community use would have a substantial beneficial effect on recreation. **Proposed Mitigation**  
• Enterprise Services would work with owners of identified properties requiring acquisition and provide compensation in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act.  
• Restrictions on motorized boat use would continue to be enforced, including signage at the entry from West Bay to the North Basin.  
• If incidental motorized boat use occurs in the North Basin, a speed limit would be established.  
• Rules such as no-wake, lower speed, or restricted access for motorized boats would be established in areas frequented for wildlife viewing. | Same as the Estuary Alternative plus the following: The barrier wall and reflecting pool would provide additional recreational opportunities compared to the other project alternatives. |
<table>
<thead>
<tr>
<th>Environmental Disciplines Analyzed in the Draft EIS</th>
<th>No Action Alternative</th>
<th>Managed Lake Alternative</th>
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</thead>
</table>
| **Cultural Resources** (Draft EIS Section 4.9)      |                       | Continued flooding could impact archaeological resources, if present, and there would be potentially significant impacts. | Continued flooding could impact cultural resources, and there would be potentially significant impacts. Recurring maintenance dredging could intersect, remove, or compact unrecorded resources, and there would be potentially significant impacts. **Proposed Mitigation**  
  - Mitigation would be identified through the Section 106 process under the National Historic Preservation Act of 1966.  
  - Several additional mitigation measures that could help to maintain the character-defining features of affected historic properties are included in Section 5.7.2.1 of the Cultural Resources Discipline Report (Attachment 13). | Same as the Managed Lake Alternative, though potential impacts from flooding would be less than the Managed Lake and No Action Alternatives. Additionally, if the Deschutes Basin Project Historic District (which includes Capitol Lake – Deschutes Estuary, the 5th Avenue Dam, the 5th Avenue Bridge, and the Olympic Street W Bridge) is determined eligible for listing, the elimination of the dam and the reflecting pool would have a significant impact. However, the return of the estuary would reestablish its historic use patterns. **Proposed Mitigation**  
  - Mitigation would be identified through the Section 106 process under the National Historic Preservation Act of 1966.  
  - Several additional mitigation measures that could help to maintain the character-defining features of affected historic properties are included in Section 5.7.2.2 of the Cultural Resources Discipline Report (Attachment 13). | Same as the Estuary Alternative plus the following: The barrier wall for the reflecting pool would mitigate impacts on historic resources related to the 5th Avenue Dam and bridge removal, and loss of the existing reflecting pool, to less than significant impact levels. |
| **Visual Resources** (Draft EIS Section 4.10)        |                       | Aquatic plants and algae populations would continue in Capitol Lake, and likely increase as it becomes shallower through sediment deposition. Capitol Lake is already affected by aquatic algae and aquatic plant populations, so there would be less than significant impacts on visual quality from continued and worsening vegetative growth. | Additional view access from the boardwalks would have substantial beneficial effects. Improved water quality and aquatic plant removal would have minor beneficial effects related to the aesthetics. There would be less than significant impacts associated with loss of some views of open water in the Middle Basin due to riparian vegetation growth in new habitat areas. **Proposed Mitigation**  
  - Design of park modifications/improvements could be developed with input from user groups.  
  - Design of habitat areas and shoreline plantings could include the establishment of view corridors.  
  - Lighting on the walkways could be placed as low as possible and directed onto the walkway surface only to reduce contrast with the natural surroundings.  
  - Maintenance dredging could be scheduled to minimize impacts on views from Marathon Park during the summer season. | Additional view access from the boardwalks would have substantial beneficial effects. Tidal fluctuations would change the appearance of the waterbody substantially, but the landscape would remain unified and harmonious with the natural setting of the existing surroundings resulting in less than significant impacts. **Proposed Mitigation**  
  - Design of park modifications/improvements could be developed with input from user groups.  
  - Design of habitat areas and shoreline plantings could include the establishment of view corridors.  
  - Lighting on the walkways could be placed as low as possible and directed onto the walkway surface only.  
  - A view corridor could be established from the realigned section of Deschutes Parkway and 4th Avenue W to maximize motorists’ views toward the water. | Same as the Estuary Alternative plus the following: Visual impacts of the barrier wall would be severe. Although mitigation for the appearance of the wall could be provided, its sheer scale would result in a significant unavoidable impact. **Proposed Mitigation**  
  - The barrier wall could have a textured concrete surface to improve the appearance of the structure.  
  - The barrier wall design could be adjusted to better integrate with the long-term plans for the Eastern Washington Butte.  
  - Guardrails on the barrier wall walkway could be designed to be as transparent as possible. |
### Environmental Disciplines Analyzed in the Draft EIS

<table>
<thead>
<tr>
<th>Environmental Health (primarily sediment quality) (Draft EIS Section 4.11)</th>
<th>No Action Alternative</th>
<th>Managed Lake Alternative</th>
<th>Estuary Alternative</th>
<th>Hybrid Alternative</th>
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</thead>
<tbody>
<tr>
<td>There would be no change to sediment quality in Capitol Lake or Budd Inlet.</td>
<td>The risk of sediment quality degradation from maintenance dredging is low because dredged sediment would be similar to the high-quality conditions currently present in Capitol Lake, resulting in less than significant impacts. <strong>Proposed Mitigation</strong>&lt;br&gt;• BMPs would be implemented in accordance with permit requirements for turbidity management and spill prevention.&lt;br&gt;• A Water Quality Monitoring and Protection Plan would also be prepared, approved by the regulatory agencies, and implemented throughout construction.</td>
<td>The risk of sediment quality degradation from maintenance dredging is low because sediment dredged from West Bay would be material deposited from the Deschutes River, which will be similar to the high-quality sediment conditions currently present in Capitol Lake, resulting in less than significant impacts. The export of sediment into West Bay would improve sediment quality in West Bay as cleaner sediment is deposited on existing sediment, resulting in minor to substantial beneficial effects. <strong>Proposed mitigation is the same as the Managed Lake Alternative.</strong></td>
<td>Same as the Estuary Alternative.</td>
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</table>

| Transportation (Draft EIS Section 4.12) | There would be no change to traffic operations in Capitol Lake or Budd Inlet. | During maintenance dredging events that are estimated to occur every 20 years, hauling dredged material by truck or rail would result in congestion and delays that would cause a significant unavoidable impact on traffic operations for several months each time. **Proposed Mitigation**<br>• A Construction Traffic Management Plan would be prepared for maintenance dredging. | During maintenance dredging events that are estimated to occur every 6 years, impacts to traffic operations would be less than significant if the dredged material is transported by barge for in-water disposal. If the dredged material is not suitable for in-water disposal, transport by truck or rail would have a significant impact on traffic operations. **Proposed Mitigation**<br>• A Construction Traffic Management Plan would be prepared for maintenance dredging. | Same as the Estuary Alternative, except maintenance dredging events are estimated to occur every 5 years. |

| Public Services & Utilities (Draft EIS Section 4.13) | There would be significant impacts on utility infrastructure from extreme river flooding, but these could be addressed through mitigation measures. There would be significant impacts if Ecology requires LOTT and other dischargers to implement more stringent actions for stormwater and wastewater discharges to improve water quality and meet regulatory standards in the Capitol Lake Basin. | Same as the No Action Alternative. **Proposed Mitigation**<br>• In coordination with the Olympia Sea Level Rise Response Plan, design parameters would be included for the flood protection design of the Heritage Park berm to account for extreme river flooding. | Impacts on utility infrastructure from saltwater exposure could cause corrosion and could reduce infrastructure life; this would be a significant impact but could be addressed through mitigation measures. The reestablished estuarine conditions would reduce the extent of overland flooding from river floods, resulting in a minor beneficial effect. **Proposed Mitigation**<br>• During design, an evaluation of utilities would be completed within low-lying areas potentially vulnerable to flooding under future conditions with relative sea level rise, and those vulnerable to seawater corrosion, and would be coordinated with public and private utility owners in developing a protection or replacement schedule. | Same as the Estuary Alternative. |
### Environmental Disciplines Analyzed in the Draft EIS

<table>
<thead>
<tr>
<th>Economics (including ecosystem services) (Draft EIS Section 4.14)</th>
<th>No Action Alternative</th>
<th>Managed Lake Alternative</th>
<th>Estuary Alternative</th>
<th>Hybrid Alternative</th>
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</thead>
<tbody>
<tr>
<td>Project benefits would not be realized under the No Action Alternative, and there would be ongoing equity and social justice issues to tribes given the sustained loss of connection to the natural environment and access to Usual and Accustomed Fishing Grounds and Stations.</td>
<td>There would be ongoing equity and social justice issues to tribes given the sustained loss of connection to the natural environment and access to Usual and Accustomed Fishing Grounds and Stations. The long-term impacts on economic activity and changes in economic value would be similar in type among the action alternatives. The enhancements to trails, habitat areas, and restored water-based recreation would increase the value of recreation in the basin across all action alternatives. The action alternatives would improve habitats, visual aesthetics, and cultural, heritage, spiritual, and educational values.</td>
<td>Same as the Managed Lake Alternative; except that the Estuary Alternative would beneficially affect tribal populations through the cultural, heritage, spiritual, and educational value that an estuarine environment provides. This would address equity and social justice impacts associated with the No Action and Managed Lake Alternatives. There would be reduced or avoided regulatory compliance costs for LOTT and stormwater discharges compared to the No Action and Managed Lake Alternatives.</td>
<td>Same as the Estuary Alternative.</td>
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</table>
### Table ES.3 Summary of Key Findings – Short-Term Construction Impacts and Proposed Mitigation

<table>
<thead>
<tr>
<th>Environmental Disciplines Analyzed in the Draft EIS</th>
<th>Construction Impacts Common to All Action Alternatives</th>
<th>Managed Lake Alternative</th>
<th>Estuary Alternative</th>
<th>Hybrid Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hydrodynamics &amp; Sediment Transport</strong> (Draft EIS Section 5.1)</td>
<td>The changes in hydrodynamics (water flow and elevation) and sediment transport (areas of sediment accumulation and erosion) would occur after construction and are summarized in Table ES.2.</td>
<td>No additional construction impact beyond those common to all action alternatives.</td>
<td>No additional construction impact beyond those common to all action alternatives.</td>
<td>No additional construction impact beyond those common to all action alternatives.</td>
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</table>

**Proposed Mitigation**

- Standard dredging and overwater and in-water construction BMPs would be implemented in accordance with permit requirements for in-water work.
- A Water Quality Monitoring and Protection Plan would be prepared, approved by the regulatory agencies, and implemented throughout construction.
- To reduce potential dissolved oxygen impacts to Budd Inlet, dam operations could be modified to restrict lake outflow during dredging and during construction activities and increase lake outflow at night.

| Navigation (Draft EIS Section 5.2) | There would be no change to navigation in West Bay during construction. Potential impacts to commercial and recreational navigation in West Bay would occur after construction and are summarized in Table ES.2. | No additional construction impact beyond those common to all action alternatives. | No additional construction impact beyond those common to all action alternatives. | No additional construction impact beyond those common to all action alternatives. |

| Water Quality (Draft EIS Section 5.3) | Construction impacts on water quality would be largely related to the sediment disturbance from dredging, habitat construction, and building recreational amenity structures. With implementation of BMPs, short-term impacts on water quality such as localized turbidity (suspended sediments that reduce water clarity) and resuspended sediments can be confined within the allowable mixing zone and, therefore, there would be less than significant impacts. | Construction impacts on water quality would occur intermittently and in varying locations over approximately 4 to 5 years. | Construction impacts on water quality would occur intermittently and in varying locations over approximately 7 to 8 years. | Same as the Estuary Alternative. |

**Proposed Mitigation**

- Standard dredging and overwater and in-water construction BMPs would be implemented in accordance with permit requirements for in-water work.
- A Water Quality Monitoring and Protection Plan would be prepared, approved by the regulatory agencies, and implemented throughout construction.
- To reduce potential dissolved oxygen impacts to Budd Inlet, dam operations could be modified to restrict lake outflow during dredging and during construction activities and increase lake outflow at night.

| Aquatic Invasive Species (Draft EIS Section 5.4) | Prior to construction, Capitol Lake would be treated to significantly reduce the population of aquatic invasive species and minimize the potential spread of aquatic invasive species outside of the study area. Construction equipment would be decontaminated before entering and leaving the Project Area. For these reasons, construction would have less than significant impacts on aquatic invasive species populations and distribution. Reuse of dredged material within the habitat areas may have a minor beneficial effect due to burial of some aquatic invasive species. | No additional construction impact beyond those common to all action alternatives. | Some dredged sediment may be exported out of the study area; this could provide a cause for transmission of aquatic invasive species. However, treatment of the dredged material and disposal at an approved upland site would ensure that there is less than significant impact on aquatic invasive species populations and distribution. | Same as the Estuary Alternative. |

**Proposed Mitigation**

- Capitol Lake would be treated prior to construction to significantly reduce the population of aquatic invasives.
- WDFW-approved BMPs would be implemented during construction.

- An Aquatic Invasive Species Management Plan would be followed during transport and upland disposal of material dredged during construction.
<table>
<thead>
<tr>
<th>Environmental Disciplines Analyzed in the Draft EIS</th>
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<th>Estuary Alternative</th>
<th>Hybrid Alternative</th>
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</thead>
<tbody>
<tr>
<td>Fish &amp; Wildlife (Draft EIS Section 5.5)</td>
<td>Construction activities could produce localized turbidity and sedimentation and temporarily disrupt ecological functions of aquatic and terrestrial habitats. With implementation of BMPs and other permit conditions (in particular, adherence to the established in-water work windows), impacts on fish and wildlife from construction would be avoided or minimized; thus, there would be less than significant impacts.</td>
<td>Construction impacts on fish and wildlife would be localized to areas experiencing active construction over approximately 4 to 5 years.</td>
<td>Construction impacts on resident fish and wildlife would be localized to areas experiencing active construction over approximately 7 to 8 years.</td>
<td>Construction impacts on resident fish and wildlife would be localized to areas experiencing active construction over approximately 7 to 8 years but would also include construction of the reflecting pool barrier wall, which would generate in-water noise and vibration that can impact aquatic species.</td>
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<td>Proposed Mitigation</td>
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<tr>
<td>• Standard overwater and in-water construction and demolition BMPs would be implemented in accordance with permit requirements.</td>
<td>• Installation of the berm that would be installed to increase stability of the 5th Avenue Dam would be timed to occur at low tide as feasible to minimize impacts of in-water work on fish.</td>
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<tr>
<td>• In-water work would only occur within the allowable work window to minimize potential impacts to fish and wildlife.</td>
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<tr>
<td>Wetlands (Draft EIS Section 5.6)</td>
<td>Construction activities would produce localized turbidity and sedimentation and temporarily disrupt ecological functions of wetlands. With implementation of standard construction BMPs, however, all impacts on wetlands from construction would be avoided or minimized; thus, there would be less than significant impacts.</td>
<td>Construction impacts on wetlands would be approximately 4 to 5 years.</td>
<td>Construction impacts on wetlands would be approximately 7 to 8 years.</td>
<td>Same as the Estuary Alternative.</td>
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<tr>
<td>Proposed Mitigation</td>
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<tr>
<td>• BMPs would be implemented, in accordance with project permits, to minimize potential construction impacts on wetlands.</td>
<td>• Installation of the berm that would be installed to increase stability of the 5th Avenue Dam would be timed to occur at low tide as feasible to minimize impacts of in-water work on fish.</td>
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<tr>
<td>Air Quality &amp; Odor (Draft EIS Section 5.7)</td>
<td>The annual emissions for criteria pollutants from construction activities are estimated to be less than state thresholds and would result in less than significant impacts to air quality and odor.</td>
<td>The Managed Lake Alternative would generate the lowest construction emissions.</td>
<td>The Estuary Alternative would generate emissions greater than the Managed Lake Alternative but less than the Hybrid Alternative.</td>
<td>The Hybrid Alternative would generate the most construction emissions.</td>
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<tr>
<td>Proposed Mitigation</td>
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<tr>
<td>• Compliance with air quality rules and implementation of BMPs for controlling dust and reducing emissions would reduce potential exposure of people to emissions during dredging and construction activities.</td>
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### Environmental Disciplines Analyzed in the Draft EIS

#### Land Use, Shorelines, & Recreation (Draft EIS Section 5.8)

**Construction Impacts Common to All Action Alternatives**

- Most recreational resources in the Project Area would remain open, but most of Marathon Park would be closed for the entire duration of construction. There would be construction noise and visual disturbance, which would reduce the value of the Project Area for some recreation activities. Impacts to Marathon Park from staging and impacts on recreational use related to noise and other disruptions could not be fully mitigated and would be a significant unavoidable impact.

**Proposed Mitigation**

- The feasibility of constructing the 5th Avenue Pedestrian Bridge prior to removal or repair of the 5th Avenue Bridge would be evaluated in order to maintain the trail loop connecting Heritage Park and Deschutes Parkway during construction. Alternatively, construction of a temporary trail trestle could be considered.
- BMPs would be implemented to minimize noise, dust, and other disturbances to visitors to recreation sites during construction, as well as in areas used for informal recreation (e.g., along roads).
- Coordination with potentially affected park districts/departments would be needed, to ensure that the public is well-informed of upcoming construction activities, and to plan construction to minimize conflicts with park events to the extent feasible.
- Alternative access points to recreation sites and trail detours would be provided.
- Signage along trails or park entrances would be provided at least 1 week prior to closures.
- Pedestrian and bicycle access routes would be clearly marked, as well as detour signage and other wayfinding elements.
- Recreation sites or trails would be restored after construction.
- Construction activities would be scheduled in a way that minimizes or avoids impacts to major festival days, whenever feasible.
- Coordination with festival and event planners would be needed when conflicting construction activities and closures cannot be avoided. This could include planning for detours, signage, media notifications, and similar actions.
- Construction hours would be limited to avoid high-use times in parks, such as weekends and festival hours.
- Given the duration of construction, interpretative signage would be provided in adjacent parks to explain how the work meets project goals, adding interest for some users.
- A 24-hour hotline would be provided to address complaints or safety concerns that may arise during construction.

#### Managed Lake Alternative

- Construction impacts to recreational resources would be approximately 4 to 5 years.

#### Estuary Alternative

- Construction impacts to recreational resources would be approximately 7 to 8 years.

#### Hybrid Alternative

- Construction impacts to recreational resources would be approximately 7 to 8 years and this would be the most intensive of the action alternatives due to construction of the reflecting pool barrier wall.

**Proposed Mitigation**

- For barrier wall construction, vibratory pile driving would be the preferred construction method, rather than impact pile driving, to minimize disruption.
## Environmental Disciplines Analyzed in the Draft EIS

<table>
<thead>
<tr>
<th>Environmental Disciplines</th>
<th>Managed Lake Alternative</th>
<th>Estuary Alternative</th>
<th>Hybrid Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultural Resources (Draft EIS Section 5.9)</td>
<td>No additional construction impact beyond those common to all action alternatives.</td>
<td>There would be a greater risk of encountering unrecorded archaeological sites due to greater ground disturbance compared to the Managed Lake Alternative.</td>
<td>Same as the Estuary Alternative.</td>
</tr>
<tr>
<td>Visual Resources (Draft EIS Section 5.10)</td>
<td>Construction impacts to visual resources would be approximately 4 to 5 years.</td>
<td>Construction impacts to visual resources would be approximately 7 to 8 years.</td>
<td>Construction impacts to visual resources would be approximately 7 to 8 years.</td>
</tr>
</tbody>
</table>

### Cultural Resources (Draft EIS Section 5.9)

Initial dredging and other construction activities could intersect, remove, or compact unrecorded archaeological resources, and, if present, there would be **potentially significant impacts**. Construction impacts on historic resources could occur from temporary construction activities and could reduce a resource's historic register eligibility or reduce the ability of the resource to convey its historic significance. However, measures to reduce construction impacts would be implemented, and there would be **less than significant impacts** from temporary construction activities.

**Proposed Mitigation**
- Mitigation would be identified through the Section 106 process under the National Historic Preservation Act of 1966. Additional mitigation measures may be separately developed through consultation with the Washington State Department of Archaeology and Historic Preservation, affected tribes, the City of Olympia, the City of Tumwater, and other stakeholders.
- An Archaeological Site Alteration and Excavation Permit may be required if impacts on a protected archaeological resource could not be avoided and would contain conditions and stipulations.
- Potential stipulations are listed in Section 5.9.6.1 of the Draft EIS.
- Several mitigation measures that could help to maintain the character-defining features of affected historic properties are included in Section 5.7.2.1 of the Cultural Resources Discipline Report (Attachment 13).

### Visual Resources (Draft EIS Section 5.10)

Construction staging areas would be established in nearby parks, and public access to these parks and other public facilities would be reduced or restricted. Most of Marathon Park would be closed during construction, resulting in an obstruction to visual access to the shoreline. Construction activities, equipment, and materials would also remain in place in the water of the Capitol Lake Basin for several years. Given the duration of construction-related staging at Marathon Park and in-water construction and staging, construction impacts on visual resources are considered a **significant unavoidable impact** for all action alternatives.

**Proposed Mitigation**
- The staging area in Marathon Park would be minimized during periods of no construction to allow visual access where feasible.
- Project areas in parks and along Deschutes Parkway would be planted as soon as feasible to minimize the duration of construction disturbance.
- In-water construction equipment, other than coffercells, would be removed from the lake between construction seasons.
<table>
<thead>
<tr>
<th>Environmental Disciplines Analyzed in the Draft EIS</th>
<th>Construction Impacts Common to All Action Alternatives</th>
<th>Managed Lake Alternative</th>
<th>Estuary Alternative</th>
<th>Hybrid Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Health (primarily sediment quality) (Draft EIS Section 5.11)</td>
<td>Construction activities and dredging would not change sediment quality in the lake basin. Dredging would uncover sediment with lower sulfide concentrations (though the existing sulfide concentrations do not pose a health risk to humans); this would result in <strong>minor beneficial effects</strong> on sediment quality in Capitol Lake. Sediment dredging and placement of dredged sediments in constructed habitat areas would have <strong>no adverse impacts</strong> on sediment quality because high sediment quality is present throughout Capitol Lake within and below the dredge areas. <strong>Proposed Mitigation</strong></td>
<td>No additional construction impact beyond those common to all action alternatives.</td>
<td>There would be no adverse impacts to sediment quality associated with removing the 5th Avenue Dam because all dam demolition would be contained within a coffercell to prevent the spread of sediment beyond the mixing zone established by the water quality permit.</td>
<td>Same as the Estuary Alternative.</td>
</tr>
<tr>
<td>Transportation (Draft EIS Section 5.12)</td>
<td>Construction for all action alternatives would include a period in which the 5th Avenue Bridge is closed. Although mitigation measures would minimize adverse traffic impacts, traffic increases along the 4th Avenue Bridge detour route could still result in congested operations during some periods of peak traffic demand, resulting in <strong>a significant unavoidable impact</strong> during the times that it occurs. <strong>Proposed Mitigation</strong></td>
<td>The 5th Avenue Bridge would be narrowed or closed for approximately 7 weeks for repairs and overhaul work.</td>
<td>The 5th Avenue Bridge would be closed for approximately 4 to 5 years for replacement.</td>
<td>Same as the Estuary Alternative.</td>
</tr>
</tbody>
</table>

**Proposed Mitigation**
- In addition to implementation of a Construction Traffic Management Plan with measures described in Section 5.12.6, the following additional measures could be considered:
  - Apply time-of-day restrictions for construction trips
  - Use rail to reduce truck trips
  - Coordinate with the City of Olympia to establish and sign traffic detour, which is expected to use the 4th Avenue Bridge and new connection to Deschutes Parkway that would be constructed with the project
  - Develop and implement a public communications strategy, to encourage alternative transportation choices and reduce overall volumes crossing the waterway
  - Prohibit construction employee parking in residential neighborhoods, Capitol Campus, and downtown streets
  - Coordinate with Intercity Transit to reroute affected bus routes to the 4th Avenue Bridge
  - Move bus stops for 5th Avenue SW routes to 4th Avenue W, about 300 to 500 feet away
  - Coordinate with rail owner to ensure that construction activities do not interfere with scheduled rail trips across the Project Area
  - Construct the 5th Avenue Pedestrian Bridge prior to closure of the 5th Avenue Bridge, or construct a temporary trail trestle during the time the 5th Avenue Bridge is closed
### Environmental Disciplines Analyzed in the Draft EIS

#### Public Services & Utilities (Draft EIS Section 5.13)

Accidental damage to utility lines during construction could temporarily disrupt utility services. However, with measures to locate utility lines and to coordinate final construction plans with affected utilities, there would be **less than significant impacts** on utilities.

**Proposed Mitigation**
- Prior to construction, consultation would be needed with local police, fire, and emergency response to develop and implement emergency response plans, establish emergency vehicle routes, and ensure that general emergency management services are not compromised.
- Coordination would be needed with utility agencies and companies to locate existing utilities and avoid damage. The extent and type of temporary protective measures that must be implemented to prevent construction damage to surface and subsurface utilities would be determined.
- Utility relocations would be staged to minimize interruptions in service.
- Contractors would be required to prepare a Construction Traffic Management Plan for construction activities that may affect road rights-of-way.

#### Economics (including ecosystem services) (Draft EIS Section 5.14)

Construction spending would temporarily support jobs, labor income, and economic output. Some recreation facilities would be closed or blocked during construction, causing people to recreate elsewhere or choose other lower-preference activities, although some people might enjoy watching the construction activities. Construction would also disrupt the value of ecosystem services, but the effects would be localized and temporary.

<table>
<thead>
<tr>
<th>Construction Impacts Common to All Action Alternatives</th>
<th>Managed Lake Alternative</th>
<th>Estuary Alternative</th>
<th>Hybrid Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accidental damage to utility lines during construction could temporarily disrupt utility services.</td>
<td>Closure of the 5th Avenue Bridge for repairs would be temporary and short (about 7 weeks), so impacts related to increased emergency response time and travel time in the corridor would be less than significant.</td>
<td>Closure of the 5th Avenue Bridge for repairs would be approximately 4 to 5 years, which could have a significant impact on emergency service response times. This impact could be reduced to less than significant levels with implementation of a Construction Traffic Management Plan and coordination with local jurisdictions.</td>
<td>Same as the Estuary Alternative.</td>
</tr>
<tr>
<td>Construction spending would temporarily support jobs, labor income, and economic output. Some recreation facilities would be closed or blocked during construction, causing people to recreate elsewhere or choose other lower-preference activities, although some people might enjoy watching the construction activities. Construction would also disrupt the value of ecosystem services, but the effects would be localized and temporary.</td>
<td>Construction spending would be least under the Managed Lake Alternative, but because of the shorter construction duration, construction would be less disruptive to ecosystem services than the Estuary and Hybrid Alternatives.</td>
<td>Construction spending would be greater than the Managed Lake Alternative but less than the Hybrid Alternative.</td>
<td>Construction spending would be highest under the Hybrid Alternative.</td>
</tr>
</tbody>
</table>

*The No Action Alternative would not result in construction impacts because the project would not be built. The No Action Alternative is not included in this table for that reason.*
Figure ES.8 Project Process Map

Environmental Impact Statement (EIS)
- Scoping
  - Scoping Notice Issued
  - Public Comment Period
  - Review Public Comments & Define Scope of EIS
- Technical Evaluation, Alternatives Analyses, & Draft EIS
  - Technical Evaluation & Alternatives Analyses
  - Joint EWG/FGWG Meeting
  - Tech Eval & Alt Analyses
  - Tech Eval & Alt Analyses
- Final EIS Issued with Preferred Alt
  - Final Funding & Governance Framework for Preferred Alt
  - Transition into Phase 2

Work Group Engagement
- Executive Work Group (EWG)
- Technical Work Group (TWG)
- Funding & Governance Work Group (FGWG)
  - EIS Scoping
    - Describe EIS Process
    - Solicit scoping comments
    - Input on process participation
  - EIS Scoping Report
    - Major comment themes
    - Scope of EIS

Decision-Making Bodies Engaged by Enterprise Services
- Capitol Campus Design Advisory Committee (CCDAC)
- State Capitol Committee (SCC)
- Legislative
  - Anticipated legislative briefings are shown, additional briefings may occur as requested or needed.
  - Legislative Briefings & OPM/Governor’s Office Briefings

Community Engagement
- Community Sounding Board (CSB) participants selected to represent diverse community perspectives.
  - Online Open House
  - Scoping Mtg #1
    - Early Outreach at Harbor Days
  - Scoping Mtg #2
    - Scoping Mtg #3
    - CSR Mtg

Legend
- Meeting
- Milestone

As Needed Coordination with Agencies to Streamline Future Permitting
# Table of Contents

## 1.0 Introduction, Project Background, & History 1-1

1.1 WHAT IS THE PURPOSE OF THIS PROJECT? 1-1

1.2 WHY IS AN ENVIRONMENTAL IMPACT STATEMENT NEEDED? 1-2

1.3 WHAT ALTERNATIVES ARE BEING CONSIDERED? 1-2

1.4 WHAT IS THE PROJECT AREA? 1-3

1.5 WHO IS THE LEAD AGENCY FOR THIS EIS? 1-5

1.6 WHICH GOVERNMENTAL & AGENCY PARTNERS HAVE BEEN INVOLVED IN THE EIS PROCESS? 1-5

1.7 WHAT EFFORTS HAVE BEEN MADE BY GOVERNMENTAL & AGENCY PARTNERS TO ADDRESS ENVIRONMENTAL CONDITIONS WITHIN CAPITOL LAKE? 1-6

1.8 WHAT IS THE PROJECT PURPOSE, AS ESTABLISHED IN PHASE 1? 1-14

1.9 WHAT ARE THE GOALS FOR THE LONG-TERM MANAGEMENT ALTERNATIVES? 1-15

1.10 HOW WAS THIS EIS AUTHORIZED? 1-16

1.11 HOW WAS PUBLIC INPUT CONSIDERED ON THE SCOPE OF THIS EIS? 1-17

1.12 HOW WILL A PREFERRED ALTERNATIVE BE SELECTED & WHAT IS THE DECISION-MAKING PROCESS? 1-18

1.13 WHAT ARE THE NEXT STEPS AFTER THE DRAFT EIS? 1-22

1.14 HOW IS THIS EIS ORGANIZED? 1-23
2.0 Project Alternatives & Construction Approach  2-1

2.1 HOW WERE THE ALTERNATIVES DEVELOPED?  2-2
2.2 WHAT ARE THE PROJECT ALTERNATIVES?  2-5
2.3 WHAT ARE THE PRIMARY COMPONENTS COMMON TO ALL ACTION ALTERNATIVES?  2-17
2.4 WHAT CONSTRUCTION ACTIVITIES WILL TAKE PLACE IN THE ACTION ALTERNATIVES?  2-34
2.5 WHAT IS THE APPROACH TO LONG-TERM SEDIMENT MANAGEMENT?  2-52

3.0 Existing Conditions & Affected Environment  3-1

3.1 HYDRODYNAMICS & SEDIMENT TRANSPORT  3-1
3.2 NAVIGATION  3-7
3.3 WATER QUALITY  3-15
3.4 AQUATIC INVASIVE SPECIES  3-46
3.5 FISH & WILDLIFE  3-59
3.6 WETLANDS  3-70
3.7 AIR QUALITY & ODOR  3-77
3.8 LAND USE, SHORELINES, & RECREATION  3-81
3.9 CULTURAL RESOURCES  3-90
3.10 VISUAL RESOURCES  3-100
3.11 ENVIRONMENTAL HEALTH  3-109
3.12 TRANSPORTATION  3-118
3.13 PUBLIC SERVICES & UTILITIES  3-124
3.14 ECONOMICS  3-129

4.0 Long-Term Impacts, Benefits, & Mitigation  4-1

4.1 HYDRODYNAMICS & SEDIMENT TRANSPORT  4-1
4.2 NAVIGATION  4-14
4.3 WATER QUALITY 4-34
4.4 AQUATIC INVASIVE SPECIES 4-49
4.5 FISH & WILDLIFE 4-63
4.6 WETLANDS 4-77
4.7 AIR QUALITY & ODOR 4-85
4.8 LAND USE, SHORELINES, & RECREATION 4-97
4.9 CULTURAL RESOURCES 4-113
4.10 VISUAL RESOURCES 4-125
4.11 ENVIRONMENTAL HEALTH 4-149
4.12 TRANSPORTATION 4-163
4.13 PUBLIC SERVICES & UTILITIES 4-173
4.14 ECONOMICS 4-180

5.0 Short-Term Impacts & Mitigation 5-1

5.1 HYDRODYNAMICS & SEDIMENT TRANSPORT 5-1
5.2 NAVIGATION 5-2
5.3 WATER QUALITY 5-2
5.4 AQUATIC INVASIVE SPECIES 5-12
5.5 FISH & WILDLIFE 5-17
5.6 WETLANDS 5-27
5.7 AIR QUALITY & ODOR 5-33
5.8 LAND USE, SHORELINES, & RECREATION 5-39
5.9 CULTURAL RESOURCES 5-48
5.10 VISUAL RESOURCES 5-56
5.11 ENVIRONMENTAL HEALTH 5-62
5.12 TRANSPORTATION 5-68
5.13 PUBLIC SERVICES & UTILITIES 5-80
5.14 ECONOMICS 5-86
# 6.0 Cumulative Effects 6-1

6.1 WHAT IS THE STUDY AREA & TIME HORIZON FOR THIS ANALYSIS? 6-1

6.2 WHAT WAS THE APPROACH TO ANALYZE CUMULATIVE EFFECTS? 6-2

6.3 WHAT ARE THE POTENTIAL ADVERSE IMPACTS OF THE PROJECT? 6-2

6.4 WHAT PAST ACTIONS OCCURRED IN THE WATERBODY? 6-3

6.5 WHAT FUTURE PROJECTS ARE REASONABLY FORESEEABLE? 6-4

6.6 WHAT ARE THE CUMULATIVE EFFECTS FOR THIS PROJECT? 6-11

# 7.0 Planning-Level Costs, Funding Recommendations, & Other Considerations 7-1

7.1 WHAT IMPORTANT FACTORS ARE ASSUMED IN THE PLANNING-LEVEL COSTS? 7-1

7.2 WHAT ARE THE RECOMMENDATIONS FOR FUNDING CONSTRUCTION & LONG-TERM MANAGEMENT? 7-7

7.3 WHAT OTHER FACTORS SHOULD BE CONSIDERED? 7-10

# 8.0 Engagement with Work Groups, Community Sounding Board, & State Government 8-1

8.1 HOW WERE STAKEHOLDERS INVOLVED IN THIS EIS? 8-1

8.2 WHAT ARE THE ROLES OF THE EXECUTIVE & TECHNICAL WORK GROUPS? 8-2

8.3 WHAT IS THE ROLE OF THE FUNDING & GOVERNANCE WORK GROUP? 8-11

8.4 WHAT IS THE ROLE OF THE COMMUNITY SOUNDING BOARD? 8-18

8.5 HOW ARE THE LEGISLATIVE & EXECUTIVE BRANCHES OF STATE GOVERNMENT ENGAGED BY ENTERPRISE SERVICES? 8-26

# 9.0 Permits & Approvals for Implementation of a Preferred Alternative 9-1
### Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1.1</td>
<td>Project Area</td>
<td>1-4</td>
</tr>
<tr>
<td>1.4.1</td>
<td>Timeline of Key Governmental &amp; Agency Efforts Related to Management of Capitol Lake — Deschutes Estuary</td>
<td>1-7</td>
</tr>
<tr>
<td>1.8.1</td>
<td>Decision-Making Process for the Preferred Alternative</td>
<td>1-21</td>
</tr>
<tr>
<td>1.9.1</td>
<td>Long-Term Management Planning Process</td>
<td>1-23</td>
</tr>
<tr>
<td>2.1.1</td>
<td>Measurable Evaluation Process for the Environmental Impact Statement</td>
<td>2-4</td>
</tr>
<tr>
<td>2.2.1</td>
<td>Managed Lake Alternative Overview</td>
<td>2-6</td>
</tr>
<tr>
<td>2.2.2</td>
<td>Managed Lake Alternative Visual Simulation</td>
<td>2-7</td>
</tr>
<tr>
<td>2.2.3</td>
<td>Estuary Alternative Overview</td>
<td>2-11</td>
</tr>
<tr>
<td>2.2.4</td>
<td>Estuary Alternative Visual Simulation at Mean Tide</td>
<td>2-12</td>
</tr>
<tr>
<td>2.2.5</td>
<td>Hybrid Alternative Overview</td>
<td>2-14</td>
</tr>
<tr>
<td>2.2.6</td>
<td>Hybrid Alternative Visual Simulation</td>
<td>2-15</td>
</tr>
<tr>
<td>2.4.1</td>
<td>Location of Primary Construction Activities &amp; Conceptual Schedule — Managed Lake Alternative</td>
<td>2-36</td>
</tr>
<tr>
<td>2.4.2</td>
<td>Location of Primary Construction Activities &amp; Conceptual Schedule — Estuary Alternative</td>
<td>2-37</td>
</tr>
<tr>
<td>2.4.3</td>
<td>Location of Primary Construction Activities &amp; Conceptual Schedule — Hybrid Alternative</td>
<td>2-38</td>
</tr>
<tr>
<td>2.4.4</td>
<td>Deschutes Parkway Realignment &amp; New 5th Avenue Bridge</td>
<td>2-46</td>
</tr>
<tr>
<td>3.1.1</td>
<td>Water Levels during Extreme River &amp; Tidal Floods under Existing Conditions</td>
<td>3-3</td>
</tr>
<tr>
<td>3.1.2</td>
<td>Total Sediment Erosion &amp; Deposition</td>
<td>3-6</td>
</tr>
<tr>
<td>3.2.1</td>
<td>Navigational Resources in West Bay</td>
<td>3-8</td>
</tr>
<tr>
<td>3.2.2</td>
<td>Budd Inlet Vessel Traffic Patterns</td>
<td>3-9</td>
</tr>
<tr>
<td>3.2.3</td>
<td>Estimated Existing Average Annual Sediment Erosion/Deposition Rates (cm/yr)</td>
<td>3-12</td>
</tr>
<tr>
<td>3.3.1</td>
<td>Comparison of Capitol Lake to Other Thurston County Lakes Using Summer 2010 to 2014 Data</td>
<td>3-29</td>
</tr>
<tr>
<td>3.3.2</td>
<td>2004 Total Nitrogen and DIN Concentrations in the Deschutes River near Tumwater Falls &amp; the North Basin of Capitol Lake</td>
<td>3-31</td>
</tr>
</tbody>
</table>
Figure 3.3.3 Deschutes River & Capitol Lake TOC Concentrations from 2004 and 2019 3-32
Figure 3.3.4 Areas of Interest to Water Quality Discipline Study 3-40
Figure 3.3.5 Ecology-Modeling of Dissolved Oxygen Depletion Resulting in Water Quality Violations 3-43
Figure 3.4.1 Purple Loosestrife Distribution in Capitol Lake in 2018 3-50
Figure 3.4.2 Eurasian Watermilfoil Distribution in Capitol Lake in 2018 3-52
Figure 3.5.1A Wildlife Habitats - North 3-66
Figure 3.5.1B Wildlife Habitats - South 3-67
Figure 3.6.1 Historic Condition of Capitol Lake Basin 3-72
Figure 3.6.2A Existing Wetland Types – North 3-74
Figure 3.6.2B Existing Wetland Types – South 3-75
Figure 3.8.1 Map of Existing Land Uses 3-83
Figure 3.8.2 Map of Existing Zoning 3-85
Figure 3.8.3 Map of Existing Shoreline Designations 3-87
Figure 3.8.4 Map of Recreation Sites 3-89
Figure 3.9.1 Flagg & Wilder & White Visions 3-95
Figure 3.9.2 Historic Districts & Listed Historic Resources 3-98
Figure 3.10.1 Visual Resource Photo Locations 3-102
Figure 3.11.1 Sediment Sample Locations 3-111
Figure 3.11.2 Surface Sediment Sample, Outfall, & Cleanup Site Locations in West Bay 3-115
Figure 3.12.1 Street & Freight Network 3-119
Figure 3.12.2 Pedestrian Network 3-122
Figure 3.12.3 Bike Network 3-123
Figure 3.13.1 Capitol Lake Stormwater Outfall Locations 3-128
Figure 3.14.1 Employment by Sector in Thurston County 3-132
Figure 3.14.2 Properties North of 5th Avenue Dam Considered in Downstream Economic Activity Analysis 3-135
Figure 4.1.1 Comparison of Maximum Water Levels for an Extreme River Flood Event by Alternative 4-9

Figure 4.1.2 Comparison of Maximum Water Levels for an Extreme Tidal Flood Event by Alternative 4-10

Figure 4.1.3 Annual Deposition/Erosion Patterns by Alternative 4-13

Figure 4.2.1 Navigational Resources in West Bay & Areas of Maintenance Dredging 4-17

Figure 4.2.2 Erosion/Deposition Pattern (cm/yr) for Event A with 0.61 meters of RSLR 4-22

Figure 4.2.3 Erosion/Deposition Pattern (cm/yr) for Event B with 0.61 meters of RSLR 4-23

Figure 4.10.1 North Overlook Visual Simulation (KVP NB-2) – Managed Lake Alternative 4-129

Figure 4.10.2 Interpretive Center Visual Simulation (KVP MB-1) – Managed Lake Alternative 4-130

Figure 4.10.3 Eastern Washington Butte at High Tide Visual Simulation (KVP NB-1) – Estuary Alternative 4-134

Figure 4.10.4 Eastern Washington Butte at Mean Tide Visual Simulation (KVP NB-1) – Estuary Alternative 4-135

Figure 4.10.5 Eastern Washington Butte at Low Tide Visual Simulation (KVP NB-1) – Estuary Alternative 4-136

Figure 4.10.6 North Overlook at High Tide Visual Simulation (KVP NB-2) – Estuary Alternative 4-137

Figure 4.10.7 North Overlook at Mean Tide Visual Simulation (KVP NB-2) – Estuary Alternative 4-138

Figure 4.10.8 North Overlook at Low Tide Visual Simulation (KVP NB-2) – Estuary Alternative 4-139

Figure 4.10.9 Interpretive Center at High Tide Visual Simulation (KVP MB-1) – Estuary Alternative 4-140

Figure 4.10.10 Interpretive Center at Mean Tide Visual Simulation (KVP MB-1) – Estuary Alternative 4-141

Figure 4.10.11 Interpretive Center at Low Tide Visual Simulation (KVP MB-1) – Estuary Alternative 4-142

Figure 4.10.12 Marathon Park at High Tide (KVP NB-3) – Hybrid Alternative 4-144

Figure 4.10.13 Marathon Park at Low Tide Visual Simulation (KVP NB-3) – Hybrid Alternative 4-145
Figure 4.10.14 North Overlook at High Tide Visual Simulation (KVP NB-2) — Hybrid Alternative 4-146

Figure 4.10.15 North Overlook at Low Tide Visual Simulation (KVP NB-2) — Hybrid Alternative 4-147

Figure 4.11.1 Modeled Future Sediment Deposition & Existing Surface Contamination in Budd Inlet 4-155

Figure 5.8.1 Construction Staging for Action Alternatives 5-42

Figure 5.12.1 Potential Truck Haul Routes 5-71

Figure 5.12.2 Potential Traffic Detours During 5th Avenue Bridge Closure 5-74

Figure 6.4.1 Historical Condition of the Capitol Lake Basin 6-5

Figure 8.1.1 Project Process Map 8-3

Figure 8.2.1 Results of Criteria Prioritization Exercise during Executive & Technical Work Group Meetings (May 2021) 8-11

Figure 8.4.1 Results of Criteria Prioritization Exercise during Community Sounding Board Meeting (May 2021) 8-26

Tables

Table 2.1.1 Objective Criteria Used in the Measurable Evaluation Process 2-3

Table 2.3.1 Comparison of Dredging during Construction 2-20

Table 2.3.2 Expected Maintenance Dredging Schedule & Locations under the Estuary Alternative 2-21

Table 2.3.3 Expected Maintenance Dredging Schedule & Locations under the Hybrid Alternative 2-22

Table 2.3.4 Comparison of Recurring Dredging 2-23

Table 2.3.5 Total Area of Habitat Types in Middle & North Basins after Construction 2-27

Table 2.3.6 Comparison of the Water Quality Approach Across Action Alternatives 2-30

Table 2.3.7 Initial Sediment Management (dredging during construction) 2-32

Table 2.3.8 Long-Term Sediment Management (projected over a 30-year time horizon) 2-33

Table 2.3.9 Ecological Functions 2-33

Table 2.3.10 Water Quality 2-34
Table 2.3.11 Recreational Use

Table 2.4.1 Commonly Used Construction Equipment

Table 3.1.1 Annual Volume of Sediment Accumulation in Capitol Lake

Table 3.2.1 Average Annual Sediment Deposition in West Bay for Existing Conditions, Predicted by Numerical Model

Table 3.3.1 Comparison of Capitol Lake Data to Washington State Surface Water Quality Standards (1)

Table 3.3.2 Comparison of Capitol Lake Data & Trophic State Thresholds for Lakes

Table 3.3.3 Comparison of 2019 Capitol Lake Water Quality Data to 2010–2014 Data

Table 3.3.4 Comparison of 2019 Bacteria Concentrations in Capitol Lake to Washington State Surface Water Quality Standards

Table 3.3.5 Average Summer Water Quality Conditions in the Deschutes River & Capitol Lake in 2019

Table 3.3.6 Comparison of Budd Inlet Water Quality with Applicable Standards (May through October)

Table 3.3.7 Percent of Total DIN Loading to Budd Inlet by Source & Season

Table 3.4.1 High Priority Aquatic Invasive Species Observed in the Study Area

Table 3.4.2 Non-High Priority Aquatic Invasive Species Observed in the Study Area

Table 3.5.1 Fish Species Potentially Present in the Study Area

Table 3.5.2 Bird Species & Species Groups Present in the Study Area

Table 3.5.3 Mammal Species & Species Groups Present in the Study Area

Table 3.6.1 Wetland & Other Habitat Types in the Study Area under Existing Conditions

Table 3.12.1 Streets & Corresponding Average Daily Trips in the Transportation Study Area

Table 3.14.1 Current Population & Population Change between 2010 and 2018

Table 3.14.2 Real Median Household Income (2018 Inflation-Adjusted Dollars)

Table 4.1.1 Comparison of Maximum Water Levels for an Extreme River Flood Event by Alternative

Table 4.1.2 Comparison of Maximum Water Levels for an Extreme Tidal Flood Event by Alternative
Table 4.1.3 Comparison of Average Annual Sediment Deposition/Erosion (Without RSRL) 4-12
Table 4.2.1 Average Annual Sediment Deposition in West Bay for the No Action & Managed Lake Alternatives (inch each year (cm each year)) 4-15
Table 4.2.2 No Action Alternative Maintenance Dredging in West Bay 4-16
Table 4.2.3 Average Annual Sediment Deposition in West Bay for the No Action & Estuary Alternatives (inch each year (cm each year)) 4-20
Table 4.2.4 Average Annual Sediment Erosion/Deposition for Modeling Events A & B 4-21
Table 4.2.5 Anticipated Maintenance Dredging in West Bay for the Estuary Alternative 4-25
Table 4.2.6 Average Annual Sediment Deposition in West Bay for the No Action, Estuary, & Hybrid Alternatives 4-28
Table 4.2.7 Anticipated Maintenance Dredging in West Bay for the Hybrid Alternative 4-30
Table 4.3.1 Summary of Long-Term Water Quality Impacts: Managed Lake Alternative 4-38
Table 4.3.2 Summary of Long-Term Water Quality Impacts: Estuary Alternative 4-42
Table 4.5.1 Summary of Long-Term Impacts: Managed Lake Alternative 4-67
Table 4.5.2 Summary of Long-Term Impacts: Estuary Alternative 4-71
Table 4.5.3 Summary of Long-Term Impacts: Hybrid Alternative 4-73
Table 4.6.1 Summary of Long-Term Impacts: Managed Lake Alternative 4-81
Table 4.6.2 Summary of Long-Term Impacts: Estuary Alternative 4-82
Table 4.6.3 Summary of Long-Term Impacts: Hybrid Alternative 4-83
Table 4.7.1 Managed Lake Alternative’s Long-Term Impacts – Upland Disposal 4-89
Table 4.7.2 Estimated GHG Emissions (MTCO$_2$e) – Managed Lake Alternative 4-90
Table 4.7.3 Estuary Alternative Maximum Annual Air Pollutant Emissions – Upland Disposal 4-93
Table 4.7.4 Estimated GHG Emissions (MTCO$_2$e) – Estuary Alternative 4-94
Table 4.7.5 Estimated GHG Emissions (MTCO$_2$e) – Hybrid Alternative 4-96
Table 4.11.1 Average Annual Sediment Deposition in Budd Inlet for Modeling without Relative Sea Level Rise (inches per year (cm per year)) 4-154
Table 4.12.1 Export Dredge Volume & Truck Trips Generated by Maintenance Dredging for the Managed Lake Alternative 4-167
Table 4.12.2 Summary of Long-Term Impacts: Managed Lake Alternative 4-167
Table 4.12.3 Export Dredge Volume & Truck Trips Generated by Maintenance Dredging for the Estuary Alternative 4-168
Table 4.12.4 Summary of Long-Term Impacts: Estuary Alternative 4-170
Table 4.12.5 Export Dredge Volume & Truck Trips Generated by Maintenance Dredging for the Hybrid Alternative 4-171
Table 4.12.6 Summary of Long-Term Impacts: Hybrid Alternative 4-172
Table 4.14.1 Summary of Long-Term Impacts: No Action Alternative 4-183
Table 4.14.2 Planning-Level Cost Estimates by Alternative 4-184
Table 4.14.3 Summary of Long-Term Economic Impacts: Managed Lake Alternative 4-190
Table 4.14.4 Summary of Long-Term Impacts: Estuary Alternative 4-191
Table 4.14.5 Summary of Long-Term Impacts: Hybrid Alternative 4-193
Table 5.3.1 Comparison of Construction Impacts from Initial Dredging 5-4
Table 5.5.1 Comparison of Construction Impacts from Initial Dredging 5-18
Table 5.7.1 Construction Air Pollutant Emission Results: Managed Lake Alternative 5-35
Table 5.7.2 Construction Air Pollutant Emission Results – Estuary Alternative 5-36
Table 5.7.3 Construction Air Pollutant Emission Results – Hybrid Alternative 5-37
Table 5.12.1 Summary of Construction Impacts Common to All Action Alternatives 5-75
Table 5.14.1 Planning Level Costs for Design, Permitting, & Construction 5-88
Table 5.14.2 Summary of Construction Impacts: Managed Lake Alternative 5-90
Table 5.14.3 Summary of Construction Impacts: Estuary Alternative 5-91
Table 5.14.4 Summary of Construction Impacts: Hybrid Alternative 5-92
Table 6.3.1 Potential Adverse Impacts 6-3
Table 6.5.1 Reasonably Foreseeable Projects 6-6
Table 7.1.1 Planning-Level Cost Estimates for the Project Alternatives 7-5
Table 9.1.1 Federal Environmental Permits & Approvals 9-2
Table 9.1.2 State Environmental Permits & Approvals, in addition to this state-led SEPA EIS 9-4
Table 9.1.3 Local Environmental Permits & Approvals 9-6
## Attachments

Attachment 1 List of Abbreviations
Attachment 2 List of Preparers
Attachment 3 Distribution List
Attachment 4 References
Attachment 5 Hydrodynamics and Sediment Transport Discipline Report
Attachment 6 Navigation Discipline Report
Attachment 7 Water Quality Discipline Report
Attachment 8 Aquatic Invasive Species Discipline Report
Attachment 9 Fish and Wildlife Discipline Report
Attachment 10 Wetlands Discipline Report
Attachment 11 Air Quality and Odor Discipline Report
Attachment 12 Land Use, Shorelines, and Recreation Discipline Report
Attachment 13 Cultural Resources Discipline Report
Attachment 14 Visual Resources Discipline Report
Attachment 15 Sediment Quality Discipline Report
Attachment 16 Transportation Discipline Report
Attachment 17 Public Services and Utilities Discipline Report
Attachment 18 Economics Discipline Report
Attachment 19 Measurable Evaluation Process – Summary of Concept Screening
Attachment 20 Scoping Report
1.0 Introduction, Project Background, & History

Historically, what is now known as Capitol Lake was part of the Deschutes Estuary, where freshwater from the Deschutes River would mix with saltwater from Budd Inlet over expansive tidal flats. The Deschutes Estuary has long-standing cultural and spiritual significance to local tribes, particularly the Squaxin Island Tribe.

Between 1949 and 1951, a dam was constructed at 5th Avenue and, without the tidal exchange, the area was transformed into a freshwater lake, fed primarily by the Deschutes River. The waterbody was renamed Capitol Lake. Capitol Lake is the 260-acre waterbody located on the Washington State Capitol Campus, adjacent to downtown Olympia, at the base of Puget Sound. Capitol Lake was designed as part of the Washington State Capitol Campus, and it quickly became an important visual and recreational resource to the community.

It has existed as Capitol Lake for more than 70 years, and for most of that time the community, agencies, and decision-makers have considered how to best manage the resource.

1.1 WHAT IS THE PURPOSE OF THIS PROJECT?

The purpose of the Capitol Lake – Deschutes Estuary Long-Term Management Project is to identify and implement an environmentally and economically sustainable long-term management alternative that improves water quality and manages existing sediment accumulation and future deposition. The project is also needed to improve the impaired ecological functions within the Capitol Lake – Deschutes Estuary and adjacent waters. These efforts would restore and enhance community use of the resource.
1.2 WHY IS AN ENVIRONMENTAL IMPACT STATEMENT NEEDED?

Since construction of the 5th Avenue Dam in 1951, an estimated 35,000 cubic yards of sediment have deposited in Capitol Lake each year, resulting in conditions that are increasingly and visibly shallow. Sediment accumulation has reached up to 13 feet in some areas.

Water quality monitoring began in the 1970s in response to excessive growth of aquatic plants, dense algal mats, and reduced water clarity, which are caused by high nutrient levels in Capitol Lake. In 1985, the swimming beach in Capitol Lake was formally closed because of high bacteria levels, following years of intermittent closures from water quality conditions. The dense community of aquatic plants that has affected aquatic life and recreational use still exists in Capitol Lake today.

Management strategies have been implemented to address aquatic invasive species. There are 15 known plant and animal aquatic invasive species in Capitol Lake. In 2009, the presence of the invasive New Zealand mudsnail resulted in official closure of Capitol Lake to all public uses.

Many of these environmental conditions persist today and active use continues to be restricted. The long-term management project would address the diminished beneficial uses of the waterbody, caused by accumulating sediment, historically poor water quality, algal blooms, and invasive plant and animal species.

**Neither short-term actions nor a long-term management alternative can be implemented until an Environmental Impact Statement (EIS) is completed and a Preferred Alternative is selected.**

1.3 WHAT ALTERNATIVES ARE BEING CONSIDERED?

This Draft EIS evaluates long-term management alternatives for the waterbody. These action alternatives include: a Managed Lake, which would be similar to existing conditions but with additional management actions; an Estuary, which would restore tidal flow more similar to historical conditions; or a Hybrid, which would restore tidal flow but would retain a smaller lake feature. Consistent with State Environmental Policy Act (SEPA) requirements, the EIS also evaluates a No Action Alternative, which describes what would likely occur if none of the long-term management alternatives are implemented.
1.4 WHAT IS THE PROJECT AREA?

The **Project Area** includes the 260-acre Capitol Lake that is managed by the Department of Enterprise Services (Enterprise Services), and it extends to the northern point of West Bay of Budd Inlet. West Bay is not managed by Enterprise Services. However, project actions may occur in West Bay, so it is included in the Project Area. The parks and public space adjoining Capitol Lake and within the jurisdiction of Enterprise Services are also included in the Project Area. This waterbody in the Project Area is referred to as **Capitol Lake – Deschutes Estuary** to reflect both the existing conditions and the ecosystem that existed before construction of the 5th Avenue Dam.

**Capitol Lake**, or the **Capitol Lake Basin**, extends from the south end at Tumwater Falls in the City of Tumwater to the north end of the 5th Avenue Dam, in the City of Olympia. There are three basins within this waterbody, referred to as the North Basin, Middle Basin, and South Basin. This area, upstream of 5th Avenue, is referred to as Capitol Lake or the Capitol Lake Basin. The Project Area, Capitol Lake – Deschutes Estuary, and Capitol Lake/Capitol Lake Basin are depicted in Figure 1.1.1.

The project area does not extend upstream of Tumwater Falls (south) into the Deschutes River because that area would not be affected by the Capitol Lake – Deschutes Estuary Long-Term Management Project. This EIS recognizes, however, that changes upstream in the watershed could affect conditions in the project area given the interconnectedness of the system.
Figure 1.1.1 Project Area

Legend
- Capitol Lake/ Capitol Lake Basin
- Capitol Lake – Deschutes Estuary
- Project Area (within Enterprise Services Jurisdiction)
- Project Area (outside Enterprise Services Jurisdiction)
1.5 WHO IS THE LEAD AGENCY FOR THIS EIS?

Enterprise Services is the lead agency for compliance with the Washington SEPA (Revised Code of Washington (RCW) Chapter 43.21C) and for preparation of this EIS. Enterprise Services serves in this role given its responsibility for stewardship, preservation, operation, and maintenance of the public and historic facilities of the Washington State Capitol Campus (RCW Chapter 79.24.720), which includes Capitol Lake.

The aquatic lands of Capitol Lake are managed by Enterprise Services under long-term lease agreement from the Washington State Department of Natural Resources (DNR). The current lease agreement was established in 1998, for a term of 30 years (through 2028), with the option for one 20-year extension (through 2048). Based on the scope of this project, it is assumed that a new governing body may be formed for long-term management of the Capitol Lake – Deschutes Estuary before the lease term expires, and management authority would be transferred from Enterprise Services. The existing lease authorizes Enterprise Services to provide public recreation and operation of parks, public access, public parking areas and lake management activities.

Enterprise Services, as the project proponent and lead agency, will lead the Preferred Alternative decision-making process. Enterprise Services will consider input from DNR, as the manager of the state aquatic lands, and input from other jurisdictional and agency partners engaged with this EIS. Refer to Section 1.12, How Will a Preferred Alternative Be Selected and What is the Decision-Making Process, for more information on the decision-making process.

1.6 WHICH GOVERNMENTAL & AGENCY PARTNERS HAVE BEEN INVOLVED IN THE EIS PROCESS?

Throughout the process to prepare this EIS, Enterprise Services has actively engaged governmental and agency partners that have jurisdiction or regulatory authority within the project area, including the Squaxin Island Tribe, DNR, Washington State Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), Washington State Department of Archaeology and Historic Preservation (DAHP), Thurston County, City of Olympia, City of Tumwater, Port of Olympia, and LOTT Clean Water Alliance (LOTT). Representatives from these entities comprise the Executive, Technical, and Funding and Governance Work Groups. These Work Groups met several times from mid-2018 through 2020 to provide feedback on a range of substantive topics. Enterprise Services shared key project updates to keep stakeholders apprised of project status and to maintain transparency.
Enterprise Services will solicit input from the Work Groups on the analysis contained in this EIS.

These governmental and agency partners have jurisdiction in the project area and have expertise concerning environmental conditions within Capitol Lake. However, Enterprise Services has not received any requests to formally share in the responsibility for the procedural and substantive content of the EIS as a co-lead agency. Enterprise Services has served in the lead position in past planning processes that sought to resolve environmental conditions within the project area, or to identify the preferred approach for long-term management. This keeps Enterprise Services in the position of lead agency under SEPA, with a continued commitment to solicit and consider comments from the Work Groups throughout the EIS process.

Work Group engagement through the EIS process is discussed in more detail in Chapter 8.0, Engagement with Work Groups, Community Sounding Board, & State Government. Chapter 8.0 also discusses similar engagement with a Community Sounding Board, where a group composed of 25 participants with a diverse range of interests are engaged to provide information, exchange ideas, and share individual or collective perspectives around substantive project topics.

1.7 WHAT EFFORTS HAVE BEEN MADE BY GOVERNMENTAL & AGENCY PARTNERS TO ADDRESS ENVIRONMENTAL CONDITIONS WITHIN CAPITOL LAKE?

The entities participating in the Work Groups have been engaged in long-term management planning for the Capitol Lake – Deschutes Estuary for almost 50 years—seeking to resolve environmental issues and to make a decision on a comprehensive management approach.

Figure 1.4.1 provides a timeline of key governmental and agency efforts to address changing environmental conditions within Capitol Lake. These efforts are further discussed in this section.
Water quality sampling began in the 1970s with documented chronic exceedances of algae, turbidity, and coliform bacteria throughout Capitol Lake. The studies issued by Ecology at that time described these trends as beginning shortly after construction of the 5th Avenue Dam, 20 years earlier. In addition to compromising ecological function, the water quality conditions were impacting recreational use of the resource, resulting in intermittent closures of the City of Olympia-run swimming beach. Also in the 1970s, governmental and agency partners began evaluating concepts to manage ongoing sediment accumulation, which had been noticeably reducing the lake volume. By 1975, the volume of sediment deposited in Capitol Lake from the Deschutes River since construction of the 5th Avenue Dam was estimated at over 1,000,000 cubic yards (570,000 to 760,000 cubic meters). That volume of sediment is enough to fill approximately 225 to 300 Olympic-size swimming pools.

In 1977, the Department of General Administration (GA; now part of Enterprise Services), issued a Final Environmental Impact Statement for a dredging project to improve recreational and visual resources and fish production, and to preserve biological and wildlife resources within Capitol Lake. The document was prepared in coordination with federal and local governmental partners and state agencies. To achieve these goals, the Department of General Administration proposed dredging of up to 257,000 cubic yards (200,000 cubic meters) of accumulated sediment to create a sediment trap. Dredging and material placement occurred the following year. The dredged material was placed at the southeast corner of the Middle Basin. (The sediment trap did not function as intended and was eventually abandoned. The dredged material placement area has transitioned into wetlands at the present-day Interpretive Center.) Recurring maintenance dredging was also proposed, at a 2-year frequency, but was never completed.

In 1982, an interagency task force was assembled by the Governor to address continued concern over environmental conditions within Capitol Lake. Coliform bacteria was frequently exceeding water quality standards and, consequently, public use of the swimming beach was increasingly restricted. High nutrient levels were causing excessive growth of aquatic plants and were reducing beneficial uses of the lake through reduced water clarity and dense algal mats and aquatic weed beds. Sediment deposition was continuing to reduce lake volume.
The interagency task force evaluated a range of studies and issued a Capitol Lake Restoration Analysis in 1984. The primary recommendations included long-term water quality monitoring and maintenance dredging programs. These actions were intended to preserve Capitol Lake for fish rearing, flood control, recreation, tourism, aesthetics, and wildlife habitat.

As a result of this analysis, approximately 50,000 cubic yards (38,000 cubic meters) of accumulated sediment were dredged from Capitol Lake in 1986, and the material was placed in the southeast corner of the Middle Basin (it would eventually be developed into wetland habitat). In approving the permit for this work, the Hearings Examiner for the City of Olympia and Thurston County required the Department of General Administration (now part of the Department of Enterprise Services) to report on the feasibility of implementing a long-term management plan to address environmental conditions within Capitol Lake before any future dredging application. The Squaxin Island Tribe proposed that a process be instituted for the Deschutes River Drainage, which would address concerns with sediment deposition in Capitol Lake. The Squaxin Island Tribe also asked that all affected federal, state, and local agencies work together in a coordinated process to identify the problem and develop a solution.

Later in 1986, the Department of General Administration, the Cities of Olympia and Tumwater, Thurston County, and the Governor’s Office formed a Capitol Lake Restoration Committee to address water quality within Capitol Lake. High nutrient levels were causing dense aquatic vegetation growth and algal blooms. High counts of fecal coliform bacteria had resulted in permanent closure of the City of Olympia-run swimming beach at Capitol Lake Park (now Heritage Park). In 1988, the Restoration Committee jointly issued the Capitol Lake Restoration: Committee Report and Proposed Action Plan. The Action Plan outlined specific measures to improve water quality, citing it as the primary environmental issue that must be addressed. The Action Plan also recommended an interagency committee for long-term monitoring of Capitol Lake. The Action Plan was never adopted due to lack of funding and lack of support for the proposed management approach.

No additional dredging has occurred in Capitol Lake since the 1986 dredge event. Disparate governmental and agency efforts to improve water quality continued throughout the following decade, including:

- Treatment or removal of aquatic vegetation.
- Installation of a siphon at the 5th Avenue Dam to address a depression of oxygen-depleted water in Capitol Lake, which was generating toxic hydrogen sulfide harmful to fish when marine water was intentionally or incidentally backflushed into the North Basin.
- Modification to stormwater discharges to minimize bacterial and other contaminated inputs.
- Regulatory changes to promote improved discharges from the Olympia Brewery.
- Reduced salmon-rearing activities in Percival Cove to minimize resulting nutrient input to Capitol Lake.

In 1997, the Department of General Administration reconvened a key group of governmental and agency partners to support long-term management planning. This was done in response to a request by the Department of General Administration to construct Heritage Park and to dredge accumulated sediment within the Middle Basin of Capitol Lake. The entities reviewing the permit applications for the Heritage Park project recognized the continued need for a comprehensive management strategy, especially considering the other worsening environmental conditions, including continued growth of dense aquatic vegetation, algal blooms, and increased presence of invasive species, that were not being addressed.

The advisory group that formed in 1997, and continued in this role through 2009, was referred to as the Capitol Lake Adaptive Management Plan Steering Committee (CLAMP Steering Committee). Shortly after formation, the Steering Committee initiated a high-level (non-project) Environmental Impact Statement process to broadly consider long-term management alternatives and support development of a Capitol Lake Adaptive Management Plan. The Environmental Impact Statement evaluated a lake, a lake/river wetland, an estuary, a combined lake/estuary, and a no action alternative. A Draft Environmental Impact Statement was issued in 1998 and generated a significant number of public comments, increasing community awareness of these planning efforts. In 1999, a Final Environmental Impact Statement for Capitol Lake Adaptive Management was issued but it did not include a Preferred Alternative for long-term management. It was intended to support additional discussion by the CLAMP Steering Committee on adaptive management.

**CLAMP Steering Committee Members**

- City of Olympia
- City of Tumwater
- Department of Ecology
- Department of Fish and Wildlife
- Department of General Administration
- Department of Natural Resources
- Port of Olympia
- Squaxin Island Tribe
- Thurston County

**What is a non-project?**

Non-projects are defined as being broader than specific projects and project actions. Non-project evaluations support an agency review of the bigger picture impacts or benefits of programs, plans, and policies. Comparatively, this project-specific EIS looks at actions that would be taken to construct or operate the action alternatives, while also providing an analysis that can support broader decision-making for management of the Capitol Lake – Deschutes Estuary.
After a review of the construction costs and environmental permits associated with the different management alternatives, as presented in the Final Environmental Impact Statement, the CLAMP Steering Committee agreed to maintain a freshwater lake over the next 10 years. In 2002, the CLAMP Steering Committee released a specific set of goals for management. The initial set of goals were later amended to include a feasibility analysis to more closely study the concept of estuary restoration.

### 2003 CLAMP Management Goals

1. Adaptively manage the Capitol Lake Basin.
2. Complete an estuary feasibility study to determine a long-range management decision.
3. Restore earthquake-damaged state infrastructure within the basin.
5. Expand and enhance public use of state-owned lands and adjacent public spaces within the Capitol Lake area.
6. Develop and implement a flood hazard management strategy for lands adjacent to Capitol Lake.
7. Rehabilitate the fish ladder in the Capitol Lake dam to provide year-round fish passage into and out of Capitol Lake.
8. Relocate the Percival Cove fish rearing operation and rehabilitate Percival Cove for other users.
9. Improve lake edges to be fish, wildlife, and people friendly.
10. Maintain less than 100 resident Canada geese on Capitol Lake.
11. Improve water quality in Capitol Lake to meet state standards.
12. Eliminate the purple loosestrife and Eurasian watermilfoil noxious weed infestations throughout Capitol Lake.
13. Develop and implement a comprehensive sediment management strategy for the Capitol Lake Basin.
14. Communicate with the community, legislators, and the State Capitol Committee on a routine basis regarding Capitol Lake.

The Deschutes Estuary Feasibility Study (DEFS) began in 2003 and was published in 2007. It evaluated potential biological conditions, developed a computer model to analyze physical processes like water flow and sediment transport, generated cost estimates, and conducted a net benefit analysis. It also considered the challenges of reestablishing an estuarine system in an urban environment. Findings from the DEFS were brought into a 2009 Alternatives Analysis, where a managed lake, estuary, dual basin estuary (or hybrid), and a status quo lake (or no action) were compared. Also in 2009, the waterbody
was closed to all recreational use due to the presence of the invasive New Zealand mudsnail, and it remains closed today.

Later in 2009 the Steering Committee delivered its recommendation to the Director of the Department of General Administration, recommending an estuary alternative for long-term management. The Steering Committee had voted on a Preferred Alternative, with five votes cast for an estuary alternative, two votes for a managed lake alternative, one vote as undecided, and no votes for a hybrid alternative. The majority recommendation described environmental benefits of an estuary alternative as greater than those of a managed lake alternative, lower long-term costs, and the potential for federal financial support. The CLAMP Steering Committee included a request to develop a new governing body and an equitable cost-sharing structure among all affected parties. A coordinated sediment management strategy would be the focus of the new governing structure for the restored estuary.

This recommendation was not advanced by the Department of General Administration to the State Capitol Committee (SCC) for consultation due to the lack of consensus among stakeholders regarding a preferred approach to long-term management. Shortly thereafter, the CLAMP Steering Committee was defunded and disbanded. A long-term management plan was not adopted, and no additional management strategies were implemented within the Capitol Lake Basin. The contrast between approaches to long-term management was mirrored by a growing divide in public opinion on how the resource should be managed.

In 2013, Enterprise Services commissioned a situation assessment to synthesize the major viewpoints on issues related to long-term management given the continued stalemate within the planning process. The 2014 Situation Assessment for Capitol Lake Management, prepared by The William D. Ruckelshaus Center, described that long-term management “...has many of the hallmarks of a complex public policy challenge: multiple organizations and individuals with vastly different and passionate views and priorities, a set of local issues weighted with history and politics, several government agencies with diverse management responsibilities, and natural hydrological sediment processes exacerbating environmental pressures.” The situation assessment also revealed continued concern around the lack of discretionary funds in the state budget to implement and manage a solution. It recommended establishing a common information base, shared goals for long-term management,
and a collaborative process to identify a management solution (or management actions).

Concurrent with the situation analysis, and also prompted by the continued visible shallowing of Capitol Lake, the Washington State Legislature provided a small funding allocation through Engrossed Substitute House Bill (ESHB) 5035 for Enterprise Services to begin the process of seeking necessary permits to dredge accumulated sediment. In coordination with governmental partners and agencies, Enterprise Services concluded that process with a determination that dredging and other management actions could not occur within Capitol Lake until a plan for long-term management had been developed and adopted. Enterprise Services understood that in order to obtain the environmental permits required to dredge Capitol Lake, a preferred approach for long-term management would have to be identified through an EIS, or the permits would not be issued by the governmental and agency partners.

In 2016, following direction from the Washington State Legislature in ESHB 2380, Enterprise Services reinitiated long-term management planning. Three Work Groups were formed, with representatives of the governmental and agency partners that had participated in this discussion over the past 50 years. An Executive Work Group was convened to provide executive- and policy-level input. A Technical Work Group considered technical topics. A Funding and Governance Work Group evaluated the concept of a shared funding and governance model for long-term management, carrying forward this concept that was introduced during the CLAMP process. The Work Groups were composed of representatives from the same entities that participated in the CLAMP process.

The goal of this 10-month process, referred to as Phase 1 of the Long-Term Planning for Capitol Lake – Deschutes Estuary, was to “make tangible progress on reaching broad agreement on a long-term plan” (per ESHB 2380). Phase 1 was conducted in a manner similar to an expanded scoping process under SEPA that could then be implemented as the first step of an EIS to promote interagency coordination and public participation. There were two key outcomes from Phase 1:

1. The Work Groups established a project purpose and a set of goals for long-term management that are common across all alternatives (Managed Lake, Estuary, and Hybrid Alternatives). This purpose statement is used as the basis to evaluate and screen the project alternatives in this EIS.
During the last meeting of the Phase 1 process, the Executive Work Group presented Enterprise Services with a letter of support for Phase 2. Signed by all members, the letter, which accompanied the December 30, 2016, Phase 1 Report on the Capitol Lake/Lower Deschutes Watershed Long-Term Management Planning report, begins, “we are writing jointly, as collaborative partners in the Capitol Lake/Lower Deschutes Watershed long-term management planning effort, to express support for funding the proposed Phase 2 to complete a project-specific Environmental Impact Statement (EIS).”

The EIS is intended to evaluate existing conditions within the Capitol Lake – Deschutes Estuary and to identify specific elements for management based on those conditions, to consider the effectiveness of alternatives and management strategies in meeting project goals, and to evaluate the cost of the alternatives. This information is needed to objectively develop data on environmental conditions and costs, and to serve as a foundation for making an informed decision that could be supported by the range of engaged stakeholders. Selecting a Preferred Alternative will also inform a range of state and local policy documents and associated actions, like state-led initiatives to improve water quality in the Deschutes River and Budd Inlet, and local policy documents that describe how goals of the Shoreline Master Programs can be achieved. Implementing a Preferred Alternative, after the EIS, to improve impaired environmental conditions within the Project Area will also align with the mission of engaged governmental and agencies partners who are charged with environmental stewardship.

1.8 WHAT IS THE PROJECT PURPOSE, AS ESTABLISHED IN PHASE 1?

The statement below was prepared in Phase 1 by the Executive and Technical Work Groups, in collaboration with Enterprise Services. It captures the primary project purpose, with goals common to all alternatives. Since that time, the project name has changed to the Capitol Lake – Deschutes Estuary Long-Term Management Project but the project area and intent remain the same.
Purpose Statement from Phase 1

The purpose of the Capitol Lake/Lower Deschutes Watershed Long-Term Management Project is to identify and implement an environmentally and economically sustainable watershed approach that improves water quality, and manages existing sediment accumulation and future deposition. The project is also needed to improve the impaired ecological functions within the existing Capitol Lake basin and adjacent watershed. These efforts would restore and enhance community use of the resource.

The Deschutes estuary has long-standing history with active use and significance to the Squaxin Island Tribe. The Deschutes watershed continues to be used for ceremonial, subsistence, and commercial harvesting of natural resources, and is a place of strong cultural and spiritual value. The area use and conditions changed after construction of Capitol Lake in 1951. The Capitol Lake area now supports community events such as the annual Capital Lakefair, organized athletic events, and various other gatherings. The trail system and nearby parks provide continued passive recreational opportunities that maintain the lake’s edge as an important recreational center and valued amenity in the south Puget Sound area. With its central location, the area holds historical and personal value for many people.

Although the shoreline remains vibrant, active use of the waterbody has been restricted for more than 30 years due to the degraded water quality and ecological functions. An estimated 35,000 cubic yards of sediment accumulates annually within the lake basin, resulting in increasingly shallow conditions. Capitol Lake was closed to swimming in 1985 due to high bacteria levels. Water draw-down and back-flushing to control algal blooms and freshwater plant growth, due to excessive nutrient loads, continued annually until 1999 and caused temporary impacts to other recreational uses, such as boating and fishing. The presence of invasive species resulted in official closure to all public uses in 2009. Active use of the waterbody continues to be restricted today.

Water quality must be improved to meet federal law and state water quality standards, and to restore aquatic life and recreational uses, which are protected under these regulations. Restoring ecosystem functions would be supported by improved water quality, enhanced fish and wildlife habitat, and management or eradication of invasive species. The project would also include elements to manage sediment within the Capitol Lake/Lower Deschutes Watershed and in adjacent Budd Inlet. These collaborative efforts between the Washington State Department of Enterprise Services and other stakeholders would be compatible with other watershed-wide restoration and improvement plans and would be consistent with the on-going state-led initiative to restore the Puget Sound. Once completed, the project would have a beneficial effect on the ecosystem service value, economic value and community value of the resource.

1.9 WHAT ARE THE GOALS FOR THE LONG-TERM MANAGEMENT ALTERNATIVES?

The Managed Lake, Estuary, and Hybrid Alternatives have been defined using goals from the purpose statement developed in Phase 1. The alternatives are being evaluated for their ability to:

- Improve water quality
- Manage sediment accumulation and future deposition
• Improve ecological functions
• Enhance community use of the resource

In order to be selected as the Preferred Alternative, a long-term management alternative must also be environmentally and economically sustainable; these were key considerations included in the purpose statement. (See Chapter 2.0, Project Alternatives & Construction Approach, for more detail on environmental and economic sustainability definitions.)

1.10 HOW WAS THIS EIS AUTHORIZED?

In 2018, the Washington State Legislature directed Enterprise Services to complete this EIS (Phase 2) and authorized funding allowing work to begin in Engrossed Substitute Senate Bill (ESSB) 6095. In 2019, the Washington State Legislature provided additional funding to complete the EIS and required the Final EIS with a Preferred Alternative be completed in 2022 in ESSB 6248.

This EIS began with a 48-day scoping period in summer 2018, which solicited input from tribes, governmental and agency partners, and the community. The EIS continues the work of evaluating long-term management alternatives, closely analyzing potential impacts and benefits across 14 environmental disciplines in support of informed decision-making.

ESSB 6095 (2017 to 2018)

The department [Enterprise Services] shall develop an environmental impact statement to consider alternatives for Capitol Lake. The alternatives considered must include, at a minimum, a lake option, an estuary option, and a hybrid option. The environmental impact statement will also consider sediment transport and locations within lower Budd Inlet. The department must work with affected stakeholders to develop mitigation plans. The environmental impact statement must also consider an expanded area around Capitol Lake and Budd Inlet including the Port of Olympia for the economic analysis. The environmental impact statement must consider the use of equal funding from nonstate entities including, but not limited to, local governments, special purpose districts, tribes, and not-for-profit organizations.
ESSB 6248 (2019 to 2020)

The appropriations in this section are provided solely for an environmental impact statement that includes the following alternatives, at a minimum:

a) Managed lake;

b) Hybrid lake; and

c) Estuary.

A draft environmental impact statement with at least the three options in subsection (1) of this section must be submitted to legislative fiscal committees by June 30, 2021. It is the intent of the legislature that a final environmental impact statement that includes identification of a Preferred Alternative for Capitol Lake management must be submitted to legislative fiscal committees by June 30, 2022.

The appropriations are subject to the provisions of section 1034, chapter 298, Laws of 2018.

It is the intent of the legislature to fully fund future capital requests necessary to complete the Capitol Lake long-term management planning in accordance with the provisions of section 1034, chapter 298, Laws of 2018.

1.11 HOW WAS PUBLIC INPUT CONSIDERED ON THE SCOPE OF THIS EIS?

Enterprise Services conducted scoping to establish and confirm the focus of the EIS, relating to the alternatives, elements of the affected environment, probable significant impacts, and potential mitigation measures. During scoping, input was solicited from governmental, agency, and tribal partners, as well as the community. Two public scoping meetings were held during a 48-day comment period.

Approximately 271 comment submissions that included 935 individual comments were received in the form of web-based comment forms, emails, oral testimonies, and letters as summarized in the Scoping Report. The alternatives and plan for analysis were refined based on scoping input received.

Based on scoping comments and initial project review, certain elements of the environment were not analyzed in the EIS, as described below:

- **Earth**: Sediment transport and sediment quality are analyzed in the Draft EIS; however, other aspects of soils and geology are not analyzed. Although seismic and geotechnical hazards (including ground shaking, liquefaction, landslides, and other hazards) are present throughout the area, impacts under all action alternatives would be less than significant with regulatory
compliance, and with implementation of industry standards, geotechnical recommendations, and best management practices (BMPs). Erosion and scour potential were considered in the identification of scour protection elements included in the Estuary and Hybrid Alternatives. Analysis of these issues will continue in the design stage for the selected alternative.

- **Energy and Natural Resources**: The project does not affect the generation or consumption of energy. Long-term consumption would be limited to recurring maintenance dredging. Such consumption is not considered a significant impact. Energy and natural resource consumption during project construction and operation would be similar under all action alternatives.

- **Noise**: Increased recreational activity (i.e., kayaking, boardwalk use) within the project area would result in some level of human-generated noise, but these levels are generally unobtrusive with little anticipated impact on visitor enjoyment or adjacent land uses. Operating equipment, hauling material, and other activities associated with construction would result in potentially disruptive noise to land and recreational use, as well as fish and wildlife. These noise impacts were considered as part of the analyses of Fish and Wildlife, as well as Land Use, Shorelines, and Recreation. No long-term noise beyond minor noise impacts associated with recurring maintenance dredging is expected.

### 1.12 HOW WILL A PREFERRED ALTERNATIVE BE SELECTED & WHAT IS THE DECISION-MAKING PROCESS?

Recognizing the need to move forward from a decades-long political stalemate, and with the comprehensive analysis provided by this Draft EIS, Enterprise Services is positioned to identify a Preferred Alternative. Further delay in decision-making is not acceptable to the range of engaged stakeholders. As part of this EIS, Enterprise Services has designed the following decision-making process that will provide a Preferred Alternative in the Final EIS and then move this project forward for funding consideration by the Washington State Legislature during the 2023 legislative session.

The following selection criteria will be considered by Enterprise Services in order to identify a Preferred Alternative for long-term

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**Could the long-term management alternatives be modified?**

Yes. The long-term management alternatives could be modified to better meet the project purpose and goals, as a result of the analyses included in this EIS, public comment on the Draft EIS, or additional technical analyses conducted for the Final EIS. Therefore, it is possible for the Preferred Alternative to vary from the specific alternatives described in this EIS.
management. It is important to note that all three action alternatives are feasible from a technical and regulatory perspective (i.e., they have been screened for potential limitations that would make them impossible to permit, construct, or manage), and they all require active and ongoing long-term management. This decision-making process moves beyond feasibility to consider the degree to which each alternative meets the following criteria:

- **Performance Against Project Goals.** The degree to which the long-term management alternatives would meet project goals.

- **Other Environmental Disciplines with Significant Findings.** The potential significant impacts and benefits across the other environmental disciplines analyzed in this EIS but not directly associated with the project goals.

- **Environmental Sustainability.** The ability to provide net environmental benefits over a 30-year horizon, considering relative contribution to project goals; and the level of active management required to achieve the project goals.

- **Economic Sustainability.** Measured by the relative cost-effectiveness in constructing and operating the alternative in a way that would meet the project goals; and the severity of economic impacts if there is a lapse in long-term funding.

- **Construction Impacts.** The duration and magnitude of construction impacts.

- **Decision Durability.** Evaluated by the ability of an alternative to achieve long-term support from local tribes, stakeholders, and communities. Input on this selection criteria will be solicited from the engaged tribes, governmental and agency partners, the Community Sounding Board convened for this project, and the State Capitol Committee (SCC). These groups collectively represent the communities most likely to be affected by this decision.

Enterprise Services solicited input from the Work Groups and Community Sounding Board on this list of selection criteria and their definitions, and the relative importance of each criterion to the identification of a Preferred Alternative. This feedback resulted in refinements to the criteria definitions reflected above and provided feedback for Enterprise Services to consider relative to how the
criteria could be prioritized, or weighted, in decision-making. Considering all criteria is critical in the decision-making process.

The collective feedback from the Work Groups and Community Sounding Board resulted in the following prioritization, in order from most important to least important:

1. Performance Against Project Goals
2. Other Environmental Disciplines with Significant Findings
3. Environmental Sustainability
4. Durability of the Decision
5. Economic Sustainability
6. Construction Impacts

Enterprise Services will supplement this prioritization with information from comments on this Draft EIS to develop weighting for the selection criteria. Weighting will prescribe specific percent values, totaling 100%. The criteria with the highest priority will account for the greatest percent of the decision. The alternative that preforms best relative to the weighted selection criteria will be identified as the Preferred Alternative for long-term management of the Capitol Lake – Deschutes Estuary.

The process to select a Preferred Alternative is outlined in Figure 1.8.1. It was developed to integrate feedback through the decision-making process, including a step to solicit input on the alternative or alternatives that could be supported as the Preferred Alternative. This is intended to increase the durability of the decision, because such support is especially important because the engaged governmental agencies may be asked to contribute to funding for long-term management.

A Preferred Alternative will be selected as part of the process to prepare the Final EIS, and the rationale for that decision will be included in the Final EIS, along with the Preferred Alternative. After the Final EIS is issued, Enterprise Services will submit a capital request to the Washington State Legislature for funding to design and permit the Preferred Alternative.
Figure 1.8.1 Decision-Making Process for the Preferred Alternative

Draft EIS Development (early to mid-2021)
- Work Groups and Community Sounding Board input on Preferred Alternative selection criteria and weighting
- Input received on the Preferred Alternative selection criteria and weighting generally described for public comment
- Decision-making process outlined for common understanding

Draft EIS Release (June 30, 2021)
- Draft EIS key findings reviewed with Work Groups and Community Sounding Board

Draft EIS Public Comment Period and Comment Processing (late 2021)
- Comments on technical analysis and alternatives received and reviewed
- Public comments on Draft EIS and any additional technical analyses to be completed reviewed with Work Groups and Community Sounding Board
- Work Group, Engaged Tribes, Community Sounding Board, and SCC input on Preferred Alternative
- Preferred Alternative selection criteria confirmed

Final EIS Development (late 2021 to early 2022)
- Preferred Alternative selection process completed by Enterprise Services with support from EIS Project Team
- Enterprise Services discusses long-term funding and governance with members of Funding and Governance Work Group and legislative funding request with SCC
- Preferred Alternative and long-term funding and governance approach described in Final EIS
- Results of selection process and key findings of Final EIS reviewed with Work Groups and Community Sounding Board

Final EIS Release (summer 2022)
- Enterprise Services submits capital request to Legislature for funding to design and permit Preferred Alternative that was identified through objective selection process

Capital Request (late summer 2022)
1.13 WHAT ARE THE NEXT STEPS AFTER THE DRAFT EIS?

SEPA includes a public comment period after the Draft EIS is issued. This allows governmental partners, agencies, tribes, and the community to provide suggestions for improving the environmental analysis, comment on the methodology used in the analysis, and request additional information or mitigation measures. Enterprise Services is extending the typical 30-day comment period to 45 days to provide sufficient time for review and comment.

Enterprise Services will consider all comments received during the Draft EIS comment period and, depending on the scope of those comments, may conduct additional technical analyses, if needed for the Final EIS. Enterprise Services will continue to consult with the Work Groups and Community Sounding Board throughout this process.

A conceptual timeline of the EIS planning process for the project is provided in Figure 1.9.1.

As described above, the Preferred Alternative will be identified in the Final EIS. The Final EIS is expected to be issued in mid-2022, pending the number of comments received on the Draft EIS and additional analyses that may need to be completed in response to public comment.

After the Final EIS is issued, Enterprise Services will advance and complete the design phase for the Preferred Alternative. Enterprise Services will also obtain the federal, state and local environmental permits required for project construction. Funding for this process, which is referred to as Phase 3, has not yet been appropriated by the Washington State Legislature. Based on the targeted completion date for the Final EIS and the legislative calendar, Phase 3 could begin as early as 2023, if funding is available.

A 3- to 5-year duration is assumed for design and permitting for a project of this magnitude. Construction would begin following design and permitting, and once funding is secured. If there are no delays in this process, project construction could begin as early as 2028. Project construction could last 4 to 8 years, depending on the alternative.
A funding approach for project construction has not yet been identified. Enterprise Services is working with the Funding and Governance Work Group to develop a funding allocation framework to support a shared funding concept, or to demonstrate the need for funding by a single entity. For more detail on this and the approach to evaluate potential shared funding and governance for the Preferred Alternative, refer to Chapter 8.0, Engagement with Work Groups, Community Sounding Board, & State Government.

### 1.14 HOW IS THIS EIS ORGANIZED?

This EIS provides a description of Managed Lake, Estuary, and Hybrid Alternatives that are being evaluated for long-term management, along with a No Action Alternative, as required by SEPA. It provides a summary of the technical analyses that were completed to support the environmental review of this project, and the engagement led by Enterprise Services to promote participation by governmental partners, agencies, and the community throughout this process.

The information is divided into chapters, with each focusing on a different aspect of the project, as follows:

- **Chapter 1.0, Introduction, Project Background, & History**: Presents an overview of the project history, including past efforts to address environmental conditions at the Capitol Lake – Deschutes Estuary. Provides an understanding of the project purpose and goals, and next steps.
• Chapter 2.0, Project Alternatives & Construction Approach: Includes an overview of the project alternatives and details the construction activities that would take place under each action alternative.

• Chapter 3.0, Existing Conditions & Affected Environment: Describes existing conditions within the project area and outlines the 14 environmental disciplines addressed in this EIS.

• Chapter 4.0, Long-Term Impacts, Benefits, & Mitigation: Describes the potential long-term impacts and benefits of the project alternatives, including measures to avoid, minimize, or mitigate impacts.

• Chapter 5.0, Short-Term Impacts & Mitigation: Describes short-term impacts within the project area that could result from construction of the action alternatives.

• Chapter 6.0, Cumulative Effects: Provides information on the potential effect of the Capitol Lake – Deschutes Estuary Long-Term Management Project when combined with other reasonably foreseeable projects.

• Chapter 7.0, Planning-Level Costs, Funding Recommendations, & Other Considerations: Includes planning-level cost estimates for the project alternatives, funding recommendations from the Funding and Governance Work Group, and other factors that may be considered during future decision-making.

• Chapter 8.0, Engagement with Work Groups, Community Sounding Board, & State Government: Describes specific engagement efforts with stakeholder groups, including the Executive Work Group, Technical Work Group, Funding and Governance Work Group, and Community Sounding Board and the Executive and Legislative branches of the state government.

• Chapter 9.0, Permits & Approvals for Implementation of a Preferred Alternative: Provides a list of environmental permits and approvals that would be required before construction of the Preferred Alternative.

The following supplemental materials are also provided:

• Attachment 1, List of Abbreviations: A list of acronyms and abbreviations used in this EIS and their definitions.
• **Attachment 2, List of Preparers:** A list of the EIS Project Team and Enterprise Services staff who contributed to this EIS.

• **Attachment 3, Distribution List:** A list of stakeholders who received a copy of this Draft EIS.

• **Attachment 4, References:** Provides a list of references specifically used for this EIS. Discipline-specific references can be found in individual discipline reports (Attachments 5 through 18).

• **Attachment 5, Hydrodynamics and Sediment Transport Discipline Report:** The detailed technical analysis that is summarized in Sections 3.1, 4.1, and 5.1 of the EIS.

• **Attachment 6, Navigation Discipline Report:** The detailed technical analysis that is summarized in Sections 3.2, 4.2, and 5.2 of the EIS.

• **Attachment 7, Water Quality Discipline Report:** The detailed technical analysis that is summarized in Sections 3.3, 4.3, and 5.3 of the EIS.

• **Attachment 8, Aquatic Invasive Species Discipline Report:** The detailed technical analysis that is summarized in Sections 3.4, 4.4, and 5.4 of the EIS.

• **Attachment 9, Fish and Wildlife Discipline Report:** The detailed technical analysis that is summarized in Sections 3.5, 4.5, and 5.5 of the EIS.

• **Attachment 10, Wetlands Discipline Report:** The detailed technical analysis that is summarized in Sections 3.6, 4.6, and 5.6 of the EIS.

• **Attachment 11, Air Quality and Odor Discipline Report:** The detailed technical analysis that is summarized in Sections 3.7, 4.7, and 5.7 of the EIS.

• **Attachment 12, Land Use, Shorelines, and Recreation Discipline Report:** The detailed technical analysis that is summarized in Sections 3.8, 4.8, and 5.8 of the EIS.

• **Attachment 13, Cultural Resources Discipline Report:** The detailed technical analysis that is summarized in Sections 3.9, 4.9, and 5.9 of the EIS.
• **Attachment 14, Visual Resources Discipline Report:**
The detailed technical analysis that is summarized in Sections 3.10, 4.10, and 5.10 of the EIS.

• **Attachment 15, Sediment Quality Discipline Report:**
The detailed technical analysis that is summarized as part of the Environmental Health evaluation in Sections 3.11, 4.11, and 5.11 of the EIS.

• **Attachment 16, Transportation Discipline Report:** The detailed technical analysis that is summarized in Sections 3.12, 4.12, and 5.12 of the EIS.

• **Attachment 17, Public Services and Utilities Discipline Report:** The detailed technical analysis that is summarized in Sections 3.13, 4.13, and 5.13 of the EIS.

• **Attachment 18, Economics Discipline Report:** The detailed technical analysis that is summarized in Sections 3.14, 4.14, and 5.14 of the EIS.

• **Attachment 19, Concepts Screened through the Measurable Evaluation Process:** Provides a brief summary of the results from the Measurable Evaluation Process, including the concepts that were eliminated from further review and those that became part of the action alternatives.

• **Attachment 20, Scoping Report:** Describes public comments that were considered as the scope of this EIS was developed.

While this is a project-level EIS, it is being prepared at an early stage of design development for the project. This is consistent with rules that intend for SEPA to be “integrated with agency activities at the earliest possible time to ensure that planning and decisions reflect environmental values, to avoid delays later in the process, and to seek to resolve potential problems” (WAC 197-11-055). This means that information about the long-term management alternatives is approximate and subject to refinement as the design and construction approach are developed for the Preferred Alternative. If substantive advancements or changes occur after the EIS, additional environmental review would be completed on those project elements.
2.0 Project Alternatives & Construction Approach

Development of alternatives is an important step in the SEPA process. Alternatives are developed to identify and analyze different ways to achieve the project purpose and goals. Each of the alternatives analyzed should be reasonable, must feasibly attain project goals, and must represent a clear choice for the decision-maker. Therefore, as outlined within this chapter, considerable effort was taken in the development of alternatives that would best achieve project goals. The No Action Alternative, which proposes no changes in the current management of the Project Area, serves as a baseline to which all other action alternatives are compared, and describes the most likely outcome in the absence of the long-term management project.

There are five sections in this chapter. Section 2.1 includes a description of how the project alternatives were developed. The project alternatives are summarized in Section 2.2, and the components of each alternative are discussed in more detail in Section 2.3. Section 2.4 provides an overview of the conceptual construction schedule, and the means and methods that may be used to construct the primary components of the alternatives. Long-term maintenance dredging for each project alternative is described in Section 2.5. Once a Preferred Alternative has been selected (refer to Section 1.8, What is the Project Purpose, as Established in Phase 1?), and design and permitting are underway following a Final EIS (Phase 3 of long-term management planning), the construction means and methods, and the specific approach to adaptive maintenance for that alternative, will be refined.
2.1 HOW WERE THE ALTERNATIVES DEVELOPED?

There are two general approaches for management of the Capitol Lake – Deschutes Estuary: keep the 5th Avenue Dam in place and maintain a freshwater lake, or remove the 5th Avenue Dam and restore tidal estuarine conditions.

Three long-term management alternatives emerge from the two approaches: a Managed Lake Alternative (keep the dam), an Estuary Alternative (remove the dam), and a Hybrid Alternative (remove the dam but retain a smaller lake impoundment in the Project Area). These are the primary alternatives that have been the subject of past planning processes, as described in Chapter 1.0, Introduction, Project Background, and History. Strategies to better manage environmental conditions within the Project Area are also included in the long-term management alternatives.

Governmental and agency partners and the community have provided a range of recommendations on elements within the long-term management alternatives.

A Measurable Evaluation Process was developed for this project to evaluate the range of discrete concepts and alternative variations that have been proposed through past planning processes and through the scoping period at the beginning of the EIS. The Measurable Evaluation Process helped Enterprise Services develop the Managed Lake, Estuary, and Hybrid Alternatives for evaluation in this EIS. Enterprise Services sought to optimize the alternatives by screening the range of concepts to identify those that would best achieve project goals.

In coordination with Enterprise Services, the known range of concepts were screened by the EIS Project Team composed of civil engineers, environmental engineers, coastal engineers, geomorphologists, water quality specialists, biologists, limnologists, economists, and planners. Screening the concepts in Step 1 of the Measurable Evaluation Process provided the following benefits:

- It provided an opportunity to screen components of an alternative without eliminating an entire alternative variation because one or more of its components were not feasible or sustainable.
- It allowed concepts to be eliminated early if they did not have technical or regulatory feasibility, or were not
environmentally and economically sustainable, which are key elements of the project purpose statement.

- It compared concepts that could be implemented to meet project goals and developed optimized versions of the Managed Lake, Estuary, and Hybrid Alternatives from those concepts found to best meet project goals.

- It ensured responsible expenditure of project funding by limiting the detailed technical analyses to the optimized alternatives. This is especially appropriate because the alternative variations did not vary significantly enough to result in substantial differences in the technical analyses, or in the differentiation among the alternatives that supports decision-making.

Table 2.1.1 provides the objective criteria that were used in this screening process. A depiction of the complete Measurable Evaluation Process is provided in Figure 2.1.1.

<table>
<thead>
<tr>
<th>Screening Criteria</th>
<th>Rating Scale</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical Feasibility</td>
<td>High</td>
<td>A component was considered technically feasible if (1) there were no apparent technical or logistical obstacles that would prevent the component from being constructed and maintained, and (2) there was technical uncertainty, and that uncertainty was at an acceptable level based on current, standard engineering practices.</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td></td>
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<tr>
<td></td>
<td>Low</td>
<td></td>
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<tr>
<td>Regulatory Feasibility</td>
<td>High</td>
<td>A component was considered to have regulatory feasibility if (1) permits and approvals could be secured within the project schedule and budget, and (2) the component was within Enterprise Services’ jurisdiction to implement and there were no legal protections on land, or other similar restrictions that could affect the feasibility.</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
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<tr>
<td></td>
<td>Low</td>
<td></td>
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<tr>
<td>Environmental Sustainability</td>
<td>High</td>
<td>A component would support an environmentally sustainable outcome if it would provide net environmental benefits over a 30-year horizon, considering relative contribution to project goals.</td>
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<tr>
<td></td>
<td>Medium</td>
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<td></td>
<td>Low</td>
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<tr>
<td>Economic Sustainability</td>
<td>High</td>
<td>A component would support an economically sustainable outcome if it would be cost-effective in meeting the project goal. A proposed approach was considered cost-effective if its present value life-cycle costs over a 30-year horizon were low relative to other proposed approaches within the same project component.</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
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<td></td>
<td>Low</td>
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<tr>
<td></td>
<td>Unknown</td>
<td></td>
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</tbody>
</table>

Management Concepts from Past Processes

Concepts and alternative variations were sourced from:

- The 2007 Deschutes Estuary Feasibility
- The 2009 Alternatives Analysis for Capitol Lake Adaptive Management
- The 2016 Phase 1 process
- The 2018 scoping comments for this EIS
Figure 2.1.1 Measurable Evaluation Process for the Environmental Impact Statement

**Step 1. Optimize Alternatives**
- Evaluate and screen concepts and components of alternative variations:
  - Feasibility (technical & regulatory)
  - Sustainability (environmental & economic)
- Develop optimized versions of the Managed Lake, Estuary, and Hybrid Alternatives using the objective evaluation criteria

**Outcome:** Optimized versions of the alternatives that are feasible and most sustainable advance into the EIS technical analyses

**Step 2. Evaluate and Compare Alternatives**
- Evaluate potential impacts and benefits of each alternative using results of the technical analyses
- Measure alternatives against discipline-specific significance criteria
- Present results in the Draft EIS for review by governmental partners, agencies, and the community

**Outcome:** Comparative summary of the impacts and benefits of the alternatives

**Step 3. Identify a Preferred Alternative**
- Evaluate the alternatives relative to their performance against project goals, other potential impacts and benefits, and environmental and economic sustainability
- Review and consider public comment on the Draft EIS
- Identify Preferred Alternative in Final EIS

**Outcome:** Identification of a Preferred Alternative that best meets the project purpose and goals

1998 – 2018
All concepts and alternative variations identified in past processes, Phase 1, and EIS Scoping

2019
Draft EIS Public Comment Period and Mtg

2020
Draft EIS Issued 2021

2021 & 2022
Final EIS Issued 2022

**IMPROVING WATER QUALITY**
**MANAGING SEDIMENT ACCUMULATION AND FUTURE DEPOSITION**
**IMPROVING ECOLOGICAL FUNCTIONS**
**ENHANCING COMMUNITY USE OF THE RESOURCE**
Optimized versions of the Managed Lake, Estuary, and Hybrid Alternatives that emerged from the Step 1 screening process are discussed in more detail throughout this chapter and are evaluated in this Draft EIS. The concepts that were eliminated from further review as a result of this screening are briefly described in Concepts Screened through the Measurable Evaluation Process (Attachment 19).

### 2.2 WHAT ARE THE PROJECT ALTERNATIVES?

#### 2.2.1 Managed Lake Alternative

The Managed Lake Alternative would retain the 5th Avenue Dam in its existing configuration. The 5th Avenue Dam would be overhauled to significantly extend the serviceable life of the structure. The reflecting pool within the North Basin would be maintained, and active recreational use would be restored in this area. Sediment would be managed through initial construction dredging and recurring maintenance dredging in the North Basin only. Sediment from construction dredging would be used to create habitat areas in the Middle Basin to support improved ecological function, habitat complexity, and diversity. Sediment would continue to accumulate and over time would promote a transition to freshwater wetlands in the South and Middle Basins. Boardwalks, a 5th Avenue Pedestrian Bridge, a dock, and a boat launch would be constructed for community use.

If selected as the Preferred Alternative, adaptive management plans would be developed during the design and permitting process to maintain water quality, improve ecological functions, and manage invasive species. See Figures 2.2.1 and 2.2.2 for a graphical summary of the key alternative components and a visual simulation of the North Basin under a Managed Lake Alternative.

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### Condition of the 5th Avenue Dam

Enterprise Services inspected the 5th Avenue Dam in 2016 to document the current condition and prioritize repair recommendations. The structural components of the dam, and its mechanical and electrical components, were found to be in **fair condition**. Fair condition means that minor to moderate deterioration was observed. The durability assessment noted increasing corrosion, and the geotechnical evaluation recommended stabilization to improve subsurface soils that are susceptible to liquefaction.

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What is an adaptive management plan?

An adaptive management plan outlines specific management objectives and the recommended management strategies that would be implemented to meet those objectives. With an adaptive management approach, a site is monitored to ensure that the management objectives and performance measures are met. If the site is not meeting objectives, the management strategies are adapted for better performance. This approach recognizes the dynamic nature of these systems, and that adjustments may be needed over time.
Figure 2.2.1 Managed Lake Alternative Overview

**New 5th Avenue Pedestrian Bridge**
Establishing a multimodal trail to connect the existing loop around the North Basin. This would enhance recreational use and connectivity within the project area.

**Adaptive Management Plan to Improve Water Quality**
An adaptive management plan would be implemented to achieve common lake management objectives and to support recreational use of Capitol Lake. Aquatic plant control is expected to be the primary component of the adaptive management plan given the improving water quality trends that have been documented in recent years.

**Restoration of Boating & Fishing**
Project actions to improve water quality and ecological functions, and to manage sediment, would restore the ability to boat and fish throughout Capitol Lake. Restoring the opportunities for water-based activities enhances community use of the resource beyond the range of existing recreational opportunities in the project area.

**Boardwalk Adjacent to Ecological Improvements in the South and Middle Basins**
Establishing a boardwalk in the South and Middle Basins increases opportunities for recreational use within the project area. It supports a community-held value of walking around Capitol Lake.

**Initial & Maintenance Dredging in North Basin Only**
Dredging in the North Basin only minimizes the extent and associated cost of dredging under the Managed Lake alternative, while still supporting project goals. The focused dredging would support recreational use of the North Basin and improved ecological function in the Middle and South Basins. Maintenance dredging is assumed at a 20-year frequency.

**Transition to Freshwater Wetlands in South & Middle Basins**
Establishing habitat areas in the South and Middle Basins and allowing these areas to transition over time to freshwater wetlands would promote ecological diversity within Capitol Lake. Freshwater wetlands would improve water quality goals and would reduce the extent of dredging required for the Managed Lake Alternative.

**Proposed Habitats & Elevations (ft NAVD 88)**
- upland: >16
- transitional: 13.5 - 15
- high marsh: 10 - 13.5
- tidal flat: 9 - 10
- submerged: 8 - 9, 6 - 8, 4 - 6, 2 - 4, 0 - 2, <2, <4

**Habitat Enhancement Plan to Maintain Ecological Functions**
Habitat Enhancement Plan would be implemented to manage invasive and nuisance species, and to ensure that the habitat areas ecological improvements in the North and Middle Basins meet performance goals defined through the permitting process.
Figure 2.2.2 Managed Lake Alternative Visual Simulation
2.2.2 Estuary Alternative

Under the Estuary Alternative, the 5th Avenue Dam would be removed, and an approximately 500-foot-wide (150-meter-wide) opening would be established in its place. This would reintroduce tidal hydrology to the Capitol Lake Basin, returning the area to estuarine conditions where saltwater from Budd Inlet would mix with freshwater from the Deschutes River. Sediment would be managed through initial construction dredging in the Capitol Lake Basin and recurring maintenance dredging within West Bay. Dredged materials from construction dredging would be used to create habitat areas in the Middle and North Basins to promote ecological diversity, though tideflats would be the predominant habitat type. Boardwalks, a 5th Avenue Pedestrian Bridge, a dock, and a boat launch would be constructed for community use. This alternative also includes stabilization along the entire length of Deschutes Parkway to avoid undercutting or destabilization from the tidal flow. Existing utilities and other infrastructure would be upgraded and/or protected from reintroduced tidal hydrology and saltwater conditions.

If selected as the Preferred Alternative, adaptive management plans would be developed during the design and permitting process to improve ecological functions and manage invasive species. See Figures 2.2.3 and 2.2.4 for a graphical summary of the key alternative components and a visual simulation of the North Basin under the Estuary Alternative.
Tidal Conditions under the Estuary & Hybrid Alternatives

Tidal conditions in the Capitol Lake Basin, under the Estuary and Hybrid Alternatives, would be similar to Budd Inlet. To determine the amount of time that the North Basin would be filled with water, an inundation curve was developed. The inundation curve represents a statistical analysis of predicted tides in Budd Inlet. The point at which the inundation curve and the average elevation in the North Basin meet is the amount of time that the North Basin would be inundated, or covered by water. (In this case, inundation does not mean flooding.) This inundation curve shows that the North Basin would have water in it (at varying depths) approximately 80% of the time. The amount of time that any other elevation would be inundated is the nexus, or point, at which the inundation curve and that elevation meet on this graph.

Abbreviations: MHHW = The average elevation of the higher high tide each day; MSL = The mean elevation of the tide each day; MLLW = The average elevation of the lower low tide each day.
Tide Variations

The graphics at right show the tide variation on representative days throughout the year, including three summer days (in June and July) and a winter, spring, and fall day. All days shown are spring tides—when higher high tides and lower low tides occur—except for the June tide chart, which shows a neap tide (moderate tide). These days are representative only, as tides are variable and change daily, and from one week or season to another. The yellow shade on the tide charts indicates approximate daylight hours, adjusted seasonally. The blue shade on the charts indicate when water would be present in the North Basin and the changes in water elevation. The gray shade indicates when tidelfats would be exposed. As shown, the largest period of daylight hours with low tide (and exposed tidelfat) is during the summer. The tide water elevation shown comes from the tide charts for Budd Inlet (NOAA Station #9446969).

A spring tide, known also as a "King Tide" refers to the slightly larger tides (higher high and lower low tides than normal) that occur during new and full moons.

A neap tide occurs 7 days after a spring tide. It refers to a period of moderate tides (lower high tides and higher low tides).
Figure 2.2.3 Estuary Alternative Overview

**Removal of the 5th Avenue Dam to Improve Water Quality**

The 5th Avenue Dam would be removed, and an approximately 50-foot opening would be established. This would enhance tidal flow to the basin, which may improve water quality relative to marine water quality standards. Water in Southern Puget Sound inlets is typically low in dissolved oxygen.

**New 5th Avenue Pedestrian Bridge**

Establishing a multimodal trail to connect the existing loop around the North Basin. This enhances recreational use and connectivity within the project area.

**Restoration of Boating & Fishing**

Project actions to improve water quality and ecological functions, and to manage sediment, would restore the ability to boat and fish throughout the system. Restoring the opportunities for water-based activities enhances community use of the resource beyond the range of existing recreational opportunities in the project area.

**Boardwalk Adjacent to Ecological Improvements in the South & Middle Basins**

Establishing a boardwalk in the South and Middle Basins increases opportunities for recreational use within the project area.

**Maintenance Dredging to Remove Accumulated Sediment**

Maintenance dredging would occur in impacted areas of West Bay to minimize effects of sediment accumulation on the marines, Port of Olympia, and navigation. Maintenance dredging is assumed at a 6-year frequency.

**Initial Dredging in the Middle & North Basin Channels**

Initial dredging would remove sediment that has accumulated within the Middle and North Basin main channel and secondary channels to reduce the amount of sediment that may be transported once the Fifth Avenue Dam is removed. The dredging plan would establish a main channel that would remain submerged under most tidal elevations.

**Establish Habitats within the Middle & North Basins**

Establishing habitat areas along the shorelines of the Middle and North Basins would promote ecological diversity with low marsh, high marsh, transitional, and upland habitat zones. Removing the dam would restore tidalflats throughout the basin; tidalflats would be the predominant habitat type.

**Proposed Habitats & Elevations**

- upland: >14
- transitional: 14.5 - 14
- high marsh: 8.9 - 14.5
- low marsh: 6.6 - 8.9
- tidelands: 4 - 6.6
- subtidal: 2 - 4
- depth: 0 - 2
- depth: 2 - 4
- depth: 4.03 - 6
- depth: 6 - 4.03
- depth: 6 - 1.8
- depth: >1.8

**Estuary Alternative at Low Water**

A Habitat Enhancement Plan would be implemented to manage invasive and nuisance species and to ensure that the habitat areas ecological improvements in the North and Middle Basins meet performance goals defined through the permitting process.
Figure 2.2.4 Estuary Alternative Visual Simulation at Mean Tide
2.2.3 Hybrid Alternative

Under the Hybrid Alternative, the 5th Avenue Dam would be removed, and an approximately 500-foot-wide (150-meter-wide) opening would be established in its place. Tidal hydrology would be reintroduced to the western portion of the North Basin and to the Middle and South Basins. Within the North Basin, a curved and approximately 2,600-foot-long (790-meter-long) barrier wall with a walkway would be constructed to create an approximately 45-acre saltwater reflecting pool adjacent to Heritage Park. A freshwater (groundwater-fed) reflecting pool was also evaluated for this EIS (refer to Attachment E of the Water Quality Discipline Report [Attachment 7]). Construction and maintenance of this smaller reflecting pool, in addition to restored estuarine conditions in part of the Capitol Lake Basin, gives this alternative its classification as a hybrid. Sediment would be managed through initial construction dredging in the Capitol Lake Basin and recurring maintenance dredging within West Bay. In the Middle and North Basins, constructed habitat areas would promote ecological diversity, though tideflats would be the predominant habitat type. Boardwalks, a 5th Avenue Pedestrian Bridge, a dock, and a boat launch would be constructed for community use. This alternative also includes stabilization along the entire length of Deschutes Parkway to avoid undercutting or destabilization from tidal flow. Existing utilities and other infrastructure would be upgraded and/or protected from reintroduced tidal hydrology and saltwater conditions.

If selected as the Preferred Alternative, adaptive management plans would be developed during the design and permitting process before operation of the alternative to improve ecological functions and manage invasive species. Adaptive management would also be needed for a freshwater reflecting pool, but not for a saltwater reflecting pool. See Figures 2.2.5 and 2.2.6 for a graphical summary of the key alternative components and a visual simulation of the North Basin under the Hybrid Alternative.

Would the Capitol Campus Powerhouse be affected by the project?

No. Although the Capitol Campus Powerhouse is located on the shoreline of the Middle Basin, it does not use water from Capitol Lake to generate steam or hot water it provides to the Capitol Campus. So, transitioning the Middle Basin to freshwater wetlands under the Managed Lake, or tideflats during some portion of the tidal cycle under an Estuary or Hybrid Alternative, would not impact the ability of the Capitol Campus Powerhouse to provide power and steam.

How would the water elevation change due to 5th Avenue Dam removal in the Hybrid Alternative?

The tidal portion of the North Basin would be filled with water most of the time under the Hybrid Alternative, similar to the Estuary Alternative. An average water depth of approximately 6 to 8 feet (1.8 to 2.4 meters) would be maintained in the reflecting pool.
Figure 2.2.5 Hybrid Alternative Overview

- **Removal of the 5th Avenue Dam to Improve Water Quality**
  Consistent with the Estuary Alternative, the 5th Avenue Dam would be removed, and an approximately 500-foot opening would be established. This would restore tidal flow to the basin, which may improve water quality relative to marine water quality standards. Water in South Puget Sound inlets is typically low in dissolved oxygen.

- **New 5th Avenue Pedestrian Bridge**
  Establishing a multimodal trail to connect the existing loop around the North Basin. This enhances recreational use and connectivity within the project area.

- **Adaptive Management Plan to Improve Water Quality in the Reflecting Pool**
  A saltwater reflecting pool is not expected to need an adaptive management plan. An adaptive management plan would be prepared for a freshwater reflecting pool to manage phosphorus concentrations and reduce aquatic plant growth.

- **Restoration of Boating & Fishing**
  Project actions to improve water quality and ecological functions, and to manage sediment, would restore the ability to boat and fish throughout the system, including in the reflecting pool. Restoring the opportunities for water-based activities enhances community use of the resource beyond the range of existing recreational opportunities in the project area.

- **Boardwalk Adjacent to Ecological Improvements in the South & Middle Basins**
  Similar to the Estuary Alternative, establishing a boardwalk in the South and Middle Basins increases opportunities for recreational use within the project area.

- **Maintenance Dredging to Remove Accumulated Sediment**
  Maintenance dredging would occur in impacted areas of West Bay to minimize effects of sediment accumulation on the marinas, Port of Olympia, and navigation. Maintenance dredging is assumed to occur at a 5-year frequency.

- **Initial Dredging in the Middle & North Basin Channels**
  Initial dredging would be similar to the Estuary Alternative, with initial dredging within the Middle and North Basin main channel and secondary channels to reduce the amount of sediment that may be transported once the Fifth Avenue Dam is removed. The dredging plan would establish a main channel that would remain submerged under most tidal elevations. Initial dredging is not assumed within the footprint of the reflecting pool. Maintenance dredging in a saltwater reflecting pool would occur at a 15-year frequency.

- **Multimodal Trail on the Retaining Wall at the Reflecting Pool**
  Developing a trail for pedestrians and bicycles would enhance recreational opportunities around the reflecting pool.

- **Establish Habitats within the Middle & North Basins**
  Similar to the Estuary Alternative, habitat areas would be established along the shorelines of the Middle and North Basins to promote ecological diversity with low marsh, high marsh, transitional, and upland habitat zones. Removing the dam and reintroducing tidal flow will restore tidal flats throughout the basin; tidal flats would be the predominant habitat type.

### Proposed Habitats & Elevations (ft NAVD 88)

- Upland: 14
- Transitional: 11.5 - 14
- High marsh: 8.9 - 11.5
- Low marsh: 6.6 - 8.9
- Tidal flat: 4 - 6.6
- Subtidal: 0 - 2
- > 2
- > 4.03
- < 4.03

### Habitat Enhancement Plan to Maintain Ecological Functions

A Habitat Enhancement Plan would be implemented to manage invasive and nuisance species, and to ensure that the habitat areas ecological improvements in the North and Middle Basins meet performance goals defined through the permitting process.
Figure 2.2.6 Hybrid Alternative Visual Simulation
2.2.4 No Action Alternative

The No Action Alternative represents the most likely future expected in the absence of implementing a long-term management project. The No Action Alternative would persist if a Preferred Alternative is not identified and/or if funding is not acquired to implement the Preferred Alternative. A No Action Alternative is a required element in a SEPA EIS and provides a baseline against which the impacts of the action alternatives (Managed Lake, Estuary, Hybrid) can be evaluated and compared.

The No Action Alternative would retain the 5th Avenue Dam in its current configuration, with limited repair and maintenance activities, consistent with the scope and scale of those that have received funding and environmental approvals over the past 30 years. In the last 30 years, the repair and maintenance activities have been limited to emergency or high-priority actions, which occur sporadically as a result of need and funding appropriations.

Although Enterprise Services would not implement a long-term management project, current management activities and ongoing projects in the Capital Lake Basin would continue. Enterprise Services would continue to implement limited nuisance and invasive species management strategies.

In the absence of a long-term management project, it is very unlikely that Enterprise Services would be able to procure funding and approvals to manage sediment, improve water quality, improve ecological functions, or enhance community use. The No Action Alternative does not achieve the project goals.

What is the current depth of the lake?

Average existing water depth in the North Basin of Capitol Lake is approximately 6 feet. Water depths in the Middle and South Basins are shallower, on average. Water depths continue to shallow as approximately 35,000 cubic yards of sediment are deposited within the Capitol Lake Basin annually.
2.3 WHAT ARE THE PRIMARY COMPONENTS COMMON TO ALL ACTION ALTERNATIVES?

All action alternatives include actions to meet project goals of improving water quality, managing sediment, improving ecological functions, and enhancing community use within the Capitol Lake – Deschutes Estuary. The primary components that are common to the long-term management alternatives are described in this section.

2.3.1 Sediment Management

2.3.1.1 Dredging in Capitol Lake Basin during Construction

All action alternatives include initial dredging during construction to remove sediment that has accumulated within the Capitol Lake Basin over time. An estimated 35,000 cubic yards of sediment from the Deschutes River and Percival Creek settle in the Project Area each year. This amounts to almost 2.5 million cubic yards (1.9 million cubic meters) of sediment accumulation since construction of the 5th Avenue Dam in 1951. There have only been two dredge events since that time to manage sediment—removing an estimated total of 300,000 cubic yards (230,000 cubic meters) of accumulated material. This sediment accumulation has resulted in increasingly shallow conditions throughout the Capitol Lake Basin over time.

If the Capitol Lake Basin was not dredged, it would continue to fill with sediment, developing more wetland type conditions and reducing open water habitat. Submerged aquatic plants would dominate the waterbody, and there would be a slow transition to emergent wetlands. The capacity of the Capitol Lake Basin to store sediments would eventually be lost and at that time, the sediment load would pass directly to West Bay. As the Capitol Lake Basin shallowed, water temperatures would rise, and this would increase algal blooms and change water chemistry. (Within the 30-year project time horizon, the Capitol Lake Basin would still provide flood storage capacity, given project rates of sediment deposition and because flood storage capacity is largely controlled by early release of lake water through the 5th Avenue Dam.)
Variation Across Action Alternatives for Dredging during Construction

**Managed Lake Alternative**

Under the Managed Lake Alternative, only the North Basin would be dredged during construction. Dredging would remove approximately 6 feet (1.8 meters) of sediment across the North Basin to obtain an average water depth of approximately 13 feet (4.0 meters) (a bottom elevation of approximately -3 feet [-0.9 meters] North American Vertical Datum of 1988 [NAVD 88]). Approximately 350,000 cubic yards (270,000 cubic meters) of sediment would be removed. This dredging would support recreational use of the Managed Lake after construction.

**Estuary Alternative**

Under the Estuary Alternative, dredging would occur in the Middle and North Basins in the area that would transition to the main channel of the estuary. This dredging design is intended to minimize the amount of sediment that would otherwise be transported by the main channel into West Bay after the 5th Avenue Dam is removed. The main channel would be dredged to a bottom elevation of -6 feet (-1.8 meters) NAVD 88, which would provide a submerged main channel under most tidal elevations. The average channel width would be 100 feet (30 meters) throughout the Middle and North Basins. Smaller secondary channels would also be established in the North Basin. These channels would be designed to mimic conditions of the historic estuary and would increase habitat complexity and diversity. These channels would be shallower than the main channel, at a bottom elevation of -4 feet (-1.2 meters) NAVD 88. In total, approximately 525,000 cubic yards (400,000 cubic meters) of sediment would be dredged from the Capitol Lake Basin during construction.

**Hybrid Alternative**

Dredging under the Hybrid Alternative would be consistent with the Estuary Alternative, except secondary channels would not be established on the east side of the North Basin given the smaller reflecting pool proposed for that area. Existing average water depths in that area are approximately 9.5 to 10.5 feet (2.9 to 3.2 meters) and would support recreation. Therefore, dredging is not proposed within the reflecting pool during construction. In total, approximately

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**How are tidal elevations determined?**

**North American Vertical Datum of 1988 (NAVD 88)** is the vertical datum established for vertical control surveying in the U.S.

**Mean Higher High Water (MHHW)** is the average height of the daily high tides at a nearby tide station.

**Mean Lower Low Water (MLLW)** is the average height of the daily low tides at a nearby tide station.

Plus (+) indicates above the NAVD 88 vertical datum. Minus (-) indicates below the NAVD 88 vertical datum.

Reference water levels in the Project Area in feet NAVD 88 (meters NAVD 88):

- **West Bay**
  - MHHW = +10.5 (+3.2)
  - MLLW = -4 (-1.2)

- **Lake Levels**
  - Winter = +8.5 (+2.6)
  - Summer = +9.5 (+2.9)
500,000 cubic yards (380,000 cubic meters) of sediment would be dredged from the Capitol Lake Basin during construction.

**Disposal of Dredged Material**

The presence of invasive species within Capitol Lake, particularly the purple loosestrife and New Zealand mudsnail, limit disposal options for the material dredged during construction. In 2000, the Dredged Material Management Program (DMMP) agencies prohibited the disposal of dredged sediments from Capitol Lake at the Anderson-Ketron Island Disposal Site (or any open-water disposal site in Puget Sound) due to the presence and potential spread of purple loosestrife. The Anderson-Ketron Island Disposal Site is close to the Nisqually River Delta, and the restriction by the DMMP agencies recognized that purple loosestrife seeds can remain viable in saltwater for several weeks and can germinate if they reach lower salinity waters, such as those at the protected Billy Frank Jr. Nisqually National Wildlife Refuge. After the New Zealand mudsnail was discovered in Capitol Lake, the DMMP agencies also prohibited disposal of Capitol Lake dredged material because of the uncertainty and risk associated with the release of New Zealand mudsnails into other waterbodies.

The DMMP agencies have stated that dredged material from Capitol Lake can be beneficially reused within Capitol Lake because such reuse would not increase populations or the extent of the purple loosestrife, New Zealand mudsnail, or other aquatic invasive species. Beneficial reuse is a key component of all action alternatives and is discussed in more detail in Section 2.3.2.1, Constructed Habitat Areas.

**Comparison of Action Alternatives for Dredging during Construction**

A comparison of the proposed location, volume, and depth is provided in Table 2.3.1.
### Table 2.3.1 Comparison of Dredging during Construction

<table>
<thead>
<tr>
<th>Dredging Design</th>
<th>Managed Lake Alternative</th>
<th>Estuary Alternative</th>
<th>Hybrid Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dredging Location during Construction</td>
<td>North Basin</td>
<td>Middle and North Basin Main Channel, North Basin Secondary Channels</td>
<td>Same as Estuary Alternative, except no secondary channels in the east side of the North Basin</td>
</tr>
<tr>
<td>Dredge Volume (cubic yards (cubic meters))</td>
<td>350,000 (270,000)</td>
<td>525,000 (400,000)</td>
<td>500,000 (380,000)</td>
</tr>
<tr>
<td>Dredge bottom elevation (feet NAVD 88 (meters NAVD 88))</td>
<td>-3 (-0.9)</td>
<td>Middle and North Basin Main Channel: -6 (-1.8), North Basin Secondary Channels: -4 (-1.2)</td>
<td>Same as Estuary Alternative, except no dredging in the east side of the North Basin</td>
</tr>
</tbody>
</table>

#### 2.3.1.2 Recurring Maintenance Dredging during Long-Term Management

Recurring maintenance dredging would occur as part of all action alternatives to manage sediment over time. The design and frequency of recurring maintenance dredging would vary across the alternatives, focusing dredging in impacted areas only and to support project goals, including enhanced community use of the resource and improved ecological functions. The frequency and volume of maintenance dredging are estimated based on predicted rates of sediment deposition and numerical modeling conducted for this project. The actual rate of sediment deposition is highly dependent on naturally fluctuating annual river flows and maximum storm events—more sediment is transported through the system in years with large storm events, and less is transported in smaller storm years.

**Variation Across Action Alternatives for Recurring Maintenance Dredging**

**Managed Lake Alternative**

Under the Managed Lake Alternative, maintenance dredging would occur in the North Basin to support continued recreational use. The North Basin would be dredged approximately every 20 years, providing capacity for sediment accumulation over time without impacting recreation, which would require a minimum average water depth of 6 feet (1.8 meters). Approximately 470,000 cubic yards
(360,000 cubic meters) of sediment is expected to be removed during the first maintenance dredging event, 20 years following construction. During later maintenance dredging events, the total volume of sediment removal would increase because sediment would no longer be settling in the South and Middle Basins. Those basins would have reached sediment equilibrium, and more sediment would pass through to the North Basin. With more sediment settling in the North Basin, dredging would have to occur more frequently than the initial 20-year frequency and an increased volume would be removed during each dredge event.

**Estuary Alternative**

Under the Estuary Alternative, maintenance dredging would occur within impacted areas of West Bay. Maintenance dredging would not occur in the Capitol Lake Basin in order to support estuary restoration in this area.

Within West Bay, the average annual sediment deposition rate is predicted to range from approximately 6 inches (15 centimeters) each year at the Olympia Yacht Club to less than one-half inch (1.3 centimeters) each year within the Federal Navigation Channel at the northern point of the Project Area. Maintenance dredging would occur at the Olympia Yacht Club, private marinas, the Port of Olympia, and in the Federal Navigation Channel and other access areas along the eastern shoreline of West Bay to support continued navigation. Maintenance dredging is expected to occur every 6 years, as shown in Table 2.3.2, with approximately 700,000 cubic yards (540,000 cubic meters) of sediment removed over a 30-year period.

**Table 2.3.2 Expected Maintenance Dredging Schedule & Locations under the Estuary Alternative**

<table>
<thead>
<tr>
<th>Year Following Construction</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Olympia Yacht Club</td>
</tr>
<tr>
<td>12</td>
<td>Olympia Yacht Club, private marinas, Port of Olympia, and Federal Navigation Channel</td>
</tr>
<tr>
<td>18</td>
<td>Olympia Yacht Club</td>
</tr>
<tr>
<td>24</td>
<td>Olympia Yacht Club, private marinas, Port of Olympia, Federal Navigation Channel, and other access areas along the eastern shoreline</td>
</tr>
<tr>
<td>30</td>
<td>Olympia Yacht Club</td>
</tr>
</tbody>
</table>
A sediment monitoring plan is proposed to record annual sediment deposition changes allowing for maintenance dredging events to be scheduled before these West Bay facilities are significantly impacted.

Maintenance dredging would not occur in areas of West Bay where navigation is not adversely impacted by sediment accumulation, such as the western shoreline, where sediment accumulation would be an ecological benefit.

**Hybrid Alternative**

Recurring maintenance dredging under the Hybrid Alternative would occur within impacted areas of West Bay, consistent with the Estuary Alternative, but every 5 years (see Table 2.3.3). The frequency increases under the Hybrid Alternative because there is less area in the North Basin for sediment deposition given the barrier wall, and consequently, more sediment is transported and deposited downstream. Approximately 985,000 cubic yards (750,000 cubic meters) of sediment is expected to be removed over a 30-year period. A sediment monitoring plan is also proposed under the Hybrid Alternative.

**Table 2.3.3 Expected Maintenance Dredging Schedule & Locations under the Hybrid Alternative**

<table>
<thead>
<tr>
<th>Year Following Construction</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Olympia Yacht Club</td>
</tr>
<tr>
<td>10</td>
<td>Olympia Yacht Club, private marinas, Port of Olympia, and Federal Navigation Channel</td>
</tr>
<tr>
<td>15</td>
<td>Olympia Yacht Club</td>
</tr>
<tr>
<td>20</td>
<td>Olympia Yacht Club, private marinas, Port of Olympia, Federal Navigation Channel, and other access areas along the eastern shoreline</td>
</tr>
<tr>
<td>25</td>
<td>Olympia Yacht Club</td>
</tr>
<tr>
<td>30</td>
<td>Olympia Yacht Club, private marinas, Port of Olympia, and Federal Navigation Channel</td>
</tr>
</tbody>
</table>

**Disposal of Dredged Material**

Sediment dredged from the Managed Lake Alternative during recurring maintenance dredging is expected to be disposed of upland because the purple loosestrife and New Zealand mudsnail will persist.
in the freshwater environment, at populations similar to existing conditions. The DMMP agencies will not authorize in-water placement of dredged material affected by these invasive species.

Sediment dredged from West Bay during the recurring maintenance dredging events under the Estuary and Hybrid Alternatives is expected to be suitable for disposal at an in-water location. New Zealand mudsnails and purple loosestrife are saltwater tolerant but do not thrive in saltwater environments. Although a small population of New Zealand mudsnail may establish in West Bay, high densities are not anticipated because of the salinity levels. New Zealand mudsnails prefer shallow waters and areas with lower salinity; also, dredging would occur in deeper water that is maintained for navigation. Additionally, the sediment to be dredged would primarily be recent deposits from the Deschutes River. The Deschutes River does not have an established population of New Zealand mudsnails and would not likely carry the purple loosestrife that may persist along the shorelines closer to Tumwater Falls.

Sediment dredged from West Bay under the Estuary and Hybrid Alternatives is also expected to have good chemical quality, because it would be the clean sediment deposited from the Deschutes River, rather than the existing West Bay sediment.

Sediment would be sampled prior to disposal to confirm suitability for in-water placement.

**Comparison of Action Alternatives for Recurring Maintenance Dredging**

As described above, there is variation in the location, estimated frequency, and approximate volume of sediment removed during recurring maintenance dredging under the three action alternatives. A comparison is outlined in Table 2.3.4.

**Table 2.3.4 Comparison of Recurring Dredging**

<table>
<thead>
<tr>
<th>Maintenance Dredging Design</th>
<th>Managed Lake Alternative</th>
<th>Estuary Alternative</th>
<th>Hybrid Alternative: West Bay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dredging Location</td>
<td>North Basin</td>
<td>West Bay (impacted areas only)</td>
<td>Same as Estuary Alternative</td>
</tr>
<tr>
<td>Estimated Dredging Frequency</td>
<td>~20 years</td>
<td>~6 years (frequency confirmed through monitoring)</td>
<td>~5 years (frequency confirmed through monitoring)</td>
</tr>
</tbody>
</table>
## Maintenance Dredging Design

<table>
<thead>
<tr>
<th>Maintenance Dredging Design</th>
<th>Managed Lake Alternative</th>
<th>Estuary Alternative</th>
<th>Hybrid Alternative: West Bay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approximate Recurring Dredge Quantity (cubic yards (cubic meters))</td>
<td>~470,000 (360,000) (first event)</td>
<td>~700,000 (540,000) 2</td>
<td>~985,000 (750,000) 3</td>
</tr>
</tbody>
</table>

Disposal Options for Dredged Sediments
- Upland disposal
- In-water disposal is assumed; upland disposal is an option
- In-water disposal is assumed; upland disposal is an option

Notes:

1. With a reduced area for sediment to settle in the Middle Basin due to constructed habitat areas, the Middle Basin will eventually reach sediment equilibrium. This means that sediment accumulating in the Middle Basin would instead be deposited into the North Basin, increasing sedimentation rates there. Once the Middle Basin reaches sediment equilibrium, the majority of sediment would accumulate in the North Basin, and maintenance dredging needs would increase during future maintenance dredging events beyond the 30-year project time horizon. Over time, the amount of dredged material removed under the Managed Lake would be comparable to the projected removal under the other alternatives.

2. The volume of sediment dredged under the Estuary Alternative is greater than the Managed Lake during the 30-year project time horizon because it is assumed that the main channel of the estuary and higher current velocities will move sediment into West Bay, rather than allowing it to settle out in the Middle Basin, as would occur under the Managed Lake. Additionally, the depth of dredging in West Bay is restricted by federal and state regulations, so less capacity can be provided, compared to a dredge event in the North Basin of the Managed Lake, where several feet of accumulated sediment could be removed.

3. The volume of sediment dredged under the Hybrid Alternative is greater than the Estuary Alternative because there would be very limited settling area near the shorelines in the North Basin due to the reflecting pool. This would result in more sediment being transported out of Capitol Lake Basin and into West Bay.

### 2.3.2 Ecological Functions

#### 2.3.2.1 Constructed Habitat Areas

Habitat areas would be constructed within the Capitol Lake Basin under all action alternatives to improve ecological function within the Project Area. The habitat areas would be constructed using sediment dredged from the Capitol Lake Basin during construction. Beneficially reusing the material on-site to develop habitat results in a significant cost savings for the project—it avoids or minimizes costs associated with hauling the material off-site and disposing it in at an upland landfill. Beneficially reusing the material in the Capitol Lake Basin also reduces the need to import soil amendments because the sediment that would be reused has a high nutrient content and is expected to support plant growth. This beneficial reuse is similar to the wetland habitat development after the historical dredge events in 1978 and 1986, in which dredged material was placed in the

**Beneficial Reuse**

Beneficial reuse is often described as turning “would-be” waste products, or material that would go to a landfill, into a valuable commodity. This project would use sediment dredged during construction to create habitat, instead of sending this material to the landfill. This is an example of beneficial reuse.
southwest corner of the Middle Basin (the area that is now referred to as Interpretive Center).

Importantly, agencies with jurisdiction have determined that the material dredged during construction cannot be beneficially reused outside of the Project Area or placed at an open water disposal site due to the presence of invasive species that exist in Capitol Lake today, and would exist during construction of any of the alternatives. However, reusing within the Project Area is considered acceptable because the sediment would remain within the same system that it currently exists, and not be spread to new aquatic sites.

The habitat areas would be planted with different assemblages of native species depending on their location, the quantity and type of water, elevation relative to the surrounding water, and other factors.

During design and permitting, concepts for the habitat areas would be advanced and included in a Habitat Enhancement Plan. The Habitat Enhancement Plan would describe the specific treatments to be applied in each of the upland, riparian, wetland, and aquatic habitat areas. Treatments include grading, planting, weed management, installation of habitat features, and similar treatments. The Habitat Enhancement Plan would define specific performance standards for the habitat areas to measure the success of these areas. Typical performance standards would define thresholds for wetland saturation; cover, density, and diversity of native plants; and other habitat attributes. Some level of adaptive management is assumed to ensure that the performance standards are met. For example, if after construction, the native plant assemblages are not establishing as designed, the adaptive management actions could include additional planting, soil amendment, modification of topography, weed control, or other corrective measures. The approach to meeting performance goals and the frequency of active management required to meet the performance goals for the habitat enhancements would vary across the alternatives. This would be further defined in the permitting process.

Performance standards would also address invasive species presence. The Habitat Enhancement Plan would include measures to address nuisance and invasive species within the Project Area. Potential approaches to managing aquatic invasive species are discussed in Sections 4.4 and 5.4, and would include hand-maintenance (i.e., pulling or seed head removal), use of bottom barriers and screens to limit growth, and potentially, herbicide application, if approved by project stakeholders.
Variation Across Action Alternatives for Constructed Habitat Areas

Managed Lake Alternative

Under the Managed Lake Alternative, approximately 210 acres of wetland, riparian, and upland habitat would be established as a result of constructed habitat areas and the natural ecological transition along the east and west shorelines of the Middle Basin. Freshwater wetlands would be established at lower elevations; riparian and upland habitats would be established at higher elevations. The constructed freshwater wetlands and riparian and upland habitat would be designed to mimic existing conditions of the South Basin or other appropriate reference sites in Puget Sound. This mix of habitat would increase ecological diversity within the Capitol Lake Basin. Habitat enhancements are not planned for the South and North Basins. The South Basin would continue to transition to vegetated freshwater wetlands, and the North Basin would be maintained as an open reflecting pool and for recreational use.

Estuary Alternative

Under the Estuary Alternative, approximately 140 acres of salt marsh and upland habitat would be established as a result of constructed habitat areas and natural ecological transition along the east and west shorelines of the Middle and North Basin. The constructed habitat areas would consist of low marsh, high marsh, transitional, and upland habitat zones. The habitats would be designed to mimic local salt marsh reference sites within South Puget Sound. Salt-tolerant species would be planted or seeded at lower elevations, and woody riparian species would be planted in areas above tidal influence. These enhancement measures would increase ecological diversity. Restored tideflats would be the predominant habitat type.

Plant species within the existing freshwater wetlands in the South Basin may transition naturally as salinity increases with restored tidal flow, but habitat areas would not be constructed.

Hybrid Alternative

Habitat enhancements for the Hybrid Alternative would be similar to the Estuary Alternative, but habitat areas would not be constructed along the east shoreline of the North Basin. Approximately 130 acres of marsh and upland habitat would be established under the Hybrid Alternative, including low marsh, high marsh, transitional, and upland habitat.
Comparison of Action Alternatives for Constructed Habitat Areas

As described above, there is variation in the habitat types constructed under the three action alternatives. A comparison is provided in Table 2.3.5.

Table 2.3.5 Total Area of Habitat Types in Middle & North Basins after Construction

<table>
<thead>
<tr>
<th>Habitat Design (1, 2)</th>
<th>Existing Conditions</th>
<th>Managed Lake Alternative</th>
<th>Estuary Alternative</th>
<th>Hybrid Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deepwater Habitat – Freshwater</td>
<td>240 acres</td>
<td>107 acres</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Deepwater Habitat – Estuarine (3)</td>
<td>-</td>
<td>-</td>
<td>37 acres</td>
<td>75 acres</td>
</tr>
<tr>
<td>River Channel – Freshwater</td>
<td>25 acres</td>
<td>5 acres</td>
<td>5 acres</td>
<td>5 acres</td>
</tr>
<tr>
<td>Vegetated Freshwater Wetlands</td>
<td>51 acres</td>
<td>210 acres</td>
<td>7 acres</td>
<td>7 acres</td>
</tr>
<tr>
<td>Tideflat</td>
<td>-</td>
<td>-</td>
<td>151 acres</td>
<td>118 acres</td>
</tr>
<tr>
<td>Low Marsh – Estuarine</td>
<td>-</td>
<td>-</td>
<td>39 acres</td>
<td>37 acres</td>
</tr>
<tr>
<td>High Marsh – Estuarine</td>
<td>-</td>
<td>-</td>
<td>46 acres</td>
<td>45 acres</td>
</tr>
<tr>
<td>Vegetated Wetland Transitional (3)</td>
<td>-</td>
<td>-</td>
<td>31 acres</td>
<td>29 acres</td>
</tr>
<tr>
<td>Upland</td>
<td>19 acres</td>
<td>14 acres</td>
<td>21 acres</td>
<td>22 acres</td>
</tr>
<tr>
<td>Total</td>
<td>336 acres</td>
<td>336 acres</td>
<td>338 acres</td>
<td>338 acres</td>
</tr>
</tbody>
</table>

Notes:
1. This table does not reflect habitat in West Bay, because that habitat would not change as a result of the project.
2. The areas provided within this table are estimated based on modeled future conditions and rounded to the nearest acre.
3. Transitional is defined as the area between freshwater and estuarine habitats.

2.3.3 Water Quality

The approach to improving water quality would vary across the action alternatives. For all alternatives, actions to improve water quality would occur within the Project Area only. It is also recognized that the watershed is part of an interconnected hydrologic system. Actions implemented by other agencies upstream of the Project Area, such as those prescribed under the Water Quality Improvement Plan issued by the U.S. Environmental Protection Agency and Ecology for the Deschutes River, are expected to result in an improvement to existing conditions. Conversely, development actions in the watershed could degrade existing water quality conditions.
2.3.3.1 Water Quality Improvements

Variation Across Action Alternatives for Water Quality Improvements

Managed Lake Alternative

The Managed Lake Alternative would include an adaptive management approach to meet established lake management objectives.

Recent data indicate that water quality conditions in Capitol Lake have been improving over time. Overall, Capitol Lake now exhibits relatively good water quality when compared to other lakes in the area. There are only occasional violations of state water quality standards (for temperature, pH, dissolved oxygen (DO), and total dissolved gas). Capitol Lake does exceed the trophic-state Action Level for total phosphorus for Puget Sound lowland lakes, indicating that it is productive for algae and aquatic plant growth. The total phosphorous levels have resulted in dense aquatic vegetation in the lake. The presence of that aquatic vegetation alone does not indicate that water quality is bad, but, left unmanaged, it would have continued impacts to visual quality and water-based recreation. Management actions under a Managed Lake Alternative may be relatively limited and largely focused on aquatic plant management, given the significant improving trends.

Management approaches, such as mechanical plant harvesting, would support a healthy aquatic plant community and would avoid significant impacts to recreation, aesthetics, and aquatic life uses from dense plant communities. The adaptive management plan would specify water quality, aquatic plant, and aquatic invasive species monitoring procedures for evaluating whether the objectives are being met or need to be modified based on changes in environmental conditions and uses.

An adaptive management plan would be developed during the permitting phase of the project if the Managed Lake Alternative is implemented. Implementing an adaptive management plan may have positive effects on West Bay. No active management strategies are assumed outside of Capitol Lake.

Estuary Alternative

Management actions to improve water quality are not included as part of the Estuary Alternative. However, watershed-based

Lake Management Objectives for Water Quality

- Meet applicable water quality standards
- Control nuisance or toxic algal blooms, including an action threshold for total phosphorus
- Control invasive species and enhance ecological value
- Control aquatic plants to improve aesthetics, boating access, and reduce fall/winter nutrient release to West Bay
- Support ongoing work to reduce nutrients and contaminants
management activities are being implemented as a result of the ongoing Total Maximum Daily Load (TMDL) processes and are expected to improve the quality of water that inflows from the tributaries to Capitol Lake.

Water quality under the Estuary Alternative would be similar to other inlets in South Puget Sound and would reflect typical estuary conditions, with periodically low dissolved oxygen concentrations. The Estuary Alternative supports the water quality goal by restoring historical estuarine beneficial uses within the waterbody, including enhanced habitat for aquatic life, and reduced aquatic plants. The Estuary Alternative would result in minor to moderate improvement to dissolved oxygen concentrations within Budd Inlet.

**Hybrid Alternative**

Management actions to improve water quality are not included as part of the Hybrid Alternative within the area of restored tidal flow.

If a freshwater reflecting pool is selected as part of this alternative, an adaptive management plan would be implemented to improve water quality. The groundwater-fed reflecting pool would be expected to have high phosphorus concentrations, which would need to be treated to prevent severe algal blooms in the summer and to achieve lake management objectives. Management actions such as stormwater treatment and phosphorous inactivation are anticipated. The adaptive management plan would be developed during the permitting phase if the Hybrid Alternative is implemented.

Management actions to improve water quality within a saltwater reflecting pool would not be needed because of tidal flushing. To avoid stagnant conditions, tide gates would be installed within the barrier wall between the reflecting pool and the estuary. During an incoming tide, the tide gates would open to allow water to enter the reflecting pool. The tide gates would close when water within the reflecting pool reached a specified elevation. During an outgoing tide, the tide gates would open again to allow water to exit the reflecting pool. The tide gates would close when water within the reflecting pool was between approximately +8 and +6 feet (+2.4 and +1.8 meters) NAVD 88. For comparison, the average existing water elevation in Capitol Lake varies between approximately +10 and +8 feet (+3.0 and +2.4 meters) NAVD 88.
Comparison of Action Alternatives for Water Quality Improvements

As described above, there is variation in the approach to maintain water quality and the level of active management required under the three action alternatives. A comparison is provided in Table 2.3.6.

Table 2.3.6 Comparison of the Water Quality Approach Across Action Alternatives

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Adaptive management plan with strategies to maintain water quality</td>
<td>No active management by the project (separate actions under the TMDL would still be implemented)</td>
<td>No active management by the project (separate actions under the TMDL would still be implemented)</td>
<td>If freshwater: adaptive management plan If saltwater: tidal flushing only</td>
<td></td>
</tr>
</tbody>
</table>

2.3.4 Community Use

New recreational amenities are proposed to improve community use of the resource. The approach to restoring recreation is similar across all of the long-term management alternatives.

2.3.4.1 Boardwalks Adjacent to Habitat Areas in South and Middle Basins

In all three action alternatives, elevated boardwalks would be constructed along the west shoreline of the South and Middle Basins. The boardwalks would support walking and public gathering and would provide seating. Design would be similar to the boardwalks at the nearby Billy Frank Jr. Nisqually National Wildlife Refuge. The approximately 8-foot-wide (2.4-meter-wide) boardwalks would also support nature and wildlife viewing opportunities within the Project Area given their proximity to the shoreline habitat.

In the South Basin, an approximately quarter-mile (0.4 km) boardwalk would extend waterward from the existing walking paths within the Tumwater Historical Park. An approximately three-quarter mile (1.2 km) boardwalk in the Middle Basin would also provide two connections to the existing walking path on Deschutes Parkway, in addition to the entries at the north and south end of the Middle Basin.

Exhibit 2.10 Boardwalks at the Billy Frank Jr. Nisqually National Wildlife Refuge
These boardwalks are a project component consistent across all action alternatives.

### 2.3.4.2 Restoration of Boating and Fishing

Project actions to improve water quality and ecological function, including actions to control invasive species, would restore the ability to boat and fish throughout the Capitol Lake Basin. Under all long-term management alternatives, the existing dock at the southern point of the Capitol Lake Interpretive Center would be rebuilt to like-kind conditions. The existing dock is a timber pile-supported structure, extending approximately 100 feet (30 meters) into the Middle Basin from the adjacent trail. An approximately 5-foot-wide (1.5-meter-wide) timber pier leads to the dock, which is approximately 50 feet by 15 feet (15 meters by 4.6 meters). Once rebuilt, this dock would support fishing within the Capitol Lake Basin.

The existing dock at the northern point of the Interpretive Center would be demolished given its proximity to the boardwalk that would be constructed in the Middle Basin.

A nonmotorized boat launch would be established at Marathon Park. The area would be maintained for entry and exit of nonmotorized boats. The slope along an approximately 50-foot (15-meter) section of the southern shoreline of Marathon Park would be regraded and the substrate in this area would be supplemented to support nonmotorized boating.

To prevent the spread of aquatic invasive species from reintroduced recreational use, educational signage would be posted throughout the Capitol Lake Basin. All watercraft would be required to be inspected before and after recreational use of the waterbody. Decontamination stations would be installed and operated at the new boat launch at Marathon Park, at the existing boat launch at Tumwater Historical Park, and at the Interpretive Center for decontaminating footwear and fishing gear. Outside of the Project Area, a decontamination station may also be installed in West Bay.

The boat launch and dock are project components consistent across all long-term management alternatives.

### 2.3.4.3 5th Avenue Pedestrian Bridge

Pedestrian access would be improved along the existing loop around the North Basin. An approximately 14-foot-wide (4.3-meter-wide)
elevated bridge would be constructed south of the 5th Avenue corridor. This would provide a connection between the existing pathways at Heritage Park to existing pathways along Deschutes Parkway. It would support the frequently used walking path and would improve circulation for bicycles through the Project Area.

**Variation Across Action Alternatives for Recreational Features that Support Community Use**

**Hybrid Alternative**

In the Hybrid Alternative, an additional pathway would be constructed atop the barrier wall that would separate the reflecting pool and the estuary in the North Basin. This pathway would accommodate both pedestrians and bicycles, with a design width of approximately 14 feet (4.3 meters). When combined with the existing walking path along the North Basin in Heritage Park, it would create an approximately 1-mile (1.6-km) loop around the reflecting pool.

2.3.5 **Summary of Primary Project Components**

Tables 2.3.7 through 2.3.11 provide the primary components of the long-term management alternatives, including sediment management (during construction and long-term after construction); ecological functions, water quality, and community use.

**Is swimming proposed?**

Formal public swimming facilities are not included as part of the action alternatives. However, the action alternatives would not include measures to prevent swimming.

Formal public swimming facilities could be constructed and operated within the North Basin, or elsewhere within the Project Area, in the future, following separate environmental review. A governmental or agency partner could negotiate a lease for public swimming facilities. Hosting formal public swimming facilities is not within the scope of services or agency mission of Enterprise Services. The historic swimming beach within Capitol Lake was run by the City of Olympia Parks Department.

<table>
<thead>
<tr>
<th>Construction Dredging</th>
<th>No Action</th>
<th>Managed Lake</th>
<th>Estuary</th>
<th>Hybrid</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dredging Location</strong></td>
<td>No dredging</td>
<td>North Basin</td>
<td>Middle and North Basins</td>
<td>Middle and North Basins</td>
</tr>
<tr>
<td><strong>Dredge Volume (cubic yards)</strong></td>
<td>N/A</td>
<td>350,000</td>
<td>525,000</td>
<td>500,000</td>
</tr>
<tr>
<td><strong>Disposal Location</strong></td>
<td>N/A</td>
<td>Beneficially reused to construct habitat in Project Area</td>
<td>Beneficially reused to construct habitat in Project Area and to stabilize Deschutes Parkway Approximately 13,000 cubic yards hauled for off-site disposal</td>
<td>Beneficially reused to construct habitat in Project Area and to stabilize Deschutes Parkway Approximately 100,000 cubic yards hauled for off-site disposal</td>
</tr>
</tbody>
</table>
Table 2.3.8 Long-Term Sediment Management (projected over a 30-year time horizon)

<table>
<thead>
<tr>
<th>Ongoing Maintenance Dredging</th>
<th>No Action</th>
<th>Managed Lake</th>
<th>Estuary</th>
<th>Hybrid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose</td>
<td>To support navigation in West Bay (dredging conducted by others)</td>
<td>To support recreational use of the North Basin</td>
<td>To avoid impacts to commercial and recreational navigation in West Bay</td>
<td>To avoid impacts to commercial and recreational navigation in West Bay To support recreational use of the reflecting pool</td>
</tr>
<tr>
<td>Location</td>
<td>Port of Olympia, navigation channel, marinas</td>
<td>North Basin</td>
<td>Impacted areas of West Bay</td>
<td>Impacted areas of West Bay Reflecting pool</td>
</tr>
<tr>
<td>Frequency</td>
<td>~20 years (dredging conducted by others)</td>
<td>~20 years</td>
<td>~6 years (1)</td>
<td>~5 years (1)</td>
</tr>
<tr>
<td>Anticipated Dredge Volume</td>
<td>Unknown</td>
<td>~470,000</td>
<td>~700,000</td>
<td>~985,000 ~200,000 (1)</td>
</tr>
<tr>
<td>Anticipated Dredge Volume</td>
<td>(cubic yards)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disposal Location</td>
<td>Unknown</td>
<td>Upland</td>
<td>In-water (3)</td>
<td>In-water (2) Upland</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. Frequency of maintenance dredging would be confirmed through a sediment monitoring program.
2. It is assumed that sediments removed from West Bay during maintenance dredging in the Estuary and Hybrid Alternatives would be disposed of in-water given the good chemical quality of sediments in the Deschutes River, and low potential for invasive species persistence in the saltwater environment. If material is determined not suitable for disposal at an allowable location in Puget Sound, it would be hauled by truck to an upload disposal location.

Table 2.3.9 Ecological Functions

<table>
<thead>
<tr>
<th>Management Strategies</th>
<th>No Action</th>
<th>Long-Term Management Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actions Taken to Improve Ecological Functions</td>
<td>Limited maintenance and monitoring of invasive species</td>
<td>Habitat areas constructed in Capitol Lake Basin to improve ecological function and increase ecological diversity in the Project Area. Monitoring and maintenance of habitat areas to ensure plantings meet performance goals. Monitoring to assess aquatic invasive species populations and to ensure decontamination effectiveness</td>
</tr>
</tbody>
</table>
### Table 2.3.10 Water Quality

<table>
<thead>
<tr>
<th>Adaptative Management Plan</th>
<th>No Action</th>
<th>Managed Lake</th>
<th>Estuary</th>
<th>Hybrid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose</td>
<td>No current management actions for water quality</td>
<td>To maintain water quality standards and beneficial uses</td>
<td>N/A</td>
<td>To maintain water quality standards and beneficial uses in the reflecting pool (1)</td>
</tr>
<tr>
<td>Potential Management Options</td>
<td>No management actions for water quality</td>
<td>Mechanical harvesting of aquatic plants, herbicide treatment, etc.</td>
<td>N/A</td>
<td>Stormwater treatment and phosphorous inactivation, etc. (1)</td>
</tr>
</tbody>
</table>

Note:
1. An adaptive management plan would only be needed for a freshwater reflecting pool; adaptive management is not needed for a saltwater reflecting pool.

### Table 2.3.11 Recreational Use

<table>
<thead>
<tr>
<th>Active Recreation to Enhance Community Use</th>
<th>No Action</th>
<th>Long-Term Management Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amenities</td>
<td>N/A</td>
<td>New boardwalks constructed in the Middle and South Basins 5th Avenue Pedestrian Bridge (1) Existing dock restored in the Middle Basin for fishing New hand-carried boat launch established in North Basin for nonmotorized boating Decontamination stations and educational signage installed in Marathon Park, Tumwater Historical Park, the Interpretive Center, and potentially at West Bay Park</td>
</tr>
</tbody>
</table>

Note:
1. The Hybrid Alternative would also provide a new pedestrian pathway atop the barrier wall constructed in the North Basin.

### 2.4 What Construction Activities Will Take Place in the Action Alternatives?

#### 2.4.1 Construction Schedule

Following selection of an alternative for implementation, the Capitol Lake – Deschutes Estuary Long-Term Management Project will transition to Phase 3. Phase 3 consists of design and permitting. Consistent with other regional projects of a similar magnitude, this process is expected to take approximately 3 to 5 years. If funding were immediately available to transition from this EIS into Phase 3,
and Phase 3 design and permitting progressed as planned, construction could begin as early as 2028.

The most significant construction activities will occur in-water. In-water work is closely regulated by environmental agencies and is confined to an “in-water work window” in order to avoid or minimize potential impacts to migrating juvenile salmonids and returning adults. Within Capitol Lake, the in-water work window also protects WDFW’s hatchery production program. In coordination with the Technical Work Group as part of the EIS process, the conceptual construction schedules assume an extended in-water work window from June 1 to August 15 and November 15 to February 15 each year, rather than the prescriptive in-water work window from July 1 to August 15. The adjusted in-water work window is similar to the prescriptive in-water work window of the adjacent marine water, which extends from July 16 through February 15 each year. This extended in-water work window will be further reviewed by the permitting agencies during the design and permitting phase to ensure that construction during this time would not impact sensitive aquatic species.

Adjustments to a prescriptive in-water work window can be granted if a need is demonstrated, and also if BMPs are implemented to avoid or minimize impacts to aquatic species. An adjustment to the in-water work window is needed for this project because significant progress could not be made during construction within the existing in-water work window.

Assuming the extended in-water work window, conceptual construction schedules provide a 4- to 5-year duration for construction of the Managed Lake Alternative, and a 7- to 8-year duration for construction of the Estuary and Hybrid Alternatives. It is assumed that construction would occur throughout the standard work week, with extended 12-hour days. The anticipated construction means and methods for the primary components of the action alternatives are described in the following sections. These construction means and methods will be refined as project design advances, as a result of input from the regulatory agencies during permitting, and after a contractor is selected to construct the project.

Figures 2.4.1 through 2.4.3 convey the anticipated sequence, schedule, location and equipment for the primary construction activities.
Figure 2.4.1 Location of Primary Construction Activities & Conceptual Schedule – Managed Lake Alternative

<table>
<thead>
<tr>
<th>Upland Staging Areas</th>
<th>In-Water Staging &amp; Dredging</th>
<th>Dredge Material Placement &amp; Habitat Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Upland Staging Area</strong></td>
<td><strong>Primary Equipment</strong>: Portable barges and boats, hydraulic high-volume dredge, crane with pile driving equipment, forklift</td>
<td><strong>Primary Equipment</strong>: Dozer, excavator, marsh buggy or similar</td>
</tr>
<tr>
<td><strong>Secondary Upland Staging Area</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Location for construction equipment and materials storage, contractor work area, and other construction support tasks.

**Primary Equipment**: Concrete and material trucks, concrete saw and excavator mounted jackhammer, blasting equipment, excavator, impact pile driving crane, barges.

**Primary Equipment**: Auger, concrete trucks.

- **5th Avenue Dam Overhaul**
- **Pedestrian Bridge & Boardwalk & Dock Construction**

**Anticipated Construction Schedule and Sequence for the Managed Lake Alternative**

<table>
<thead>
<tr>
<th>Year</th>
<th>Upland Staging</th>
<th>In-Water Staging, Dredging, &amp; Material Placement</th>
<th>5th Avenue Dam Overhaul</th>
<th>Dredge Material Placement &amp; Habitat Construction</th>
<th>Boardwalks &amp; Dock</th>
<th>Pedestrian Bridge</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Year 1</strong></td>
<td><strong>Year 2</strong></td>
<td><strong>Year 3</strong></td>
<td><strong>Year 4</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Each year during construction, in-water work is assumed to occur June 1 to August 15 and November 15 to February 15.
Figure 2.4.2 Location of Primary Construction Activities & Conceptual Schedule – Estuary Alternative

<table>
<thead>
<tr>
<th>Upland Staging Areas</th>
<th>In-Water Staging &amp; Dredging</th>
<th>Deschutes Parkway Stabilization &amp; Utilities Work</th>
</tr>
</thead>
</table>
| Location for construction equipment and materials storage, contractor work area, and other construction support tasks | Primary Equipment: Portable barges and boats, hydraulic high-volume dredge, crane with pile driving equipment, forklift | Parkway Stabilization Primary Equipment: Concrete and material trucks, excavator, dozer, grader, paver, land-based crane, concrete saw and jackhammer
Utilities Work Primary Equipment: Excavator and loader, forklift |

<table>
<thead>
<tr>
<th>Dredged Material Placement &amp; Habitat Construction</th>
<th>Road Reconfiguration, Dam Removal, &amp; Bridge Reconstruction</th>
<th>Pedestrian Bridge &amp; Boardwalk &amp; Dock Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Equipment: Dozer, excavator, marsh buggy or similar</td>
<td>Primary Equipment: Concrete and material trucks, concrete saw and excavator mounted jackhammer, blasting equipment, excavator, impact pile driving crane, barge</td>
<td>Primary Equipment: Auger, concrete trucks</td>
</tr>
</tbody>
</table>

Anticipated Construction Schedule and Sequence for the Estuary Alternative

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
<th>Year 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upland Staging</td>
<td>In-Water Staging, Dredging, &amp; Material Placement</td>
<td>Utilities Work</td>
<td>Deschutes Parkway Stabilization</td>
<td>Road Reconfiguration, Dam Removal, &amp; Bridge Reconstruction</td>
<td>Habitat Area Construction</td>
<td>Boardwalks &amp; Dock</td>
</tr>
</tbody>
</table>

Each year during construction, in-water work is assumed to occur June 1 to August 13 and November 13 to February 13.
Figure 2.4.3 Location of Primary Construction Activities & Conceptual Schedule – Hybrid Alternative

**Upland Staging Areas**
- **Primary Upland Staging Area**
- **Secondary Upland Staging Area**

**In-Water Staging & Dredging**
- **Primary Dredging Equipment:** Portable barges and boats, hydraulic high-volume dredge, crane with pile driving equipment, forklift
- **Primary Wall Construction Equipment:** Barges and small work boats, vibratory and impact pile driving hammer, crane barge rig

**Deschutes Parkway Stabilization & Utilities Work**
- **Utilities Work**
- **Deschutes Parkway Stabilization**

**Dredged Material Placement & Habitat Construction**
- **Primary Equipment:** Dozer, excavator, marsh buggy or similar

**Road Reconfiguration, Dam Removal, & Bridge Reconstruction**
- **Primary Equipment:** Concrete and material trucks, concrete saw and excavator mounted jackhammer, blasting equipment, excavator, impact pile driving crane, barge

**Pedestrian Bridge & Boardwalk & Dock Construction**
- **Primary Equipment:** Auger, concrete trucks

---

**Anticipated Construction Schedule and Sequence for the Hybrid Alternative**

<table>
<thead>
<tr>
<th>Year</th>
<th>Year</th>
<th>Year</th>
<th>Year</th>
<th>Year</th>
<th>Year</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upland Staging</td>
<td>In-Water Staging, Dredging, &amp; Material Placement</td>
<td>Hybrid Wall Construction</td>
<td>Utilities Work</td>
<td>Deschutes Parkway Stabilization</td>
<td>Road Reconfiguration, Dam Removal, &amp; Bridge Reconstruction</td>
<td>Habitat Area Construction</td>
</tr>
</tbody>
</table>

Each year during construction, in-water work is assumed to occur June 1 to August 15 and November 15 to February 15.
2.4.2 Construction Staging and Access

Construction will primarily be staged from portable barges or on floats throughout the Capitol Lake Basin. Marathon Park will be used throughout construction as the primary upland staging area. Additional staging would occur temporarily in other adjoining parks and public spaces throughout construction.

In-water construction staging would move throughout Capitol Lake as construction progresses. To stabilize the portable barges and floats, spud piles or anchors may be used for mooring. The portable barges and floats would be outfitted with bin walls to contain construction equipment and stockpiled materials.

To establish upland construction staging areas, vegetation would be removed as needed and the staging area may be regraded. Primary utilities may be extended from the adjacent facilities to provide adequate electricity and water. The staging areas would be delineated with fencing and temporary erosion and sediment control measures to prevent runoff of sediment-laden or untreated stormwater. These upland staging areas may support smaller construction activities. They may also provide space for storage of construction equipment and material, construction offices, and parking. Following construction, these areas would be restored to preconstruction conditions or better, and public access would be restored.

2.4.3 Dredging

Dredging is one of the primary construction activities for all long-term management alternatives.

Before dredging begins, temporary sheetpile containment areas would be constructed in the North and/or Middle Basins in the locations where the dredged material will be placed to create new habitat areas, as described previously. Sheetpiles used to construct the containment areas would be installed with a vibratory pile driver, working from both land and water. The sheetpiles would be installed at a rate of up to 300 linear feet (90 linear meters) each day. To support this work, a temporary crane pad or work trestle would be installed from the shore and along the waterward edge of the sheetpile. A crane pad is constructed with a series of heavy timbers that are often up to 1 foot (0.3 meters) thick and 4 feet (1.2 meters) wide. When these timbers are rafted together and secured to crossbeams, they create a temporary pad upon which a crane can

Approach to Construction Dredging

Under the Estuary and Hybrid Alternatives, dredging would occur before the 5th Avenue Dam is removed. This would:

- Provide additional containment for sediment suspended during dredging.
- Maintain water levels for water-based equipment to move throughout the Capitol Lake Basin.
- Minimize the amount of sediment that is moved downstream after 5th Avenue Dam removal.
traverse. A pile spacing of approximately 20 feet (6.1 meters) is assumed. The work trestle would be approximately 15 feet (4.6 meters) wide and would extend approximately 50 feet (15 meters) into the water.

Installation of the temporary sheetpile would take approximately 6 months for all action alternatives. Once installed, the containment areas would provide approximately 100 acres for material placement, across 20 discrete sheetpile containment cells. Silt curtains would be placed around the containment cells to contain turbidity from the subsequent activities.

Dredging would begin after the temporary containment cells were constructed. Dredging is expected to occur with a small hydraulic high-volume dredge on a portable barge. A hydraulic dredge works like a vacuum—sediment is sucked from the bottom of the lake with a cutter head and extendable pipe. Water is also captured with the sediment, and the material that is discharged is a slurry of the combined sediment and water. Hydraulic dredging is effective at removing silty and sandy materials, which is characteristic of the sediment that has accumulated throughout the Project Area. If needed, mechanical dredging could be used in areas with cobbles or coarser sediments.

The cutter head of the hydraulic dredge, or the “vacuum,” would be approximately 8 inches (20 centimeters) in diameter. A pipeline would be attached to the opposite end and would move slurry to the containment areas. The pipeline would float on the surface of the water and would be assisted by booster pumps, which would provide additional force to move the slurry. Slurry from this construction dredging would be pumped into the containment cells in a way that spreads the daily volume of material across the total placement area. Up to 7,500 cubic yards (5,700 cubic meters) of slurry would be moved to the placement areas each day, with up to 1,500 cubic yards (1,100 cubic meters) of sediment captured within the slurry.

Use of multiple containment cells would allow the slurry to settle, wherein the mix of sediment and water would begin to separate. As the water rises to the top, it would be pumped from the containment cells back into Capitol Lake.

Dredging would occur over 3 years, throughout the adjusted in-water work windows from June 1 to August 15 and November 15 to February 15 each year. Initial construction dredging would require approximately 12 months total for the Managed Lake Alternative,
and approximately 15 months total for the Estuary and Hybrid Alternatives.

### 2.4.4 Constructing and Planting Habitat Areas

As dredging is completed, marsh buggies or other similar equipment would be used to develop the slope of the consolidated sediment where habitat areas would be installed. The habitat areas may be developed at a rate of approximately 1 acre every 3 days. The habitat areas would be hand-planted with native species. The total duration to construct and plant the habitat areas would be approximately 8 months under all alternatives. Work to construct the habitat areas, within the containment cells, would not be confined to the in-water work window.

Following this work, the sheetpile containment walls would be removed. Sheetpile removal would occur with vibratory equipment, staged from land or water. As each containment cell is deconstructed and equipment moves closer to the shoreline, sections of the temporary crane pad or work trestle would also be removed. The total duration to remove the sheetpile would be approximately 6 months and would occur within the in-water work window.

### 2.4.5 Constructing Boardwalks and Docks

Following removal of the containment cells, boardwalks would be constructed in the South and Middle Basins. The boardwalks would be supported by wood posts or timber piles, with two piles per pile bent. A pile bent is a row of piles that work together to support a structure, such as a bridge or boardwalk. The pile bents would have a spacing of approximately 10 feet (3.0 meters).

Each pile would be supported with a concrete foundation that would be installed in the sediment. The concrete foundations would be installed with an auger, which is a large drill that penetrates the lake bottom. As the auger is extracted, concrete would be pumped into the space that has been created. Reinforcing steel could be set into the wet concrete for additional strength. Once the concrete foundations have cured, the wood posts or timber piles would be fastened with brackets or a similar system. The approximately 8-foot-wide (2.4-meter-wide) timber deck and railing of the boardwalk would then be installed.
Dock construction would be consistent with the approach used to construct the boardwalks. The work would occur concurrent to boardwalk construction.

Construction of the boardwalks and docks is expected to occur over an approximately 4- to 6-month duration and would be staged from land or water. Activities to construct the concrete foundations and to set the wood posts or timber piles would occur within the in-water work window. However, water levels may be lowered in the lake to allow the work to occur in the dry.

### 2.4.6 Constructing the 5th Avenue Pedestrian Bridge

The new 5th Avenue Pedestrian Bridge would be 14 feet (4.3 meters) wide and up to 775 feet (240 meters) long. It would be supported by 24-inch-diameter (61-centimeter-diameter) steel pipe piles, with two piles per bent and a bent spacing of approximately 100 feet (30 meters). The steel piles would be installed with a vibratory pile driver and then finished with an impact pile driver, which uses a series of pulses or “hits” to advance the pile into the sediment. After the piles are installed, prefabricated concrete deck sections with guardrails would be placed to develop the superstructure. The bridge would be constructed with water-based equipment and would take approximately 4 to 5 months to construct. This work would be confined to the in-water work window.

### 2.4.7 Establishing a Nonmotorized Boat Launch at Marathon Park

The nonmotorized boat launch at Marathon Park would be a natural surface launch, using existing site characteristics to support this use. An excavator would develop a gradual slope within the 50-foot (15-meter) section of the southern shoreline of Marathon Park. Soil would be removed to develop a slope no greater than 8% and extending from shore by approximately 100 feet (30 meters). Gravel or other substrate would be placed along the shoreline and into the water to develop a natural ramp for hand-carried launching.
2.4.8 Variation Across Action Alternatives during Construction

2.4.8.1 Managed Lake Alternative

Repairing the Existing 5th Avenue Dam

The 5th Avenue Dam is aging and is in need of overhaul repairs. It is composed of two distinct parts: an 82-foot-wide (25-meter-wide) tide gate structure with a control house, two concrete spillways, and a fish ladder; and an earthen dam that extends up to 150 feet (46 meters) westward toward the shoreline. In 2016, the structural, mechanical, and electrical components of the 5th Avenue Dam were evaluated by a team of professional engineers. Following the evaluation, a suite of repairs were recommended to maintain a serviceable structure and to avoid a major failure event. This work would be performed as part of the Managed Lake Alternative. Work would occur in various places in and along the 5th Avenue Dam. This work would include the following:

- **Work within the control house.** Electrical components that control the tide gates would be replaced, including gears and gear boxes, controllers, electrical panels, and other appurtenances. The control house itself would also be repaired to ensure that it remains weather resistant.

- **Work on or from the 5th Avenue Bridge or existing adjacent pedestrian bridge.** The fish ladder would be repaired using a crane staged from the roadway. Work on the pedestrian bridge would focus on minor safety upgrades, such as replacing existing guardrails and ladders.

- **Work within the spillways.** Spillways are the structures that allow for controlled water release from Capitol Lake, into West Bay. When work occurs within a spillway, stoplogs would be used on the upstream and downstream ends of the spillway to restrict water flow, and the spillway would be dewatered. Components that control the tide gates would be replaced, the radial gates would be repaired, and a system would be installed to avoid corrosion of steel parts.

- **Work outside of the spillway, above water.** Damaged concrete outside of the spillway would be chipped out with a handheld hydraulic hammer and new concrete would be poured.

What is an earthen dam?

An earthen dam (or berm) is an area of compacted soil that is used to separate or stabilize an area. The earthen dam constructed in 1951 was used to separate Capitol Lake from West Bay and acts as part of the 5th Avenue Dam.
• **Work outside of the spillway, in-water.** The cutouts within the spillway would also be repaired. A small sheet pile cofferdam would be installed with a vibratory hammer to facilitate this work.

In addition to these repair and maintenance activities, work at the earthen dam is also needed because the subsurface soils are susceptible to liquefaction. The primary construction activities at the earthen dam would include:

• **Jet grouting to improve soil strength.** Jet grouting is a construction technique that mixes grout with soil to improve the soil strength. A drill pipe is inserted into the soil to the desired depth and, as it is raised back to the surface, it rotates and injects grout into the surrounding area. A mix of soil, grout, and water is also returned to the surface, having been displaced by the high-pressure placement of grout. Jet grout forms into columns as it is installed in the ground. The columns would be installed within the center of the earthen dam, creating a spine up to 100 feet (30 meters) wide and extending from below the ground surface to a depth of approximately 30 feet (9.1 meters). To install the jet grout columns, the westbound lanes of 5th Avenue SW and the eastbound lanes of Olympic Street W would be closed. The roadway would be demolished before jet grouting began and would be restored to preconstruction conditions once this work was finished. Installation of the jet grout columns would take approximately 3 months. During this time, a concrete batch plant would be mobilized to the work area and spoils would leave the area by truck for disposal at a landfill.

• **Installation of a buttressing berm.** The final protective measure would be construction of a buttressing berm to improve stability of the earthen dam. Up to 25,000 cubic yards (19,000 cubic meters) of aggregate and riprap would be placed along the shoreline and in-water on the downstream (Budd Inlet) side of the earthen dam. This work would be confined to the in-water work window and would take approximately 4 weeks to complete.
2.4.8.2  Estuary and Hybrid Alternatives

Replacing Existing Outfall Pipes

There are approximately 50 existing outfalls that discharge stormwater into the Capitol Lake Basin. Many of these outfalls are made of corrugated metal that would deteriorate with exposure to saltwater. The metal pipes would be replaced with saltwater-resistant pipes. A trench would be excavated around the immediate area of the outfall and the metal pipes would be removed. New pipes would be laid inside the trench, and the area would be backfilled and compacted with stockpiled or imported material. In some areas, a splash pad of larger rock or riprap may be installed to help diffuse the discharge.

The total duration to replace the affected outfall pipes and restore the work areas to preconstruction conditions is estimated at up to 6 months total, some of which would be confined to the in-water work window.

Replacing Culverts at Capitol Lake Interpretive Center

The Interpretive Center is separated from the Middle Basin by an earthen containment berm, but is hydraulically connected by two arch culverts that measure 6 feet (1.8 meters) in diameter. These culverts flush water into the existing habitat area to sustain the freshwater wetlands. The Estuary and Hybrid Alternatives would replace the culverts with an open channel through the containment berm and provide a boardwalk structure over the opening to maintain the public path. The existing culverts and a portion of the berm above the culvert would be removed. A bridge or boardwalk would be constructed over the gap to maintain trail continuity. Size, configuration, and constructions methods for the boardwalk structure would be similar to the other boardwalks described above.

Removing the 5th Avenue Dam and Reconstructing 5th Avenue

The 5th Avenue Dam and the 5th Avenue Bridge above the dam would be removed in its entirety under the Estuary and Hybrid Alternatives. The construction activities to remove the 5th Avenue Dam and reconstruct a new 5th Avenue Bridge are summarized in the following sections and in Figure 2.4.4.
Figure 2.4.4 Deschutes Parkway Realignment & New 5th Avenue Bridge

Legend
- Parcel Boundaries
- Deschutes Parkway Stabilization
- Proposed Roadway Realignment
- Shoreline Restoration after Road Realignment
The primary construction activities at the current 5th Avenue Dam location would include:

- **Construct a new roadway connection.** The first step in removal of the 5th Avenue Dam is to construct a roadway connection that allows continued movement of vehicles to and from Deschutes Parkway.

  Under existing conditions, Deschutes Parkway connects to 5th Avenue SW. A new connection would be constructed between Deschutes Parkway and the roundabout at 4th Avenue W. This connection would enable Deschutes Parkway to remain in service, and would allow vehicles to be rerouted from 5th Avenue SW.

  Access to the existing 5th Avenue Bridge would be maintained as this new connection is constructed. Lane width on Deschutes Parkway would be reduced and vehicular movement would be confined to movement between 5th Avenue W and Deschutes Parkway. Access between the existing 5th Avenue Bridge and the 4th Avenue W roundabout would be closed during this phase of construction, which is expected to last up to 6 months.

  The new roadway connection from Deschutes Parkway to the roundabout at 4th Avenue W would be constructed by installing a mechanically stabilized earth (MSE) retaining wall structure below the roadway and filling behind the wall face to develop the roadway grade. The MSE retaining wall is constructed by alternating layers of compacted backfill and soil reinforcements, such as steel reinforcing strips or grids to provide lateral stability for the filled area. The MSE wall would be installed west of the existing trail connection beneath the 5th Avenue Bridge. Constructing the retaining wall in this location would allow the trail connection to remain open after construction and would allow the estuary opening at 5th Avenue SW to be approximately 500 feet (150 meters) wide. Approximately 40,000 cubic yards (31,000 cubic meters) of imported geotechnically suitable fill would be placed behind the retaining wall.

  The new roadway connection would encroach on an undeveloped portion of two privately owned properties. A portion of a railroad right-of-way would also be needed for placement of fill to support the road connection. This
property, currently vacant since the tracks have been removed, is no longer used for rail transportation.

Once the new roadway connection is established, traffic would be shifted from the 5th Avenue Bridge to the 4th Avenue Bridge. Vehicles and pedestrians would be detoured around 5th Avenue SW to facilitate dam removal and construction within the 5th Avenue corridor.

- **Remove the 5th Avenue Dam and 5th Avenue Bridge.**
  Existing utility lines within the 5th Avenue SW roadway would be removed from the bridge and directionally drilled across the corridor. Directional drilling is a construction method that is commonly used to install utility lines underground. A directional drill would bore a horizontal hole between receiving pits established on the east and west shorelines, and a polyethylene pipe would be pulled through to establish a long-term conduit. Utility lines would be reconnected. This utility work would take up to 2 months.

To demolish the existing 5th Avenue Dam and 5th Avenue Bridge, approximately 900 linear feet (270 linear meters) of sheetpile would be installed around the earthen dam to create a cofferdam. The sheetpiles would be installed with a vibratory hammer and the sheets would be sealed to maintain a dry work area. Installation of the cofferdam would occur from land-based equipment over approximately 4 months. The cofferdam would only enclose the earthen dam at this point, so water from Capitol Lake would continue to move to West Bay through the tide gates. Following installation of the cofferdam, earthmoving equipment would be mobilized to excavate material from within the cofferdam. Some of the removed earthen dam material would be recycled, some may be beneficially reused on site, and some would be taken to an appropriate upland disposal facility. In total, approximately 64,000 cubic yards (49,000 cubic meters) of material would be removed from an approximately 145,000 square foot (13,500 square meter) area. Excavation would last for up to approximately 2 months.

- **Construct a new 5th Avenue Bridge.** The new 5th Avenue Bridge would be constructed within the cofferdam. The bridge would be supported by reinforced concrete drilled
shafts and precast concrete columns. To construct the drilled shafts, a large casing would be advanced into the substrate with a vibratory pile driver to the desired depth. Sediment within the casing would be removed with an auger and reinforcing steel would be lowered into the excavated area. Concrete would be pumped into the casing to form the drilled shaft. During the concrete placement, the resultant water or slurry would be contained for treatment at an upland location or disposal.

After construction of the western portion of the bridge substructure, the cofferdam would be removed. This would partially reintroduce tidal flow to the basin, and water would flow through this opening as work transitioned to the tide gate structure. The sheetpile would be reinstalled around the tide gate structure. Removal, reinstallation, and sealing of the sheetpile would require approximately 4 to 5 months. The tide gate would then be demolished. Marine-based equipment would support demolition of the concrete structure. Smaller components of the tide gate structure would be saw cut and removed with demolition hammers. The thicker concrete sidewalls and bottom concrete slab would be drilled and micro-blasted in order to be removed. Removal of the tide gate structure would take approximately 6 months. The eastern portion of the bridge substructure would then be constructed within the cofferdam.

The cofferdam would be removed from the site after all site demolition and construction of the bridge superstructure was complete. The bridge superstructure would be built with precast bridge sections, forming a concrete girder bridge. The new 5th Avenue Bridge would be approximately 79 feet (24 meters) wide, with four lanes of traffic and a bicycle and pedestrian path with a guardrail system on either side. It would span the approximately 500-foot (150-meter) estuary opening and connect to the existing 5th Avenue SW roadway at the isthmus and the realigned Deschutes Parkway.

- **Restore Areas of Impact.** Given the reconfiguration of this area, a small portion of the roadway south of the new 5th Avenue Bridge and east of the new Deschutes Parkway would no longer be used. The roadway would be removed from this area and the shoreline would be
planted with native species, consistent with plantings at similar elevations in the constructed habitat areas (Figure 2.4.4). This work would take approximately 2 months.

**Slope Stabilization Along Deschutes Parkway**

The slope along Deschutes Parkway would be stabilized to minimize potential impacts associated with restored tidal flow. The placement of additional material would help to avoid undercutting or slope failure. Material excavated from the earthen dam could be beneficially reused for the slope stabilization if the quality were suitable for reuse in the Project Area. Imported material may also be used. The material would be placed along the shoreline with a long-arm excavator. This work would occur over approximately 4 weeks during the 5th Avenue Dam removal, before the reintroduction of tidal flow. Areas above the intertidal zone may be planted consistent with the habitat areas to enhance the aquatic and adjacent terrestrial habitats and in accordance with a habitat-enhancement plan. Areas within the intertidal zone would be tideflats.

**Coating at the Seawall at Heritage Park**

The existing seawall separating the North Basin from Heritage Park would be prone to deterioration in a saltwater environment. To provide additional protection, it would be treated with an epoxy coating. Before the epoxy coating could be applied, the surface would be cleaned and any visible damage to concrete areas would be repaired as needed. The epoxy coating would then be applied and given time to set.

This would occur when water levels in the lake were lowered, allowing the work to be conducted “in the dry.” Crews would use hand-held equipment. Coating this seawall would take approximately 1 month. This activity would also occur if a saltwater reflecting pool were chosen as part of the Hybrid Alternative.

**Construction of the Reflecting Pool Barrier Wall**

Construction of the Hybrid Alternative would be similar to the Estuary Alternative, with the exception of the barrier wall that would be constructed in the North Basin to create a smaller reflecting pool.

**Is stabilization needed anywhere else?**

Riprap will be placed along critical infrastructure to avoid scour from restored tidal action. Up to 1,500 cubic yards of riprap may be placed in the following locations:
- Interstate 5 (I-5) Bridge (South Basin)
- BNSF Railway Trestle (North Basin)
- 4th Avenue Bridge (West Bay)
The barrier wall would be constructed of coated sheetpile with concrete panels and would be curved to maintain aesthetic consistency with the seawall at Heritage Park. Approximately 2,600 linear feet (790 linear meters) of the sheetpile panels would be driven from a barge using a vibratory pile driver. An impact pile driver would be used to ensure the intended load-bearing capacity, or if hard subsurface layers are encountered. Shorter tail walls running perpendicular to the primary barrier wall would be installed to increase structural stability. These tail walls would be approximately 20 feet (6.1 meters) long and spaced approximately 20 feet (6.1 meters) apart. The tail walls would be short enough to remain submerged under most tidal elevations.

At the top elevation of the barrier wall, a cast-in-place concrete closure pour would affix the concrete sheetpile to its pile cap and to the pathway that would be installed atop the barrier wall. Sections of the approximately 14-foot-wide (4.3-meter-wide) precast concrete pathway and railing would be installed atop this barrier wall and a connection would be developed with the existing walking path in Heritage Park.

The barrier wall would be installed prior to removal of the 5th Avenue Dam to provide adequate water depth for the water-based equipment. Work to install the sheetpile panels would occur over approximately 3 months, at a rate of approximately 100 linear feet (30 linear meters) each day. Installation of the sheetpile panels would be confined to the in-water work window. The total duration to construct the barrier wall would be approximately 15 months over two or three in-water work windows.

### 2.4.9 Typical Construction Equipment

Construction equipment that would commonly be used to complete the activities described within Chapter 2.0 are shown in Table 2.4.1:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Intended Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portable barge</td>
<td>Support water-based construction and staging</td>
</tr>
<tr>
<td>Small hydraulic high-volume dredge</td>
<td>Remove sediment from lake bottom</td>
</tr>
<tr>
<td>Booster pump</td>
<td>Move slurry to placement areas and water to shore</td>
</tr>
<tr>
<td>Crane with vibratory pile-driving hammer</td>
<td>Install and remove sheetpile</td>
</tr>
<tr>
<td>Impact pile driver</td>
<td>Install sheetpile panels</td>
</tr>
</tbody>
</table>
### Equipment and Intended Use

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Intended Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dozer, loader, and excavator</td>
<td>Support general construction activities</td>
</tr>
<tr>
<td>Marsh buggy</td>
<td>Develop slope of habitat areas</td>
</tr>
<tr>
<td>Forklift</td>
<td>Move materials within staging areas and construction site</td>
</tr>
<tr>
<td>Survey and assist boat</td>
<td>Move employees and support water-based construction</td>
</tr>
<tr>
<td>Haul truck and concrete truck</td>
<td>Import construction materials</td>
</tr>
<tr>
<td>Crane with drill auger</td>
<td>Install boardwalk foundations</td>
</tr>
<tr>
<td>Concrete saw and jackhammer</td>
<td>Remove existing concrete</td>
</tr>
<tr>
<td>Blasting equipment</td>
<td>Remove thick layers of concrete</td>
</tr>
<tr>
<td>Grader and paver</td>
<td>Support roadway construction</td>
</tr>
</tbody>
</table>

### 2.5 WHAT IS THE APPROACH TO LONG-TERM SEDIMENT MANAGEMENT?

#### 2.5.1 Maintenance Dredging

Maintenance dredging is the primary maintenance activity for all the long-term management alternatives. Maintenance dredging would occur by mechanical means from a portable barge. Mechanical dredging is an approach that “digs” or “bites” the sediment from the bottom of the lake with a bucket similar to an excavator or a clamshell. After each pass of the bucket, the dredged sediment would be placed on a receiving barge. The receiving barge would be equipped with bin walls to contain the dredged material. The bin walls would likely have scupper drains that would allow for passive dewatering of the dredged material, and the scuppers could be outfitted with fabric or fencing to minimize the release of sediment during dewatering.

Under the Managed Lake Alternative, portable barges would be trucked to the site and launched into the lake to support a mechanical dredge on a barge, and others outfitted with hoppers to transport dredged material from the lake to a temporary handling facility established at Marathon Park. Depending on the rate of production, the dewatered dredged material could be temporarily stockpiled at Marathon Park. Dredged material would be transferred to trucks or railcars for disposal at an upland facility.

Dredging in Capitol Lake under the Managed Lake Alternative is expected to occur across three extended in-water work windows.
(June 1 to August 15 and November 15 to February 15), for a total duration of approximately 18 months, if only a single dredge is used. Dredging operations are assumed to be 10 hours each day, 5 days each week.

Under the Estuary and Hybrid Alternatives, maintenance dredging in West Bay would occur within the prescriptive in-water work window, which extends from July 16 through February 15 each year. Depending on the dredge event, the total duration could be as short as 2 months, or up to 14 months across two in-water work windows. This assumes mobilization of a single dredge, and 10-hour workdays, 5 days each week.

Maintenance dredging at the Olympia Yacht Club or within private marinas may require piles or floats to be removed. Derrick barges, flat deck barges, and land-based equipment could be used to pull floats and piles from shoaled areas of the marinas if necessary. Boathouses located in shoaled areas may need to be temporarily relocated. Many dredge events at marinas within Puget Sound are able to complete maintenance dredging without removing piles or floats. Small hydraulic dredges provide flexibility while dredging around boathouses, or boathouses can be relocated temporarily within or near the marina.

Dredged material (accumulated sediment) removed from West Bay is expected to be suitable for disposal at the nearby Anderson-Ketron Island Disposal Site. Split hull receiving barges would be towed by barge to the disposal site, and the material would be released. Existing transload facilities would be used if the dredged material is not suitable for in-water disposal. Use of Port of Olympia facilities for transloading would require coordination with Port of Olympia operations.

### 2.5.2 Management Activities for Water Quality and Ecological Functions

Management activities to maintain water quality and ecological functions would be defined during permitting. The adaptive management plan and habitat enhancement plan would be developed in coordination with, and approved by, Ecology, WDFW, City of Olympia, City of Tumwater, other applicable local, state, and federal agencies, and tribes.
This chapter provides an overview of existing conditions within the project area. It describes the natural and built environment that would be changed (impacted or improved) by the project alternatives. There are 14 sections to the chapter; each section describes a separate environmental discipline that was analyzed as part of this EIS. This information is summarized from the full description of existing conditions included in Attachments 5 through 18. Although the environmental disciplines are described separately, they are interrelated and together comprise the Capitol Lake – Deschutes Estuary.

3.1 HYDRODYNAMICS & SEDIMENT TRANSPORT

Hydrodynamics refers to the movement of surface water (rivers, streams, and estuaries) within a system. The Deschutes River and other smaller streams deliver freshwater from the surrounding watersheds to Capitol Lake. These flows are temporarily stored in Capitol Lake before discharging into West Bay (part of Budd Inlet and Puget Sound) via the 5th Avenue Dam. The 5th Avenue Dam controls when, and at what rate, water can exit the lake, depending on water levels in the lake and tide elevations in Budd Inlet.

Sediment transport refers to the movement of sediment within a system. Sediments are transported from the adjacent watershed to Capitol Lake by the Deschutes River and other smaller streams. The movement of sediments to West Bay (and the greater Puget Sound) is interrupted by the 5th Avenue Dam, causing large volumes of sediment to settle within the Capitol Lake Basin. Some of the sediment, particularly fine sediment, that is transported from the upper watershed is suspended in the water and discharged into West Bay, through the 5th Avenue Dam. Periodically, high currents in the lake can redistribute sediments and flush even more sediment into West Bay.

What are the issues associated with sediment accumulation?

Excessive sediment accumulation can influence water quality, visual resources, aquatic habitat, and recreational use in Capitol Lake by reducing lake depth.
The analysis of hydrodynamics and sediment transport are closely related because sediment is primarily moved by flowing surface water.

Changes in hydrodynamics and sediment transport affect the many resources addressed in this EIS, such as fish and wildlife, land use, and navigation. The daily and seasonal fluctuations in water levels and currents influence what types of aquatic plants and animals can occupy Capitol Lake. Water levels during storm events determine the extent of lowland flooding around the lake, and the movement and deposition of sediment in West Bay affects navigation for vessels using the Port of Olympia and nearby marinas.

The study area for hydrodynamics and sediment transport includes the waters and low-lying land of the Capitol Lake Basin and West Bay. The Deschutes River, Percival Creek, and Puget Sound influence hydrodynamics in Capitol Lake and were considered as part of the extended study area.

**Methods for Studying Hydrodynamics & Sediment Transport**

A state-of-the-art and process-based three-dimensional computer model, Delft3D, was used to predict the movement of water and sediment in the study area under different project alternatives. The numerical model uses complex systems of physics-based equations to calculate how water and sediment move in response to tides, river inflow, the lake bed, and the sediment load input. The model predicted variations among the project alternatives using the same hydrologic and tidal inputs but varying project geometries. For each alternative, two storm events were modeled: an extreme +100-year river flow event and a 100-year tide event. These events were selected as the “extreme” events for purposes of the model because riverine and tidal floods have both been documented to cause flooding in the basin under existing conditions, and the 100-year storm is the standard flood level studied in floodplain assessments.

Data used as inputs to the model include bathymetry that was collected in 2020 for the project, streamflow records, tide records, current speed measurements, water levels upstream of the dam, records of dam opening and operational rules, meteorological data, flood mapping, and climate change predictions. Historical surveys of the lake bed were also used to determine past and current sedimentation rates and patterns. Physical measurements of sediment properties were also collected. Previous studies measured incoming sediment loads carried by the Deschutes River and other tributaries to quantify the rate at which sediment enters the Capitol Lake Basin from the upper watershed.

These data sources are fully described in the Hydrodynamics and Sediment Transport Discipline Report (Attachment 5).
3.1.1 What are the existing water levels in Capitol Lake?

Under normal conditions, daily and seasonal water levels are relatively steady, and water current speeds are low. However, during storm events, water levels (and current speeds) in Capitol Lake Basin can be elevated. Enterprise Services adjusts discharge at the dam to generally maintain a summer lake level and a winter lake level (a foot lower than the summer lake level). Figure 3.1.1 shows modeled existing water levels during an extreme river flow event and extreme tidal event. Riverine floods result in the highest current speeds and water levels under existing conditions. Water levels are presented in meters NAVD 88.

**Figure 3.1.1 Water Levels during Extreme River & Tidal Floods under Existing Conditions**

The North American Vertical Datum of 1988 (NAVD 88) is a vertical reference system used to measure elevations relative to the Earth’s surface. In the U.S., NAVD 88 is the current official vertical datum.
3.1.2 Where does freshwater enter Capitol Lake?

The Deschutes River flows into Capitol Lake at Tumwater Falls in the South Basin. This river is the main source of freshwater to the Capitol Lake Basin. Typical annual peak flow rates in the Deschutes River are approximately 3,800 cubic feet (110 cubic meters) each second. Other smaller tributary streams also flow into Capitol Lake. Percival Creek, which enters the Middle Basin at Percival Cove, is the largest of these streams. Typical annual peak flow rates in Percival Creek are much lower than the Deschutes River at around 150 cubic feet (4.2 cubic meters) each second. These freshwater inflows influence currents within Capitol Lake and, during high river flow events, can cause elevated water levels and flooding within the basin.

3.1.3 How does the 5th Avenue Dam work?

The 5th Avenue Dam was completed in 1951 to create Capitol Lake. The dam forms the existing northern boundary of Capitol Lake, and acts as a primary control on water levels and currents in the lake. The dam operation generally blocks movement of saltwater from Budd Inlet upstream and minimizes mixing with freshwater in the basin. The dam consists of a rock and earth embankment, a fish ladder, and two gates that can be raised and lowered to control the water level within Capitol Lake. The east and west gates are 24 and 36 feet (7.3 and 11 meters) wide, respectively, with a maximum opening height of 11.9 feet (3.6 meters).

The dam gates are lowered to block incoming tidal waters when the water level in Budd Inlet is greater than the lake level. Depending on the tide level, the gates will also close when lake water levels drop below a minimum elevation, or open when the lake levels exceed a maximum elevation.

3.1.4 What is the existing sediment composition within Capitol Lake?

Within the lake, sediments are primarily composed of silt and sand. These types of sediments are typical of low-energy waterbodies such as lakes and tidal estuaries. Sediment composition is variable throughout the basin; sediments in areas of higher current speeds tend to be slightly coarser, such as near the 5th Avenue Dam and the BNSF Railway Trestle. For information on sediment characteristics and quality, see Section 3.11, Environmental Health.
3.1.5 How much sediment enters Capitol Lake each year?

The Deschutes River and Percival Creek carry the majority of sediment that reaches Capitol Lake. The estimated annual sediment load from the Deschutes River into the lake is between 29,000 and 55,000 cubic yards (22,000 and 42,000 cubic meters) each year. Percival Creek delivers approximately 1,400 cubic yards (1,100 cubic meters) of sediment each year. The annual sediment load from these rivers varies significantly from year to year. The rate of sediment input is directly related to stream flows, where greater flow rates contribute greater amounts of sediment.

3.1.6 How much sediment has accumulated since the 5th Avenue Dam was constructed?

Construction of the 5th Avenue Dam affected the rate and amount of sediment deposition throughout the basins that compose Capitol Lake. The method used to estimate the sediment deposition rates and spatial pattern was based on a comparison of a series of past bathymetric surveys. Although erosion occurs in isolated areas, most of the lake bed has accumulated between 0 and 6 feet (0 and 1.8 meters) in sediment thickness since the dam was constructed in 1951. The North and Middle Basins have experienced the highest rates of sediment deposition, as shown in Table 3.1.1 and Figure 3.1.2. There have been two dredge events in Capitol Lake since 1951 (in 1978 and 1986), with a total combined sediment removal of approximately 300,000 cubic yards (230,000 cubic meters).

Surveys are also periodically conducted in Budd Inlet in the federal navigation channel and ship turning basin. Surveys dating back to 1998 show that the navigation channel and turning basin have accumulated between 0.1 and 1.2 inches (0.3 to 3 centimeters) of sediment each year.

| Table 3.1.1 Annual Volume of Sediment Accumulation in Capitol Lake |
|-----------------|-----------------|--------------------|-----------------|-----------------|
|                 | South Basin     | Middle Basin       | North Basin      | Percival Cove   |
|                 | (cy/yr m³/yr)   | (cy/yr m³/yr)      | (cy/yr m³/yr)    | (cy/yr m³/yr)   |
| 1949–2013       | 3,150 (2,408)   | 18,391 (14,061)    | 6,133 (4,869)    | 639 (489)       |
| 2013–2020       | -1,265 (-967)²  | 3,586 (2,741)      | 11,005 (8,414)   | 668 (511)       |

Note:
1. Negative values indicate areas of net erosion, rather than of net accumulation over time.

Abbreviations: cy/yr = Cubic yards each year; m³/yr = Cubic meters each year
3.1.7 How does climate change affect Capitol Lake?

The hydrodynamic and sediment transport numerical model-simulated alternatives incorporated relative sea level rise (RSLR) projections. RSLR is the sea level observed using a land-based reference frame. The numerical model used projections consistent with those used in the Olympia Sea Level Rise Response Plan developed by the City of Olympia, Port of Olympia, and LOTT Clean Water Alliance (LOTT). The Sea Level Rise Response Plan outlines how downtown Olympia can adapt to rising seas, using projections based on data from the Washington Coastal Resilience Project. Scenarios modeled for the hydrodynamic assessment of this project include 2 feet (0.61 meters) of RSLR, which is projected to occur in Olympia between 2050 and 2080, according to the Sea Level Rise Response Plan.

Climate change will also affect rainfall patterns and river flow rates. Climate models predict that the Deschutes Watershed may experience a 10% to 30% increase in extreme 24-hour rainfall by mid-century. Similarly, future peak flow rates in the Deschutes River may increase; however, flow rate change projections are uncertain. Increased peak

Relative Sea Level Rise Projections

The EIS Project Team evaluated the best available science on RSLR, including the Olympia Sea Level Rise Response Plan as well as the latest projections developed for the State of Washington to define the “future condition” to include 2 feet (0.61 meters) of RSLR.
flow rates have the potential to cause more frequent and substantial flooding in the Capitol Lake Basin. Increased peak flow rates will also mobilize more sediment, which may lead to higher rates of lake bed elevation change.

### 3.2 NAVIGATION

Navigation refers to the movement of commercial and recreational watercraft. The study area for navigation includes West Bay, with the southern boundary at the 5th Avenue Dam and the northern boundary at the end of the peninsula between West and East Bay. This is the area in which commercial and recreational navigation could be affected by changes in sediment deposition from the project alternatives. Results of the numerical model showed that changes in sediment deposition, outside of the Capitol Lake Basin, would be limited to West Bay.

Navigational resources and facilities in West Bay include the southern portion of the existing U.S. Army Corps of Engineers (USACE) federal navigation channel (FNC) and adjacent turning basin, the Port of Olympia's three marine terminal berths, private marinas along the eastern shoreline of West Bay (Fiddlehead Marina, Martin Marina, and Olympia Yacht Club), and other public moorage facilities (Figure 3.2.1).

**Methods for Studying Navigation Analysis**

Data sources used for navigation analysis included existing navigation patterns for the study area, vessel use, depth, hydrodynamics, sediment erosion/deposition rates for the study area, and existing maintenance dredging data from the Port of Olympia, USACE, and several private marinas located in West Bay.

**Navigation Patterns.** Information about existing vessel navigation patterns was obtained from shipborne Automatic Identification Systems, which is a real-time network of transmitters and receivers that broadcast, track, and record vessel movement. These data were used to establish and evaluate the movement of larger vessels that use the FNC to access the Port of Olympia.

**Sediment Deposition Rates.** Past and present bathymetric condition surveys and hydrodynamic and sediment transport numerical modeling were compared to determine sediment deposition rates for West Bay.

**Existing Maintenance Dredging.** Information on the types of vessels, incidents of vessel grounding or light-loading, operations, navigational constraints, sediment deposition, and long-term plans for accommodating different types of vessels was obtained from stakeholders. It was determined that maintenance dredging is expected to occur at most facilities within the next 10 years, prior to, or concurrent with the implementation of any of the action alternatives.

Additional information on navigation is presented in the Navigation Discipline Report (Attachment 6).
Figure 3.2.1 Navigational Resources in West Bay

Legend
- Olympia Yacht Club
- Federal Navigation Channel
- Other Nearby Marinas
- Marina Access Area
- Port Berth and Turning Basin (Portions of FNC)

Budd Inlet
Federally Authorized Turning Basin
Port of Olympia
Fiddlehead Marina
Martin Marina
Olympia Yacht Club
Percival Landing (Dock D and E)
Fifth Avenue Dam
North Basin
West Bay
East Bay

Scale in Feet:
0 250 500 1,000
Figure 3.2.2 Budd Inlet Vessel Traffic Patterns

Legend

<table>
<thead>
<tr>
<th>Number of Vessel Passes (Annual)</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 - 10</td>
<td></td>
</tr>
<tr>
<td>11 - 15</td>
<td></td>
</tr>
<tr>
<td>16 - 20</td>
<td></td>
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<td>21 - 25</td>
<td></td>
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<td>51 - 75</td>
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<td>76 - 100</td>
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<td>101 - 150</td>
<td></td>
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<tr>
<td>151 - 200</td>
<td></td>
</tr>
<tr>
<td>201 - 300</td>
<td></td>
</tr>
</tbody>
</table>

- Limit of Federal Channel

Notes:
- AIS data was obtained from the US Coast Guard.
- Areas with 5 or fewer vessel passes per year are not shaded.
- Background nautical chart is ENC US5WA23M (April 30, 2020).
3.2.1 What are the general navigation patterns in West Bay?

Figure 3.2.2 provides a summary representation of vessel use from Budd Inlet into West Bay. The patterns reflect areas where vessel traffic generally occurs. This is known by vessel tracking beacons that are located on larger commercial vessels and some recreational vessels. Note that areas not shaded may still have occasional transit because smaller recreational vessels are not universally equipped with tracking beacons.

Vessel navigation was observed to be highest within the authorized FNC and turning basin and throughout the east side of West Bay closest to the Port of Olympia, local private marinas, and marina access areas along the east shore. This also corresponds to the area of the greatest water depth.

Typical vessels calling at the Port of Olympia include bulk cargo ships about 600 feet (180 meters) long and 100 feet (30 meters) wide. Typical vessels calling at West Bay marinas include recreational powerboats and sailboats, with an average draft between 2 and 7 feet (0.61 and 2.1 meters).

3.2.2 How were sediment deposition and erosion rates evaluated within the study area?

Commercial and recreational navigation within West Bay occurs along the eastern shoreline, in areas of sufficient water depth. When sediment is deposited in these areas, it incrementally reduces the depth of water. When sediment continues to accumulate and is not removed by dredging, commercial and recreational navigation is adversely impacted.

For this analysis, historical patterns and rates of sediment erosion and deposition within West Bay are evaluated by comparing available bathymetric surveys dating back to 1998. This provides the existing annual rate of sediment deposition that occurs within the study area (and has impacted navigation over time). Patterns and rates of sediment deposition that may occur in the future, after project construction, are evaluated with a numerical model that was built for this project. The predicted rates of sediment deposited throughout the study area each year indicate how quickly commercial and recreational navigation could be impacted. Understanding the potential sediment deposition rates informs the impact analysis and the frequency of maintenance dredging that would be needed to avoid or minimize impacts. The observed and

Three-Dimensional Modeling Study

The EIS Project Team selected the Delft 3D modeling software because this state-of-the-art three-dimensional model is one of the best numerical models widely used across the world to capture sediment dynamics of estuarine systems. The numerical model was built to a very high resolution, with greater coverage than other common model configurations.
projected total and annual rates of erosion/deposition in the study area are described below.

3.2.2.1 Federal Navigation Channel, Turning Basin and the Port of Olympia

The USACE conducts periodic bathymetric surveys of the FNC and turning basin to monitor changes in sediment deposition and erosion. Survey comparisons show that average observed rates of sediment deposition throughout the majority of the FNC ranged from 0.79 to 1.2 inches (2 to 3 centimeters) each year between 1998 and 2020, although some erosion has been observed over the past 9 years. Sediment deposition within the adjacent turning basin is similar to the FNC, with an average observed rate of approximately 1.2 inches (3 centimeters) each year between 2011 and 2020.

Other sedimentation rate studies have been conducted at the Port of Olympia, and these suggest an annual deposition rate in the Port of Olympia vessel berths of approximately 0.047 to 0.43 inches (0.12 to 1.1 centimeters) each year. Considering the range of available data, the average annual rate of sediment deposition within the FNC, turning basin, and Port of Olympia vessel berths is estimated between -0.39 and +1.6 inches (-1 and +4 centimeters) each year, but varies over time and by area. Figure 3.2.3 provides details on average annual sediment erosion and deposition rates.
Figure 3.2.3 Estimated Existing Average Annual Sediment Erosion/Deposition Rates (cm/yr)

1998-2011

2011-2020

1998-2020
### 3.2.2.2 West Bay Marinas

Existing bathymetry at West Bay marinas is limited and therefore deposition rates could not be determined with observed data. However, the marina owners have reported isolated areas of sediment accumulation. In the absence of data, average annual sediment erosion and deposition rates for the Olympia Yacht Club and other West Bay marinas were estimated based on the numerical model.

### 3.2.2.3 Sediment Deposition Pattern Summary for West Bay

The existing sediment deposition rates were used to calibrate and validate the sediment transport numerical model. This process confirmed that the model results were in alignment with the historical bathymetric survey, which means that the numerical model was accurately capturing the Project Area functions. After calibrating and validating the numerical model against existing conditions, it was used to simulate sediment transport for the project alternatives.

The modeled sediment deposition rates for existing conditions are summarized in Table 3.2.1. Table 3.2.1 shows that the highest sediment deposition rate occurs closest to the 5th Avenue Dam (near the Olympia Yacht Club) and decreases with distance away from the 5th Avenue Dam, northward into West Bay and Budd Inlet. The numerical model evaluated two storm events—without and with RSLR. The deposition rates were higher without RSLR and lower with RSLR. This is likely due to the higher water levels in the Capitol Lake Basin associated with RSLR, which would reduce current velocities and would reduce erosion of sediments in the Middle Basin. For this reason, later sections describing the analysis of impacts focus on numerical model results without RSLR, because impacts are greater under this scenario.

Importantly, annual sediment deposition rates in West Bay are highly dependent on river flow events with more extreme flow events depositing more sediments. Additionally, sediment deposition rates are higher on the east side of West Bay because of an area of shallow intertidal habitat along the west side of West Bay, which directs sediment eastward.

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**Relative Sea Level Rise**

RSLR is the rise in sea level observed using a land-based reference frame. A 2-foot (0.61-meter) RSLR was implemented in the numerical modeling study to represent future increase in the sea level due to climate change. Conditions are applied as relative (i.e., a local, upward shift in offshore water levels).
Table 3.2.1 Average Annual Sediment Deposition in West Bay for Existing Conditions, Predicted by Numerical Model

<table>
<thead>
<tr>
<th>Location</th>
<th>Average Annual Sediment Deposition Without RSLR (inches each year)</th>
<th>Average Annual Sediment Deposition With RSLR (inches each year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olympia Yacht Club</td>
<td>1.7 (4.3)</td>
<td>1.3 (3.4)</td>
</tr>
<tr>
<td>Other West Bay Marinas and Marina Access</td>
<td>0.83 (2.1)</td>
<td>0.67 (1.7)</td>
</tr>
<tr>
<td>Port of Olympia/Turning Basin</td>
<td>0.87 (2.2)</td>
<td>0.63 (1.6)</td>
</tr>
<tr>
<td>FNC (excluding Turning Basin)</td>
<td>0.039 (0.1)</td>
<td>0.039 (0.1)</td>
</tr>
<tr>
<td>Rest of Budd Inlet (not within study area)</td>
<td>0.039 (0.1)</td>
<td>0.039 (0.1)</td>
</tr>
</tbody>
</table>

3.2.3 What maintenance dredging is currently performed in West Bay?

The USACE is responsible for maintaining authorized water depths within the FNC and turning basin through maintenance dredging. The existing authorized depth within these channels is -30 feet (-9.1 meters) MLLW. The USACE last dredged the FNC in 2007.

The Port of Olympia is responsible for maintaining authorized water depths within their vessel berths. The average elevation within these vessel berths is -39 feet (-2.7 meters) MLLW. The Port of Olympia last dredged its vessel berths in 2014.

These two dredging events are the most recent maintenance dredging to occur within these navigational facilities within the last 40 years. Maintenance dredging is currently needed within the FNC and turning basin but it has been delayed due to the chemical quality of the sediment, which is impacted and being evaluated by Ecology.

Vessel navigation is currently impacted due to the accumulated sediment; cargo vessels typically sail on rising high tides or lighten their loads because the increasingly shallow water is not sufficient for a fully loaded vessel. There is active coordination between USACE and the Port of Olympia regarding these conditions. It is expected that maintenance dredging will be conducted by the USACE in the FNC and turning basin and by the Port of Olympia in their berths within the next 10 years to reestablish authorized water depths.

Maintaining navigational water depth at the marinas is the responsibility of the marina owners. Water depth at the marinas in West Bay is estimated to average about -7 feet (-2.1 meters) MLLW. The minimum
water depth of 5 to 7 feet (-1.5 to -2.1 meters) MLLW is stipulated in environmental regulations and aquatic land leases, helping to avoid vessel contact with the underlying sediment.

The Olympia Yacht Club last completed maintenance dredging within specific shallow portions of their marina in 2014; prior to this, maintenance dredging was completed in 1987. Maintenance dredging at the Martin Marina last occurred in the 1980s.

All three West Bay marinas experience shoaling and/or sediment accumulation to some extent and have either conducted maintenance dredging recently or plan to complete maintenance dredging within the next 10 years to maintain navigation, to comply with lease requirements, and/or in parallel with dock upgrades and/or reconfiguration. Maintenance dredging is often planned around other necessary marina upgrades focused on key areas that experience shoaling.

### 3.3 WATER QUALITY

For the EIS water quality analysis, the study area includes Capitol Lake and its major inflow sources of the Deschutes River and Percival Creek, as well as West Bay and East Bay of Budd Inlet. These areas are included because they would be impacted (beneficially or adversely) by the project alternatives. Upstream areas in the Deschutes River and Percival Creek are not part of the study area because these areas would not be impacted by the project alternatives.

Several federal, state, and local government policies, regulations, and ordinances protect water quality in the Deschutes River, Capitol Lake, and Budd Inlet. Ecology has been delegated authority by the U.S. Environmental Protection Agency (USEPA) to implement the federal Clean Water Act in Washington by establishing water quality standards, identifying impaired waterbodies, conducting TMDL studies, and issuing water quality permits. In July 2020, USEPA approved a TMDL for the Deschutes River. A TMDL is currently being prepared for Budd Inlet. Numerous discharges to the watershed are regulated through the National Pollutant Discharge Elimination System (NPDES).

A TMDL is a formal plan that outlines discharge limits of problematic pollutants to improve water quality in an impaired waterbody.
Methods for Studying Water Quality

Previous studies, historical monitoring data, and recent data collected for this analysis were used to characterize the conditions in both Capitol Lake and Budd Inlet. For Capitol Lake, the first step was to evaluate whether any trends in water quality should be considered to ensure that the data used for the analysis are representative of existing conditions. The water quality was then compared to applicable water quality standards and thresholds, and to conditions in nearby lakes. Existing conditions within Budd Inlet were also characterized by comparing existing water quality to applicable state criteria.

The data sources used in the analysis are fully described in the Water Quality Discipline Report (Attachment 7).

3.3.1 What past work has been conducted to assess water quality?

Over the decades, government agencies and others have evaluated water quality conditions in Capitol Lake in response to visual and chemical changes. Water quality has changed within the project area because of 5th Avenue Dam construction and the impoundment of Deschutes River water, inputs to the river and lake from various sources, lake treatments, accidental spills, and a range of other factors. As a result, Capitol Lake historically experienced various water quality problems including aquatic weed infestations, algal blooms, and high bacteria concentrations that resulted in closure of the swimming area and restrictions on boating and other beneficial uses. Capitol Lake has been listed on Ecology’s 303(d) list for impaired waters due to bacteria and total phosphorus since 1996.

A number of factors affect the water quality and overall aquatic health of the aquatic ecosystem in Capitol Lake. Within this context, it is important to note that “water quality” is more than just chemicals in the water.

Capitol Lake is profoundly affected by a complex and continually changing interaction between physical (e.g., temperature, river flow and tides, erosion, and sedimentation), chemical (e.g., nutrients, dissolved oxygen, pH), and biological (e.g., algae, bacteria, and aquatic plants and animals) characteristics. The Deschutes River, which is the predominant inflow source, flows through Capitol Lake at a rate that keeps the water well circulated compared to other lakes in the region, most of which become stratified in the summer with a warm layer at the surface and colder water below.

Water quality standards are only occasionally exceeded in Capitol Lake, primarily for temperature and dissolved oxygen. A water quality trend
analysis conducted for this EIS used data that were not available to Enterprise Services or the general public during preparation of the Capitol Lake Adaptive Management Plan (CLAMP) in 1999.

Perceptions of poor water quality and worsening conditions in Capitol Lake are likely based on the impaired aesthetics from aquatic plant growth and the ongoing restrictions on recreational use, rather than water chemistry. However, recent monitoring data indicate that water quality in Capitol Lake is relatively good. The interrelationship between the various factors affecting the aquatic ecosystem in Capitol Lake are important to consider in evaluating the water resources throughout the ecosystem.

Low dissolved oxygen in Budd Inlet during the summer has also been a long-term water quality concern, leading to extensive modeling efforts to better understand the contributing factors to dissolved oxygen depletion. Recent water quality monitoring has provided further insights into the nutrient dynamics and loading from the Deschutes River and Capitol Lake inflows that contribute to marine algae productivity and oxygen depletion in Budd Inlet. Deschutes River and Capitol Lake water quality and flow inputs have historically affected Budd Inlet, along with important and substantial inputs from the greater Puget Sound.

### 3.3.2 What methods were used for studying existing water quality?

Previous studies, historical monitoring data, and recent data collected for this analysis were used to characterize the conditions in both Capitol Lake and Budd Inlet. The primary studies used, which are fully referenced in the Water Quality Discipline Report (Attachment 7), include:

- **Capitol Lake Restoration Analysis** (Entranco 1984): Preliminary study conducted to characterize the water quality conditions in Capitol Lake.

- **Budd Inlet Scientific Study Final Report** (LOTT 1998): Analyzed field data to quantify circulation patterns and nutrient loading to Budd Inlet.

• **South Puget Sound Dissolved Oxygen Study: Water Quality Model Calibration and Scenarios** (Ecology 2014): Identified anthropogenic causes of dissolved oxygen depletion in South Puget Sound, providing an overview of the conditions between inlets.

• **Deschutes River, Capitol Lake, and Budd Inlet Total Maximum Daily Load Study Supplemental Modeling Scenarios** (Ecology 2015b): Used historical data to model scenarios that predict causes of poor water quality in Budd Inlet.

• **Total Maximum Daily Loads (TMDLs) for the Deschutes River and its Tributaries** (USEPA 2020): Provided TMDLs for sediment, bacteria, dissolved oxygen, pH, and temperature in the Deschutes River and its tributaries.

Ecology is currently developing a TMDL for Budd Inlet. This report and its findings were not available for this EIS.

Historical monitoring data used include:

• **Deschutes River and Capitol Lake:**
  - Stream Flow 2004–2014 (United States Geological Survey [USGS]): These data were used to develop water and phosphorus budgets for Capitol Lake.
  - Water Quality 2004 (Ecology): These data were used to augment 2019 data collected for this EIS.
  - Water Quality 2004–2014 (Thurston County): This dataset was used to identify long-term trends and to develop the phosphorus budget and support the alternatives analysis.

• **Budd Inlet:**
  - Water Quality 2000–2020 (Ecology): These data were used to compare the observed water quality conditions to surface water quality standards.

For this assessment, the first step was to evaluate whether any trends in water quality should be considered to ensure that the data used for the analyses are representative of existing conditions. The water quality of Capitol Lake was then compared to surface water quality standards to evaluate existing conditions, and also compared to the total phosphorus action threshold for Puget Sound lowland lakes. Conditions in Capitol Lake were compared to nearby lakes to provide a perspective for water quality conditions in the region. Previous studies and data were
supplemented with additional data collected in 2019. These data and a water and phosphorus budget provide further insight into the current interactions between the Deschutes River and Capitol Lake.

Analyzing potential trends in water quality and selecting data that represent existing conditions involved examining the monitoring results from the past two decades to identify data most appropriate for this analysis. Water quality data for Capitol Lake collected by Thurston County from 2004 through 2014 were used for the trend analysis. The presence of strong trends for key parameters indicates that data from the earlier years in the data record are not appropriate to use in characterizing existing conditions. Therefore, only the most recent 5-year period (2010 to 2014) was used to evaluate water quality criteria, trophic status, and comparisons to nearby lakes. For the water and phosphorus budgets, data from hydrologic water years 2008 to 2012 (e.g., water year 2011 is from October 2010 through September 2011) were analyzed because this was the most recent 5-year period that contained flow, storage, and phosphorus data for the Deschutes River, Capitol Lake, and Percival Creek. Having five consecutive years of data provides an understanding of both average water quality conditions and year-to-year variability.

Similar to Capitol Lake, existing conditions for Budd Inlet were assessed based on available data. Current conditions within Budd Inlet were characterized by comparing existing water quality to applicable state criteria. Sediment quality was also analyzed, largely referencing the findings from the Sediment Quality Discipline Report (Attachment 15). Several studies and modeling efforts conducted in Budd Inlet were used to compare the waterbody to other inlets in South Puget Sound.

Multiple previous water quality studies in the project area were supplemented by additional data collected by the EIS Project Team in 2019 and 2020 to characterize existing conditions.

Key studies reviewed include a 2012 Ecology study with modeling results, Ecology TMDL studies, Thurston County water quality monitoring in the Deschutes River and Capitol Lake, and Ecology water quality monitoring in Budd Inlet. The full description of methodology and information sources is presented in the Water Quality Discipline Report (Attachment 7).

3.3.3 What are the existing water quality conditions?

This section summarizes the information on existing water quality and forms the baseline for evaluating potential adverse impacts or beneficial
effects of the project alternatives. A more detailed description of water quality is provided in the Water Quality Discipline Report (Attachment 7).

Information on dissolved oxygen and nutrients is emphasized in this EIS analysis because low dissolved oxygen concentrations have been a long-term problem in Budd Inlet, and these parameters have been the focus of water quality improvement planning efforts.

Ecology has previously modeled the lake’s influence on dissolved oxygen in Budd Inlet. Ecology’s model focused on: (1) nitrogen, because it typically drives algae production in marine waters, and the seasonal die-off and decomposition of algae consumes (or reduces) dissolved oxygen concentrations; and (2) total organic carbon (TOC) as an indicator of organic matter that, when decomposing, contributes to dissolved oxygen depletion. Other key parameters that influence dissolved oxygen conditions in Budd Inlet are phosphorus and biochemical oxygen demand (BOD). Other existing water quality conditions (e.g., temperature, pH, bacteria) and sediment quality were also considered in this analysis, but with less detail.

### 3.3.3.1 Capitol Lake

Construction of the 5th Avenue Dam in 1951 transformed the Deschutes Estuary into a freshwater waterbody now known as Capitol Lake. Prior to that time, the Deschutes River flowed to Budd Inlet, with the current-day Capitol Lake Basin consisting of estuary habitat and tideflats. The Deschutes River, which is the predominant inflow source to the lake, now flows through the lake at a rate that replaces the water within about 1 week and keeps the water well mixed. The rapid replacement of lake water results in Capitol Lake being regulated as a surface waterbody where water quality standards for lakes are not specifically applicable. However, this EIS provides comparisons to other lakes in the region and anticipates that a lake management plan for Capitol Lake would be developed and implemented under the Managed Lake Alternative, and potentially the Hybrid Alternative.

The existing conditions for water quality in Capitol Lake are presented in the following subsections by:

- Assessing water quality trends in Capitol Lake and Deschutes River.
- Comparing water quality monitoring data to regulatory standards and indicators of trophic state (biological productivity).
• Evaluating water quality and algae monitoring data from 2019.
• Comparing Capitol Lake to other lakes in Thurston County.
• Comparing water quality in the Capitol Lake Basin to water quality entering from the Deschutes River.
• Summarizing information on lake sediment quality.
• Evaluating water and phosphorus budgets for Capitol Lake.
• Summarizing water quality modeling studies from the Deschutes River TMDL.

**Water Quality Trends in Capitol Lake**

Thurston County collected water quality data in Capitol Lake and other area surface waters, including the Deschutes River, for several decades until 2014 as part of an ambient water quality monitoring program. The most recent water quality data collected by Thurston County from 2004 through 2014 for Capitol Lake and the Deschutes River, the period since brewery discharges ceased, were compiled to evaluate existing conditions. The data were used to assess trends in annual and summer conditions to ensure that the data used in the analysis reflect existing conditions. During these years, the Deschutes River was monitored year-round, whereas Capitol Lake was monitored only during May through October. Trends in the Deschutes River were therefore evaluated for both full years and the May through October periods. Trends in Capitol Lake were evaluated using all the available data (May through October) as well as by separating data into seasons: spring (May through June), summer (July through August), and fall (September through October). Lake monitoring was performed at two depths: near surface and near bottom.

The following significant trends were observed in Capitol Lake during the summer over the years from 2004 through 2014:

• Improvement was observed with lower algal productivity indicated by surface pH, surface total phosphorus chlorophyll-\(a\), pheophytin-\(a\), and Secchi depth. Increasing surface and bottom conductivity indicated saltwater intrusion through the dam.
• During the spring, total phosphorous and chlorophyll-\(a\) exhibited improving water quality.
• Surface temperature and pH both indicated improving water quality. Increasing surface conductivity indicated the influence of saltwater intrusion.

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**Key Water Quality Terms**

- **Chlorophyll-\(a\) and pheophytin-\(a\):** Pigments analyzed to indicate algae productivity.
- **Dissolved oxygen:** An important requirement for fish life.
- **Fecal coliform:** An indicator of the potential presence of bacterial pathogens.
- **pH:** A measure of acidity.
- **Secchi depth:** A measure of water transparency that is sometimes decreased by algae in the water.
Total phosphorous, chlorophyll-α, and pheophytin-α all had improving water quality trends in the fall. Surface results for dissolved oxygen exhibited a worsening trend, potentially due to a decrease in oxygen production from algae or aquatic plants, which is consistent with the improving trends of lower chlorophyll-α, pheophytin-α, and pH. A significantly increasing trend in surface conductivity again indicated saltwater intrusion.

The following significant trends were also observed in Deschutes River water quality over the same period:

- Using year-round data, pH improved, indicating lower algal productivity.
- Using May through October data, fecal coliform bacteria and pH both exhibited improvements.

The trend analysis results indicate that Capitol Lake exhibited improving water quality from 2004 to 2014 based on significant improvement in temperature, total phosphorous, chlorophyll-α, Secchi depth, and fecal coliform bacteria. These trends appear to be most evident in the fall and spring. Because of the observed trends, evaluations of existing water quality data were limited to the most recent 5-year period (2010 through 2014) to better reflect current conditions in the lake and river.

The improvements summarized here and measured in other studies indicate that watershed improvement activities carried out over the past 25 years, including removal of the brewery discharge, have been effective at improving overall water quality in the lower Deschutes River and Capitol Lake.

**Applicable Water Quality Standards and Existing Water Quality in Capitol Lake**

Capitol Lake water quality is regulated using water quality standards and criteria for fresh waters of the state. Capitol Lake has an average detention time (i.e., the time it takes for inflows to replace the lake’s water volume) of less than the 15-day mean detention time used by the state (WAC 173-201a-020) to define a lake. For this reason, Capitol Lake is classified as a river and regulatory requirements for water quality in Washington lakes (WAC 173-201a-230) do not apply. Information on existing conditions for nutrients and trophic state indicators is included in this EIS because it is relevant to future lake management under the Managed Lake and Hybrid Alternatives.
Comparing water quality data from 2010 through 2014 with state surface water quality standards (WAC 173-201A-602) indicates that the lake occasionally does not meet standards for temperature, dissolved oxygen, total dissolved gas, and pH (Table 3.3.1).

If lake water quality standards were applied at Capitol Lake, it would continually exceed the Action Level for total phosphorus (>20 micrograms per liter [μg/L]) in lowland lakes of the Puget Sound region. The standards recommend that lakes that exceed the Action Level for total phosphorous develop specific management plans and actions to reduce algae productivity and improve water quality. By definition, all eutrophic lakes in Washington exceed the Action Level for total phosphorous, including most lowland lakes in the Puget Sound region.

Table 3.3.1 Comparison of Capitol Lake Data to Washington State Surface Water Quality Standards (1)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mean</th>
<th>Median</th>
<th>Min.</th>
<th>Max.</th>
<th>Surface Water Quality Standard/Action Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature (°C) (Surface)</td>
<td>16.5</td>
<td>17.1</td>
<td>9.3</td>
<td>21.1</td>
<td>17.5 (2)</td>
</tr>
<tr>
<td>Temperature (°C) (Bottom)</td>
<td>16.2</td>
<td>16.9</td>
<td>9.7</td>
<td>20.1</td>
<td>17.5 (2)</td>
</tr>
<tr>
<td>Dissolved oxygen (mg/L) (Surface)</td>
<td>12.2</td>
<td>12.2</td>
<td>9.2</td>
<td>16.3</td>
<td>8.0 (2)</td>
</tr>
<tr>
<td>Dissolved oxygen (mg/L) (Bottom)</td>
<td>10.7</td>
<td>10.6</td>
<td>7.7</td>
<td>13.1</td>
<td>8.0 (2)</td>
</tr>
<tr>
<td>Total dissolved gas (%) (Surface)</td>
<td>124.8</td>
<td>124.8</td>
<td>95.3</td>
<td>168.5</td>
<td>110.0 (3)</td>
</tr>
<tr>
<td>Total dissolved gas (%) (Bottom)</td>
<td>108.1</td>
<td>109.8</td>
<td>83.0</td>
<td>133.3</td>
<td>110.0 (3)</td>
</tr>
<tr>
<td>pH (Surface)</td>
<td>8.2</td>
<td>8.2</td>
<td>7.4</td>
<td>9.2</td>
<td>6.5–8.5 (2)</td>
</tr>
<tr>
<td>pH (Bottom)</td>
<td>7.7</td>
<td>7.7</td>
<td>6.6</td>
<td>8.8</td>
<td>6.5–8.5 (2)</td>
</tr>
<tr>
<td>Total phosphorous (μg/L) (Surface)</td>
<td>32.3</td>
<td>32.0</td>
<td>22.0</td>
<td>59.0</td>
<td>20.0 (4)</td>
</tr>
</tbody>
</table>

Notes:
- Data are from monthly summer (May through October) grab samples collected by Thurston County.
- Bold and shaded values indicate problematic excursions from the standard or Action Level.
- 1. Based on 2010–2014 data from the North Basin.
- 3. WAC 173-201A standard for total dissolved gas.
As presented in greater detail in the Water Quality Discipline Report (Attachment 7), very similar results for temperature and dissolved oxygen from near the surface and near the bottom show that water in Capitol Lake is well mixed, unlike many regional lakes that become thermally stratified in the summer with warmer water near the surface and cooler water at depth.

Vertical Mixing

Vertical mixing is important in moderating water quality conditions in Capitol Lake and preventing oxygen depletion in the deeper waters. As a result, dissolved oxygen concentrations only infrequently drop below the 8.0 milligrams per liter (mg/L) minimum standard near the lake bottom, and Capitol Lake remains well oxygenated through most of the summer.

Water temperature frequently exceeds the 17.5 °C maximum criterion both near the surface and near the bottom in Capitol Lake.

Because the temperature criterion is also exceeded in the main incoming water sources (Deschutes River and Percival Creek), maximum temperatures in the lake can be attributed to both the incoming water and warming in the lake basin where there is less shade and more solar exposure.

The 8.5 maximum pH criterion is also exceeded during periods of high algae and aquatic plant growth and daytime photosynthesis, particularly in the near-surface waters of Capitol Lake (see Table 3.3.1.).

Temperature Criterion

Compared to other regional lakes, temperature criterion exceedances near the surface in Capitol Lake are moderate and less frequent.

Table 3.3.2 compares conditions in Capitol Lake to thresholds commonly used for assigning a trophic state to lakes. Based on total phosphorous, chlorophyll-α, and Secchi depth, Capitol Lake would be classified as eutrophic (i.e., enriched with nutrients and productive for algae) even after the improving trends in these parameters observed in recent years. The Action Level for total phosphorous for Washington lakes (>20 μg/L) does not apply to Capitol Lake because of its regulatory status due to its rapid flushing rate. WAC 173-201A-230 recommends for lakes that a study be initiated to develop a lake-specific standard for total phosphorous where the Action Level is exceeded. The summer mean total phosphorous concentration in Capitol Lake (32.3 mg/L) is much greater than the Action Level. Although not a regulatory requirement, this information is included because it is anticipated that a lake management plan would be developed and implemented under the Managed Lake Alternative and potentially the Hybrid Alternative.
### Table 3.3.2 Comparison of Capitol Lake Data & Trophic State Thresholds for Lakes

<table>
<thead>
<tr>
<th>Trophic State</th>
<th>Secchi Depth (m)</th>
<th>Chlorophyll-a (μg/L)</th>
<th>Total Phosphorus (μg/L)</th>
<th>Total Nitrogen (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capitol Lake Data</td>
<td>1.8</td>
<td>12.3</td>
<td>32.3</td>
<td>0.60</td>
</tr>
<tr>
<td>Oligotrophic</td>
<td>&gt;4</td>
<td>&lt;2.6</td>
<td>&lt;12</td>
<td>&lt;0.35</td>
</tr>
<tr>
<td>Mesotrophic</td>
<td>2–4</td>
<td>2.6–7.2</td>
<td>12–24</td>
<td>0.35–0.65</td>
</tr>
<tr>
<td>Eutrophic</td>
<td>1–2</td>
<td>7.1–20.1</td>
<td>24–48</td>
<td>0.65–1.2</td>
</tr>
<tr>
<td>Hypereutrophic</td>
<td>&lt;0.5</td>
<td>&gt;56</td>
<td>&gt;96</td>
<td>&gt;1.2</td>
</tr>
</tbody>
</table>

Notes:
- **Bold/shaded text** shows how levels in Capitol Lake would be characterized.
- 1 Summer mean value for surface water measurements taken between 2010 and 2014.

An Ecology modeling study of Budd Inlet indicated that the largest human-caused contributor to low dissolved oxygen problems in Budd Inlet was loading of nutrients and TOC from Capitol Lake. For the parameters of most interest (e.g., biological indicators such as TOC and dissolved organic carbon [DOC]), the Ecology modeling study was based on data collected in Capitol Lake in 2003 and 2004. To provide more recent data and to augment the historical dataset, limited additional monitoring was conducted in Capitol Lake from May through October 2019 as part of the EIS evaluation. The routine monitoring of the Deschutes River performed by Thurston County was also expanded to include some key analytes. More details on the monitoring results are included in the Water Quality Discipline Report (Attachment 7) and summarized below.

Importantly, three events occurred in 2019 that may have influenced water quality results. The first event occurred on February 25, 2019, when there was a large spill of transformer oil, just downriver of Tumwater Falls. The oil entered the Deschutes River from several storm drains and flowed into Capitol Lake. Ecology immediately launched an extensive cleanup that involved removing oil from the system by skimming the surface, cleaning the shoreline vegetation, and vacuuming contaminated sediment. The cleanup efforts occurred from March through July 2019. Water quality may have been affected by both the transformer oil and the site disturbances from cleanup operations. The remaining two events were associated with large sewage spills on Percival Creek in early February 2019 and near the end of May 2019.

Because of concerns that the spills described above may have impacted water quality results intended for characterizing existing conditions, 2019 data were not used in long-term trend analyses but were compared...
with those from previous years (2010 to 2014), as summarized in Table 3.3.3. Phosphorus data from 2019 were suspected to be influenced by spill cleanup and were thus not used in the analysis; however, data for other water quality parameters collected in 2019 were generally within the expected range of historically observed values and accepted for analyses.

### Table 3.3.3 Comparison of 2019 Capitol Lake Water Quality Data to 2010–2014 Data

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total nitrogen (mg/L) (Surface)</td>
<td>0.60</td>
<td>0.49</td>
<td>0.69</td>
<td>0.65</td>
</tr>
<tr>
<td>Total phosphorous (mg/L) (Surface)</td>
<td>0.032</td>
<td>0.069</td>
<td>0.032</td>
<td>0.22</td>
</tr>
<tr>
<td>Soluble reactive phosphorous (^1) (mg/L) (Surface)</td>
<td>0.010 (^1)</td>
<td>0.024</td>
<td>0.014 (^1)</td>
<td>0.115</td>
</tr>
<tr>
<td>Chlorophyll-(\alpha) (μg/L) (Surface)</td>
<td>12.3</td>
<td>14.1</td>
<td>5.2</td>
<td>3.8</td>
</tr>
<tr>
<td>Pheophytin-(\alpha) (μg/L) (Surface)</td>
<td>3.0</td>
<td>3.3</td>
<td>3.1</td>
<td>1.7</td>
</tr>
<tr>
<td>Secchi Depth (m)</td>
<td>1.8</td>
<td>1.6</td>
<td>2.4</td>
<td>1.9</td>
</tr>
</tbody>
</table>

Note:

1. These values are based on the 2004 dataset because SRP was not measured from 2010 to 2014.

Overall, the monitoring data (2010 to 2014, and 2019) indicate that Capitol Lake currently has relatively good water quality in terms of physical and chemical characteristics important to aquatic life; water quality standards (such as for temperature and dissolved oxygen) are occasionally exceeded, but these are tempered by the Deschutes River. Chlorophyll-\(\alpha\) concentrations are also relatively low, especially given the lake’s eutrophic condition, indicating that algal productivity is generally not excessive. Public perceptions of degraded water quality in Capitol Lake may be linked to aesthetic impacts of the extensive and dense aquatic plant population that becomes more exposed during summer low river flows. Monitoring data indicate that, with the exception of phosphorus, water quality in Capitol Lake in 2019 was generally consistent with results for 2010 to 2014 and characteristic of good water quality in terms of physical and chemical properties important to aquatic life.
Table 3.3.4 provides a summary of bacteria data from the 2019 field study. Overall, bacteria concentrations were low and geometric mean (an average used where values may be widely variable) values were much less than the standard for *Escherichia coli* (*E. coli*). One sample from the North Basin (from May 28, 2019) exceeded the maximum standard due to a large sewage spill in Percival Creek on the same day that resulted in very high bacteria concentrations in Percival Creek. With the exception of the monitoring event during the spill that impacted the North Basin only, the Middle and North Basin stations had similar concentrations and geometric mean values. The station near the eastern shoreline of the North Basin had elevated bacteria concentrations compared to the other lake stations, but still met water quality standards.

### Key Water Quality Terms

- **Total nitrogen**: A critical nutrient for algae and plant growth, particularly in marine waters.
- **Soluble reactive phosphorous**: A critical nutrient for algae and plant growth, particularly in freshwater lakes.

### Table 3.3.4 Comparison of 2019 Bacteria Concentrations in Capitol Lake to Washington State Surface Water Quality Standards

<table>
<thead>
<tr>
<th>Sample Date</th>
<th>Middle Basin: Fecal Coliform Bacteria (CFU/100 mL)</th>
<th>Middle Basin: E. Coli (CFU/100 mL)</th>
<th>North Basin: Center: Fecal Coliform Bacteria (CFU/100 mL)</th>
<th>North Basin: Center: E. Coli (CFU/100 mL)</th>
<th>North Basin: Shore: Fecal Coliform Bacteria (CFU/100 mL)</th>
<th>North Basin: Shore: E. Coli (CFU/100 mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5/28/2019</td>
<td>16</td>
<td>11</td>
<td>540</td>
<td>335</td>
<td>115</td>
<td>68</td>
</tr>
<tr>
<td>6/26/2019</td>
<td>&lt;10 (2)</td>
<td>&lt;10 (2)</td>
<td>&lt;2 (1)</td>
<td>&lt;2 (1)</td>
<td>&lt;2 (1)</td>
<td>&lt;2 (1)</td>
</tr>
<tr>
<td>7/24/2019</td>
<td>2</td>
<td>2</td>
<td>&lt;2 (2)</td>
<td>&lt;2 (2)</td>
<td>&lt;2 (2)</td>
<td>&lt;2 (2)</td>
</tr>
<tr>
<td>8/22/2019</td>
<td>&lt;2 (2)</td>
<td>&lt;2 (2)</td>
<td>4</td>
<td>4</td>
<td>78</td>
<td>66</td>
</tr>
<tr>
<td>9/24/2019</td>
<td>64</td>
<td>54</td>
<td>7</td>
<td>7</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>10/22/2019</td>
<td>171</td>
<td>171</td>
<td>35</td>
<td>35</td>
<td>44</td>
<td>44</td>
</tr>
<tr>
<td>Geometric Mean</td>
<td>14</td>
<td>13</td>
<td>11</td>
<td>10</td>
<td>43</td>
<td>30</td>
</tr>
<tr>
<td>Geometric Mean Standard (3)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Maximum Standard (3)</td>
<td>200</td>
<td>320</td>
<td>200</td>
<td>320</td>
<td>200</td>
<td>320</td>
</tr>
</tbody>
</table>

Notes:

- **Bold and shaded values** indicate problematic excursions from the standard or Action Level.
- 1. Until recently, the state water quality standards for lakes and rivers (WAC 173-201A-200) used fecal coliform bacteria and *E. coli* as alternative indicators of bacterial contamination. Both were measured during the 2019 monitoring to evaluate lake conditions. As of this year (2021), only *E. coli* bacteria will be used to determine compliance.
- 2. Values with a < indicate that the sample concentration was less than the detection limit.
- 3. WAC 173-201A-200: Table 200 (2)(b) Criteria based on datasets where there are fewer than 10 sample points.

Abbreviation CFU = Colony forming unit
Another potentially important biological component of water quality is algae. As previously described, algae consumes oxygen in the water column during respiration and decomposition. One type of algae (cyanobacteria, or blue-green algae) can cause toxic algal blooms that can result in illness and death in animals and humans if consumed. Monitoring in 2019 indicated that blue-green algae, when present in samples, represented only 5% to 10% of the total algae community. The predominant algae in 2019 were diatoms (not a toxin-producing algae), representing 70% to 95% of the total algae population. In 2004, the lake algae population included one blue-green algal bloom, which occurred in August.

Water Quality in Capitol Lake Compared to Other Local Lakes

Figure 3.3.1 compares average measured conditions in Capitol Lake to other lakes in Thurston County using data from 2010 to 2014. Better water quality is indicated by cooler surface temperatures and higher dissolved oxygen near the lake bottom, while greater algal productivity is indicated by higher total nitrogen and total phosphorous, higher chlorophyll-a concentrations, and lower Secchi depths.

Nearby lakes, Black Lake and Long Lake are similarly eutrophic (i.e., nutrient enriched), while Ward Lake is likely mesotrophic (i.e., moderately nutrient enriched). As shown, Capitol Lake is cooler and has more oxygen than the other lakes. It has higher concentrations of both total phosphorous and total nitrogen; however, other measures indicate there is less algal productivity compared to the other lakes. These differences are likely due to the different hydrodynamics of Capitol Lake: the large inflow from the river and low residence time (i.e., the time it takes to replace the water volume). Capitol Lake is typically well mixed and therefore does not stratify into layers with warm, oxygenated water near the surface and cooler, oxygen-depleted waters at depth as is common in most Puget Sound lowland lakes.
Water Quality in Capitol Lake Compared to the Deschutes River

One of the main objectives of the 2019 data collection effort was to compare BOD, total nitrogen, and TOC between the lake and river to evaluate the extent to which Capitol Lake, rather than the river, primarily: (1) contributes to the delivery of these materials into Budd Inlet, and (2) is a principal contributor to low dissolved oxygen conditions in Budd Inlet. Before this comparison could be made, it was necessary to evaluate the extent to which the 2019 transformer oil spill and/or spill-related activities may have resulted in increases in BOD, total nitrogen, or TOC due directly to the release or movement of additional organic matter that would increase carbon, or due indirectly to increased algae. Based on comparisons between the 2010 to 2014 data and 2019 data, the spills did not appear to have substantial effects on BOD, total nitrogen, and TOC; therefore, the datasets were considered representative for comparisons between Capitol Lake and the inflowing Deschutes River.

Table 3.3.5 compares Deschutes River and Capitol Lake water quality data from monitoring in 2019. As summarized in the table, there was a small decrease in average total nitrogen between the river and lake as
well as decreases in dissolved inorganic nitrogen (DIN). The data also indicate small increases in BOD, total suspended solids (TSS), and TOC between the river and lake but these were generally small in relation to the overall low concentrations measured. Chlorophyll-\(a\) was not measured in the river, but a comparison between the Middle and North Basin results indicates that chlorophyll-\(a\) increases as the water moves from the river through the lake. Thus, the increases in BOD, TSS, and TOC are likely due in part to increased algae growth.

### Nutrients and the Low Dissolved Oxygen in Budd Inlet

Ecology studies and modeling have shown the primary contributing role of nutrients in the depletion of oxygen in Budd Inlet. Phosphorus and nitrogen fuel the growth of algae and aquatic plants (sources of TOC) in Capitol Lake, which consume oxygen when they are decomposed in the lake or in Budd Inlet. The Deschutes River and Capitol Lake are sources of nutrients to Budd Inlet along with other sources and can therefore help to fuel the growth of marine algae that also contributes to oxygen depletion.

### Table 3.3.5 Average Summer Water Quality Conditions in the Deschutes River & Capitol Lake in 2019

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Deschutes River</th>
<th>Middle Basin Surface</th>
<th>North Basin Surface</th>
<th>North Basin Bottom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total phosphorous (mg/L)</td>
<td>0.033</td>
<td>0.031(^{(1)})</td>
<td>0.032(^{(1)})</td>
<td>–</td>
</tr>
<tr>
<td>Soluble reactive phosphorous (mg/L)</td>
<td>0.017</td>
<td>0.014(^{(1)})</td>
<td>0.010(^{(1)})</td>
<td>ND(^{(2)})</td>
</tr>
<tr>
<td>Total nitrogen (mg/L)</td>
<td>0.79</td>
<td>0.65</td>
<td>0.49(^{(1)})</td>
<td>0.51</td>
</tr>
<tr>
<td>Ammonia (mg/L)</td>
<td>–</td>
<td>0.075</td>
<td>&lt;0.056(^{(2)})</td>
<td>&lt;0.030(^{(2)})</td>
</tr>
<tr>
<td>Nitrogen dioxide + nitrate (mg/L)</td>
<td>–</td>
<td>0.42</td>
<td>&lt;0.20(^{(2)})</td>
<td>0.22</td>
</tr>
<tr>
<td>Chlorophyll-(a) ((\mu)g/L)</td>
<td>–</td>
<td>3.83</td>
<td>14.1</td>
<td>10.1</td>
</tr>
<tr>
<td>Pheophytin-(a) ((\mu)g/L)</td>
<td>–</td>
<td>1.7</td>
<td>3.3</td>
<td>3.0</td>
</tr>
<tr>
<td>TSS (mg/L)</td>
<td>1.70</td>
<td>1.81</td>
<td>2.63</td>
<td>2.83</td>
</tr>
<tr>
<td>TOC (mg/L)</td>
<td>1.83</td>
<td>2.22</td>
<td>2.55</td>
<td>2.94</td>
</tr>
<tr>
<td>DOC (mg/L)</td>
<td>–</td>
<td>2.00</td>
<td>2.44</td>
<td>2.10</td>
</tr>
<tr>
<td>BOD (mg/L)</td>
<td>&lt;2.00(^{(2)})</td>
<td>&lt;2.06(^{(2)})</td>
<td>&lt;2.25(^{(2)})</td>
<td>&lt;2.08(^{(2)})</td>
</tr>
</tbody>
</table>

Notes:
1. For these parameters, 2019 data were likely influenced by unusual events and considered unrepresentative of average conditions. In these cases, average values from 2010 to 2014 are shown.
2. SRP data that were collected in 2019 did not represent typical conditions due to extensive spill cleanup efforts.
3. Values with a < indicate the sample set had at least one sample at concentrations less than the detection limit: BOD = 2 mg/L; TSS = 0.5 mg/L; ammonia = 0.01 mg/L; nitrogen dioxide + nitrate = 0.01 mg/L.

Abbreviation: ND = No data
Previous Ecology modeling studies concluded that Capitol Lake increased the load of TOC and decreased the DIN load to Budd Inlet as compared to the river, and these findings are supported by monitoring data. Figure 3.3.2 compares the total nitrogen and DIN concentrations in the river and lake. As shown, the concentrations are consistently lower in the lake during the growing season, and they steadily decrease relative to the river as the growing season progresses. The decrease in DIN over the growing season has been attributed to uptake by plants and algae in the lake.

![Figure 3.3.2 2004 Total Nitrogen and DIN Concentrations in the Deschutes River near Tumwater Falls & the North Basin of Capitol Lake](image)

The conversion of DIN into algae and aquatic plants in the lake corresponds to higher TOC concentrations in the lake relative to the river (Figure 3.3.3). During each monitoring year, the notable peaks in TOC in late summer (2004) or fall (2019) were attributed to aquatic plant die-off; 2004 was not a typical year for plant die-off because of two herbicide applications in the summer to kill aquatic plants. The herbicide applications resulted in nearly immediate die-off of most of the plants, resulting in a large release of TOC in a short period of time in mid-summer (Figure 3.3.3). Under natural conditions, aquatic plants would die off slowly over an extended period in late summer and fall, similar to the timing of increased TOC as observed in 2019 (Figure 3.3.3).
Note:
The red line indicates the approximate total organic carbon under the Estuary Alternative, reflective of modeled conditions without the 5th Avenue Dam in place during summer months in 1997. This corresponds to the modeled estimate of 5 mg/L of total organic carbon with the 5th Avenue Dam in place.

These monitoring results and previous studies indicate that Capitol Lake may increase the load of TOC to Budd Inlet, but decrease the load of total nitrogen and DIN when compared to the Deschutes River input without the lake. While the differences in nitrogen between the river and lake are clear, there is less distinction in TOC concentrations. While TOC in the lake is consistently higher than the river through most of the summer, they are both generally low overall (below 3 mg/L), with the important exception of the peak that occurs in the lake during late summer or early fall due to plant die-off.

Although an increase in TOC was noted in the lake, there were no concurrent increases in BOD. As described in Section 4.1.1.4 of the Water Quality Discipline Report (Attachment 7), BOD concentrations measured in 2019 were quite low in comparison to TOC concentrations in both the lake and the river; therefore, the TOC is largely made up of organic matter that is resistant to rapid decomposition. This observation implies that the decomposition of organic matter likely occurs very slowly in Budd Inlet, and it may not be contributing much to summer oxygen depletion. In summary, while Capitol Lake results in a modest increase in TOC to Budd Inlet, this TOC may not be exerting an
immediate or substantial oxygen demand in the inlet during the critical summer months.

**Sediment Quality in Capitol Lake**

In some lakes, sediments are a major source of nutrients for aquatic plants or algae. Sediments may also contain toxic constituents accumulated over many years that can be harmful to aquatic life. When sediments are disturbed by dredging or other activities, nutrients and chemicals may reenter the water and stimulate algal blooms or cause harm to fish and plankton.

Sediment samples were collected from the Middle and North Basins of Capitol Lake by the EIS Project Team in March 2020 and analyzed for multiple chemicals of potential concern, including metals, organic chemicals (e.g., petroleum hydrocarbons), and phosphorous. Samples were collected from near the sediment surface, from the depth ranges proposed for dredging, and from deeper sediments that would become the new sediment surface after dredging. Sediment quality was found to be generally good with low chemical concentrations in all three layers of both sampled lake basins. No organic chemicals were found to exceed sediment management standards. Except for lead, metals were generally either not detected or detected at low concentrations. The only criterion exceeded was the freshwater Cleanup Screening Level (CSL) for total sulfides protective of benthic invertebrates. High sulfide concentrations are common in lake sediments due to microbial decay of natural organic matter present in algae and aquatic plants.

The amount of bioavailable phosphorus for potential release and algal uptake in the lake is higher in surface sediments in the North Basin than the Middle Basin and much lower in buried sediments that could become exposed by dredging. See Section 3.11.2 for more information on existing sediment quality.

**Capitol Lake Water and Phosphorus Budgets**

Water and total phosphorous budgets were developed to quantify sources of total phosphorous to the lake. The budgets were developed using data from water years 2008 to 2012, as this was the most recent 5-year period containing data for all major sources (e.g., both rivers and lake). A water budget is necessary to develop a budget for phosphorus, an important nutrient that can control algae productivity in Capitol Lake, which in turn contributes to the TOC that is part of the oxygen depletion process in Budd Inlet.
The results of both the water and total phosphorous budgets are described in Section 4.1.3 of the Water Quality Discipline Report (Attachment 7). In many lakes, internal loading of phosphorus from sediments is a substantial source of summer total phosphorous. In Capitol Lake, the high dissolved oxygen and relatively low phosphorus concentrations measured in the bottom waters indicate that loading from sediments is negligible, which is also a finding of the phosphorus budget. Total phosphorous discharged over the dam represents a large portion of the total phosphorous loss during summer. Sedimentation (i.e., loss) of total phosphorous in Capitol Lake appears to be largely a function of the load of phosphorus entering the lake from the Deschutes River.

In summary, the total phosphorus budget found that 96% of the phosphorus entering Capitol Lake during the summer growing season comes from the Deschutes River and Percival Creek, and 79% of phosphorus exits the lake via the tide gate outlet while 21% is retained in lake sediments. Water and sediment budgets support the notion that the Deschutes River strongly influences Capitol Lake physically and ecologically.

3.3.4 What modeling studies have been performed in the study area?

There have been several modeling studies of the Deschutes River over the past 10 to 15 years. Although they have primarily focused on the river and its watershed, each has predictions and assumptions that help with understanding existing conditions in Capitol Lake and Budd Inlet. The findings and model predictions related to both Capitol Lake and Budd Inlet are described further in Section 3.3.1.2 of the Water Quality Discipline Report (Attachment 7). A TMDL is currently being prepared for Budd Inlet that will address loadings and allocations associated with Capitol Lake and will likely supersede some of the findings from the studies summarized here; however, the date of issuance for the Budd Inlet TMDL is unknown but anticipated in mid-2022.

3.3.4.1 What were the findings of the Deschutes River TMDL Water Quality Study?

In 2012, Ecology issued a Deschutes River, Capitol Lake, and Budd Inlet Temperature, Fecal Coliform Bacteria, Dissolved Oxygen, pH, and Fine Sediment Total Maximum Daily Load Technical Report: Water Quality Study Findings Report. The primary goal of the study was to provide the technical basis to support development of Deschutes River TMDL allocations designed to move the river toward compliance with water
quality standards. The water quality analytes addressed by the TMDL include fecal coliform bacteria, temperature, dissolved oxygen, pH, and fine sediment. The study used historical data, as well as supplemental data collected from July 2003 to December 2004, to develop an analytical model of river water quality.

The supplemental data collected represent the only recent comprehensive dataset for some of the analytes such as TOC, BOD, and DIN that are critical to model predictions. As documented in the study, an herbicide treatment was performed in the summer of 2004 to eliminate Eurasian watermilfoil. This treatment resulted in an immediate die-off of a large stand of the Eurasian watermilfoil as well as other aquatic plants. The resultant decomposition would have increased TOC and nutrients and produced immediate algae growth in the lake, as was noted by the researchers. Nutrient and TOC concentrations were likely affected throughout the summer. As documented in the same study, the aquatic plant biomass grew back entirely over the summer and therefore was present to decompose in the fall, and again result in TOC release from the lake. Thus, the magnitude and seasonal relationships for nutrient and TOC discharges to Budd Inlet in 2004 were not representative of a typical year.

The TMDL Water Quality Study Findings served as a precursor to future studies because it calibrated and validated the water quality model for the mainstream Deschutes River as well as a model applied to Capitol Lake. Although the focus of the TMDL was the Deschutes River, Capitol Lake and Budd Inlet were also modeled under current conditions and with removal of the dam.

The TMDL Water Quality Study Findings Report concluded that the combined effects of nonpoint and point sources of pollutant loads from the Deschutes River Watershed exceed the pollutant loading capacity of Budd Inlet and Capitol Lake for nutrients, and reductions in pollutant load were required to meet water quality standards for dissolved oxygen in Budd Inlet.

### 3.3.4.2 Deschutes River TMDL

Following Ecology’s development of a TMDL for multiple water quality indicators in the Deschutes River and other Budd Inlet tributaries, USEPA revised and reissued the TMDL in 2020. These documents and supplemental water quality modeling by Ecology provide information that informs our understanding of existing conditions in Capitol Lake and Budd Inlet.
In 2015, Ecology released the Deschutes River, Percival Creek, and Budd Inlet Tributaries TMDL. The parameters assessed in the TMDL included fine sediment, bacteria, dissolved oxygen, pH, and temperature. In 2018, the USEPA disapproved some portions of the TMDL and then released a revised version in 2020; the revised version from USEPA is the source of information provided in this section unless otherwise indicated.

For this assessment, the TMDL results are primarily of interest for characterizing the quality of water entering Capitol Lake. The TMDL also identifies upstream sources of pollutants that need to be controlled to improve water quality downstream in Capitol Lake and Budd Inlet (e.g., municipal stormwater, hatchery effluent, industrial and construction stormwater, sand and gravel operations). To improve dissolved oxygen levels, the TMDL set allocation targets for total nitrogen and total phosphorous.

The Deschutes River and Percival Creek currently comprise 86% and 9% of the summer total phosphorous load to Capitol Lake, respectively. By replacing the existing concentrations of total phosphorous in these streams with the target concentrations recommended by the TMDL, the summer load of total phosphorous from these sources would decrease by over 30%. If achieved, this decrease would result in significant changes in water quality in Capitol Lake. Based on limited summer 2019 monitoring, average total nitrogen concentrations in the Deschutes River are already very near the target set by the TMDL. Implementation of the TMDL is predicted to contribute to the continuation of declines in phosphorus in the lake and an improvement in lake water quality conditions in the future.

### 3.3.4.3 Supplemental Scenarios for the Deschutes River TMDL

Ecology performed additional modeling to evaluate 15 different management scenarios for Budd Inlet. The model focused on nitrogen because it typically drives algae production in marine waters, and algae production and decomposition in Budd Inlet is believed to be the major driver of low dissolved oxygen there. The model also focused on TOC as an indicator of organic matter that, when decomposed, contributes to dissolved oxygen depletion.

Relevant to understanding existing conditions, the model attributed dissolved oxygen depletion in Budd Inlet to the 5th Avenue Dam due to a combination of factors:
- The 5th Avenue Dam creates a pulsed flow that alters circulation in southern Budd Inlet.
- The 5th Avenue Dam and Capitol Lake alter concentrations and loads of carbon.
- The 5th Avenue Dam and Capitol Lake alter concentrations and loads of nitrogen. The assimilation of inorganic nitrogen by freshwater plants (e.g., phytoplankton) in Capitol Lake, with resultant production of TOC, alters discharges to Budd Inlet.

The model assumes that much of the DIN is converted to organic nitrogen in plants and algae as the water moves through Capitol Lake. The model predictions for the DIN load to Capitol Lake and impacts on Budd Inlet are supported by 2 years of monitoring data collected by Ecology (2003 and 2004). Figure 3.3.2 shows concentrations of total nitrogen and DIN in the Deschutes River and Capitol Lake as measured in 2004. Generally, the concentrations of nitrogen were higher in the Deschutes River than in Capitol Lake. Similarly, in 2019 (Table 3.3.5), the mean total nitrogen concentration in Capitol Lake was only 62% of what was measured in the Deschutes River.

Monitoring data and model results both support a conclusion that Capitol Lake decreases the total nitrogen and DIN load to Budd Inlet during the summer; therefore, removal of the dam would increase the total nitrogen and DIN load to Budd Inlet. Increased DIN load would supply additional nutrients for algal production in Budd Inlet.

### 3.3.1.2 Budd Inlet

The hydrodynamics of Budd Inlet are dominated by tidal exchange but are also influenced by inflow from the Deschutes River and Capitol Lake. In Budd Inlet, 75% of the water originates from Puget Sound, and the remaining 25% is from freshwater sources. Budd Inlet has a relatively short residence time (the average time dissolved or suspended matter resides in an estuary), ranging from 8 to 12 days. The rate of discharge over the 5th Avenue Dam is highly variable and depends on Deschutes River discharge. On some days, no water is released; on other days, high volumes of water are released for several hours. The combination of tides and Capitol Lake inflow support a counterclockwise circulation pattern within Budd Inlet.

Water circulation and water quality in Budd Inlet have been altered by the filling of much of the historic estuary (the Port of Olympia peninsula and much of downtown Olympia are part of the historic estuary), the
5th Avenue Dam, Puget Sound conditions, point and nonpoint sources of pollution, and watershed modifications. Studies over the past 20 years or more have focused on the relative importance of many of these factors and how they influence the low dissolved oxygen problems in much of Budd Inlet.

Information on existing conditions in Budd Inlet relevant to evaluating potential project effects include data from water quality monitoring and sediment quality studies, and water quality modeling used to predict dissolved oxygen conditions under different scenarios with or without the 5th Avenue Dam.

3.3.5 How is existing water quality in Budd Inlet evaluated?

Existing water quality in Budd Inlet is characterized by comparing monitoring data to water quality standards, comparing water quality conditions in Budd Inlet to other inlets and embayments in Puget Sound, and summarizing nutrient loading information from a previous study.

3.3.5.1 How does the water quality compare to water quality standards?

The current conditions of Budd Inlet were evaluated using data collected from Ecology’s Marine Waters Monitoring program at two stations in Budd Inlet: BUD005 (outer inlet) and BUD002 (inner inlet) (Figure 3.3.4).

The water quality standards designate two categories for protection of aquatic life in Budd Inlet. Inner Budd Inlet (south of Priest Point) is categorized as “good quality,” whereas waters north of Priest Point are categorized as “excellent quality,” with each category having different water quality standards. For dissolved oxygen, there are two parts to the standards: the first are 1-day minimum dissolved oxygen criteria that apply to most marine waters (5.0 mg/L minimum in inner Budd Inlet and 6.0 mg/L minimum in outer Budd Inlet). However, the developers of the state standards recognized that many marine waters, including the long narrow inlets that comprise much of South Puget Sound, have naturally low dissolved oxygen concentrations that are all below the criteria. For these areas, a second part to the standard was developed to limit the amount of decrease in dissolved oxygen that could be caused by human activity. In both parts of Budd Inlet, water quality standards apply that limit human-caused dissolved oxygen depletion to no more than 0.2 mg/L.
For consistency with the evaluation of existing conditions presented for Capitol Lake (Section 3.3.3.1), water quality characteristics from the same period (May through October from 2010 to 2014) are presented for Budd Inlet (Table 3.3.6). Temperature, dissolved oxygen, and pH are typically the worst in summer to early fall, making it an important period for evaluation. For this date range, only data collected in 2014 were available for the BUD002 site.
Figure 3.3.4 Areas of Interest to Water Quality Discipline Study

Legend
- Freshwater monitoring station
- Marine monitoring station
Both Ecology monitoring stations exceeded (did not comply with) the water quality standards for temperature and dissolved oxygen, and the Outer Budd Inlet site (BUD005) also exceeded the pH standard (Table 3.3.6). Inner Budd Inlet experiences consistently lower dissolved oxygen than outer Budd Inlet.

**Table 3.3.6 Comparison of Budd Inlet Water Quality with Applicable Standards (May through October)**

<table>
<thead>
<tr>
<th>Station</th>
<th>Parameter</th>
<th>Mean</th>
<th>Median</th>
<th>Min</th>
<th>Max</th>
<th>Standard (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUD002 Inner Budd Inlet (2014)</td>
<td>Temp. (°C)</td>
<td>13.97</td>
<td>13.47</td>
<td>10.94</td>
<td><strong>19.64</strong></td>
<td>19</td>
</tr>
<tr>
<td>BUD002 Inner Budd Inlet (2014)</td>
<td>Top dissolved oxygen (mg/L) (2)</td>
<td>7.21</td>
<td>6.10</td>
<td><strong>1.97</strong></td>
<td>13.54</td>
<td>5.0</td>
</tr>
<tr>
<td>BUD002 Inner Budd Inlet (2014)</td>
<td>Bot. dissolved oxygen (mg/L) (2)</td>
<td>6.55</td>
<td>5.82</td>
<td><strong>3.05</strong></td>
<td>10.66</td>
<td>5.0</td>
</tr>
<tr>
<td>BUD002 Inner Budd Inlet (2014)</td>
<td>pH</td>
<td>7.55</td>
<td>7.53</td>
<td>7.21</td>
<td>8.04</td>
<td>7.0–8.5</td>
</tr>
<tr>
<td>BUD005 Outer Budd Inlet (2010–2014)</td>
<td>Temp. (°C)</td>
<td>13.37</td>
<td>13.56</td>
<td>9.00</td>
<td><strong>19.36</strong></td>
<td>16</td>
</tr>
<tr>
<td>BUD005 Outer Budd Inlet (2010–2014)</td>
<td>Top dissolved oxygen (mg/L) (2)</td>
<td>10.23</td>
<td>9.95</td>
<td><strong>5.10</strong></td>
<td>18.08</td>
<td>6.0</td>
</tr>
<tr>
<td>BUD005 Outer Budd Inlet (2010–2014)</td>
<td>Bot. dissolved oxygen (mg/L) (2)</td>
<td>7.49</td>
<td>6.99</td>
<td><strong>4.83</strong></td>
<td>12.80</td>
<td>6.0</td>
</tr>
<tr>
<td>BUD005 Outer Budd Inlet (2010–2014)</td>
<td>pH</td>
<td>7.83</td>
<td>7.82</td>
<td>7.14</td>
<td><strong>8.87</strong></td>
<td>7.0–8.5</td>
</tr>
</tbody>
</table>

**Notes:**
- **Bold and shaded values** indicate problematic excursions from the standard or Action Level.
- 1. WAC 173-201A-210 for “excellent” and “good” water quality criteria for BUD005 and BUD002, respectively.
- 2. Top: 0.0–6.0 m depth; Bottom: 6.5–12 m depth.

Based on mean concentrations, results from the Budd Inlet monitoring stations indicate that surface dissolved oxygen concentrations were more than 3 mg/L lower in inner Budd Inlet than in the outer inlet.
Dissolved oxygen problems normally occur late summer to early fall at both stations.

At the outer station (BUD005), dissolved oxygen appears to be plentiful in the upper portions of the water column most of the time, although the minimum value measured (5.1 mg/L dissolved oxygen) was less than the 6.0 mg/L criterion. In the lower portion of the water column, concentrations were also less than the criterion starting in July and lasting through November. At the inner station (BUD002), dissolved oxygen concentrations were much lower. The period of low dissolved oxygen in the deeper waters below the minimum dissolved oxygen criterion of 5.0 mg/L is shorter than at the outer station, but this difference is primarily a function of the lower dissolved oxygen criterion that applies in inner Budd Inlet (see Figure 4.15 in Water Quality Discipline Report).

Nutrient and chlorophyll-a data from Ecology’s ambient monitoring for the Budd Inlet sites, summarized in the Water Quality Discipline Report (Attachment 7), indicate that the two stations have similar nutrient concentrations that do not vary substantially between depths, indicating well-mixed conditions. Chlorophyll-a concentrations appear to be higher at the outer station (BUD005) based on average values, and the outer station experiences substantially higher maximum concentrations.

3.3.5.2 How does Budd Inlet compare to other South Puget Sound inlets?

Figure 3.3.5 provides context for dissolved oxygen conditions in Budd Inlet relative to other inlets and embayments in Puget Sound, as predicted by Ecology’s Salish Sea model. The figure shows the predicted number of days and areas in Puget Sound that would not meet dissolved oxygen water quality standards during 2006, 2008, and 2014. Budd Inlet, along with most inlets in South Puget Sound, frequently violate the water quality standard for dissolved oxygen. The model shows that Budd Inlet has a relatively high maximum daily depletion of dissolved oxygen due to anthropogenic sources when compared to other South Puget Sound inlets. These model results also indicate that the low dissolved oxygen issues of Budd Inlet are not atypical for inlets in South Puget Sound and they also emphasize the importance of the Deschutes River in moderating dissolved oxygen conditions in Budd Inlet.
Figure 3.3.5 was generated by Ecology’s Salish Sea model, and the predicted dissolved oxygen depletions are less than those predicted by Ecology’s Budd Inlet model. Ecology considers the Budd Inlet model to be more accurate for predicting conditions in Budd Inlet. However, the relationships among inlets are assumed to be similar even if the values shown for Budd Inlet are not directly comparable between the models.

### 3.3.5.3 Nutrient Loading to Budd Inlet

Nutrient loading to Budd Inlet was documented by LOTT in 1998. DIN was specifically analyzed because it fuels algae growth and subsequently results in decreased dissolved oxygen concentrations as the algae die and decompose. Sources of DIN calculated in the LOTT study are summarized in Table 3.3.7. Focusing on the summer months, which is the period of concern for low dissolved oxygen, nutrient loading
estimates show that Puget Sound was by far the largest contributor of DIN to Budd Inlet and that the load from sediments was the next largest source. Combined, these two major sources were predicted to contribute all but 3% to 14% of the summer DIN load to Budd Inlet. Both Capitol Lake and LOTT are predicted to have a larger influence in inner Budd Inlet compared to the entire inlet, where combined they were predicted to contribute 5% to 22% of the summer DIN load.

Table 3.3.7 Percent of Total DIN Loading to Budd Inlet by Source & Season

<table>
<thead>
<tr>
<th>Source</th>
<th>Whole Inlet: Winter</th>
<th>Whole Inlet: Summer</th>
<th>Inner Inlet: Winter</th>
<th>Inner Inlet: Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puget Sound</td>
<td>78–83%</td>
<td>60–84%</td>
<td>73–78%</td>
<td>47–82%</td>
</tr>
<tr>
<td>Sediments</td>
<td>2–11%</td>
<td>6–34%</td>
<td>0.4–6.0%</td>
<td>0.7–37%</td>
</tr>
<tr>
<td>Capitol Lake</td>
<td>7–11%</td>
<td>1–8%</td>
<td>12–17%</td>
<td>3–14%</td>
</tr>
<tr>
<td>LOTT</td>
<td>2–5%</td>
<td>1–3%</td>
<td>3–7%</td>
<td>2–8%</td>
</tr>
<tr>
<td>Other Inputs</td>
<td>1–2%</td>
<td>1–3%</td>
<td>1–2%</td>
<td>1–5%</td>
</tr>
</tbody>
</table>

Winter: November–January; Summer: July–September.

3.3.6 What is the sediment quality in Budd Inlet?

Sediments can release nutrients and other chemicals into the water column, affecting water quality. Sediment quality criteria include thresholds for effects on benthic (i.e., bottom-dwelling) marine life and criteria to protect human and ecological health from harmful exposures to bioaccumulative chemicals (e.g., dioxins and carcinogenic hydrocarbon chemicals that become more concentrated moving up the food chain). Based on recent studies, sediment chemical concentrations generally do not exceed Sediment Management Standards (SMS) and DMMP criteria for marine benthic toxicity in West Bay of Budd Inlet except for a few chemicals in some samples collected near stormwater outfalls in marinas and at the Port of Olympia along the eastern shoreline of West Bay. Additional information can be found in Section 3.1, Hydrodynamics and Sediment Transport, Section 3.11, Environmental Health, and the Sediment Quality Discipline Report (Attachment 15). In general, lower concentrations of organic chemicals and metals were found in the central and southwest areas of West Bay. Generally, sediment quality in Budd Inlet has not met human and ecological health criteria for bioaccumulative chemicals in West Bay. Some carcinogenic hydrocarbons slightly exceed regional background levels and may increase risks to wildlife and people.

The benthic invertebrate community in West Bay is currently impacted from the high organic matter content of surface sediments, not the low
chemical concentrations. The average TOC concentration in Budd Inlet sediments is 3.7%, which slightly exceeds the typical range of 0.5% to 3.5% for Puget Sound.

3.3.7 How were potential human-caused impacts to water quality in Budd Inlet evaluated?

The most detailed information on existing conditions in Budd Inlet relevant to the project is from Ecology's Deschutes River, Capitol Lake, and Budd Inlet TMDL Study (2015). This Ecology model was used to predict current and natural conditions in Budd Inlet and evaluate various scenarios to quantify the effects of different anthropogenic sources on dissolved oxygen in Budd Inlet. The results focused largely on predicting the magnitude of human-caused dissolved oxygen depletion in comparison to the modeled natural conditions. Model outcomes for both the cumulative effects of all human-caused influences and for effects attributed solely to the presence of the 5th Avenue Dam are described under the evaluation of long-term water quality impacts (see Section 4.3, Water Quality).

3.3.8 How would existing water quality in the Project Area be summarized?

Capitol Lake is a small, eutrophic (i.e., biologically productive) waterbody that experiences dense aquatic plant growth and algal blooms typical of many lowland lakes in Puget Sound. Conditions in Capitol Lake are strongly influenced by inflows from the Deschutes River, which result in rapid flushing of the lake and well-mixed water. Monitoring indicates improving trends in water quality in the Deschutes River and Capitol Lake. Capitol Lake does not meet all applicable water quality standards; relative to other lakes in the region, however, Capitol Lake exhibits comparable or better water quality (based on temperature, dissolved oxygen, and chlorophyll-a levels).

Budd Inlet is also a productive system that supports extensive algal blooms. Dissolved oxygen is routinely less than the numeric minimum criteria (primarily in the bottom waters) at both the outer and inner Budd Inlet monitoring stations in the summer and early fall. To a large extent, the low dissolved oxygen is a natural condition that occurs in other inlets and embayments in South Puget Sound. The water quality standards acknowledge that dissolved oxygen concentrations may be naturally low, and in those cases the water quality standards are aimed at limiting human-induced sources of dissolved oxygen depletion. The standards allow for a human-induced dissolved oxygen depletion of no more than 0.2 mg/L. Ecology modeling has indicated that human-
induced sources in Budd Inlet are responsible for up to 3.1 mg/L of dissolved oxygen depletion (based on worst-case in East Bay), and therefore Budd Inlet does not meet the applicable water quality standard.

Recent modeling by Ecology has indicated that Capitol Lake and the 5th Avenue Dam are the primary cause of human-induced depletion of dissolved oxygen in Budd Inlet, and that they may account for up to 1.8 mg/L of depletion (based on the worst-case location in East Bay from Ecology’s model). The Ecology model attributes dissolved oxygen depletion from Capitol Lake to altered circulation caused by operations of the 5th Avenue Dam but more so due to loading of carbon from Capitol Lake. For Capitol Lake, Ecology's model results indicated that “the production and decomposition of organic carbon is the process that is most responsible for depletion of dissolved oxygen in Budd Inlet.”

Monitoring data summarized above and Ecology’s model both indicate that DIN is higher in the Deschutes River compared to Capitol Lake. Conversely, the data and model also indicate that TOC is lower in the Deschutes River compared to Capitol Lake. This relationship is likely a result of the uptake of inorganic nitrogen by algae growth in Capitol Lake that then increases TOC, which is eventually discharged to Budd Inlet. Ecology’s model predictions for scenarios looking at removal of the 5th Avenue Dam are described in the section evaluating long-term water quality impacts of alternatives (see Section 4.3, Water Quality).

3.4 AQUATIC INVASIVE SPECIES

Aquatic invasive species (AIS) are non-native plants and animals that rely on the aquatic environment for a portion of their life cycle and can spread to new aquatic areas, causing economic or environmental harm.

The study area for AIS includes the Capitol Lake Basin, Percival Creek up to US Highway 101, the Deschutes River upstream of Tumwater Falls, and West Bay extending north from the 5th Avenue Dam to the southern end of Priest Point Park near the mouth of Mission Creek (47 07’N). This area is based on the local aquatic resources where AIS could be directly affected by the project and does not include distant waterbodies where AIS potentially could be transported to by project-related activities.

Capitol Lake has a well-documented presence of AIS including plants, invertebrates, fish, waterfowl, and aquatic mammal species. The presence of AIS has resulted in closure of Capitol Lake to all water-based use.
Methods for Studying Aquatic Invasive Species

An extensive literature review was conducted to evaluate AIS in the study area. Information was derived from existing management plans (e.g., vegetation management, annual reports of aquatic weed treatments, and recommendations for invasive species treatments), surveys that have been conducted to monitor the presence and distribution of AIS in Capitol Lake, databases on invasive species, and research papers and studies that focused on detection, species biology, population fluctuations, transport and spread, and treatment options and effectiveness.

For further information on data sources, see the Aquatic Invasive Species Discipline Report (Attachment 8).

3.4.1 What AIS species are discussed in the EIS?

Although there are numerous species of plant and animal AIS in Capitol Lake and within the study area, the EIS focuses on the four high-priority AIS in the Capitol Lake Basin: purple loosestrife, Eurasian watermilfoil, New Zealand mudsnail, and nutria (refer to Table 3.4.1). This section provides a summary of their documented presence in the study area, the ecological impact of their presence, and previous and current management efforts to control their presence and spread. For more detailed information on the full analysis of the high-priority AIS, including additional tables and figures, refer to the Aquatic Invasive Species Discipline Report, provided as Attachment 8.

For a brief summary of the non-high priority AIS within the study area, which include plants, invertebrates, fish, waterfowl, and aquatic mammal species, refer to Section 3.4.3. These species are discussed in full detail in the Aquatic Invasive Species Discipline Report (Attachment 8).

How many AIS exist in Capitol Lake?

Fifteen different AIS have been documented in Capitol Lake in recent survey efforts. These include:

- 3 emergent plant species
- 1 floating leaved plant
- 2 submersed plant species
- 3 invertebrates
- 4 fish species
- 1 waterfowl
- 1 mammal
### Table 3.4.1 High Priority Aquatic Invasive Species Observed in the Study Area

<table>
<thead>
<tr>
<th>Scientific/ Common Name</th>
<th>State Status (1)</th>
<th>Waterbody</th>
<th>Relative Abundance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquatic Invasive Plant: Lythrum salicaria Purple loosestrife</td>
<td>Class B High Priority</td>
<td>Capitol Lake, Deschutes River, Budd Inlet</td>
<td>High in the South Basin and Percival Cove; low in the Middle and North Basins</td>
</tr>
<tr>
<td>Aquatic Invasive Plant: Myriophyllum spicatum Eurasian watermilfoil</td>
<td>Class B High Priority</td>
<td>Capitol Lake</td>
<td>Moderate in South Basin, Middle Basin, and Percival Cove; low in North Basin</td>
</tr>
<tr>
<td>Aquatic Invasive Animal: Potamopyrgus antipodarum New Zealand mudsnail</td>
<td>Prohibited High Priority</td>
<td>Capitol Lake</td>
<td>20,000 snails per square meter in limited areas of the North Basin</td>
</tr>
<tr>
<td>Aquatic Invasive Animal: Myocastor coypus Nutria</td>
<td>Prohibited High Priority</td>
<td>Capitol Lake</td>
<td>Fewer than 25 animals</td>
</tr>
</tbody>
</table>

Note:
1. Washington State Noxious Weed Class (WNWCB 2020) or High Priority Invasive Species (WISC 2020c).

### 3.4.2 What are the high-priority invasive plants in the study area?

#### 3.4.2.1 Purple Loosestrife

Purple loosestrife (*L. salicaria*) is a non-native emergent species typically found in freshwater and brackish wetlands, along streams, and in other wet areas. It has narrow, lance-shaped leaves; showy purple flowers that occur in erect spikes at the top of stems from late June through October; and a rhizomatous growth pattern.

The plant is a vigorous grower that spreads by rhizomes or by seed. Purple loosestrife forms dense colonies that outcompete native plant species and provide minimal wildlife habitat. These dense colonies can also be detrimental to aesthetics and inhibit access to shorelines for recreation. Management of purple loosestrife is a costly effort requiring repeated monitoring and removal efforts to prevent its spread. The seeds can be viable for several years.

#### Current Distribution of Purple Loosestrife within the Study Area

Purple loosestrife was first discovered in Capitol Lake in 1986. Figure 3.4.1 presents the most current map of purple loosestrife distribution in the study area, as of 2018. Observation points and areas...
where purple loosestrife was observed are colored in purple. Purple loosestrife was most abundant in the South Basin but was present along the shorelines of all three basins, at the Interpretive Center wetland areas, and Percival Cove. Only one plant was observed in the North Basin, and no plants were observed along the east shoreline of the Middle Basin.

Although purple loosestrife is a high-priority species based on its aggressive growth and potential impacts on native species, it is not likely significantly impacting native wildlife or recreation in and around the Capitol Lake Basin based on its current abundance and the emergent plant diversity.

**Management of Purple Loosestrife**

Over the years, the Thurston County Noxious Weed Control Board and the Washington State Department of General Administration (GA; now Enterprise Services) have employed numerous mitigation efforts to decrease the spread of purple loosestrife in Capitol Lake.

Starting in 1989, removal techniques such as flowerhead removal, aquatic herbicide treatment, impacted soil removal, and beetle application were conducted. In general, although the presence of purple loosestrife would sometime decrease after treatment, the lack of continuity in treatments from year to year and the lack of monitoring after control efforts were implemented limited the understanding of the efficacy of management actions.

In 2001, under direction from the CLAMP Steering Committee, the Capitol Lake Integrated Purple Loosestrife Management Plan was adopted, which established the goal to eradicate purple loosestrife from Capitol Lake and adjacent areas. In this plan, a combination of monitoring, public education, chemical control with glyphosate spot-treatment, biological controls (insect introductions), and manual removal were recommended.

Since 2001, the primary methods to remove purple loosestrife have been through the application of glyphosate and later, application of the herbicide imazapyr and seed head removal. The populations and densities of purple loosestrife have decreased and increased throughout Capital Lake since 2001. In 2019, continued use of surveys, seed head removal, and imazapyr treatments was recommended for future years because purple loosestrife has continued to persist throughout the basin. Surveys conducted in 2016, 2017, and 2018 indicate density and numbers of purple loosestrife have stabilized.

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**Purple Loosestrife**

Purple loosestrife is a wetland plant native to Europe and Asia that was brought to North America in the early 19th century. This highly invasive plant was likely introduced when its seeds were included in soil used as ballast in European sailing ships and discarded in North America. It reproduces primarily by seed. Each plant may produce up to 2.7 million seeds annually. It can also spread through stem cuttings and root fragmentation. The seeds can be viable for several years, but because the seeds are small and carry little food reserves, germination must occur when photosynthesis can occur immediately.
Figure 3.4.1 Purple Loosestrife Distribution in Capitol Lake in 2018

Legend
- Study Area
- Purple Loosestrife
3.4.2.2 **Eurasian Watermilfoil**

Eurasian watermilfoil (*M. spicatum*) grows submersed below water surfaces. The plant has feather-like underwater leaves, emergent flower spikes, and many fibrous roots. Roots may form on broken plant fragments, enabling the plant to spread by plant fragments in addition to spreading by rhizomes. The abundance of viable plant fragments allows this plant to rapidly spread and colonize new areas and it commonly forms dense, thick mats early in the growing season due to its rapid growth rate of up to 1 foot per week. These mats reduce sunlight and oxygen in underlying waters, which degrade water quality, outcompete native vegetation, decrease habitat quality for native fish species, and inhibit recreational activities. Management of Eurasian watermilfoil is costly, requiring repeated monitoring and removal efforts to prevent its spread.

**Current Distribution of Eurasian Watermilfoil within the Study Area**

The Eurasian watermilfoil was first reported in Capitol Lake in September 2001. Figure 3.4.2 presents the most current map of Eurasian watermilfoil distribution in the study area, as of 2018. Observation points and areas where Eurasian watermilfoil was observed are colored in brown. Individual plants and patches of plants were observed in all three basins, the Interpretive Center wetland areas, and Percival Cove. The large patch observed in the North Basin adjacent to the 5th Avenue Dam had not been observed in previous surveys. Although Eurasian watermilfoil is a high-priority species based on its aggressive growth and potential impact on native species, it is likely not significantly impacting native wildlife or recreation in and around the Capitol Lake Basin based on its current abundance and the aquatic plant habitat diversity.
Figure 3.4.2 Eurasian Watermilfoil Distribution in Capitol Lake in 2018

Legend
- Study Area
- Eurasian Watermilfoil
Native submersed plants currently impact the ability of maintenance vessels to navigate within Capitol Lake in summer, because they grow up to the water surface over most of the lake area. This dense vegetation is coontail (*Ceratophyllum demersum*) not Eurasian watermilfoil.

**Management of Eurasian Watermilfoil**

Similar to the purple loosestrife, numerous management efforts have been employed to decrease the spread of Eurasian watermilfoil in the study area.

Shortly after Eurasian watermilfoil was discovered in Capitol Lake, the CLAMP Steering Committee adopted an Invasive Aquatic Vegetation Management Plan in 2002 that included application of an herbicide triclopyr and subsequent monitoring to determine whether it was successful.

In 2004, triclopyr was applied to Eurasian watermilfoil throughout the study area. The Washington State Department of Agriculture monitored the application process and noted that triclopyr was effective in killing Eurasian watermilfoil, and it dissipated quickly, and did not harm native aquatic vegetation.

In 2005, the GA would periodically monitor and remove observed plants manually using contracted divers, equipped with a water vacuum to capture any floating fragments.

From 2007 to 2018, Eurasian watermilfoil was surveyed annually and removed manually by a boat and/or snorkel team. In 2007, 1,386 plants were removed from the South and Middle Basins. The number of plants removed from these basins decreased annually thereafter, with only six plants requiring removal in 2013 and 2014. However, the number of plants removed then increased each year up until 2018 when 105 plants required removal.

Other control strategies were employed throughout the study area, such as biocontrol (i.e., through application of the watermilfoil weevil) and installation of bottom barriers. However, neither method was very successful in controlling the spread of the Eurasian watermilfoil over time. Barriers installed on the lake bed were initially thought to be effective but require ongoing maintenance because they are susceptible to displacement, degradation, and sediment accumulation.

How pervasive can Eurasian watermilfoil be in the environment?

In 2009, only one Eurasian watermilfoil plant was reported in Capitol Lake (in Percival Cove). Between 2012 and 2013, approximately 4,820 pounds of Eurasian watermilfoil were removed by divers, indicative of the fast rate of spread for Eurasian watermilfoil.
3.4.3 What are the high-priority invasive animals in the study area?

3.4.3.1 New Zealand Mudsnail

The New Zealand mudsnail (*P. antipodarum*) is an invertebrate AIS. It is a very small (4 to 6 millimeters [mm]) freshwater snail with an elongated shell. The opening of the shell has an operculum, which is a retractable lid that can seal the shell. The operculum allows the mudsnail to protect itself from short-term exposure to chemicals and allows them to survive outside water for long periods of time (i.e., up to several months).

The New Zealand mudsnail is self-cloning and one female is enough to initiate a new population. New Zealand mudsnails are found in shallow freshwater and brackish water ecosystems. Due to their ability to survive outside the aquatic environment for several weeks to months, new populations can be established through inadvertent transport on boots, gear, and equipment.

In addition to outcompeting native species for natural resources, their ability to withstand highly variable environmental conditions allows New Zealand mudsnails to take advantage of changing environmental conditions, including climate change, to further spread and outcompete native species. By outcompeting native species, the New Zealand mudsnail reduces prey species for native fish, resulting in reduced body weight and health of native salmonids.

Biofouling is the major economic impact associated with the introduction of New Zealand mudsnails, as they can pass through water pipes and emerge from domestic taps, and can ultimately block pipes and meters.

**Current Distribution of New Zealand Mudsnail within the Study Area**

New Zealand mudsnails were first observed in Capitol Lake in 2009. Multiple surveys over the years have shown them to be present throughout the study area, including the North Basin, Middle Basin, and the Deschutes River, but they have not been found extending into nearby creeks and tributaries.

In 2015, a survey did not find any New Zealand mudsnails in the five new sites in streams and lakes that were surveyed within a 5-mile radius of Capitol Lake, including Percival Creek. Since the 2015 survey, there have been no reported sightings of the New Zealand mudsnail in Percival...
Creek or other nearby waters, suggesting that the spread of mudsnails from the lake has been very limited over the past 10 years. The New Zealand mudsnail has effectively been contained within the Capitol Lake Basin by prohibiting public access to the lake.

New Zealand mudsnails are currently affecting recreational opportunities in the project area because active use of the Capitol Lake Basin was prohibited as a result of their presence. The impact of New Zealand mudsnails on native wildlife is unclear. Several native species of snails are also abundant in Capitol Lake, and the New Zealand mudsnail population has not overtaken the benthic community in the lake as was expected.

### Management of New Zealand Mudsnails

Given the persistence of the New Zealand mudsnail, avoiding or minimizing further spread relies heavily on public outreach and education. Other potentially effective management approaches were identified through literature review, preliminary testing, past experience within Capitol Lake, and professional judgement. The management approaches are described in this section.

### Freezing

Freezing has increased the mortality of the New Zealand mudsnail when the lake bed has been drained and exposed to hard freezing weather conditions for a few consecutive days. However, this is highly dependent upon the weather being cold and dry without insulating snow, which is an unusual combination of conditions for the Capitol Lake area.

In December 2016, Enterprise Services lowered the level of Capitol Lake as a management approach. The New Zealand mudsnail mortality varied depending on location. For example, mortality near Marathon Park was approximately 50%, while mortality along Powerhouse Road SW was approximately 90%. These differences were attributed to the proportion of the survey areas exposed to freezing conditions, where less mortality was observed when more area was below ice cover.

### Heat and Desiccation

Heat and desiccation through local weather conditions is more frequently achieved than dry and freezing conditions. However, this seasonally dependent action requires several consecutive hot-dry days and has been shown in productive lakes to cause nuisance odors from decaying algae and aquatic plants and animals. Both the freezing and heat factors are limited in Capitol Lake by the mild climate and constant inflow from the Deschutes River.

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**New Zealand Mudsnail**

There are several factors that contribute to the difficulty in controlling New Zealand mudsnail. Per WDFW, a single female self-clones at a rate that results in a colony of 40 million snails over the course of one year. Mudsnails are often found in densities up to 500,000 snails per square meter and can travel at a rate of up to 10 feet per hour.

The New Zealand mudsnail can completely seal its shell, which allows the snail to survive out of water for several weeks in cool, damp conditions.
Saltwater Backflush

In 2010, an experiment was done in Capitol Lake to see if increased salinity would cause mortality of the New Zealand mudsnail. The lake was backflushed with water from West Bay to test the tolerance of the New Zealand mudsnail to higher salinities and thermal shock. Researchers found the snails had significantly higher mortality at higher salinities that increased with higher temperatures. While increasing the salinity may increase mortality, the experimental backflush resulted in a reduction of the entire macroinvertebrate community and was subsequently discontinued as a management approach. Researchers also speculated that after the lake returned to normal freshwater conditions, the backflush could result in a larger mudsnail population as a product of rapid reproduction and newly available resources that are no longer consumed by competing species.

Chemical Agents

Two chemical agents have been examined for use in Capitol Lake (1) Bayluscide (with niclosamide as the active ingredient) and (2) sodium chloride. Bayluscide acts quickly, killing the New Zealand mudsnail before they have a chance to respond or find protection. Sodium chloride is much slower, allowing the snail to close its operculum and wait for the toxic level of the introduced agent to dissipate. However, further study is needed to better understand how it might perform in a field application.

Neither chemical is currently allowed for aquatic use under the Aquatic Invasive Species Management Permit, but application of either chemical may be allowed by an experimental use permit or addition of the chemical to the existing permit as part of its 5-year update, which is next due in 2021, then 2026, and so on.

In addition to treatment efforts to control the New Zealand mudsnail population growth and spread, public outreach and education can help to prevent the spread by human activity. Existing signage warns recreational users at Marathon Park of New Zealand mudsnail infestations. Although educational outreach is a helpful approach to encourage public awareness and control, signs alone are not effective to prevent the spread of invasive species.

3.4.3.2 Nutria

Nutria (M. coypus) is a mammal AIS. Nutria are semiaquatic rodents native to South America. Adults are approximately 2 feet long with dark
brown fur and large orange teeth. Although they are often mistaken for beavers, nutria have a thin tail. Nutria breed year-round and can produce up to three litters a year, with a litter size ranging from 2 to 9 young. In their introduced range, nutria have few natural predators.

Although they are well adapted for movement on land, nutria are more at home in the water and prefer slow-flowing streams, lakes, and freshwater marshes as well as brackish and saltwater habitats. Nutria are herbivores and feed mostly on wetland plants, targeting the base of plant stems, and they dig for roots and rhizomes in the winter. They often construct circular platforms of compacted, coarse emergent vegetation for use during feeding, birthing, resting, and grooming. They also construct burrows in levees, dikes, and embankments.

Nutria negatively impact invaded ecosystems. Their feeding activity destroys marsh vegetation, transforming marsh areas into open water, displacing native species; their burrows undermine water-management infrastructure and destabilize banks, increasing erosion along shorelines; and they host infectious diseases that affect humans, livestock, and wildlife.

**Current Distribution of Nutria within the Study Area**

In 1935, nutria were brought to Washington for use in the fur industry. It is unknown whether they escaped or were intentionally released when fur farming was no longer profitable; however, they spread rapidly throughout western Washington. Nutria observations in Capitol Lake were first recorded in 1975.

Although nutria are a high-priority species based on their potential impacts, they are not likely significantly impacting water quality or native plants and wildlife in the Capitol Lake Basin based on the current abundance.

**Management of Nutria**

Typically, feral populations of nutria are managed by shooting and trapping. Eradication is preferable for small- to medium-sized populations, but some level of control is essential in most cases if eradication is not feasible. Fences, walls, and other structures can reduce nutria damage, but high costs usually limit their use. No chemical repellents for nutria are currently registered. Other rodent repellents (such as Thiram) may repel nutria, but their effectiveness has not been evaluated.
The U.S. Department of Agriculture Wildlife Service was under contract with Enterprise Services from 2014 to 2019 to manually control the population in and around Capitol Lake. In 2017, they conducted a survey for areas of fresh nutria activity and removed one nutria. No nutria were observed during night survey efforts, and an estimated number of nutria in the basin was not determined.

### 3.4.4 What other aquatic invasive plants and animals are in the study area?

Although the EIS focuses on the four high-priority AIS in the Capitol Lake Basin, Capitol Lake has a well-documented presence of other non-high priority AIS that include plants, invertebrates, fish, waterfowl, and aquatic mammal species.

Table 3.4.2 provides a summary of their classification status, abundance in the study area, and previous and current management efforts to control their presence and spread. For more detailed information on the remaining AIS in the study area, including additional tables and figures, refer to the Aquatic Invasive Species Discipline Report (Attachment 8).

**Table 3.4.2 Non-High Priority Aquatic Invasive Species Observed in the Study Area**

<table>
<thead>
<tr>
<th>Scientific/Common Name/State Status</th>
<th>Relative or Estimated Abundance</th>
<th>Previous Management Techniques</th>
<th>Current Management Techniques</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plants: <em>Iris pseudacorus</em>/ Yellow flag iris/ Class C</td>
<td>High in the South and Middle Basins; moderate in Percival Cove; low in the North Basin</td>
<td>Annual surveys Treatment with 3% solution of glyphosate</td>
<td>Annual surveys Treatment with 1.5% solution of imazapyr Seed removal from plants</td>
</tr>
<tr>
<td>Plants: <em>Phalaris arundinacea</em> Reed canary grass/ Class C</td>
<td>Present at unknown locations in 2006</td>
<td>No management or monitoring efforts have been conducted</td>
<td>No management or monitoring efforts have been conducted</td>
</tr>
<tr>
<td>Plants: <em>Nymphaea odorata</em>/ Fragrant waterlily/ Class C</td>
<td>Moderate in the North Basin and Percival Cove; low to zero in the Middle and South Basins</td>
<td>Annual surveys Cutting of leaves and tops of stems to stress the plants</td>
<td>Annual surveys Cutting of leaves and tops of stems to stress the plants</td>
</tr>
<tr>
<td>Plants: <em>Potamogeton crispus</em>/ Curlyleaf pondweed/ Class C</td>
<td>Present at unknown locations in 2006 and primarily in the south end of lake in 2004</td>
<td>Low abundance; no management or monitoring efforts have been conducted</td>
<td>Low abundance; no management or monitoring efforts have been conducted</td>
</tr>
<tr>
<td>Invertebrates: <em>Corbicula fluminea</em> Asiatic clam/ Not listed</td>
<td>Present in 2003 along the west shoreline of the North Basin</td>
<td>Low abundance; no management or monitoring efforts have been conducted</td>
<td>Low abundance; no management or monitoring efforts have been conducted</td>
</tr>
<tr>
<td>Scientific/Common Name/State Status</td>
<td>Relative or Estimated Abundance</td>
<td>Previous Management Techniques</td>
<td>Current Management Techniques</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>---------------------------------</td>
<td>------------------------------</td>
<td>------------------------------</td>
</tr>
<tr>
<td>Invertebrates: Radix auriculata/ European ear snail/ Not listed</td>
<td>Present in 2003 in Capitol Lake</td>
<td>Low abundance; no management or monitoring efforts have been conducted</td>
<td>Low abundance; no management or monitoring efforts have been conducted</td>
</tr>
<tr>
<td>Fish: Cyprinus carpio/ Common carp/ Regulated</td>
<td>Fewer than 200 fish</td>
<td>No management or monitoring efforts have been conducted</td>
<td>No management or monitoring efforts have been conducted</td>
</tr>
<tr>
<td>Fish: Ameiurus nebulosus/ Brown bullhead/ Not listed</td>
<td>Fewer than 50 fish</td>
<td>Enhancing native predation</td>
<td>Physical removal and chemical agents (but can affect native species)</td>
</tr>
<tr>
<td>Fish: Micropterus salmoides/ Largemouth bass/ Not listed</td>
<td>Fewer than 200 fish</td>
<td>Low abundance; no management or monitoring efforts have been conducted</td>
<td>Low abundance; no management or monitoring efforts have been conducted</td>
</tr>
<tr>
<td>Fish: Perca flavescens/ Yellow perch/ Not listed</td>
<td>Fewer than 50 fish</td>
<td>Low abundance; no management or monitoring efforts have been conducted</td>
<td>Low abundance; no management or monitoring efforts have been conducted</td>
</tr>
<tr>
<td>Waterfowl: Branta canadensis/ Canada goose/ Not listed</td>
<td>142 birds</td>
<td>Surveys Addling eggs in nests and good removal</td>
<td>Surveys Addling eggs in nests and good removal</td>
</tr>
</tbody>
</table>

### 3.5 FISH & WILDLIFE

Aquatic and terrestrial habitats in the Capitol Lake Basin support a variety of native and non-native fish and wildlife species, including aquatic invasive species. The presence, abundance, and distribution of these species reflect the current habitat conditions, which differ from historical conditions because of the construction of the 5th Avenue Dam in 1951, and other development actions.

The study area for fish and wildlife includes the Capitol Lake Basin from Tumwater Falls to West Bay and the marine waters of West Bay, including associated riparian, wetland, and upland terrestrial habitats. The study area also encompasses Percival Cove and Percival Creek to where changes could occur as a result of the action alternatives.

Fish, wildlife, and the habitats on which they depend are protected by various federal, state, and local laws and regulations. These include...
(among others) the federal Endangered Species Act (ESA), Magnuson–Stevens Fishery Conservation and Management Act, the Migratory Bird Treaty Act, the Washington State Hydraulic Code, and local critical area regulations.

Additional information on the regulatory context for fish and wildlife resources is presented in the Fish and Wildlife Discipline Report (Attachment 9).

### Methods for Studying Fish & Wildlife

Information on fish and wildlife species in the study area was derived from available scientific literature, technical reports, and data from various federal, tribal, state, and local agencies. The analysis focuses on specific species groups for fish (based on similar habitat preferences) or indicator species for wildlife (specifically selected for this project) whose response to impacts is representative of a larger group of species.

For further information on data sources, see the Fish and Wildlife Discipline Report (Attachment 9).

#### 3.5.1 Fish

##### 3.5.1.1 What are current aquatic habitat conditions in the study area?

The construction of the 5th Avenue Dam in 1951 changed the Capitol Lake Basin from an estuary to a freshwater impoundment. Prior to that time, the Deschutes River flowed to Budd Inlet, with the current-day Capitol Lake Basin consisting of estuary habitat and substantial tideflats (also called mudflats). Construction of the 5th Avenue Dam limited anadromous fish passage, created a barrier to tidal exchange, and altered natural hydrological and sediment transport processes. The study area now includes riverine, lacustrine (lake), and estuarine fish habitat. Each of these habitats provides important ecological functions that support a variety of freshwater and marine fish.

Sediment deposition in Capitol Lake has promoted the development of freshwater wetland habitat, especially along the margins of the basins. These changes, in combination with nutrient sources from the Deschutes River, contributed to phosphorus levels and caused an increase in algae and plant growth, which can alter water quality and freshwater habitat conditions, potentially affecting freshwater fish species. Development in the basin altered habitat conditions and have also contributed to the proliferation of both invasive and nuisance aquatic species.
species in the study area, especially Eurasian watermilfoil, purple loosestrife, New Zealand mudsnail, and Canada geese.

Development in the watershed has also degraded water quality and altered the marine habitat conditions in the study area. Within West Bay, dredge and fill activities and the presence of the 5th Avenue Dam have reduced habitat for important juvenile salmonid food sources and Olympia oysters. Fill placed between the East and West Bays of Budd Inlet and associated bulkheads and overwater structures have displaced tideflat habitat and degraded intertidal habitat. Dissolved oxygen is routinely at levels less than the numeric minimum criteria (primarily in the bottom waters) in the summer and early fall. While dissolved oxygen levels are naturally low in many inlets and embayments in South Puget Sound, oxygen depletion can be harmful for fish and other aquatic species.

### 3.5.1.2 How are fish using the study area?

West Bay and Capitol Lake, as well as the riverine habitats of the Deschutes River and Percival Creek, support a diverse group of native and non-native fish species, including several species and stocks of native salmon and trout (Table 3.5.1). Many of these species, particularly salmon, have significant ecological, cultural, economic, and recreational value in Washington. Capitol Lake is located within the traditional territory of the Southern Coast Salish and Southwestern Coast Salish cultural groups, which includes, but is not limited, to the Steh-chass, Nusehchatl, Squaxin, Nisqually, and the Chehalis.

**Table 3.5.1 Fish Species Potentially Present in the Study Area**

<table>
<thead>
<tr>
<th>Species Sub-Group</th>
<th>Species / Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anadromous Fish: Hatchery-origin and ESA-Listed Salmonids</td>
<td>Hatchery-origin Chinook salmon, native population Chinook salmon (FT, SC), steelhead trout (FT), bull trout (FT)</td>
</tr>
<tr>
<td>Anadromous Fish: Other Salmonids</td>
<td>Coho salmon, chum salmon, sea-run cutthroat trout, sockeye salmon</td>
</tr>
<tr>
<td>Anadromous Fish: Non-Salmonids</td>
<td>Starry flounder, three-spined stickleback</td>
</tr>
<tr>
<td>Freshwater Fish: Native Fish (resident)</td>
<td>Resident cutthroat trout, rainbow trout, peamouth, Northern pikeminnow, speckled dace, redside shiner, largescale sucker, prickly sculpin, largescale sucker, prickly sculpin, raffle sculpin, Western brook lamprey</td>
</tr>
</tbody>
</table>
Species
Sub-Group | Species / Status
--- | ---
Freshwater Fish: Exotic/Non-native | Common carp, brown bullhead, smallmouth bass, largemouth bass, yellow perch
Marine Fish: Native Fish | Pacific sand lance, shiner perch, surf smelt, arrow goby, pile perch, bay pipefish, staghorn sculpin, tidepool sculpin, sand sole, specked sand dab

Abbreviations: FT= Federally Threatened, SC = State Candidate.

Anadromous Fish

Seven anadromous (fish that migrate from freshwater to and from the ocean) salmonid species may occur in the Capitol Lake Basin or its vicinity at different stages of their life history. Historically, use of the project area by anadromous salmonids only extended to Tumwater Falls. No naturally reproducing native populations of Chinook salmon, steelhead, or bull trout are present within the Deschutes River because Tumwater Falls is a natural fish barrier.

All anadromous salmonids produced in the Deschutes River watershed migrate through the fish ladders at the 5th Avenue Dam and at Tumwater Falls. Some juvenile rearing is assumed to occur in Capitol Lake during the spring outmigration and possibly extending into summer or later. Adult anadromous salmonids returning to the basin continue their upstream migration by moving into the Deschutes River or Percival Creek. The Chinook salmon returning to the Deschutes River and Percival Creek are fall-run Chinook salmon of hatchery origin. Very low numbers of steelhead are thought to return to the Deschutes River, and they are presumed to occur in Percival Creek. The steelhead returning to the Deschutes River are winter-run steelhead and are a distinct non-native stock.

In 1954, a fish ladder was constructed to allow anadromous salmonids to access habitats in the Deschutes River upstream of Tumwater Falls. WDFW operates a hatchery at Tumwater Falls with a production goal of 3.8 million juvenile Chinook salmon each year. These salmon are released into the Deschutes River. Chinook salmon from the Tumwater Falls Hatchery are not listed under ESA.

Two species of anadromous non-salmonids occur in Capitol Lake: three-spined stickleback and starry flounder. Three-spined stickleback have both anadromous and resident life history forms. It is not known how much of the current population in Capitol Lake is the anadromous form.
Studies indicate that three-spined stickleback comprise an overwhelming majority of the fish population in Capitol Lake.

**Freshwater Fish**

Limited information is available on the freshwater fish community of Capitol Lake, which includes both native and non-native (exotic) species. Table 3.5.1 lists the documented freshwater fish in Capitol Lake. Many of the freshwater species are either competitors of or prey on juvenile salmonids, and some provide prey for larger fish. Freshwater habitats include the lake basins created by the 5th Avenue Dam, as well as the riverine environments in Percival Creek and the Deschutes River.

**Marine Fish**

West Bay and the lower portion of Budd Inlet provide marine water habitat for anadromous fish, forage fish, saltwater fish species, and shellfish. Like the freshwater species in the Capitol Lake Basin, some of the saltwater fish species found in Budd Inlet are either competitors of or prey on juvenile salmonids, and some provide an important prey base for salmonids.

Table 3.5.1 lists the documented marine species of West Bay. It should be noted that many more marine species inhabit Puget Sound than are listed below. For example, the marine waters of Puget Sound are home to dozens of species of bottomfish, including dogfish, skates, rockfish (at least 14 species), greenlings, sculpins, surfperches, and flatfish (sanddab, halibut, sole, and flounder). While any of these species may occasionally be present in the waters of West Bay, this analysis focuses on those marine fish that have been documented in the study area and are likely to occur.

3.5.1.3 What threatened or endangered fish species and habitats are present in the study area?

Puget Sound Chinook salmon are listed as threatened under the ESA; however, this applies to native populations, which are not present in the Deschutes River or Percival Creek watersheds. The estuarine waters of Budd Inlet are designated as critical habitat for Chinook salmon.

Puget Sound steelhead are also listed as threatened under the ESA. Capitol Lake and the Deschutes River are designated as critical habitat for steelhead, although the steelhead returning to the Deschutes River are a distinct non-native stock.
Bull trout, listed as federally threatened, may occasionally be present in the marine waters of West Bay, but there is no bull trout habitat in Capitol Lake or its tributaries. No designated critical habitat for bull trout is present in the study area.

Two species of ESA-listed rockfish occur in Puget Sound. The bocaccio rockfish is listed as endangered while the yelloweye rockfish is listed as threatened under the ESA. Although larval and juvenile rockfish could occasionally be present in the study area, adults and juvenile rockfish are not likely to occur in the relatively shallow waters of West Bay.

3.5.2 Wildlife

The study area contains a mix of terrestrial and aquatic habitats important for numerous wildlife species.

3.5.2.1 What habitats can be found along the shoreline of Capitol Lake?

As with the aquatic environment, development in the basin has substantially altered the habitats along the Capitol Lake shoreline compared to historical, natural conditions. Existing conditions include riparian, wetland, and contiguous terrestrial habitats along the shorelines, which now support shorebirds, waterbirds, raptors, songbirds, and terrestrial mammals that have adapted to these relatively disturbed habitation conditions. Human development has resulted in armored shorelines and decreased the quality and quantity of riparian vegetation, reducing the habitat value for native species.

Riparian conditions around Capitol Lake vary substantially. In the North Basin, the Arc of Statehood path and adjacent roadways are so close to the shore that there is only a narrow strip of riparian vegetation. Although some trees are present, these are generally ornamental like native deciduous trees, with few to no tall trees or coniferous trees. These provide less valuable riparian functions compared to what occurred before the lake was created. Although conditions on the west bank of the Middle Basin are similar, this area contains larger deciduous and some coniferous trees. In addition, the vast majority of the east bank of the Middle Basin provides a 300-foot-wide (91-meter-wide) riparian zone, consisting of mature mixed forest, including overhanging vegetation. The South Basin also has somewhat more natural riparian conditions, consisting of emergent and scrub-shrub vegetation as well as some patches of deciduous trees.
The area, including Capitol Lake, Percival Cove, and the riparian corridor associated with Percival Creek, is considered a biodiversity area (native habitat within an Urban Growth Area) by WDFW Priority Habitats and Species (PHS) mapping because of its terrestrial habitat and remnant wooded shoreline, which provide nesting and foraging habitat for wildlife.

Wetland areas are important for many wildlife species. As described in Section 3.6, Wetlands, wetland types in the study area include freshwater wetlands and estuarine wetlands.

Wildlife habitat types in the study area are shown in Figures 3.5.1A and 3.5.1B.
Figure 3.5.1A Wildlife Habitats - North

Legend

Wetland Habitats
- Deepwater habitat - estuarine
- Deepwater habitat - freshwater
- Tideflat

River channel
- Vegetated wetland - freshwater (PEM)
- Vegetated wetland - freshwater (PFO)
- Vegetated wetland - freshwater (PSS)
- Vegetated wetland - estuarine (high marsh)
- Upland

Upland Habitats
- Developed
- Grassland
- Mixed forest
- Shrub
Figure 3.5.1B Wildlife Habitats - South

Legend

Wetland Habitats
- Deepwater habitat - estuarine
- Deepwater habitat - freshwater
- Tideflat

River channel
- Vegetated wetland - freshwater (PEM)
- Vegetated wetland - freshwater (PFO)
- Vegetated wetland - freshwater (PSS)
- Vegetated wetland - estuarine (high marsh)
- Upland

Upland Habitats
- Developed
- Grassland
- Mixed forest
- Shrub
3.5.2.2 What birds can be found in the study area?

Birds in the study area can be described in five groups: shorebirds/wading birds, diving/dabbling ducks, insectivorous birds, raptors, and passerine birds (Table 3.5.2). Numerous species in each group use the study area year-round or seasonally for breeding or wintering.

Table 3.5.2 Bird Species & Species Groups Present in the Study Area

<table>
<thead>
<tr>
<th>Species Group</th>
<th>Habitat Association and Use</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shorebirds / Wading Birds</strong></td>
<td>Forage on small invertebrates in shallow water or exposed substrates during low tide; use Capitol Lake only during drawdowns or summer low flows that expose foraging substrates; herons forage on fish, amphibians, and invertebrates; most shorebirds are migratory and only seasonally present, while herons are year-round residents.</td>
</tr>
<tr>
<td>(e.g., western sandpiper, great blue heron)</td>
<td></td>
</tr>
<tr>
<td><strong>Diving / Dabbling Ducks</strong></td>
<td>Forage on aquatic plants in fresh and saltwater, plant seeds and tubers, weeds, aquatic invertebrates (insects, crustaceans, and mollusks); use freshwater and riparian habitats for roosting and breeding.</td>
</tr>
<tr>
<td>(e.g., common goldeneye, American wigeon)</td>
<td></td>
</tr>
<tr>
<td><strong>Insectivorous Birds</strong></td>
<td>Seasonal (spring and summer); forage on flying insects; Capitol Lake is important source for insect production and emerging prey.</td>
</tr>
<tr>
<td>(e.g., violet-green swallow)</td>
<td></td>
</tr>
<tr>
<td><strong>Raptors</strong></td>
<td>Year-round and seasonal use of Capitol Lake and shoreline habitats; prey on shorebirds and ducks (peregrine falcon), small shorebirds (merlin), fish (osprey), and birds and fish (bald eagle).</td>
</tr>
<tr>
<td>(e.g., bald eagle)</td>
<td></td>
</tr>
<tr>
<td><strong>Passerine Birds</strong></td>
<td>Use a wide variety of terrestrial and wetland habitats (freshwater and nearshore) to forage, breed, and over-winter; many permanent residents with some seasonal migrants using habitats for breeding (e.g., warblers, thrushes).</td>
</tr>
<tr>
<td>(e.g., yellow warbler)</td>
<td></td>
</tr>
</tbody>
</table>

3.5.2.3 What bats can be found in the study area?

Capitol Lake is an important source of emerging flying insects that are prey for multiple species of bats. Capitol Lake appears to be an important feeding area for two bat species in particular, little brown bat and Yuma myotis. Both species have been radio-tagged from large breeding colonies located at Woodard Bay in Henderson Inlet and at the Evergreen State College. An estimated 3,000 bats occupy the Woodard Bay colony, located approximately 7 miles (11 km) from Capitol Lake, but the proportion of the colony that forages at the Capitol Lake is not known. These bats use Capitol Lake to forage and do not appear to use other smaller lakes and ponds closer to their colonies.

Exhibit 3.43 Little Brown Bat (Source: WDFW)
3.5.2.4  What other mammals can be found in the study area?

Apart from bats, most mammals that use the study area are aquatic or semiaquatic and primarily visit the area to find prey or forage. WDFW noted 11 species of freshwater aquatic and marine mammals that have been recorded in the Capitol Lake area; no formal surveys have been conducted and all records are anecdotal. Table 3.5.3 summarizes the species and species groups of mammals.

Table 3.5.3 Mammal Species & Species Groups Present in the Study Area

<table>
<thead>
<tr>
<th>Species Group</th>
<th>Habitat Association &amp; Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshwater Aquatic Mammals: (e.g., nutria ¹, muskrat, beaver, northern river otter, mink, raccoon)</td>
<td>Some forage on aquatic plants and emergent vegetation of wetlands and generally use freshwater wetlands and streams (nutria, beaver, raccoon); some use estuarine and nearshore habitats to prey on aquatic birds, crayfish, fish, and amphibians (otter, mink).</td>
</tr>
<tr>
<td>Marine Mammals ²: (e.g., orca ³, harbor seal, California sea lion)</td>
<td>Seasonal and migratory use of marine waters to prey on salmon and other fish species during seasonal runs.</td>
</tr>
</tbody>
</table>

Notes:
1. Nutria are considered an aquatic invasive species in Washington State.
2. All marine mammals are protected under the federal Marine Mammal Protection Act.
3. Southern resident orca are listed as Endangered under the federal ESA.

3.5.2.5  Are there threatened, endangered, or sensitive wildlife species and habitats in the Capitol Lake Basin?

The Southern resident orca population is listed as endangered under the federal ESA, and critical habitat is currently designated for inland waters of Washington State including Budd Inlet. Washington State, under the direction of Governor Inslee, recently completed a final report and recommendations for ensuring the survival of orcas in Puget Sound. The Southern Resident Killer Whale Recovery Task Force led this work, which was completed in 2019, some of which became legislation.

Little brown bat and Yuma myotis are not listed as threatened, endangered, or candidate species by the state. However, myotis roosting concentrations are listed as a Priority Habitat. Townsend’s big-eared bat, a state candidate species, has been detected in the South Basin area through acoustical detection. No information is available about the specific habitats used by the species or its frequency of occurrence.
3.5.3 **Tribal Resources**

Capitol Lake is located within the ancestral lands of the Southern Coast Salish and Southwestern Coast Salish cultural groups, which include, but are not limited to, the Steh-chass, Nusehchatl, Squaxin, Nisqually, and the Chehalis. These groups have used the area since time immemorial for various levels of habitation, ceremony, and resource gathering. Descendants of these people are members of today’s federally recognized Squaxin Island Tribe, Nisqually Indian Tribe, and Confederated Tribes of the Chehalis Reservation.

Many of the fish, shellfish, and wildlife species in the study area (particularly the salmonids) have significant cultural and economic value to area tribes. The traditional diet of the Southern Coast Salish and Southwester Coast Salish relies heavily upon salmon, but also includes other important saltwater, freshwater, and terrestrial resources. Historically, the inlets surrounding the southernmost portion of Puget Sound provided abundant resources.

West Bay provides fish harvesting opportunities for some tribes, which are protected treaty rights under the Medicine Creek Treaty of 1859. These rights for Indigenous people in the South Puget Sound region were affirmed in a landmark court case decided by Judge Boldt and upheld by the U.S. Supreme Court in 1979. Capitol Lake is closed to all active use, including tribal fishing.

### 3.6 WETLANDS

Wetlands are important natural resources that perform vital ecological functions and provide many societal benefits and ecosystem services, such as water storage and flood protection, groundwater recharge, water quality improvements, sediment retention, habitat for fish and wildlife, recreation, and others. Wetlands are protected by a variety of federal, state, and local laws, plans, and policies. These laws, plans, and policies have different, but overlapping, requirements to protect and maintain these habitats and their functions. The Clean Water Act (CWA) is the primary federal law protecting wetland resources; the CWA regulates the discharge of dredge and fill materials into wetlands and other waters of the U.S. The CWA is administered by the U.S. Army Corps of Engineers (USACE), with support in Washington State from Ecology. Project proponents are required to avoid and minimize impacts on wetlands and must compensate for any unavoidable impacts. Additional information on the regulatory context for wetland resources is presented in the Wetlands Discipline Report (Attachment 10).

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**Regulatory Wetland**

As defined by both federal and state laws, wetlands are “areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.”
The wetlands study area includes the Capitol Lake Basin and associated wetland from Tumwater Falls to West Bay. The study area also encompasses Percival Cove and Percival Creek and associated wetlands to where changes could occur as a result of the action alternatives.

### Methods for Studying Wetlands

Existing conditions in the study area were determined based on the available geographic information system (GIS) data, aerial imagery, critical area and shoreline maps, the bathymetric survey, and previous readily accessible wetland studies applicable to the study area. This information was used to estimate the presence, extent, and type of wetlands, deep water habitats, and tideflats in the study area. This planning-level analysis was supplemented with a site reconnaissance to the Project Area in the summer of 2019, but wetlands were not delineated, rated, surveyed, or sampled for the EIS analysis.

For further information on wetlands, see the Wetlands Discipline Report (Attachment 10).

#### 3.6.1 What types of wetlands are present in the study area?

##### 3.6.1.1 Historical Conditions

Historically, the Deschutes River formed a broad estuary as it flowed into Budd Inlet in the area that is now Capitol Lake (Figure 3.6.1). The historic delta consisted of river deposits, with braided channels and scattered tidal marshes.

Construction of the 5th Avenue Dam in 1951 blocked the tidal exchange between the Deschutes River and Budd Inlet. It also altered the morphology and ecology of the lower river system. Other development throughout the basin (e.g., construction of I-5, development of Olympia and Tumwater, port-related facilities) have similarly altered wetland conditions in the study area. Although different from their historic condition, Capitol Lake Basin and West Bay include wetlands that provide habitat for a range of birds, fish, bats, aquatic and semiaquatic mammals, and invertebrates.
3.6.1.2 Wetland Types in the Study Area

For this EIS analysis, the term “wetland” encompasses five broad types to characterize both the freshwater and estuarine habitats present in the Capitol Lake Basin and West Bay:

- Vegetated wetlands – freshwater
- Vegetated wetlands – estuarine
- Tideflats
- Deepwater habitats – freshwater (i.e., Capitol Lake)
- Deepwater habitats – estuarine (i.e., West Bay)

Tideflats and deepwater areas are not technically considered “wetlands” but are protected and regulated by multiple federal, state, and local laws.
as waters of the U.S., waters of the state, and/or critical areas. Streams and rivers, such as the Deschutes River and Percival Creek, are also waters of the U.S., waters of the state, and critical areas (see Section 3.3, Water Quality, and Section 3.5, Fish and Wildlife, for more information on these waters).

The wetland types present in the study area are defined and described in this section. Wetland acreage is summarized by type in Table 3.6.1, and Figures 3.6.2A and 3.6.2B show the location of these wetland types in the basin. More information is presented on the location of these types by basin in the Wetlands Discipline Report (Attachment 10).

### Table 3.6.1 Wetland & Other Habitat Types in the Study Area under Existing Conditions

<table>
<thead>
<tr>
<th>Wetland Types</th>
<th>Location</th>
<th>Estimated Acreage¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deepwater Habitat – Estuarine</td>
<td>West Bay</td>
<td>208</td>
</tr>
<tr>
<td>Tideflat</td>
<td>West Bay</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Vegetated Wetland – Estuarine (High Marsh)</td>
<td>West Bay</td>
<td>3</td>
</tr>
<tr>
<td>Deepwater Habitat – Freshwater</td>
<td>North and Middle Basins</td>
<td>240</td>
</tr>
<tr>
<td>Vegetated Wetland Freshwater (emergent)</td>
<td>North, Middle, and South Basins</td>
<td>19</td>
</tr>
<tr>
<td>Vegetated Wetland Freshwater (scrub-shrub)</td>
<td>North, Middle, and South Basins</td>
<td>16</td>
</tr>
<tr>
<td>Vegetated Wetland Freshwater (forested)</td>
<td>North, Middle, and South Basins</td>
<td>18</td>
</tr>
<tr>
<td>River Channel – Freshwater</td>
<td>Middle and South Basins</td>
<td>25</td>
</tr>
<tr>
<td>Upland</td>
<td>North, Middle, and South Basins</td>
<td>19</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>549</strong></td>
</tr>
</tbody>
</table>

**Note:**

1. Areas are approximate, based on National Wetlands Inventory data and a high-level reconnaissance investigation. All numbers are rounded to the nearest acre.
Figure 3.6.2A Existing Wetland Types — North

Legend:
- Deepwater Habitat - Estuarine
- Tideflat
- Vegetated Wetland - Estuarine (High Marsh)
- Deepwater Habitat - Freshwater
- Vegetated Wetland - Freshwater (emergent)
- Vegetated Wetland - Freshwater (scrub-shrub)
- Vegetated Wetland - Freshwater (forested)
- Upland
Vegetated Wetlands — Freshwater

These wetlands are dominated by trees, such as willow, red alder, and Western red cedar; shrubs such as spirea, twinberry, and dogwood); and/or emergent vegetation, such as slough sedge, soft rush, and piggyback plant. They are fed by surface or groundwater and occur on the edges of lakes or rivers, on slopes, or in shallow depressions. Vegetated freshwater wetlands may or may not have standing water, and when they do, it is typically shallow. Vegetated freshwater wetland types include forested, scrub-shrub, and emergent wetlands.

Vegetated freshwater wetlands make up about 10% of the wetland acreage in the study area and are scattered throughout all of the basins. Within the North Basin, emergent and scrub-shrub wetlands occur along Heritage Park on the east and Marathon Park in the southwest, and a few fringes along Deschutes Parkway. Within the Middle Basin, the western shoreline is dominated by fringes of emergent and scrub-shrub wetlands with areas of forested wetland being common along the eastern shoreline. The hydrology of the South Basin is dominated by the Deschutes River and side-slope seeps, with vegetated freshwater wetlands forming a complex of emergent, scrub-shrub, and forested wetlands.

Vegetated Wetlands — Estuarine

These wetlands occur in the zone where freshwater and saltwater meet and are referred to as low marsh and high marsh. These wetlands have salinity levels greater than 0.5 ppt and are usually influenced by tides. Vegetated estuarine wetlands are characterized based on their elevation levels within the intertidal zone and dominant vegetation form. High marsh wetlands occur in the upper intertidal zone and are infrequently inundated with water. Typical vegetation species include tufted hair grass and arrow grass. Low marsh wetlands occur at lower elevations and are typically characterized by the presence of pickleweed, arrow grass, Lyngbye’s sedge, and saltgrass.

Very little (~3 acres) of this wetland type occurs in the study area, all in the form of high marsh along the southwest shoreline of West Bay.

Tideflats

These wetlands are broad, flat areas in the intertidal zone that are exposed at low tides and inundated at high tides. The substrate is mostly clay and silt-sized (i.e., very small) particles as well as organic material. They are either unvegetated or vegetated only by algal mats or annual
plants such as sea lettuce. Eelgrass can be present at lower elevations if tidal currents, sediment deposition, and water quality create appropriate growing conditions.

Although prevalent before the 5th Avenue Dam was constructed, very little (<1 acre) of this wetland type now occurs in the study area. Shallow water tideflats are found along the western shoreline of West Bay.

**Deepwater Habitats – Freshwater and Estuarine**

These include areas where surface water is permanent and deep, such that water is the principal medium within which the dominant organisms live. Deepwater habitats can be freshwater or estuarine. If present, vegetation is aquatic bed vegetation that is usually visible above the water surface. The boundary between wetlands and deepwater habitats in an estuarine system is the elevation of the extreme low water. The boundary between wetlands and deepwater habitat in the freshwater environment is a depth of 8.2 feet (2.5 meters) or the edge of emergent vegetation, shrubs, or trees.

Deepwater habitats make up the vast majority (~82%) of existing wetland types in the study area. The existing estuarine deepwater areas are all in West Bay, and the freshwater deepwater areas are in the North and Middle Basins. The estuarine and freshwater areas are divided by the 5th Avenue Dam.

### 3.7 AIR QUALITY & ODOR

Air quality refers to the condition of the breathable air with respect to the presence of pollutants identified by the USEPA and Ecology as pervasive in urban environments, and for which state and federal health-based ambient air quality standards have been established. The air quality analysis addresses pollutants, which can have negative effects on human health and the environment. It also addresses greenhouse gases (GHGs), which can contribute to climate change.

Odor is a commonly experienced human sensation. The olfactory sense can detect and discriminate thousands of odors. The presence of an odor is the product of small quantities of certain chemicals, or mixtures of chemicals, in the air we breathe.
Methods for Studying Air Quality & Odor

Data sources used for the air quality analysis include relevant USEPA reports and standard computer tools, as well as odor studies, particularly those concerning hydrogen sulfide (H$_2$S), an odorous gas that can be naturally produced from tideflats. Available literature on odor-producing emissions of tideflats was also reviewed.

For further information on data sources, see the Air Quality and Odor Discipline Report (Attachment 11).

For assessing air quality and odor associated with the project, the study area is the project area and the surrounding ambient air that has the potential to be influenced by the project, based on the scope and nature of the construction and post-construction air emissions, as well as the nature of the topography and meteorological conditions in the area. Based on the nature and quantities of the air pollutant emissions and potential odors generated by the action alternatives, the impacted area is not expected to extend far from the project area.

3.7.1 What is the existing odor environment at Capitol Lake?

Existing potential sources of odor in the vicinity of the project area include the existing tideflats along the East and West Bay. Odors produced by tideflats have not been studied in depth, and the literature on associated quantitative odor-producing emissions is sparse. Most of the available literature focuses on sulfur compound emissions, which have been quantified per unit of tide-influenced area. These emissions are often driven by hydrogen sulfide (H$_2$S), a gas that has a characteristic odor of rotten eggs and an odor detection limit with a range that spans from 0.5 to 300 parts per billion depending on the studies considered. Ambient H$_2$S air concentrations in the Olympia area are not readily available to characterize existing odor conditions. However, the Olympic Region Clean Air Agency (ORCAA) logs odor complaints received from the public.

During a 5-year period (March 2015 through March 2020), the primary sources of odor complaints in the region were burning garbage, as well as smoke from woodstoves and burn piles, all of which accounted for approximately 86% of the total odor complaints. Other recurring sources of odor complaints received by ORCAA were from a hot-mix asphalt plant, a mushroom farm, and a packaging facility. A summary of odor complaints is provided in the Air Quality and Odor Discipline Report (Attachment 11). There were no odor complaints associated with

Did the historic estuary smell bad?

Historical anecdotal evidence of odors within the estuary are not reliable because they cannot be attributed to specific odor sources. There have been many changes in sewage management, industrial activities and related discharges, and other unknown contributors in the Project Area since that time.
tide fluctuations or associated natural odor-producing sources, and there were no odor complaints during a 2016 drawdown of Capitol Lake.

### 3.7.2 What is the existing air quality environment in the Project Area?

Washington is subject to air quality regulations issued by USEPA, Ecology, and local air agencies such as ORCAA. These agencies have established National Ambient Air Quality Standards (NAAQS).

Concentration levels of the criteria pollutants must not exceed the NAAQS over specified time periods. Ecology and ORCAA monitor air quality in the region to compare the levels of criteria pollutants found in the atmosphere with the NAAQS. Areas that meet the limits set by the NAAQS are referred to as “attainment areas,” and areas that exceed the limits for one or more pollutants are referred to as “nonattainment areas.” When an area is designated as nonattainment, measures must be taken to bring the area back into compliance; after a nonattainment area achieves compliance, it becomes a “maintenance” area. This designation requires that Ecology, in coordination with ORCAA, develop an attainment plan to demonstrate how the area will come back into compliance with the standard.

Existing sources of air pollution in the vicinity of the project include industrial-zoned areas and transportation corridors, including marine diesel-fueled vessels and both diesel and gas vehicles on the nearby roadways.

Criteria air pollutants of primary concern are nitrogen dioxide, Particulate Matter$_{10}$, and Particulate Matter$_{2.5}$. Other pollutants include ozone precursors (i.e., hydrocarbons and nitrogen oxides), sulfur dioxide, ozone, and carbon monoxide. Given the setting, industrial and transportation sources likely comprise the largest contributors to ambient pollutant concentrations in the vicinity of the project. Smoke from residential wood combustion, one of the main sources of air pollution in Washington State, may also be a significant contributor to ambient particulate matter concentrations during winter months.

The area was designated as nonattainment during the period of 1992 to 1999 due to exceedances of the particulate matter of 10 micrometers or less (PM$_{10}$) 24-hour standard, primarily caused by smoke from woodstoves and fireplaces. In 2000, local monitoring indicated that the air quality had improved, and the area implemented a 20-year maintenance plan that concluded on December 4, 2020. The area...
continues to be in attainment for $\text{PM}_{10}$ and is no longer required to adhere to the maintenance plan.

### 3.7.3 How are greenhouse gases assessed?

An executive order issued by Governor Christine Gregoire in February 2007 (Executive Order No. 07-02) established goals for Washington for reducing GHG emissions as follows:

- To reach 1990 levels of GHG emissions by 2020
- To reach 25% below 1990 emission levels by 2035
- To reach 50% below 1990 emission levels by 2050

On April 30, 2020, Ecology announced the beginning of the rulemaking process to create a new rule, Chapter 173-445 WAC, Greenhouse Gas Assessment for Project, which will help address analysis and mitigation of GHG emissions for environmental assessments of certain projects. The new rule is slated to be completed by spring 2021. As new rulemaking is under development, this EIS considers previous Ecology guidance as adopted in Chapter 173-441 WAC – Reporting of Emission of Greenhouse Gases. This rule aligned the state’s GHG reporting requirements with USEPA regulations, and required facilities that directly emit 10,000 metric tons of carbon dioxide ($\text{CO}_2$) equivalents ($\text{MTCO}_2\text{e}$) or more each year, as well as fuel suppliers that supply fuels in the state that would result in 10,000 $\text{MTCO}_2\text{e}$ when combusted, to report their GHG emissions to Ecology.

Ecology estimated state-wide annual GHG emissions in 2015 at approximately 97 million $\text{MTCO}_2\text{e}$, and annual worldwide GHG emissions for 2010 were estimated by the World Resources Institute to be approximately 46 billion $\text{MTCO}_2\text{e}$. The state is seeking to reduce its GHG footprint to 45% and 95% of 1990 emissions by 2030 and 2050, respectively.

In addition to GHG emissions created during construction and operation of the project, this EIS considers the carbon sequestration or emissions potential of the wetlands established under the project alternatives. Coastal wetland environments remove $\text{CO}_2$—a GHG—from the atmosphere and sequester the carbon as biomass, dead organic matter, and soil carbon. The environmental service of wetland carbon sequestration is often referred to as “blue carbon.”

While carbon is typically sequestered in wetland environments, methane ($\text{CH}_4$) emissions occur in marshes when anaerobic (i.e., oxygen-starved) conditions allow microbes to decompose organic matter and produce...
CH₄. The effect of wetlands on GHGs can vary widely from a net negative to a net positive, depending on the salinity and biomass in the system. The relative GHG sequestration or emission expected under the alternatives are described in Section 4.7, Air Quality and Odor.

In 2018, the Thurston Regional Planning Council adopted the Thurston Climate Adaptation Plan (TCAP) to guide Thurston County and the broad South Puget Sound region in developing strategies for adaptation and response to climate change. This 22-member intergovernmental board has a mission to provide visionary leadership on regional plans, policies, and issues. The TCAP includes a number of Guiding Principles, including a goal relating to GHG emissions.

The Guiding Principles support increased resiliency through achievable, flexible, and, where possible, measurable and replicable climate adaptation strategies. Relating to GHG emissions, the Guiding Principle states: “Identify and leverage climate change adaptation strategies and actions with mitigation co-benefits, such as reducing, capturing, and storing greenhouse gas emissions.”

In 2021, collaborating jurisdictions adopted the Thurston Climate Mitigation Plan (TCMP) to address local contributions to the causes of climate change. The plan includes an emissions reduction target of reducing net communitywide GHG emissions 45% below 2015 levels by 2030 and 85% below 2015 levels by 2050. The TCAP and TCMP together form a comprehensive Climate Action Plan for the Thurston Region.

### 3.8 LAND USE, SHORELINES, & RECREATION

Land use refers to how land is developed and managed for various human uses. It also refers to the preservation or protection of land as a natural resource. Shorelines refers to land along a waterbody, which can also be developed for human purposes or preserved as a natural resource, subject to regulations specifically for shorelines. Recreation refers to opportunities for people to engage with and enjoy the natural and built environment. These three resources are combined in this analysis.

The study area for land use, shorelines, and recreation includes the Capitol Lake Basin that Enterprise Services manages, and encompasses areas within 1,000 feet (300 meters) where shoreline use or recreation activities could change, or the alternatives could influence adjacent land uses. The study also includes areas within and adjacent to West Bay where shoreline uses such as recreational marinas or shipping could be affected by changes in sediment movement.
Methods for Studying Land Use, Shorelines, & Recreation

Data sources used include relevant zoning and parcel information in GIS format, policy and planning documents, and land and shoreline use regulations applicable to the study area. The study also included input from the Community Sounding Board and Work Groups and data from a recreational user survey. Park users were surveyed at parks adjacent to Capitol Lake during high usage periods in the summer of 2019, including during Capital Lakefair.

The Land Use, Shorelines, and Recreation Discipline Report (Attachment 12) contains the full list of data sources used for the evaluation.

3.8.1 What is the existing land use, planning, and zoning in the study area?

The study area includes a range of uses, from open space used for wildlife habitat and recreation to intensively-used commercial and industrial areas. Figure 3.8.1 shows the existing land uses in the study area.

Most land uses abutting Capitol Lake are various forms of open space. Capitol Lake itself is considered open space. Surrounding open space includes portions of the Capitol Campus, parks, habitat areas, and undeveloped portions of large single-family lots.

Transportation is also a notable land use surrounding Capitol Lake. The I-5 highway crosses between the South and Middle Basins. The BNSF Railway Trestle crosses between the Middle and North Basins. Deschutes Parkway extends the entire length of the west side of Capitol Lake, and 5th Avenue crosses the water between the North Basin and West Bay.

Around the North Basin, in addition to the open space described above, single-family development dominates the uses to the west, and a mixture of office, retail, and government uses are adjacent to the east.

Around the Middle Basin, in addition to the open space described above, uses are predominantly single-family residences and state capitol offices to the east. To the west, office and commercial uses front Lakeridge Way SW, including the Thurston County Courthouse. A steam plant (the Capitol Campus Powerhouse) occupies the shoreline at the northeast edge of the Middle Basin.
Figure 3.8.1 Map of Existing Land Uses

Legend
- City Boundary
- Land Use Type
  - Parks and Open Space
  - Public Assembly
  - Recreation
  - Residential Multi-Family
  - Residential Single-Family
  - Service
  - Retail
  - Other
- Study Area
- Transportation
- Undeveloped Land
- Utilities
- Manufacturing
- Hotel-Motel
- Cultural
Around the South Basin, single-family development is also predominant to the east. The South Basin abuts the New Market District and Brewery District in Tumwater, two commercial districts that surround and include the former Olympia Brewery.

West Bay is surrounded by parks, private recreational marinas, the Port of Olympia, commercial offices, a large sawmill, and a small number of townhouse residences.

The study area lies within the city limits of Olympia and Tumwater. The city limits and zoning designations within the study area are shown in Figure 3.8.2.

Residential zones comprise 33% of the study area, with the majority of that in single-family zoning. Green Belt and Open Space zoning comprises only 4% of the land within the study area, but much of the Capitol Campus could also be categorized as open space, especially areas adjacent to Capitol Lake.

A major portion of the land abutting Capitol Lake is designated Capitol Campus on the City of Olympia zoning map. The Capitol Campus includes the main upper campus, Heritage Park, Deschutes Parkway, and the land surrounding Percival Cove in the Middle Basin, plus a few scattered parcels.
3.8.2 Which areas of the study area have shoreline environment designations?

Shoreline designations are overlay zones authorized under the Shoreline Management Act and are shown on Figure 3.8.3. A large majority of the shoreline of Capitol Lake is designated Urban Conservancy, reflecting the goals of Olympia and Tumwater to support water-related and water-enjoyment uses while protecting and restoring ecological functions of these shorelines. The east side of the South Basin is designated Urban Intensity in recognition of the historic high-intensity uses associated with the brewery, and allowing commercial and recreational uses that are compatible with shoreline protection. The eastern and southern shores of the North Basin are designated Waterfront Recreation. This designation is applied to areas to be used for recreation or habitat conservation, and allows for low-intensity recreational use of the shorelines. A small portion of the Middle Basin is designated Urban Intensity in recognition of the historic Capitol Campus Powerhouse.

Along West Bay within Budd Inlet, designations of Waterfront Recreation and Urban Intensity predominate. A designation of Port Marine Industrial applies to the log shipping terminal in West Bay. This designation prioritizes and supports water-dependent industrial uses. Adjacent to and north of the shipping terminal, the shorelines are designated Marine Recreation, supporting public access and intensive recreational use such as the existing public dock and boat launch.

Shoreline Management Act

Under the state’s Shoreline Management Act (SMA), each city and county that abuts a shoreline of statewide significance adopts a Shoreline Master Program (SMP) that applies to those waters and the adjacent land. Each SMP is based on SMA goals to protect the public trust by ensuring public access, protecting shoreline ecology, and accommodating water-dependent uses. This is accomplished through regulations in the SMP that establish shoreline environment designations, and corresponding use and development standards.
Figure 3.8.3 Map of Existing Shoreline Designations

Legend
- City Boundary
- Study Area
- Aquatic
- Island
- Marine Recreation
- Natural
- Urban Conservancy
- Port Marine Industrial
- Urban Intensity
- Shoreline Residential
- Waterfront Recreation

Scale in Feet
0 500 1,000 2,000

North Basin
Middle Basin
South Basin
West Bay (Budd Inlet)
Olympia
Tumwater
Highway 101
Interstate 5
3.8.3 What are current recreation sites and their uses?

Several parks provide both local and regional benefits. Brewery Park at Tumwater Falls and Tumwater Historical Park are tourist attractions on the shore of the South Basin, and provide facilities for picnicking, wildlife viewing, and other activities. Heritage Park, on the eastern shore of the North Basin, hosts major community gatherings and provides trails and other recreation facilities for the broader Olympia-Tumwater area and tourists visiting the capitol. Marathon Park, on the southwest shore of the North Basin, and Interpretive Center, on the southwest shore of the Middle Basin, both provide active recreation, wildlife viewing, and other recreational opportunities serving the broader Olympia-Tumwater area. All of these parks are linked by a series of trails extending around the North Basin and along the west shore of the Middle Basin and South Basin. Figure 3.8.4 shows the recreation sites within the study area.

Recreation sites around Capitol Lake and West Bay attract hikers, runners, walkers, bicyclists, tourists, and other visitors to the Capitol Campus, downtown Tumwater, and downtown Olympia. Many community-supported events occur around the lake, including Capital Lakefair, Festival of the Steh-chass, Olympia Harbor Days, Olympia Wooden Boat Fair, and Capital City Marathon. Capital Lakefair, the largest recreational event that occurs in the Capitol Lake area, began in the 1950s, after construction of Capitol Lake and before the creation of Heritage Park. Capital Lakefair is an annual community festival at Heritage Park in the third week of July with an attendance of approximately 200,000. Despite current restrictions on water-oriented activities, shoreside activities remain as part of the current Capital Lakefair festival. For a list of events held in the Capitol Lake area see Table 4.3 in the Land Use, Shorelines, and Recreation Discipline Report (Attachment 12).
Figure 3.8.4 Map of Recreation Sites

Legend

- Public Trail
- Study Area
- Public Park
3.8.4 Does the EIS consider input from area recreationists?

Information on recreational use of the surrounding open space resources was gathered through surveys conducted during the summer of 2019 at locations around the Capitol Lake Basin, and at a Community Sounding Board meeting. Capitol Lake and nearby Budd Inlet shorelines are important places for many types of recreation, especially walking, attending events, and family time. Diverse activities continue around the lake despite restrictions on in-water uses. Many people indicated they would use the area more if uses like boating, fishing, swimming, and wading were restored. Enterprise Services will consider this information during the decision-making process for this project. For additional information, see the Land Use, Shorelines, and Recreation Discipline Report (Attachment 12).

3.9 CULTURAL RESOURCES

Cultural resources include archaeological and historic built environment resources as well as traditional cultural properties.

Archaeological resources are places where past human activity has left physical traces. These traces include artifacts, deposits of debris, food remains (shells and bones), ruins of dwellings and other structures, and human remains and cemeteries. Historic built environment resources (historic resources) include buildings, structures, and landscape features built by people, and which remain in a functional state or operational readiness. Built environment resources typically must be at least 50 years old to be considered historic. Traditional cultural properties, sometimes referred to as areas of traditional cultural concern, are properties associated with cultural practices, beliefs, the sense of purpose, or existence of a living community that is rooted in that community's history or is important in maintaining its cultural identity and development as an ethnically distinctive people.

Certain cultural resources are protected under various federal, state, and local historic registers. These include districts, sites, buildings, structures, or objects that are already included in, or may be eligible for listing, in the National Register of Historic Places (NRHP), Washington Heritage Register, City of Olympia Heritage Register, or City of Tumwater Register of Historic Places.

The federal Section 106 process under the National Historic Preservation Act (NHPA) is used to consider how cultural and historic resources would be affected by an undertaking. As part of this process,
resources first are evaluated regarding their eligibility for listing in the NRHP. If they are eligible, then the process determines if the impacts are adverse or not, and whether mitigation is needed to offset adverse impacts. The USACE will be the lead agency for the Section 106 review for this project, and the review process is expected to include the Squaxin Island Tribe, Nisqually Indian Tribe, Confederated Tribes of the Chehalis Reservation, and DAHP. The Section 106 process will start once the SEPA EIS process concludes, a Preferred Alternative is selected, and the design and permitting process begins. Additional information on the regulatory context for cultural resources is presented in the Cultural Resources Discipline Report (Attachment 13).

The study area for archaeological resources is defined as a 0.25-mile (0.40-kilometer) buffer east, south, and west of the project area; the northern boundary is the extent of anticipated sediment deposition and dredging that would occur within West Bay under the Estuary and Hybrid Alternatives. The study area for the historic built environment consists of areas that could be directly or indirectly impacted by construction or operation of the project and is larger than the project area. At the south end, the boundary extends to the top edge of the steep bluffs around the South Basin, I-5, and US Highway 101; the eastern boundary encompasses the South Capitol Neighborhood, West Capitol Campus, Downtown Olympia historic districts, and Capitol Way S; and the western boundary is the upland edge of the project area; finally, the northern boundary is defined by a direct line from the north end of the Port of Olympia harbor west to the shore.

Methods for Studying Cultural Resources

The review of archaeological and historic built environment resources included both desktop analysis and a field inventory for historic resources. The desktop analysis of existing conditions and context for cultural resources was conducted using previous studies, database searches, historical maps, and historical registers. A field inventory and completion of historic property inventory (HPI) forms were completed for historic resources that would be directly or indirectly impacted by one or more of the action alternatives. The completed HPI forms and survey information will help support future Section 106 consultation as part of permit evaluations for the selected alternative, and may be supplemented at that time with additional survey work.

The full list of studies, reports, and other data sources is presented in the Cultural Resources Discipline Report (Attachment 13). Given the large volume of publicly available information on historic development context and history of the Capitol Lake area, there is a larger volume of information presented in this EIS and in the Cultural Resources Discipline Report (Attachment 13) on the historic built environment relative to archaeological resources.
3.9.1 What archaeological resources can be found in the study area?

3.9.1.1 Indigenous Context of the Study Area

The Capitol Lake – Deschutes Estuary is located within the ancestral lands of the Southern Coast Salish and Southwestern Coast Salish cultural groups, which includes, but is not limited, to the Steh-chass, Nusehchatl, Squaxin (people of the water), Nisqually (people of the river, people of the grass), and the Chehalis. The Southern Coast Salish and Southwestern Coast Salish have used the area since time immemorial for various levels of habitation and resource gathering. Descendants of these people are members of today’s federally recognized Squaxin Island Tribe, Nisqually Indian Tribe, and Confederated Tribes of the Chehalis Reservation.

The natural waterways of the study area, including the Deschutes River and Percival Creek, along with other nearby rivers, lakes, and forests provided fishing and hunting opportunities for resources such as salmon, beaver, waterfowl, deer, elk, bear, and other animals. The ethnographic record and oral tradition speak to the importance of the land, its resources, and fishing among indigenous groups throughout the region. This includes ceremonies and rites related to the resources and their procurement, including the First Salmon Ceremony. This ceremony celebrates the first catch of the season and ensures the fish return and remain an abundant resource for future seasons and generations.

The Southern Coast Salish groups in this area were signatories of the 1854 Medicine Creek Treaty. Under this treaty, ratified in 1859, lands in the South Puget Sound stretching from the Cascades to the Black Hills were ceded to the U.S. Government by the treaty signatories. This area includes the ancestral lands of the Squaxin Island Tribe, Nisqually Indian Tribe, and Confederated Tribes of the Chehalis Reservation. This treaty was the first negotiated between the U.S. Government and indigenous groups in the Washington Territory and established certain rights, amongst them fishing rights in all “usual and accustomed grounds and stations.” This right was later upheld by the Boldt decision in 1974.

3.9.1.2 Recorded Archaeological Resources

Given the shoreline setting of the Project Area and its proximity to water, the Project Area is classified as Very High to High Risk for presence of precontact-era archaeological resources. Upland areas adjacent to the North and South Basins contain recorded precontact-era archaeological sites, and it is likely that further as-yet-undiscovered sites
are present in the uplands adjacent to all three basins. It is also possible that some upland sites could extend downslope into the basins.

Landforms in the vicinity of 5th Avenue Dam are more notable for recorded historic-era archaeological sites rather than precontact-era sites. Recorded resources include “Heritage Park Bottle Dump” associated with the Olympia Brewing Company Bottle Works Plant Site in the North Basin, as well as refuse dumps and structural ruins. Also, the “Roadbed of the Olympia and Chehalis Valley Railroad” is situated along the western shoreline of the Middle Basin.

For a listing of previously recorded archaeological sites in the Project Area and their register status, see Table 4.3 in the Cultural Resources Discipline Report (Attachment 13).

3.9.2 What historic built environment resources can be found in the study area?

3.9.2.1 Historic Setting of the Study Area

The Capitol Lake Basin began as a natural feature, part of the estuary transitioning between the freshwater Deschutes River and the saltwater tides of Budd Inlet. Over time, several events have changed the character of the Capitol Lake Basin: the establishment of Tumwater and Olympia; the growth of the west side of Olympia; the crossing of multiple railroad lines; and the evolution of the Capitol Campus, which includes the addition of the Des Chutes Basin Project (Capitol Lake).

In 1889, Washington became a state and Olympia the state capital. The state legislature selected New York architect Ernest Flagg to design the capitol building. Flagg’s proposal oriented the capitol building to the south, and had it fronting a plaza with a reflecting pool and formal plantings. Twenty years later, the State Capitol Commission selected the architects Wilder & White to develop a master plan for the Capitol Campus. In their design, Wilder & White identified the capitol building site’s height above the surrounding water (Middle and North Basins) and the city as key to conveying its monumental significance. The State Capitol Commission also hired the Olmsted Brothers to develop a preliminary plan for the general layout based on an earlier design by Wilder & White.

In 1912, the Olmsted Brothers worked with the State Capitol Commission and Wilder & White, showing their vision for reorganization of the land at the base of the bluff (Figure 3.9.1). The Olmsted Brothers’ proposal for the estuary included creating a saltwater pond, selective
infilling of the tideflats, relocating the Northern Pacific Railway alignment, and capitalizing on the Capitol Waterway’s alignment with the proposed location of the Legislative Building to extend a park along the infilled former waterway alignment to end at a railroad depot.

The saltwater pond was proposed to be created through a low retaining berm with a road along the top and an inlet and outlet to exchange water during tidal fluctuations. Ultimately, Wilder & White’s design of the capitol group was selected by the State Capitol Commission and construction commenced. In 1927, the now State Capitol Committee (SCC) retained the Olmsted Brothers to design the campus landscape and approaches.

Much of the present-day configuration of the Capitol Lake Basin was established as part of the Des Chutes Basin Project, initiated by the State Legislature in 1937 through House Bill 530 authorizing work on the Des Chutes Basin Project in part “to be in keeping with and become a part of the capitol building and grounds; [...].” This work included clearing development from the shoreline of the Capitol Lake Basin, buying back tidelands, and developing the 5th Avenue Dam, the 5th Avenue Bridge, and Deschutes Parkway. The SCC retained James W. Carey & Associates to develop the overall design, which ultimately included selecting an earth fill dam for the 5th Avenue Dam as the best suited and most economical design approach. The 800-foot-long and 80-foot-wide (at the top) dam was built as three units and completed in 1951. Fill for the dam was pulled from the nearby Percival Creek borrow pit.

For additional information on the historic setting, see the Cultural Resources Discipline Report (Attachment 13). This includes further information on the historic development context and themes applicable to the history of the Capitol Lake area, such as early European settlement, land development, State Capitol development and design, commercial development, transportation, and neighborhood development.
Figure 3.9.1 Flagg & Wilder & White Visions

Ca. 1893 view of architect Ernest Flagg’s design for the State Capitol Building.

Courtesy Washington State Archives.

Ca. 1911 Bird’s Eye View prepared by architects Wilder & White showing their vision for the capitol grounds.

Courtesy of the National Park Service, Frederick Law Olmsted National Historic Site. File No. 5350-32.
3.9.2.2 Listed and Potentially Eligible Historic Built Environment Resources

Historic built environment resources in the study area include historic districts and individually designated resources, both listed and those recommended as eligible for listing in the NRHP and other historic registers.

To determine potential impacts, the EIS analysis considered both listed historic resources and historic resources that the EIS Project Team evaluated and recommends as eligible for listing, as well as currently unlisted and unevaluated resources that may be eligible for listing in the NRHP and other historic registers. Potentially affected resources would be evaluated for eligibility as part of the Section 106 process during permitting for the selected alternative. During the Section 106 process, the lead federal agency will make a determination of eligibility for the identified resources, and forward that determination to DAHP in a letter with a request for concurrence on the determination(s).

The field inventory results were combined with information from previous historic resources investigations to create a comprehensive summary of the historic built environment of the study area. The comprehensive inventory includes both listed and potentially eligible resources as well as those that have not been reviewed for eligibility. A total of 103 historic resources were identified in the historic built environment study area, along with five existing historic districts. This evaluation also recommended a potential new historic district: the Des Chutes Basin Project. Figure 3.9.2 shows the location of the historic districts, as well as the individually listed and designated resources. For more information on the individual resources, see Cultural Resources Discipline Report (Attachment 13).

Many of the individually eligible resources are within one of the historic districts described below:

- **Des Chutes Basin Project Historic District (Recommended).** The 1937 Des Chutes Basin Project is recommended by the EIS Project Team as a historic district due to its influence on and interconnectedness with the development and visual character of Tumwater, Olympia, and the Capitol Campus. Based on the results of this analysis, the following individual resources within the district are also recommended as eligible for certain federal, state,
and local historic registers: the Capitol Lake – Deschutes Estuary itself, 5th Avenue Dam, 5th Avenue Bridge, and Olympic Street W Bridge. The recommended historic district is within both the Cities of Tumwater and Olympia and within the Project Area, with most features within the Olympia city limits. This potential historic district possesses a significant concentration of associated structures, open space, and sites that present a unified entity and are historically interrelated and aesthetically mutually dependent.

- **Tumwater Historic District (Listed).** The Tumwater Historic District, located within the Project Area in the South Basin, is listed on both the NRHP and the Washington Heritage Register. The historic district encompasses most features remaining from Tumwater’s early development and includes the 1906 Brewery Building, Crosby house (built ca. 1860), and Henderson house (built ca. 1905). Tumwater Historical Park is also within the district.

- **Olympia Downtown Historic District (Listed).** The Olympia Downtown Historic District is listed in both the NRHP and the Washington Heritage Register. The district is adjacent to the Project Area in the North Basin and West Bay.

- **Downtown Olympia Historic District (Listed).** The Downtown Olympia Historic District is listed in the Olympia Heritage Register. The district is adjacent to the Project Area in the North Basin and West Bay.

- **Washington State Capitol Historic District (Listed).** The Washington State Capitol Historic District is listed in both the NRHP and Washington Heritage Register. The district is adjacent to the Project Area in the North and Middle Basins.

- **South Capitol Neighborhood Historic District (Listed).** The South Capitol Neighborhood Historic District is listed in both the NRHP and Washington Heritage Register. The district is adjacent to the Project Area in the Middle Basin.

These eligible and listed resources are shown on Figure 3.9.2.

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**Are the 5th Avenue Dam and 5th Avenue Bridge eligible for listing in the NRHP?**

Both the 5th Avenue Dam and 5th Avenue Bridge are recommended as eligible for listing in the NRHP as a contributing resource within a historic district encompassing the Des Chutes Basin Project. These structures have historic significance for their association with the Des Chutes Basin Project and their impact on the community planning and development of Olympia. As individual structures, they are also recommended as individually eligible for listing in the NRHP due to their high level of architectural integrity.
Figure 3.9.2 Historic Districts & Listed Historic Resources

Legend
- Individually Listed and Designated Resources
- Historic Districts
- Project Area

Historic Built Environment Study Area
130 foot contour line
City Limits
3.9.3 Are there traditional cultural properties in the study area?

As part of an earlier planning effort for the Capitol Lake Basin, a study was conducted in 2009 of cultural and spiritual values associated with future alternatives for the Capitol Lake Basin (*Study of Cultural & Spiritual Values Associated with Future Alternatives for Capitol Lake Basin*). The study was intended to identify the cultural and spiritual values associated with the Capitol Lake Basin held by a variety of stakeholders, and to assess potential impacts on those values from proposed alternatives for Capitol Lake Basin at that time.

Values were identified through document review and interviews with stakeholders, including representatives of:

- The Native American community (the Squaxin Island Tribe)
- The Olympia Chinese-American community

The 2009 report contains information regarding beliefs and experiences associated with the Capitol Lake Basin, which are summarized below. Stakeholder participants in the earlier study confirmed to the EIS Project Team that the 2009 report remains a valid representation; no new information on the communities’ history and ties to the area were identified.

### 3.9.3.1 Squaxin Island Tribe

The Deschutes Estuary is the ancestral home to many of the Squaxin Island Tribe’s members. The Deschutes Estuary was originally inhabited by the Steh-chass people who occupied the area around Budd Inlet. The Deschutes watershed continues to be used for ceremonial, subsistence, and commercial harvesting of natural resources, and is a place of strong cultural and spiritual value. The tribe sees value and significance of the Capitol Lake – Deschutes Estuary area as a provider, educator, connection to ancestors, and source of meditative tranquility. In addition, the natural condition of the original river and estuary is valued for the sake of itself. In its natural state, the basin provided water and mud for spiritual cleansing rituals; fish, shellfish, birds, and eggs; medicinal plants; and materials for basket-weaving such as sweetgrass. The tribe considers that a reintroduced estuary could be an educational resource to teach people about nature, land, and ancestors, as the area was once an important regional hub of indigenous trade and transportation.
3.9.3.2 Chinese-American Community

The Chinese-American community is linked to the Deschutes Estuary through Olympia’s historic Chinatown.

Chinese immigrants first arrived in Olympia during the mid-19th century. Many found employment as construction laborers, in lumber camps, harvesting shellfish, commerce, and domestic work. From its roots on 4th Avenue W at Columbia Street and Capitol Way, Chinatown moved progressively south and west to 5th Avenue SW and Water Street SW, and the waterfront district known as Little Hollywood.

During the economic depression of 1882 to 1885, Chinese residents in Seattle and Tacoma were forcibly removed, but this did not happen in Olympia. However, anti-Chinese immigration laws and sentiment eventually led to the abandonment of Olympia’s Chinatown. In 1937, the SCC was authorized to develop and extend the State Capitol grounds, which involved purchasing or condemning basin and tidelands. Little Hollywood was razed in 1943, and remnants of Chinatown are now gone.

The Chinese-American community values the area as an embodiment of the American Dream. Capitol Lake Basin represents a first immigrant home in the U.S., and it was a starting point for establishing Olympia’s Chinese-American community. This experience is commemorated in a historic marker at Heritage Park Fountain, the site of the former Chinatown. The dedication of the Olympia Dragon Mural at the corner of 5th Avenue SW and Columbia Street SE in 2019 to commemorate the Chinese-American business community that was located along Columbia Street underscores the continued connection of this community with the area.

3.10 VISUAL RESOURCES

Visual resources are natural and human landscapes that are valued for their views. However, the importance of, sensitivity to, and impacts from changes to views can vary greatly from person to person. Public preferences for certain views are expressed in several planning policies and regulations.

The study area for visual resources extends beyond the Project Area to the areas where the project would be visible. This includes public viewpoints, scenic routes and highways, and views from private properties. The study area includes Deschutes Parkway and the parks around the lake’s north, west, and south shores; a portion of the Capitol Campus on the eastern shore; and the shorelines lining the southeast
Methods for Studying Visual Resources

The affected environment was evaluated based on a review of the study area landscape and its uniqueness within the regional landscape, with reliance on agency policies to determine specific features that are valued. Data sources used for the analysis include aerial and terrestrial photography; GIS data including terrain, vegetative cover, and 3D modeling of structures and vegetation; relevant policy and planning documents; and land and shoreline use regulations applicable to the study area.

The full list of data sources is presented in the Visual Resources Discipline Report (Attachment 14).

3.10.1 What is the relevant context and regulatory landscape for this viewshed?

Capitol Lake is a large waterbody and a highly valued visual resource. Capitol Lake and the adjoining parks define edges of downtown Tumwater and Olympia, and contribute to the setting for the Washington State Capitol. The design of the Capitol Campus takes advantage of views of the water as a connection with the larger landscape setting that includes Puget Sound and the Olympic Mountains. While the state has adopted regulations regarding the use of Capitol Lake, no state regulation specifically directs the management of views or visual quality. Master Plans for the Capitol Campus do include goals relating to the views of the water and Olympic Mountains from the North Overlook. At a local level, the Cities of Tumwater and Olympia have policy guidance related to a general preference for protecting public views of the water, water’s edge, and surrounding mountain views, and for naturalistic design treatments, but do not call out specific views that must be preserved (aside from views of the Capitol Dome).
3.10.2 What are the existing views within the North Basin?

The North Basin includes Heritage Park, Deschutes Parkway, and Marathon Park. The North Basin is noted for views of the Capitol Dome, which are available around much of the east, north, and west perimeter of Capitol Lake. The North Basin can also be seen from the Capitol Campus, particularly from the North Overlook. The North Basin is also a defining visual feature at the southwest edge of downtown Olympia. Views from taller buildings in downtown Olympia include the basin. The North Basin consists of four Landscape Similarity Zones, described in the following sections.

3.10.2.1 Heritage Park

The area east of the 5th Avenue Dam is dominated by Heritage Park, a highly visited public park that is an extension of the Washington State Capitol Campus. The park comprises the east shoreline of the North Basin and is generally flat. At the northern edge of Heritage Park, a mound known as the Eastern Washington Butte offers views across the North Basin toward the Capitol (see Exhibit 3.32). The southeast portion of the North Basin also provides views of the Capitol Dome and large areas of water (see Exhibit 3.33).

The views from Heritage Park extend to Marathon Park and Deschutes Parkway. Views do not extend to the Middle Basin because of the BNSF Railway Trestle, which marks the division between the basins. The views looking south toward the Capitol Campus are highly unified, with the formal tree plantings along the shorelines leading to the forested hillside.
topped by the Capitol Dome. There are some private views of Heritage Park from taller buildings downtown.

### 3.10.2.2 Capitol Campus North Overlook

The North Overlook, located on the Capitol Campus atop a steep hillside, offers views of Capitol Lake, downtown Olympia, Budd Inlet, Puget Sound, and the Olympic Mountains beyond (see Exhibit 3.34). Heritage Park stands in the foreground and the marinas and buildings of downtown Olympia form the middle ground of the view. The 5th Avenue Dam is visible on the far shore of Capitol Lake, but it is not prominent.

The view from the North Overlook provides a strong sense of place for viewers visiting the Capitol Campus.

![Exhibit 3.57 Photo Point 3: Capitol Campus North Vista looking northwest](image)

### 3.10.2.3 Deschutes Parkway

Deschutes Parkway extends west of the 5th Avenue Dam and continues south, along the west shore of the North Basin. Views from Deschutes Parkway are primarily open water (see Exhibit 3.35). The far shoreline is Heritage Park, which appears as a line of trees along the shore, with a low urban skyline behind it. The 5th Avenue Dam is visible but not prominent. Overall, the view is highly unified, like the view from Heritage Park. For a person traveling on the roadway, views of the water are intermittent, interrupted by parked vehicles as well as the street trees and in some areas, low shoreline vegetation. A few houses uphill and west of the parkway have views across the North Basin.
3.10.2.4 Marathon Park

Marathon Park is a large open space in the southwest portion of the North Basin. Views from this park are similar to those from Deschutes Parkway. Marathon Park has an east-west oriented pedestrian boardwalk that crosses the channel between the North Basin and the Middle Basin. The views from this vantage point looking northeast across the North Basin afford the only experience of being over the water on the North Basin (see Exhibit 3.36). The views to the south from the Marathon Park boardwalk have a railroad bridge in the foreground (see Exhibit 3.37).
3.10.3  What are the existing views within the Middle Basin?

The Middle Basin is bounded on the north by the BNSF Railway Trestle and on the south by the I-5 bridge. Viewed from a distance, both the eastern and western shores of the Middle Basin appear heavily vegetated and form a naturalistic frame for the open water of the basin. Except when standing near them, the built elements (the bridges and the Capitol Campus Powerhouse) are not dominant features in this landscape. Like the North Basin, the Middle Basin as a waterbody is predominantly open water. There are overwater views of the Capitol Dome from viewpoints on the south and west sides of the basin. Trails at Percival Cove and the Interpretive Center provide very different visual experiences where vegetation varies in height from very low to well overhead. The Middle Basin consists of three Landscape Similarity Zones described in the following sections.

3.10.3.1 Deschutes Parkway

The west shore of the Middle Basin is a continuation of Deschutes Parkway. The Middle Basin also includes Percival Cove, a largely natural area that is separated from the main basin by a causeway and bridge, which Deschutes Parkway traverses. Views are similar to those in the North Basin except that the roadway has open water on both sides. The Capital Dome can also be seen along much of the corridor.

3.10.3.2 Interpretive Center

The Interpretive Center, at the southwest edge of the Middle Basin near the I-5 bridge, is made up of wetlands and paths, and has two small piers that provide close visual access to the water. The pathways afford views across the wetlands in the park as well as views north along the long sweep of the Middle Basin. From the shoreline path, open water and tree-lined shores dominate the view. In places, the Capitol Dome can be viewed (see Exhibit 3.38). Along other pathways, views are obscured by shrubby shoreline vegetation, but there are also openings where the entire basin can be observed.

This zone includes portions of I-5 and US Highway 101, as well as a small area upslope from US Highway 101. Only fleeting views of the Middle Basin are available from these highways.
3.10.3.3 **East Shore**

There are no public view locations along the waterfront of the east shore. The area is mostly privately owned and has an extensive tree canopy on the steep slopes that line the shore and block views from the streets. The east shore of the Middle Basin is composed of steep slopes rising approximately 100 feet (30 meters) above the water level, forested with a mix of deciduous and coniferous trees (see Exhibit 3.39).

At the northeast end of the Middle Basin is the Capitol Campus Powerhouse, a historic industrial building nestled in the slope that provides steam heat to the Capitol Campus (see Exhibit 3.40). Viewed from Deschutes Parkway or the Interpretive Center, the eastern shore appears as a unified landscape of forest greenbelt, with the Capitol Dome and the I-5 bridge to the south being the only built features of any prominence.
3.10.4 What are the existing views within the South Basin?

The South Basin is bounded on the north by the I-5 bridge and on the south by Tumwater Falls. The falls form a natural and dramatic visual terminus (see Exhibit 3.41). The South Basin is the smallest of the basins and is dominated by views of riparian wetlands and forest, with the river channel and a small area of open water as a central spine. The South Basin is considered one Landscape Similarity Zone because views of it are similar from most angles, and views from within it, although varied, contain similar visual elements.

The features of the South Basin form a popular tourist attraction, and thousands of visitors come to the area every year to see the river, the fish hatchery, and the historic brewery and other buildings in the area. Therefore, most viewers see this zone from within one of the two parks that form the shorelines of this basin. Tumwater Historical Park has open areas with trails leading to the water’s edge (see Exhibit 3.42). Brewery Park at Tumwater Falls also has trails and a pedestrian bridge over the river that allow users to see the river up close.

The visual character is largely unified, even in areas where built elements are close to the water. The main exception is the area near the I-5 bridge, where the massive overhead stricture contrasts sharply with rest of the basin.
Environmental health addresses the physical, chemical, and biological factors that could affect human health. For this project, the chemical quality of sediment was evaluated as the primary potential change to environmental health. Additional information on sediment quality, including data collected for this project, is presented in the Sediment Quality Discipline Report (Attachment 15). Other aspects of environmental health that were evaluated in this EIS include the potential increase or decrease of mosquitos and toxic algae based on changing water quality conditions.

The study area for environmental health consists of areas that could be directly or indirectly affected by construction or operation of the action alternatives. This includes the North and Middle Basins within the Capitol Lake Basin, and West Bay, which could be affected by sediment transport from the Capitol Lake Basin, depending on the long-term management alternative. In this area, sediment quality could change as a result of the project.
Methods for Studying Environmental Health

Sediment quality data collected by the EIS Project Team in Capitol Lake, and those data publicly available in West Bay, are compared against regulatory criteria to determine if the sediment poses a risk to the environment. For this study, sediment quality data were compared to the following criteria:

- **Washington State Sediment Management Standards (SMS)** freshwater and marine chemical criteria that are protective of the benthic community and human health in freshwater and marine sediment. SMS sediment cleanup standards chemical criteria include the Sediment Cleanup Objective (SCO) and CSL.
- **Dredged Material Management Program (DMMP)** marine sediment screening levels (SLs) are applicable for any future dredging project in West Bay that would dispose of dredged sediments within the waters of the U.S.
- **Model Toxics Control Act (MTCA)** Method A soil cleanup levels for unrestricted land use are used to evaluate options for the beneficial reuse of the sediments at a non-landfill upland location.

The Sediment Quality Discipline Report (Attachment 15) contains the full list of data sources used for the evaluation.

### 3.11.1 How was existing sediment quality evaluated?

Information about the existing sediment quality conditions in Capitol Lake was obtained during a March 2020 sediment sampling event, as described in Section 3.11.2. Information about sediment quality for West Bay was evaluated using historical data available in Ecology’s Environmental Information Management (EIM) online database and existing reports, as described in Section 3.11.3.

To evaluate sediment quality, chemical concentrations in surface sediments were compared to criteria for protecting benthic invertebrates (bottom-sediment dwelling organisms), wildlife, and human health in fresh and marine waters, as well as criteria for allowing potential disposal of sediments removed from the project site to an open-water disposal site in Puget Sound or an upland location.

### 3.11.2 What is the existing sediment quality in Capitol Lake?

In March 2020, a sediment sampling event was conducted in the North and Middle Basins to support the EIS analysis (Figure 3.10.1). The goal of this sediment sampling was to characterize the physical and chemical quality of sediments within the Capitol Lake Basin to evaluate existing conditions. This information was important for analyzing potential impacts to environmental health during construction and operation of each project alternative.
Figure 3.11.1 Sediment Sample Locations

Legend

• Sampling Station

Scale in Feet

0 375 750 1,500

North Basin (Reflecting Pool)
Surface, dredge layer, and Z layer sediment samples were collected in the North and Middle Basins in order to understand the quality of sediment that would be dredged and the sediment that would remain. Surface grab samples were collected from the top 3.9 inches (10 centimeters) of the sediment to characterize surface sediment quality. Subsurface sediment cores were collected to characterize the deeper layers. Samples were analyzed for the chemicals listed below. These chemicals were selected for analysis primarily because they are the chemicals that are regulated under SMS. Dioxins/furans do not have similar regulatory criteria under SMS, but have DMMP criteria to inform disposal options.

- Ammonia and sulfides
- Metals
- Butyltins
- Semivolatile organic compounds (SVOCs). For example, polycyclic aromatic hydrocarbons (PAHs), phthalates, and phenols.
- Polychlorinated biphenyls (PCBs)
- Organochlorine pesticides
- Total petroleum hydrocarbons (TPH)
- Dioxins/furans

The data indicated that, overall, Capitol Lake has high quality (good) sediment, meeting nearly all applicable sediment criteria. Refer to the Sediment Quality Discipline Report for detailed data table and analysis (Attachment 15). Sediment chemical concentrations were low in all three layers of both basins. The only criterion exceeded was the freshwater CSL for total sulfides protective of benthic invertebrates. High sulfide concentrations are common in lake sediments due to microbial decay of natural organic matter present in algae and aquatic plants.

Average concentrations of total sulfides exceeded the freshwater CSL in the surface and dredge layer in both basins, but not in the Z layer of either basin. This is because there is typically a low amount of organic matter in the deeper sediment. Organisms present in the surface layer are likely impacted by the high concentrations of total sulfides (and associated low dissolved oxygen), but not by anthropogenic chemicals.

### Three Layers of Sediment Evaluated

**Surface layer** sediments in many areas would be left undisturbed during and following construction. These are areas that would not be dredged.

**Dredge layer** sediments may be used to create habitat areas or be removed for off-site disposal or upland reuse (if treated for invasive species).

**Z layer** sediments are in dredge areas that would become exposed after dredging, but would remain.

### Potential Toxic Effects of Total Sulfides

**Risk to Benthic Organisms**
Sulfides in sediment are naturally occurring. Elevated sulfide levels indicate the sediment may have low oxygen. Sometimes, the elevated sulfides in sediment can be toxic to benthic invertebrates or cause them to avoid the surrounding environment.

**No Risks to Human Health**
The sulfides that are present in Capitol Lake do not pose a health risk to humans during recreational activities such as boating or swimming.
Although there were detections of other chemicals, none of the observed metals or organic chemicals concentrations would trigger sediment cleanup, as the detected concentrations were less than the CSL and are common in urban areas. Concentrations of dioxins/furans would not trigger sediment cleanup but may not allow for open-water disposal, depending on the volume-weighted average concentration in all dredged sediments. However, in-water disposal of sediments dredged during construction is not anticipated. Based on the chemical quality, there would be no restrictions for reuse or placement of sediments dredged from Capitol Lake at an upland location based on chemical concentrations.

Overall, the data were consistent with past historical studies from Capitol Lake, which have always shown the sediment in Capitol Lake to be of good quality.

### 3.11.3 What is the existing sediment quality in West Bay?

Sediment quality in West Bay was evaluated for this project because of the potential for characteristics to change if the 5th Avenue Dam was removed and sediment was deposited in West Bay from the Capitol Lake Basin; and to evaluate the potential impacts to sediment quality if sediment was transported from West Bay into the Capitol Lake Basin during flooding/incoming tides.

Sediment quality has been evaluated in West Bay in four studies conducted between 2008 and 2019. Sediment sampling locations are shown on Figure 3.11.2. In general, sediment quality in West Bay has not met sediment quality criteria based on data provided in these historical studies. Contaminants of primary concern include carcinogenic PAHs and dioxins/furans, which affect human and ecological health, and are located throughout West Bay, while localized exceedances of benthic criteria, which protect biological organisms in the sediment, occur near stormwater outfalls. Results from the studies are summarized below, and the sediment data from all the studies are available in Ecology’s EIM database.

Sediment chemical concentrations in West Bay only exceed SMS and DMMP criteria for select chemicals. The exceedances occur near the stormwater outfalls in the Fiddlehead Marina and the Port of Olympia along the eastern shoreline of West Bay. Chemicals that exceed SMS criteria included organic compounds (phthalates, benzoic acid, benzyl alcohol, acenaphthene [a PAH]) and mercury. In general, lower
concentrations of chemicals were found in the central and southwest areas of West Bay.

Average concentrations of dioxins/furans and carcinogenic PAHs in West Bay were calculated for comparison to their respective regional background concentrations that are protective of ecological and human health. The average dioxin/furan concentration for West Bay did not exceed regional background but did exceed the DMMP SL for disposal sites, indicating that these sediments, if dredged, cannot be disposed of in open water disposal sites. The average carcinogenic PAHs concentration for West Bay exceeded regional background, indicating potential impacts to ecological and human health.

Ecology has identified four sites around Budd Inlet that will require future cleanups based on existing chemical concentrations in sediments or in the uplands (soil and groundwater). These cleanup sites are presented in Figure 3.11.2 and described below.

- **Port of Olympia Peninsula Investigation.** The Port of Olympia has investigated contamination of the peninsula located between and including part of East Bay and West Bay and is currently evaluating possible cleanup actions for an interim cleanup action plan with Ecology. Ecology has not provided a timeline for that cleanup, but it is a foreseeable future action.

- **Reliable Steel.** A draft cleanup plan was prepared in 2014 but cleanup has not yet occurred. Contaminants found at concentrations greater than sediment cleanup levels include metals, PAHs, and phthalates.

- **Solid Wood Inc.** Initial investigations found levels of metals, TPH, and PAHs that exceeded MTCA criteria for soil or groundwater. An interim cleanup was conducted in 2009 for soil and groundwater contamination and a remedial investigation is currently underway.

- **Cascade Pole.** The Port of Olympia has been working on cleaning up the Cascade Pole site from creosote contamination for many years. The most recent sediment monitoring in 2012 and 2013 showed decreasing dioxin/furan concentrations and no exceedances of CSLs protective of benthic invertebrates.

**Regional Background**

Regional background is the concentration of a chemical in the environment that exists from both natural sources and from man-made diffuse sources not associated with a specific cleanup site, such as traffic and other widespread impacts from urban environments.

For chemical concentrations less than regional background concentrations, cleanup is not required.

**What is the sediment quality in the Project Area?**

The sediment in Capitol Lake is high quality. The sediments in West Bay are impacted by carcinogenic polycyclic aromatic hydrocarbons (cPAHs) and dioxins/furans and future cleanups are planned to address the contamination.
Figure 3.11.2 Surface Sediment Sample, Outfall, & Cleanup Site Locations in West Bay

Legend:
- Cleanup Site
- Federal Navigation Channel
- Port of Olympia Peninsula Investigation
- LOTT Outfall
- Stormwater Outfall
- Historical Surface Sediment Sample Location

Scale in Feet
3.11.4 How are mosquitoes relevant to environmental health?

Within the state of Washington there are 52 species of mosquitoes, of which 26 have been identified in Thurston County. Mosquitoes are known vectors capable of spreading disease-causing agents to humans. In 2008 the Washington State Department of Health (WDOH) reported that 12 species of mosquitoes found in Thurston County were West Nile Virus (WNV) positive. However, detection or isolation of WNV viral RNA in a species of mosquito does not indicate that the species is a competent vector for the disease, but is an indication that the species has come into contact with the WNV transmission cycle. Two species of mosquito, *Culex pipiens* and *Culex tarsalis*, are considered the state’s primary vectors of WNV, both of which are known to occur within Thurston County. Other mosquito-borne illnesses include Western Equine Encephalitis and St. Louis Encephalitis. The Centers for Disease Control reported that in 2018 there were a total of 56 mosquito-borne disease cases within Washington State.

Mosquitoes lay their eggs in standing water and moist soil and have adapted to a wide variety of habitats including ponds and marshes. Larvae are rarely found in deep water lakes and ponds or in flowing water such as streams or rivers.

A study conducted on the salinity tolerance of six different species of mosquitoes found that 100% mortality occurred with salinity levels between 10.2 and 17 ppt (30% to 50% saltwater). Of the six species *C. pipiens* was found to be the least salinity-tolerant species. A different study found that *C. tarsalis* had a higher salinity tolerance, up to 70% saltwater. These findings are applied to the analysis of potential changes in mosquito presence under the project alternatives.

3.11.5 Why is toxic algae considered as part of the environmental health analysis?

Capitol Lake experiences summer-time algal blooms. The algae community within the lake is primarily dominated by diatoms and cyanobacteria (blue-green algae). As described in Section 3.3, Water Quality, the lake experienced one blue-green algal bloom, which occurred in August 2004. People are typically exposed to toxic algae through contact with skin, inhalation of aerosols, or by consuming toxins via contaminated shellfish or water. Exposure can be linked to recreational activities associated with swimming, boating, and fishing. Symptoms of exposure to a toxic algae generally depend on the length...
and type of exposure, but include irritation to the skin, eyes, nose, throat, and respiratory system. Some forms of cyanobacteria create toxins called cyanotoxins, which can impact the nervous system, liver, skin, stomach, and intestines.

In the past, Budd Inlet has been closed to shellfishing due to the presence of Diarrhetic Shellfish Poison (DSP). DSP is a biotoxin produced by a microscopic algae, *Dinophysis*, which is dinoflagellate. If ingested, symptoms of DSP include abdominal pain, vomiting, nausea, and diarrhea. Domoic acid is another biotoxin produced by a microscopic diatom belonging to the genus *Pseudo-nitzchia* that can accumulate in shellfish and cause Amnesic Shellfish Poisoning. Symptoms of Amnesic Shellfish Poisoning include gastrointestinal and neurological disorders and can be life-threatening. In 2008 domoic acid was detected in blue mussels in Budd Inlet.

**Reference Materials for Section 3.11**
(beyond those used in the sediment quality analysis)

- WDOH. 2020. *Diarrhetic Shellfish Poisoning (DSP)*.
3.12 TRANSPORTATION

The transportation analysis includes the following elements: vehicle traffic on the street system, transit, nonmotorized travel (walking, bicycling), freight service (by rail and truck), and parking.

The study area for transportation includes all roadways, nonmotorized facilities, transit, and rail facilities located within and adjacent to the Project Area, streets that could carry truck trips hauling materials to and from the site during construction, and streets that could experience additional traffic generated by construction of the action alternatives. The study area is adjacent to and just north of the intersection of I-5 and US Highway 101. Deschutes Parkway is a major collector running along the western shore of the Capitol Lake Basin. Both 4th Avenue W and 5th Avenue SW are roadways and bridges that cross the basin between West Bay and the North Basin. The information presented in this section is summarized from the Transportation Discipline Report (Attachment 16).

### Methods for Studying Affected Environment

Data sources used for studying the affected environment for the transportation analysis include inventories of street, sidewalk, bike, and rail facilities in GIS format, as well as transportation planning and policy documents for the jurisdictions in which the facilities are located. Adherence to applicable engineering design and construction standards adopted at the federal, state, and local levels were also taken into account. Sources used in the transportation analysis include (among others) the City of Olympia Comprehensive Plan and Engineering Design and Development Standards; the City of Tumwater Transportation Master Plan; Thurston County GIS data; and the Washington State Department of Transportation (WSDOT) Design Manual and Standard Specifications for Road, Bridge, and Municipal Construction.

The full list of data sources is presented in the Transportation Discipline Report (Attachment 16).

3.12.1 What is the existing street network in the study area?

Figure 3.12.1 shows the street network in the Project Area and study area. Average daily traffic volumes are listed in Table 3.12.1.

### Table 3.12.1 Streets & Corresponding Average Daily Trips in the Transportation Study Area

<table>
<thead>
<tr>
<th>Street</th>
<th>Average Daily Traffic (vehicles each day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4th Avenue W (across bridge)</td>
<td>22,000</td>
</tr>
<tr>
<td>5th Avenue SW (across bridge)</td>
<td>17,000</td>
</tr>
<tr>
<td>Deschutes Parkway</td>
<td>5,000 – 7,000</td>
</tr>
<tr>
<td>Capitol Way S / Capitol Boulevard SE</td>
<td>7,000 – 12,000</td>
</tr>
<tr>
<td>State Avenue NE</td>
<td>12,000</td>
</tr>
</tbody>
</table>
Figure 3.12.1 Street & Freight Network

Legend
- Interstate/Freeway
- Arterial
- Major Collector
- Designated Truck Route
- Neighborhood Collector
- Local Access
- Project Area
- Study Area

Scale in Feet: 0, 625, 1,250, 2,500
3.12.2 What are the existing traffic operations in the study area?

Traffic operations were evaluated based on level-of-service (LOS). The transportation analysis examined existing peak hour LOS at key intersections within the transportation study area, based on the most recent available information from the Cities of Olympia and Tumwater. For most intersections within the study area, LOS E is the locally adopted standard that applies. All study area intersections within Olympia are operating at LOS C or better during all times of day, with most operating at LOS A or B, and the study area intersections within Tumwater are operating at LOS D or better. These operations are well within the cities’ adopted standard of LOS E for these intersections.

3.12.3 What is the existing parking available in the study area?

On-street parking in the transportation study area includes both unrestricted and time-restricted parking facilities. Most of the streets in Downtown Olympia have time-limited parking restrictions, many with parking meters. Unrestricted on-street parking is available on Deschutes Parkway, and also along West Bay Drive NW and in the residential neighborhoods to the west of the Project Area. Parking is also available in the public parks in the study area, including Marathon Park and Heritage Park.

3.12.4 What is the existing transit network in the study area?

Bus service is provided in the study area by Intercity Transit. The Olympia Transit Center is located at State Avenue NE / Washington Street NE in downtown Olympia, and serves as the start and end point for all bus routes that travel through the transportation study area. Bus routes that serve the transportation study area, either via 4th Avenue W or 5th Avenue SW, include routes 41, 45, 47, and 48 (4th Avenue routes) and 12 and 42 (5th Avenue routes); most routes provide either daily or weekday service about every 30 minutes.

3.12.5 What is the existing freight network in the study area?

Freight movement within the transportation study area includes truck and rail movement to and from the Port of Olympia, located in West Bay at the south end of Budd Inlet, and also local truck deliveries. The City of

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**Level of Service (LOS)**

LOS is a qualitative measure used to characterize intersection operating conditions. Six letter designations, “A” through “F,” are used to define LOS. LOS A is the best and represents good traffic operations with little or no delay to motorists. LOS F is the worst and indicates poor traffic operations with long delays. The Cities of Olympia and Tumwater have adopted LOS standards that are applicable to streets within the study area.
Olympia has designated certain streets as truck routes (as shown on Figure 3.12.1). Trucks are restricted to these streets for all freight movement, except for local deliveries. The route between the Project Area and the regional highway system using designated streets would utilize 4th Avenue E, State Avenue NE, and Plum Street SE.

One railroad mainline crosses the Project Area, shown on Figure 3.12.1. These tracks are part of the Olympia & Belmore Railroad, Inc., owned and operated by Genesee & Wyoming. The Olympia & Belmore Railroad, Inc., also provides a link between the Port of Olympia and the national rail freight network (BNSF Railway and Union Pacific Railroad lines). This line serves about three trains each week.

3.12.6 What is the existing pedestrian and bicycle network in the study area?

The City of Olympia’s walking and bicycling infrastructure supports nonmotorized travel to employment centers, commercial districts, transit stops, schools and major institutions, and recreational destinations. There are several trails near the Project Area, many traversing the parks along the water. The docks located in the waterways are also considered public trails. Deschutes Parkway, West Bay Drive NW, 4th Avenue W, and 5th Avenue SW are all part of the pedestrian and bicycle network within the study area (see Figures 3.12.2 and 3.12.3).

The bicycle network includes facilities that are designated as Multi-Use Paths, Bike Lanes, and Bike Streets. These designations are consistent with the City of Olympia’s designations of Class I Bike Path, Class II Bike Lane, and Class III Bike Route, respectively.
Figure 3.12.2 Pedestrian Network

Legend
- **Sidewalk**
- **Public Trail**
- **Project Area**
- **Study Area**
Figure 3.12.3 Bike Network

Legend

- Green: Multi-Use Path
- Red: Bike Lane
- Yellow: Bike Street
- Light Blue: Project Area
- Blue: Study Area
3.13 PUBLIC SERVICES & UTILITIES

The public services and utilities considered in this analysis include the following:

- Fire and emergency response services
- Water, sewer, and stormwater utilities
- Electricity, natural gas, and telecommunications

The study area for the analysis includes the Project Area and adjacent areas where these services could be affected by either construction or operation of the project.

Information in the EIS is summarized from the Public Services and Utilities Discipline Report (Attachment 17), which includes more detailed information on public services and utilities in the study area, as well as information on the regulatory context.

Methods for Studying Public Services and Utilities

Data and information sources used for the public services and utilities analysis include inventories of sewer and water lines, storm drains, underground gas lines, fiber-optic conduit, electrical transmission lines, and emergency services from local planning documents, as well as interviews with local jurisdictions.

Additional information is presented in the Public Services and Utilities Discipline Report (Attachment 17).

3.13.1 What fire and emergency response services are currently available in the study area?

The Olympia Fire Department and Tumwater Fire Department provide emergency fire and medical services to the study area. Most of the study area is located within Olympia Fire Districts 1 and 2, with a very small portion within District 3. Each district is served by a fire station. The southern portion of the study area is located within the service area of the City of Tumwater Fire Department. No fire stations are located within the study area; however, multiple stations are within 1 mile (1.6 km) of the study area, which ensures a timely response to incidents in the area. Average response times are about 7 minutes for Olympia Fire Districts and about 6 minutes for Tumwater Stations.

Four law enforcement agencies have jurisdictions that overlap the study area: the Olympia Police Department, Tumwater Police Department, Thurston County Sheriff, and Washington State Patrol. All stations and other facilities are located outside of the study area.
County sheriffs are responsible for maintaining the peace within their respective counties and filing complaints within their jurisdictions. Washington State Patrol has jurisdiction over state roadways (I-5 and US Highway 101) and the Capitol Campus.

No hospitals are located within the study area. The nearest hospital is Capital Medical Center, about 1.5 miles (2.4 km) west of the study area.

3.13.2 What water, sewer, and stormwater utilities are currently in the study area?

The water systems for both the Cities of Olympia and Tumwater include wells, reservoirs, pumps, and distribution lines to supply residents with water. Water lines within the study area include a potable water line that is routed across the 5th Avenue Bridge, an 8-inch-diameter (20-centimeter-diameter) line routed along Deschutes Parkway, and a 16-inch-diameter (41-centimeter-diameter) line that is routed under Marathon Park and suspended from the pedestrian bridge adjacent to the Olympia & Belmore Railroad, Inc., railroad.

The wastewater systems for both the Cities of Olympia and Tumwater include gravity pipes, pressure pipes, and pump stations. The Olympia Wastewater Utility and Tumwater Water Resources Divisions are responsible for collecting and conveying wastewater flows to regional treatment facilities operated by LOTT. The main treatment facility for LOTT is the Budd Inlet Treatment Plant, which processes approximately 14 million gallons of wastewater on an average day. The Budd Inlet Treatment Plant, located between downtown Olympia and the Port of Olympia, discharges treated water through an outfall in West Bay, and also provides reclaimed water.

A LOTT reclaimed water force main is routed on the western side of the Middle Basin and around the North Basin crossing at the 5th Avenue Bridge and between the North and Middle Basins near Heritage Park. LOTT also owns and maintains a 12- to 18-inch-diameter (30- to 46-centimeter-diameter) reclaimed water distribution line that is routed along the eastern shoreline of the North Basin, crossing between the North and Middle Basins near Heritage Park along the pedestrian walkway bridge, and running along the western shoreline of the Middle Basin into the City of Tumwater.

The City of Olympia’s sewer gravity mains range from 6 inches to 24 inches in diameter, with most pipelines located in the outer portions of the study area. Flow from West Olympia is conveyed across the 4th Avenue Bridge via an 18-inch-diameter sewer gravity main. Two
pump stations are located within the study area: one at the south end of Budd Inlet east of the 4th Avenue Bridge and the other (Percival Pump Station) near the southwestern portion of the North Basin. Sanitary sewer infrastructure within the study area includes a 22-inch-diameter high-density polypropylene gravity line to the west of the Middle Basin, a 20- to 24-inch-diameter force main routed to the west of the North Basin and across the 5th Avenue Dam, and a 24-inch-diameter ductile iron pipe under the pedestrian bridge adjacent to the BNSF Railway Trestle. In the City of Tumwater portion of the study area, a water treatment structure is located just south of the junction between I-5 and US Highway 101, adjacent to the east side of I-5. Most of the water lines and sewer lines within the study area are made of ductile iron.

The storm system for each city includes a system of catch basins, conveyance lines, and outfalls. Within the study area, there are approximately 74 corrugated metal (steel) pipe (CMP) stormwater outfall sites, of which 63 are located within the shoreline of Capitol Lake. In addition to outfalls within the City Olympia and City of Tumwater storm systems, state-owned and privately owned outfalls discharge to the lake. Figure 3.13.1 shows the type and location of each outfall.

Increased flooding from both extreme river flows and/or sea-level rise can damage utility infrastructure. A major concern in downtown Olympia is the impact of floodwaters on stormwater infrastructure. The City of Olympia has a combined sanitary sewer and stormwater system, which means that when floodwaters enter storm drains, generally the water is routed to the Budd Inlet Treatment Plant on the East Bay of Budd Inlet. Increased groundwater elevations due to sea-level rise can also cause excess infiltration into sanitary sewer mains.

Contributions of floodwater to the stormwater system impact the processing capacity of the Budd Inlet Treatment Plant and increase the likelihood of bypassing events, where untreated or partially treated wastewater is discharged directly to Budd Inlet. The overwhelmed sanitary-stormwater system can also back up sewer mains and potentially flood buildings and street drains with untreated sewage. This problem will become more frequent with sea-level rise.

Olympia Sea Level Rise Response Plan

To address flooding vulnerabilities of downtown and the combined sewer system, the City of Olympia, LOTT, and the Port of Olympia prepared an Olympia Sea Level Response Plan. In the near term, flooding is managed through emergency response activities, installing backflow prevention on key stormwater outfalls and pipes, and landscaping of low spots to reduce flood impacts. Even with these actions, however, low-lying areas within and adjacent to Heritage Park will be vulnerable to flooding during infrequent, high-discharge flood events in the Deschutes Watershed.
Water quality is also an issue of concern for utility services in the study area. As described in Section 3.3.2, Ecology has identified Capitol Lake and the 5th Avenue Dam as the primary cause of human-induced depletion of dissolved oxygen in Budd Inlet (due to altered circulation caused by the 5th Avenue Dam, but more so due to loading of nutrients [carbon] from Capitol Lake. Other anthropogenic sources of nutrients identified include wastewater treatment plants (WWTP) that discharge directly to Budd Inlet (such as LOTT), WWTPs that discharge in Puget Sound north of Budd Inlet, and other non-point pollution sources.

3.13.3 What electricity, natural gas, and telecommunications services are currently in the study area?

Puget Sound Energy (PSE) is the primary electricity and natural gas service provider to the Cities of Olympia and Tumwater, and both electric lines and natural gas lines are located within the study area. Most of the electrical lines are located aboveground. PSE power lines cross the 5th Avenue Bridge and the southeastern portion of the South Basin. In the 5th Avenue Bridge vicinity, east-west aligned overhead powerlines cross over the 4th Avenue W bridge and the southerly end of West Bay before splitting to the northwest and southwest, just east of the Olympic Street W and Deschutes Parkway fork. Within the study area, natural gas lines are buried and strung under the 5th Avenue Bridge.

A steam plant occupies the shoreline at the northeast edge of the Middle Basin. Known as the Capitol Campus Powerhouse, the plant has produced steam since the 1920s serving east and west Capitol Campus with nearly 3 miles (4.8 km) of steam and condensation piping, providing steam to 12 of the 19 campus buildings.

The primary provider of telecommunication services in the study area is Qwest Corporation, which does business as CenturyLink QC. A number of other private companies (e.g., AT&T, Verizon, Comcast, and Ziply) also maintain fiber optic cables and provide service throughout the area.
Figure 3.13.1 Capitol Lake Stormwater Outfall Locations

Legend
- Project Area
- Study Area
- Site Type
- Brewery Outfall Site
- City of Olympia Outfall Site
- City of Tumwater Outfall Site
- WSDOT Outfall Site
- Seep or Other Outfall

Scale in Feet

0 500,000 1,000,000 2,000,000
3.14 ECONOMICS

SEPA does not require the economic analysis of a proposed action. As such, the statutes and regulations governing SEPA do not provide specific guidance for what methods to use to analyze economic effects in an EIS. For the Capitol Lake – Deschutes Estuary Long-Term Management Project, however, the Washington State Legislature and project stakeholders have stressed that an economic analysis is a critical component of the EIS and is needed to support the overall decision-making process. According to the Washington State Legislature in Engrossed Substitute Senate Bill 6095 (2018):

“The appropriation in this section is subject to the following conditions and limitations: ... The environmental impact statement must also consider an expanded area around Capitol Lake and Budd Inlet including the Port of Olympia for the economic analysis. The environmental impact statement must consider the use of equal funding from nonstate entities including, but not limited to, local governments, special purpose districts, tribes, and not-for-profit organizations.”

The Funding and Governance Work Group is coordinating the approach to future funding and management of the resources associated with the Capitol Lake – Deschutes Estuary. The Funding and Governance Work Group includes representatives from Enterprise Services, Department of Natural Resources, the Squaxin Island Tribe, the Cities of Olympia and Tumwater, Thurston County, the Port of Olympia, and LOTT. The economic analysis presented in this Draft EIS will help inform the decision-making process.

In the absence of relevant laws, plans, and policies governing economic resources, the methodology followed for this EIS is consistent with professional standards of economic analysis, in the context of environmental impact review. It reflects federal guidance for using economic analysis in regulatory decision-making, water resource planning, and socioeconomic analysis under NEPA.

Based on scoping and early project coordination among the EIS Project Team, Enterprise Services, and stakeholders in the region, it was determined that the economic analysis for the EIS would focus on the following key topics:

- Downstream economic activity
- Development in downtown Olympia (both commercial and residential)
• Demand for and value of recreation
• Demand for and value of ecosystem services

Economics also relates to equity and social justice, topics that are considered in this economic analysis. The subject of economics is interrelated with and linked to other resource topics addressed throughout the EIS, and the affected environments for the latter two topics (recreation and ecosystem services) are described in other sections of the EIS (in particular, Section 3.3, Water Quality, Section 3.6, Wetlands, Section 3.5, Fish and Wildlife, Section 3.7, Air Quality and Odor, Section 3.8, Land Use, Shorelines, and Recreation, and Section 3.9, Cultural Resources). The key factors of the affected environment that influence economic activity and development in the downtown area are summarized in this section, focusing on population, employment, income, and economic activity. The information presented in the EIS summarizes the baseline conditions that inform the analysis of potential long-term and short-term impacts. More details on the affected environment for economics, as well as broader information that provides valuable context, is presented in the Economics Discipline Report (Attachment 18).

Equity and Social Justice

The distribution of economic resources has implications for equity and social justice. By examining who benefits, who experiences costs, and where, when, and how economic impacts materialize across different groups of people, the economic analysis brings into focus issues of fairness and consideration of people's different needs and values. For this project, key equity and social justice issues are related to tribal values for, and use of, natural resources.

Methods for Studying the Affected Environment for Economics

The affected environment was evaluated based primarily on a literature review of publicly available demographic and economic data, data reported in past assessments of Capitol Lake – Deschutes Estuary long-term management planning, coordination with the Port of Olympia as a primary downstream resource, proprietary data from data service providers, and information generated from interviews and email correspondence conducted specifically for this project. The interviews were conducted by telephone with two groups: (1) planners and economic development officials (to capture the public sector perspective), and (2) private developers and real estate experts (to capture the private sector perspective). The EIS Project Team also conducted an on-site park user survey in the summer of 2019 to gather information about recreational use.

For more information on the data sources and how they were used, see the Economics Discipline Report (Attachment 18).

3.14.1 What are the regional population and economic conditions?

The economy in the study area is influenced by the current and expected future conditions related to population and economic resources in Thurston County and the Cities of Olympia and Tumwater. Background information on population, employment, and income for the study area is summarized in this section. It should be noted that the onset of the COVID-19 pandemic in early 2020 affected economic
conditions, resulting in uncertainties regarding future conditions. Existing conditions are described according to available information (most of which is pre-pandemic), and projections based on pre-pandemic conditions are subject to some level of uncertainty. For those conditions that have been described as affected by the COVID-19 pandemic, the data reflect conditions as recent as summer 2020 when the economic analysis was underway.

3.14.1.1 Population

Similar to overall population increases throughout the Puget Sound region, the population in Thurston County increased by 9% between 2010 and 2018 (see Table 3.14.1). Much of that growth occurred in Lacey, which is adjacent to nearby military installations (e.g., Joint Base Lewis-McChord). Within Thurston County, the City of Tumwater has seen the largest rate of growth (30%) as the State of Washington recently opened new campuses to accommodate the state’s public-sector workforce and housing remains relatively affordable.

Table 3.14.1 Current Population & Population Change between 2010 and 2018

<table>
<thead>
<tr>
<th>Geographic Area</th>
<th>2010</th>
<th>2018</th>
<th>Percentage Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thurston County</td>
<td>252,264</td>
<td>274,684</td>
<td>9%</td>
</tr>
<tr>
<td>City of Olympia</td>
<td>46,478</td>
<td>50,836</td>
<td>9%</td>
</tr>
<tr>
<td>City of Tumwater</td>
<td>17,371</td>
<td>22,500</td>
<td>30%</td>
</tr>
</tbody>
</table>

As it grows, Thurston County is becoming more ethnically and racially diverse. A quarter of Thurston County residents identify as non-white, followed by 23% of Olympia residents, and 18% of residents in the City of Tumwater. Those who identified as either Hispanic/Latino or Asian alone made up the largest share of non-white residents in the study area. Native American/Alaska Native populations comprised about 1% of the population in the study area.

Looking ahead, the Washington State Office of Financial Management estimates that the population in Thurston County will continue to grow, increasing by 26% between 2020 and 2040, with an average annual growth rate of 1%.
3.14.1.2 Employment

Historically, natural resources played an important role in the local economy, with mining and lumber as the main industries in Thurston County through the 1920s. When Olympia was established as the state capitol in 1927, employment in the government sector grew, eventually outpacing the lumber industry in the 1950s. Decades later, the area’s accommodation sectors and food services, as well as arts, entertainment, and recreation sectors grew with the passage of the Indian Gaming Regulatory Act (IGRA). Tribal casinos are now among Thurston County’s top five employers.

Today, government at the local, state, and federal levels continues to be the county’s largest employer. In 2018, about 154,500 people were employed (part-time and full-time) in Thurston County, with most employees (39,855) working in the government sector. The county’s five largest private employers that year were Providence St. Peter Hospital, Safeway, Walmart, Nisqually Red Wind Casino, and Lucky Eagle Casino & Hotel. Figure 3.14.1 shows the major employment sectors in Thurston County. Aside from government, employment is heavily concentrated in health care and social assistance, retail, and accommodation and food services.

![Figure 3.14.1 Employment by Sector in Thurston County](image-url)
The employment forecast for Thurston County through 2045 suggests that government will remain the largest employment sector, followed by healthcare and social assistance, professional services, and retail trade (similar to today’s conditions). The sector expected to grow the most between 2017 and 2045 is arts, entertainment, and recreation, which may more than double. Despite this expected growth, it will remain a small proportion of overall county employment. “Other services,” which is a catch-all category that covers a wide range of service businesses, is also expected to grow substantially, likely in part driven by expected steady growth in residential populations and household income.

### 3.14.1.3 Income

Median household income (MHI) is calculated as the midpoint between the incomes for all households within a defined study area. The City of Tumwater and Thurston County have a higher MHI than Olympia, but the gap has narrowed in recent years. As Table 3.14.2 shows, MHI in both the City of Tumwater and Thurston County has decreased since 2010, while the City of Olympia’s MHI has increased by 3% over the last decade.

<table>
<thead>
<tr>
<th>Geographic Area</th>
<th>2010</th>
<th>2018</th>
<th>Percentage Change</th>
</tr>
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<td>$70,165</td>
<td>$69,592</td>
<td>-1%</td>
</tr>
<tr>
<td>City of Olympia</td>
<td>$56,958</td>
<td>$58,606</td>
<td>3%</td>
</tr>
<tr>
<td>City of Tumwater</td>
<td>$69,768</td>
<td>$65,167</td>
<td>-7%</td>
</tr>
</tbody>
</table>

### 3.14.2 What is economic activity and development like downstream of the 5th Avenue Dam?

The Port of Olympia has been an economic development resource for the surrounding local and regional economy for over 100 years, even before the 5th Avenue Dam was constructed. Funding for the Port of Olympia is mostly derived from operating revenue (e.g., cargo handling, leases). The Port of Olympia also receives financial support through a tax levy, which in recent years has generated over $6 million per year. In 2014, the Port of Olympia’s marine terminal, marina, general aviation activity, and real estate tenants supported $106.1 million in direct wages and 2,400 jobs, with an average salary of
$44,204. Approximately 89% of the direct jobs were held by Thurston County residents. The Port of Olympia was also responsible for almost 1,200 induced jobs and $90.3 million in purchases of local supplies and services from firms providing direct services to the Port of Olympia.

In addition to the Port of Olympia, economic development adjacent to West Bay includes:

- **NorthPoint**, an area of restaurants and views of Puget Sound. Formerly an industrial site, the area was restored by the Port of Olympia and Ecology in 2006.

- **The Market District**, retail and commercial establishments, the centerpiece of which is the popular year-round Olympia Farmers Market.

- **Fiddlehead Marina**, a private marina on the eastern side of West Bay, directly south of the Port of Olympia. It consists of 75 boat slips and hosts family-owned and operated offices and docks.

- **The Olympia Yacht Club**, a private organization offering moorage opportunities to members, sailing education programs in partnership with Olympia Parks, Arts, and Recreation, and other activities.

- **West Bay Tidelands**, the western shoreline of West Bay, which is undeveloped and has been the subject of habitat restoration and recreational planning efforts over the past several years. The objective of the restoration is to improve the ecological functioning of West Bay by connecting restoration sites that promote natural coastal processes, while the recreational opportunities would support public use of the shoreline. Ongoing restoration and recreation development activities have the potential to generate employment opportunities and enhance recreational use and spending in the local area. See Figure 3.14.2.
Figure 3.14.2 Properties North of 5th Avenue Dam Considered in Downstream Economic Activity Analysis

Source: ECONorthwest
3.14.3 What are the economic conditions in Downtown Olympia?

Downtown Olympia covers about a half of a square mile (1.3 square kilometers) to the east of the northernmost portion of Capitol Lake, and to West Bay, and is home to more than 450 local businesses and about 1,900 residents. Its main attractions include waterfront activities, a farmers market near the waterfront, various dining and retail establishments, a children’s museum, multiple theaters, and a Creative District that supports artists and cultural venues. City planning efforts support future development in the downtown area. The 2017 Downtown Strategy calls for downtown to absorb 25%, or about 5,000 residents, of the City of Olympia's population growth over the next 20 years. The City of Olympia plans for a walkable, family-friendly neighborhood with a mix of urban housing options. In recent years, more than $180 million of public and private money has been invested in development and redevelopment in downtown Olympia.

Based on a synthesis of findings from the sources used to study the affected environment (key-informant interviews, market assessment, and literature review), the following conclusions are the most relevant for assessing the potential impact of the action alternatives on development in downtown Olympia:

- The appropriate study area for impacts to development in downtown Olympia is the Downtown Olympia Community Renewal Area, the relevant area defining downtown development in the City of Olympia.
- Population growth in the region is the primary driver of demand for development in downtown Olympia.
- A segment of the growing population is attracted to development similar to what is currently being developed in downtown Olympia: primarily smaller households, which are most often made up of younger and older people.
- Retail demand is currently driven by visitors, workers, and tourists, as well as a growing base of downtown residents. Increasing residential demand will drive new retail growth, which in turn attracts more residential development.
- Downtown Olympia will successfully attract demand for residential development based on two main factors: competitive rents compared to other locations, and the portfolio of amenities (including environmental amenities) that downtown has to offer.
• The downtown area has many amenities that differentiate it from other areas. These include the waterfront facing both sides of Budd Inlet, the Capitol Campus grounds, public attractions (museums and the farmers market), and Percival Landing.

• For Capitol Lake specifically, interviewees most frequently cited the surrounding walking trails as one of its most compelling features for downtown residents, followed by the views it provides. These features would continue to contribute to attracting residential demand to downtown to the extent they are maintained in future management alternatives.

Growth in downtown Olympia is driven in part by its amenities, including Capitol Lake. Existing and potential new residents will assess quality-of-life factors in their decision to live downtown. Visitors will come for work or to visit the capitol grounds and will return (or not) based on the quality of their experience. Retailers, restaurant owners, and service providers will respond to demand from residents and visitors and locate and invest accordingly. However, the largest influence on new development continues to be overall regional demand for housing among demographic segments that are more likely to prefer high amenity, urban environments.

3.14.4 What is the demand for and value of recreation?

Recreation resources, facilities, and opportunities in the Project Area include local parks, trails and paths, events, and water-based opportunities (as described in Section 3.8, Land Use, Shorelines, and Recreation). Heritage Park, Marathon Park, Tumwater Historical Park, the Interpretive Center, and Percival Landing Park are all particularly important recreation sites in the basin, and recreational use is popular with local residents and visitors. Throughout the county, there are a variety of publicly and privately owned and operated parks and natural areas. Recreational resources throughout the county provide opportunities similar to the features offered by recreational resources within the basin, meaning that opportunities are not limited to those within the Project Area. People who recreate within the basin may also visit these other areas throughout the county, or may choose to visit Capitol Lake.

Based on a synthesis of findings from the economic analysis in the Economics Discipline Report (Attachment 18), the following are key
conclusions relevant to the demand for and value of recreation in the
Capitol Lake – Deschutes Estuary:

- Demand for the types of recreation provided by the
  Capitol Lake Basin is strong. Demand will likely increase in
  the future with regional population growth, local
  population growth supported by residential development
  in downtown Olympia, and increasing participation rates
  in many types of outdoor recreation supported by the
  Capitol Lake – Deschutes Estuary.

- The Capitol Lake Basin provides the types of recreation
  opportunities that Washington state and Thurston County
  residents demand the most: urban trails and paths for
  walking and biking; exploring waterways, coastlines, and
  natural spaces; and participating in outdoor events.

- Annual use of the parks and facilities surrounding
  Capitol Lake during formal events likely exceeds
  200,000 people. Monthly use of Heritage Park during peak
  summer season likely exceeds 30,000 people. Recorded
  pedestrian use of paths throughout the Capitol Lake Basin
  varies from thousands of trips in some parts of the North
  Basin to hundreds of thousands of trips in parts of the
  South Basin per year. The path circumnavigating
  Capitol Lake is most popularly used by pedestrians.
  Recorded bicycle use is more concentrated along
  Deschutes Parkway, with an average of over 60,000 trips
  per year (primarily reflecting trips for commuting).

- Other similar opportunities for trail- and park-based
  recreation are available in the region, which can offset
  direct losses of economic value when recreation closures
  occur in the study area.

- Demand for some activities not currently available in the
  Capitol Lake Basin (such as nonmotorized boating,
  paddling, and fishing) is present and growing. Availability
  of substitutes for paddling opportunities in the downtown
  area is limited. The nearest access for small, hand-launched
  watercraft, such as canoes and kayaks, is in West Bay Park
  and the northern part of Budd Inlet.

- Recreation activity is economically important because it is
  something people value. Enhancements to recreation
  improve people’s overall economic well-being, and may
lead to more people moving to the region in part because they value recreation amenities.

- Recreation activity is also important economically in the region because visitors coming into the study area to participate in recreation activities spend money that would not likely otherwise be spent in the region. Spending ranges from $8 per participant per day for local park use to over $80 per day for nonmotorized boat use. (Residents spend money on recreation too, but it is likely this money would have been spent locally whether they were recreating or doing something else.)

- The economic value people place on recreation experiences is influenced by the quality of the environmental setting where recreation takes place, and on their understanding of the cultural and symbolic meaning attached to place. People place higher values on visually interesting sites. Symbolic and cultural meaning cannot be quantified but is highly influential and varies from person to person.

- The alignment of preferences and economic value may bias toward maintaining status quo because people tend to value more highly what they know; and people who perceive they are giving something up that they care about may value the loss more highly than the value someone may place on gaining something new, a manifestation of the endowment effect.

In short, recreation in the Capitol Lake Basin is economically important, and changes in development patterns in downtown Olympia will likely increase the value of recreation opportunities in the future. Rising demand may also lead to more crowded recreation sites, further increasing the value of expanding recreation opportunities.

### 3.14.5 What is the demand for and value of ecosystem services?

Ecosystem services describe the capacity of an ecosystem to provide goods and services that people value. Increases in an ecosystem’s ability to provide goods and services produce economic benefits, as they increase the value people derive from the ecosystem. Conversely, decreases in an ecosystem’s ability to provide goods and services produce economic costs. These values may accrue as factors of production to industries and tribes (e.g., commercial fishing), recreational use values of the broader ecosystem (e.g., fishing or
birdwatching), or nonuse values related to the health and function of the ecosystem. Ecosystem goods and services typically are not traded in markets, so their value is inferred from nonmarket valuation techniques to assess changes in value. Ecosystem services addressed in this economic analysis include the following:

- **Habitat Provision**: Ecosystem services are largely determined by the type and quality of habitat available. The habitat types currently present in the Project Area include submerged/open water, river channel, freshwater wetlands, tideflat, low marsh, high marsh, transitional, and upland areas. These habitats provide benefits and functions for fish, wildlife, and plant species, which people value. The affected environment for the habitats that make up ecosystem services are described in detail in other sections of Chapter 3.0, Existing Conditions and Affected Environment (see Section 3.5, Fish and Wildlife, and Section 3.6, Wetlands).

- **Water Regulation**: Water regulation includes maintenance of water quality and flood regulation. Clean water—at the right place and right time—contributes to a variety of goods and services that people rely on. Clean water supports commercial livelihoods, subsistence, recreation, cultural meaning, and individual well-being, in part by supporting aquatic ecosystems that humans depend on and value (see Section 3.3, Water Quality). Flood regulation and management of wastewater and stormwater are crucial for maintaining infrastructure in the region (see Section 3.13, Public Services and Utilities).

- **Climate Regulation**: Another ecosystem service provided by the natural capital in the Capitol Lake – Deschutes Estuary is the ability to regulate climate through sequestering GHGs. GHGs in the basin are primarily sequestered in the vegetation and soil in and around the water. In contrast to sequestration, GHGs are released by decomposing organic matter, such as vegetation (see Section 3.7, Air Quality and Odor). The threats from climate change in Washington state include sea level rise, increased flooding, reduced snowpack, droughts, increased fire risk, ocean acidification, and others. Sea level rise is especially relevant for this project because downtown Olympia is vulnerable to flooding given the extensive shorelines, including Capitol Lake – Deschutes Estuary and West Bay,
and it is only 12 inches (30 centimeters) above sea level. All of these influence economic value in the study area.

- **Cultural, Heritage, Spiritual, Historical, and Education Values:** Cultural, heritage, spiritual, historical, and education values are a component of cultural services that represent the nonmaterial benefits that people obtain from ecosystems and environments. Three primary components to these values are associated with Capitol Lake – Deschutes Estuary. The first is the cultural, heritage, and spiritual values associated with the environment and natural resources used for ceremonial and subsistence purposes by tribes since time immemorial. The second is the historic value of Capitol Lake as a component of the Capitol Campus and the City of Olympia. The third is the potential for the ecosystem and ecosystem management activities to offer educational opportunities to the public, resource managers, and researchers. Studies of the area’s ecology add to scientific knowledge of the region’s ecosystems and how natural and human-influenced processes are affected by various management strategies. This research is ongoing and has the potential to evolve in different ways depending on future conditions.

- **Visual Aesthetics:** The visual aesthetic of the Capitol Lake – Deschutes Estuary creates value in two ways: by defining and enhancing public areas, such as parks, trails, and roads that are available to all; and by serving as a more distant backdrop to private properties with restricted access. Public views include all those around Capitol Lake – Deschutes Estuary, such as the view of the Capitol Dome from the reflecting pool in the North Basin, mountain views and views of downtown from the North Overlook, the waterfront views throughout the trails on the shoreline, and secluded views of vegetation that provide an immersive experience in the South Basin. Although the exact value of these public visual amenities is unknown, these visual amenities likely increase tourism, recreational use, and overall visitation to the area. Some private views of the water features in the basin are from residential properties in the sloped area above Deschutes Parkway and from taller buildings in downtown, particularly to the east and north of the lake. For more information on the affected environment for visual aesthetics, including public and private views, see Section 3.10, Visual Resources.
4.0 Long-Term Impacts, Benefits, & Mitigation

This chapter describes the potential long-term (operational) impacts and mitigation measures for each element of the environment.

Long-term impacts are defined as impacts that would be present or persist after construction. They also include impacts that would occur as a result of long term management actions. Future long-term management actions described throughout this chapter would be the responsibility of the governing body, which is being evaluated by the Funding and Governance Work Group (FGWG) to ensure that these actions are implemented.

The information presented in this chapter is summarized from the full analysis presented in the discipline reports prepared for each element of the environment. This EIS intentionally focuses on the most important elements and conclusions of the analysis and, in particular, the differences among the four project alternatives.

The magnitude of long-term impacts was identified as either less than significant or significant for each resource based on criteria described in the discipline reports. While the primary focus of a SEPA analysis is the identification of adverse impacts, the analysis also considered the potential for beneficial effects. Long-term beneficial effects were considered minor, moderate, or substantial. See the discipline reports in Attachments 5 through 18 for the full impact analysis, including additional tables, figures, and supporting discussion.

4.1 HYDRODYNAMICS & SEDIMENT TRANSPORT

This section describes the potential long-term hydrodynamic and sediment transport conditions of the Capitol Lake – Deschutes
Estuary Long-Term Management Project. These conditions affect other disciplines addressed in this EIS. As such, the potential adverse impacts related to hydrodynamics and sediment transport conditions are incorporated into the evaluations of the other disciplines.

The information presented in this section is based on the results of a hydrodynamic numerical model and is summarized from the Hydrodynamics and Sediment Transport Discipline Report (Attachment 5). The discipline report includes complete details on the data used as inputs to the numerical model, model calibration and run scenarios, and model results. This EIS focuses on the most important differences in future water levels, flooding extents, and sediment deposition.

### Key Findings: Long-Term Hydrodynamic and Sediment Transport Impacts

**Water Levels and Flooding Extents:** Based on numerical modeling, the No Action and Managed Lake Alternatives would have similar long-term hydrodynamic and sediment transport conditions, and the Estuary and Hybrid Alternatives would have similar long-term conditions. All alternatives would experience high water levels and lowland flooding around the Capitol Lake Basin. For the No Action and Managed Lake Alternatives, the highest water levels would occur during extreme Deschutes River flood events. Under the Estuary and Hybrid Alternatives, the highest water levels would occur during extreme tides. Among all alternatives, the highest maximum water levels and greatest extent of flooding would occur for the Managed Lake Alternative during extreme river floods. The No Action Alternative would experience similar, although slightly lower, water levels during extreme river floods.

**Sediment Deposition:** In all alternatives, sediment would continue to accumulate within the Capitol Lake Basin and in West Bay. Under the Managed Lake Alternative, sediment deposition would be similar to the No Action Alternative. The removal of the 5th Avenue Dam under the Estuary and Hybrid Alternatives would allow more sediment to be transported farther downstream into Budd Inlet. This would result in less deposition in the basins and substantially more deposition in Budd Inlet during periods of high river flows. The reflecting pool wall in the Hybrid Alternative would force water to accelerate around the wall as it exits the North Basin, resulting in localized scour and increased transport of sediment to Budd Inlet. Sediment deposition in Budd Inlet would increase up to 283% during periods of high river flow for the Estuary Alternative, and up to 387% for the Hybrid Alternative. Under all alternatives, the majority of the sediment accumulation in Budd Inlet would occur in the eastern portion of West Bay.

### 4.1.1 What methods were used to assess hydrodynamic conditions?

Long-term hydrodynamic conditions were assessed using a 3D numerical model of the Capitol Lake – Deschutes Estuary system. Two hydrodynamic conditions were simulated for each project alternative to represent the extreme conditions: a +100-year river flood event and a 100-year tidal flood event. Both events were modeled with and without 2 feet (0.61 meters) of relative sea level
rise (RSLR). Details on these flood conditions, which are described as Event #1 and Event #2, are provided in the Hydrodynamics and Sediment Transport Discipline Report (Attachment 5).

Sediment transport was predicted for each project alternative over a simulated period of 3 years. The 3-year period was modeled once using typical to low river flow conditions, and separately using extreme river flow conditions. Details on these hydrologic conditions, which are described as Event A and Event B, are provided in the Hydrodynamics and Sediment Transport Discipline Report (Attachment 5).

4.1.2 What are the long-term conditions under the No Action Alternative?

4.1.2.1 Hydrodynamics

Under the No Action Alternative, the 5th Avenue Dam would remain in its current configuration. The dam gates would continue to control water levels in Capitol Lake by limiting when, and at what rate, water can leave the lake and flow into Budd Inlet.

When major river floods occur (i.e., the 100-year flood on the Deschutes River), water levels will rise in the lake and will cause lowland flooding throughout the Capitol Lake Basin, as has happened during previous flood events. Flooded areas will include Heritage Park, the Interpretive Center at the southwest end of the Middle Basin, parts of the Deschutes Parkway, Marathon Park, and Tumwater Historical Park, and portions of downtown Olympia. The modeled +100-year river flood event will cause high water levels of up to 17.4 feet (5.3 meters) NAVD 88 in the North Basin, 17.7 feet (5.4 meters) NAVD 88 in the Middle Basin, and 21.0 feet (6.4 meters) NAVD 88 in the South Basin.

During extreme high tides (i.e., the 100-year tide), elevated water levels in Budd Inlet are prevented from entering Capitol Lake by the 5th Avenue Dam. Water levels in Budd Inlet will reach 16.1 feet (5.0 meters) NAVD 88 during the 100-year tide, while water levels in Capitol Lake only reach a maximum of 12.5 feet (3.8 meters) NAVD 88. Flood waters from Budd Inlet will extend into parts of downtown Olympia and Heritage Park via overland flooding east of the 5th Avenue Dam along 4th Avenue W, Water Street NW, and Percival Landing. The existing low wall (Arc of Statehood) bordering the lake in Heritage Park prevents Budd Inlet flood waters from...
reaching Capitol Lake. No appreciable flooding will occur in low-lying areas of the Capitol Lake Basin as a result of the 100-year tide.

Under the No Action Alternative (and the Managed Lake Alternative), additional flood storage capacity can be provided by preemptive draining, or drawdown, of the lake in anticipation of Deschutes River flooding, as is currently done. The ability to manage river flood waters and provide drawdown relies on operations at the 5th Avenue Dam. As this infrastructure ages, despite periodic repair and maintenance, the risk of operational failure at the 5th Avenue Dam increases. The risk of failure would be highest during back-to-back flood events, which will occur with increasing frequency given future climate projections. In this scenario, equipment malfunction or human error could result in extreme overland flooding. This risk is greater under the No Action Alternative because only minor repair and maintenance activities for the 5th Avenue Dam are anticipated.

4.1.2.2 Sediment Transport

Under the No Action Alternative, the 5th Avenue Dam would remain in its current configuration. The dam would continue to capture most of the sediments transported into the basin and limit the amount of sediment that discharges into Budd Inlet. During high river flow events, sediment will continue to scour from the channel in the Middle Basin. Sediment will deposit in the South Basin, shallow (non-channel) areas of the Middle Basin, North Basin, and Budd Inlet.

Sediment has gradually been accumulating in all three basins since the construction of the 5th Avenue Dam. This long-term accumulation of sediment would continue under the No Action Alternative and would gradually reduce the depth of Capitol Lake. No sediment or depth management strategies would occur under the No Action Alternative.

4.1.3 What are the long-term conditions common to all action alternatives?

The hydrodynamics and sediment transport of each alternative vary; the Managed Lake Alternative would function differently than the Estuary Alternative, which would also change if a barrier wall were constructed in the North Basin per the Hybrid Alternative. There are no conditions common to all alternatives.
4.1.4 What are the long-term conditions under the Managed Lake Alternative?

4.1.4.1 Hydrodynamics

The long-term hydrodynamic conditions of the Managed Lake Alternative are similar to the No Action Alternative. Like the No Action Alternative, the 5th Avenue Dam would continue to control water levels and current speeds in the managed lake. Maximum water levels are determined by extreme river floods, and high water levels from extreme tides would be prevented from entering Capitol Lake.

During major river floods, water levels would be similar to the No Action Alternative. However, the Managed Lake Alternative includes construction of habitat areas in the Middle Basin, which would reduce the flood storage capacity within the basin; therefore, the modeled 100-year river flood event would cause water levels of up to 0.7 feet (0.2 meters) higher than the No Action Alternative in the Middle and South Basins. Although the Managed Lake Alternative would include deepening of the North Basin, construction of habitat areas reduces the net peak volume of water that can be held in Capitol Lake without overland flooding.

Like the No Action Alternative, elevated water levels during extreme high tide events would be prevented from entering Capitol Lake by the 5th Avenue Dam, although flooding from Budd Inlet into downtown Olympia and Heritage Park would still occur via overland flooding east of the 5th Avenue Dam along 4th Avenue W, Water Street NW, and Percival Landing.

4.1.4.2 Sediment Transport

The Managed Lake Alternative would not change the operation or configuration of the 5th Avenue Dam, although the dam and gates would be overhauled to extend their serviceable life.

Overall, sediment deposition patterns would be largely the same under the No Action and Managed Lake Alternatives. However, the ongoing maintenance dredging in the North Basin would periodically remove sediments from the system, and as a result, water depth in the basin would remain deeper than under the No Action Alternative.
4.1.5 What are the long-term conditions under the Estuary Alternative?

4.1.5.1 Hydrodynamics

Under the Estuary Alternative, removal of the 5th Avenue Dam would restore natural hydrodynamic processes within the estuary. Direct connection with Budd Inlet would allow for tidal exchange in Capitol Lake. Much of the basin would experience two high tides and two low tides each day, although most of the North Basin would be submerged under the majority of tidal elevations.

With the Estuary Alternative, maximum water levels in most of the Capitol Lake Basin occur during major tidal flood events rather than river flood events. Water levels throughout the basin would be similar to those in Budd Inlet during an extreme tidal event.

The Estuary Alternative would reduce the exposure of the Capitol Lake Basin flooding from river floods and increase the exposure of the basin to flooding from tidal floods. However, planned construction of flood improvements in Heritage Park as part of the Olympia Sea Level Rise Response Plan would mitigate extreme tidal flood impacts in Heritage Park and downtown Olympia for the 100-year tide event and up to 2 feet (0.61 meters) of RSLR. Considering these planned improvements, the Estuary Alternative would provide an overall reduction in flood risk from both river and tidal floods when compared to the No Action or Managed Lake Alternatives.

4.1.5.2 Sediment Transport

Removal of the 5th Avenue Dam would restore tidal flow to the Capitol Lake Basin and would reestablish natural sediment deposition patterns of the estuary. There would be long-term increased sediment deposition in West Bay. This alternative includes long-term maintenance dredging in impacted areas of West Bay.

Sediments would be transported farther downstream within the Capitol Lake Basin due to the unobstructed river current. During periods of high river flow, more sediment would deposit within Budd Inlet than under the No Action and Managed Lake Alternatives, and the sediment deposition would extend farther north into Budd Inlet. During periods of lower flow, this effect would be reduced. Deposition in Budd Inlet is predicted to occur primarily on the eastern
shoal of West Bay, due to the presence of a shallow intertidal bench on the west side of the inlet.

On average, sediment deposition throughout lower Budd Inlet would increase by over 200% from the No Action Alternative under high flow periods. In some locations, there would be an increase of up to 283%. The Olympia Yacht Club and other private marinas would experience the greatest increases in deposition. Increased sedimentation can impact large vessels accessing berths at the Port of Olympia and smaller craft using marina slips in West Bay. However, the Estuary Alternative includes initial pre-dredging of the Capitol Lake Basin during construction to reduce the amount of sediment that could be mobilized following removal of the 5th Avenue Dam, development of a long-term sediment monitoring program to avoid and minimize the impacts related to sediment transport. Details on impacts of sediment transport on navigation are provided in Section 4.2, Navigation.

4.1.6 What are the long-term conditions under the Hybrid Alternative?

4.1.6.1 Hydrodynamics

The long-term hydrodynamic conditions for the Hybrid Alternative would be similar to those of the Estuary Alternative. Removal of the 5th Avenue Dam would restore natural hydrodynamic processes within the estuary, with the exception of the reflecting pool. Tidal exchange into the saltwater reflecting pool, if selected, would be controlled by tide gates. Tidal exchange would not occur under a freshwater reflecting pool concept.

With the Hybrid Alternative, maximum water levels in most of the basin would occur during major tidal flood events. Under the modeled 100-year tidal flood, water levels and flood extents are approximately the same as those described for the Estuary Alternative. However, flooding in Heritage Park and along Powerhouse Road SW in the North Basin would be limited due to the wall that would define the westerly perimeter of the reflecting pool. In the South Basin, major river floods would determine maximum water levels for the Hybrid Alternative. Flood levels and extents would be approximately the same as the Estuary Alternative for major river floods.

The Hybrid Alternative would offer similar flood resilience benefits for river and marine floods as described for the Estuary Alternative.
4.1.6.2 Sediment Transport

As in the Estuary Alternative, the Hybrid Alternative includes the removal of the 6th Avenue Dam, initial dredging in portions of the basin during construction to remove excess sediment that would otherwise be mobilized, and maintenance dredging in impacted areas of West Bay. In the North Basin, a vertical wall would be constructed to create a 45-acre (18-hectare) reflecting pool along Heritage Park.

As in the Estuary Alternative, removal of the dam would immediately restore tidal flow to the Capitol Lake Basin and reestablish natural sediment deposition patterns in most of the estuary. Predicted changes to sediment patterns are similar to those described for the Estuary Alternative. However, as water flows through the North Basin and out to Budd Inlet, it would accelerate along the reflecting pool wall. This increase in speed would scour sediment near the wall. Sediment eroded from the North Basin in this way would be transported into Budd Inlet, causing increased sedimentation. As a result, the Budd Inlet deposition for the Hybrid Alternative would be approximately 23% greater than the predicted deposition for the Estuary Alternative, although the patterns of change would be similar.

Sediment transport in and out of a saltwater reflecting pool would be affected by the operation of the tide gates. The tide gates would likely limit the amount of sediment that reaches the interior of the pool. Sediment transport into and out of the pool was not modeled as part of this study. Additionally, under a freshwater reflecting pool, tidal water with a suspended sediment load would not enter the reflecting pool. The absence of tidal gates under this freshwater pool concept would avoid sediment transport into the reflecting pool.

4.1.7 How do the maximum water levels compare between all alternatives?

Numerical model results for maximum water levels at specific locations throughout the study area graphically illustrated in Figures 4.1.1 (for extreme river flood event) and 4.1.2 (for extreme tidal flood event), both with 2 feet (0.61 meters) of RSLR, are listed in Tables 4.1.1 and 4.1.2.
Figure 4.1.1 Comparison of Maximum Water Levels for an Extreme River Flood Event by Alternative
Figure 4.1.2 Comparison of Maximum Water Levels for an Extreme Tidal Flood Event by Alternative
### Table 4.1.1 Comparison of Maximum Water Levels for an Extreme River Flood Event by Alternative

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<tr>
<th>Location</th>
<th>No Action: Elevation (feet NAVD 88 (meters NAVD 88))</th>
<th>Managed Lake: Elevation (feet NAVD 88 (meters NAVD 88))</th>
<th>Estuary: Elevation (feet NAVD 88 (meters NAVD 88))</th>
<th>Hybrid: Elevation (feet NAVD 88 (meters NAVD 88))</th>
</tr>
</thead>
<tbody>
<tr>
<td>5th Avenue Dam Gates (north side)</td>
<td>15.1 (4.6)</td>
<td>15.1 (4.6)</td>
<td>15.1 (4.6)</td>
<td>15.1 (4.6)</td>
</tr>
<tr>
<td>North Basin</td>
<td>17.4 (5.3)</td>
<td>17.7 (5.4)</td>
<td>15.1 (4.6)</td>
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<td>Olympia &amp; Belmore Railroad Inc., Railroad Trestle</td>
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<td>15.4 (4.7)</td>
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<td>Middle Basin</td>
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<td>16.1 (4.9)</td>
<td>16.4 (5.0)</td>
</tr>
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<td>19.4 (5.9)</td>
<td>20.0 (6.1)</td>
<td>17.4 (5.3)</td>
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### Table 4.1.2 Comparison of Maximum Water Levels for an Extreme Tidal Flood Event by Alternative

<table>
<thead>
<tr>
<th>Location</th>
<th>No Action: Elevation (feet NAVD 88 (meters NAVD 88))</th>
<th>Managed Lake: Elevation (feet NAVD 88 (meters NAVD 88))</th>
<th>Estuary: Elevation (feet NAVD 88 (meters NAVD 88))</th>
<th>Hybrid: Elevation (feet NAVD 88 (meters NAVD 88))</th>
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<tr>
<td>5th Avenue Dam Gates (north side)</td>
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<td>16.4 (5.0)</td>
<td>16.1 (4.9)</td>
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<tr>
<td>Olympia &amp; Belmore Railroad Inc., Railroad Trestle</td>
<td>9.8 (3.0)</td>
<td>10.5 (3.2)</td>
<td>16.1 (4.9)</td>
<td>16.1 (4.9)</td>
</tr>
<tr>
<td>Middle Basin</td>
<td>11.2 (3.4)</td>
<td>11.2 (3.4)</td>
<td>16.4 (5.0)</td>
<td>16.4 (5.0)</td>
</tr>
<tr>
<td>I-5 Bridge</td>
<td>10.2 (3.1)</td>
<td>10.8 (3.3)</td>
<td>16.4 (5.0)</td>
<td>16.4 (5.0)</td>
</tr>
<tr>
<td>South Basin</td>
<td>10.8 (3.3)</td>
<td>11.5 (3.5)</td>
<td>16.4 (5.0)</td>
<td>16.4 (5.0)</td>
</tr>
</tbody>
</table>
4.1.8 How does the sediment transport compare between all alternatives?

Numerical model results of annual deposition/erosion patterns for the four alternatives are presented in Figure 4.1.3, using the modeled high flow river event to represent worst-case deposition patterns, and are listed in Table 4.1.3 for the average annual sediment erosion/deposition.

Table 4.1.3 Comparison of Average Annual Sediment Deposition/Erosion (Without RSRL\(^1\))

<table>
<thead>
<tr>
<th>Location</th>
<th>No Action (in/year)</th>
<th>Managed Lake (in/year)</th>
<th>Estuary (in/year)</th>
<th>Hybrid (in/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Basin</td>
<td>1.54</td>
<td>2.13</td>
<td>0.39</td>
<td>0.39</td>
</tr>
<tr>
<td>South Basin (% Change w.r.t. No Action)</td>
<td>--</td>
<td>(-39%)</td>
<td>(-75%)</td>
<td>(-75%)</td>
</tr>
<tr>
<td>Middle Basin</td>
<td>-0.94</td>
<td>-0.67</td>
<td>-1.46</td>
<td>-1.34</td>
</tr>
<tr>
<td>Middle Basin (% Change w.r.t. No Action)</td>
<td>--</td>
<td>(-28%)</td>
<td>(54%)</td>
<td>(-44%)</td>
</tr>
<tr>
<td>Percival Cove</td>
<td>0.16</td>
<td>0.16</td>
<td>0.24</td>
<td>0.24</td>
</tr>
<tr>
<td>Percival Cove (% Change w.r.t. No Action)</td>
<td>--</td>
<td>(-15%)</td>
<td>(43%)</td>
<td>(44%)</td>
</tr>
<tr>
<td>North Basin</td>
<td>1.73</td>
<td>1.77</td>
<td>0.63</td>
<td>-0.67</td>
</tr>
<tr>
<td>North Basin (% Change w.r.t. No Action)</td>
<td>--</td>
<td>(2%)</td>
<td>(-64%)</td>
<td>(-138%)</td>
</tr>
<tr>
<td>Olympia Yacht Club</td>
<td>1.65</td>
<td>1.69</td>
<td>6.18</td>
<td>7.64</td>
</tr>
<tr>
<td>Olympia Yacht Club (% Change w.r.t. No Action)</td>
<td>--</td>
<td>(1%)</td>
<td>(271%)</td>
<td>(358%)</td>
</tr>
<tr>
<td>Private Marinas</td>
<td>0.83</td>
<td>0.83</td>
<td>3.23</td>
<td>3.90</td>
</tr>
<tr>
<td>Private Marinas (% Change w.r.t. No Action)</td>
<td>--</td>
<td>(-1%)</td>
<td>(283%)</td>
<td>(366%)</td>
</tr>
<tr>
<td>Port of Olympia &amp; Turning Basin</td>
<td>0.83</td>
<td>0.83</td>
<td>3.07</td>
<td>3.58</td>
</tr>
<tr>
<td>Port of Olympia &amp; Turning Basin (% Change w.r.t. No Action)</td>
<td>--</td>
<td>(-2%)</td>
<td>(265%)</td>
<td>(328%)</td>
</tr>
<tr>
<td>Navigation Channel (excluding Turning Basin)</td>
<td>0.04</td>
<td>0.04</td>
<td>0.12</td>
<td>0.12</td>
</tr>
<tr>
<td>Navigation Channel (excluding Turning Basin) (% Change w.r.t. No Action)</td>
<td>--</td>
<td>(-4%)</td>
<td>(195%)</td>
<td>(234%)</td>
</tr>
<tr>
<td>Rest of Budd Inlet</td>
<td>0.04</td>
<td>0.04</td>
<td>0.16</td>
<td>0.16</td>
</tr>
<tr>
<td>Rest of Budd Inlet (% Change w.r.t. No Action)</td>
<td>--</td>
<td>(17%)</td>
<td>(236%)</td>
<td>(300%)</td>
</tr>
</tbody>
</table>

Notes:
1. Numerical modeling was conducted for events that assumed RSLR and events that did not assume a rise in sea level. The analysis in the EIS presents the findings that assume no rise in sea level. This is because, based on the numerical modeling, these results are more conservative as they result in more sediment deposition.

Abbreviation:

w.r.t = With respect to
Figure 4.1.3: Annual Deposition/Erosion Patterns by Alternative
4.2 NAVIGATION

This section describes the potential long-term impacts and benefits of the Capitol Lake – Deschutes Estuary Long-Term Management Project on navigation in West Bay. The EIS focuses on the most important elements and conclusions of the analysis and, in particular, the differences among the four alternatives.

Information presented in this section is summarized from the full analysis in the Navigation Discipline Report (Attachment 6).

4.2.1 What methods of analysis were used to assess long-term impacts to navigation?

Operational impacts could be either adverse or beneficial. Operational impacts to vessel navigation were assessed both qualitatively and quantitatively, incorporating results from hydrodynamic and sediment transport modeling and data collected from the Port of Olympia, USACE, and private vessel moorage facilities in West Bay.

Key Findings: Long-Term Navigation Impacts

For the No Action Alternative, ongoing rates of sedimentation in West Bay would not change substantially as a result of the project. Maintenance dredging would still occur but a long-term maintenance dredging plan would not be implemented. Operational impacts to navigation would be less than significant for this alternative, but over time could become significant if dredging is delayed again and causes navigational impacts, similar to existing conditions.

For the Managed Lake Alternative impacts to navigation in West Bay would be less than significant because there would be no change from existing conditions. Long-term maintenance dredging would occur in the North Basin of Capitol Lake.

For the Estuary and Hybrid Alternatives, sediment deposition in West Bay would be three to four times the rate of sediment deposition under the No Action and Managed Lake Alternatives. To avoid or minimize impacts to navigation in West Bay, both alternatives would include an adaptable long-term maintenance dredging plan (part of the alternative), with the frequency of dredging established by a sediment monitoring plan (mitigation measure). Impacts to navigation are considered significant, but could be reduced to less than significant, if consistent funding is available for the long-term maintenance dredging program, and with implementation of the recommended sediment monitoring. Maintenance dredging events would be coordinated (scheduled and phased) with the Port of Olympia and affected marinas to reduce the navigation-related disruption associated with these events to less than significant levels.

Under the Estuary and Hybrid Alternatives, there would be a coordinated effort for long-term maintenance dredging and sediment monitoring, where one does not currently exist. This could provide a minor beneficial effect under the Estuary and Hybrid Alternatives because it would help to avoid or minimize impacts from chronically shallowed areas.
4.2.2 What are the long-term impacts to navigation under the No Action Alternative?

Under the No Action Alternative, sediment management strategies would not be implemented, and sedimentation would continue at existing rates from the Capitol Lake – Deschutes Estuary.

4.2.2.1 Sediment Deposition Rates

Annual sediment deposition/erosion rates in West Bay are highly dependent on river flow events with more extreme flow events depositing more sediments. Sediment deposition has a substantive effect on water depth, which can in turn affect navigation.

Table 4.2.1 includes sediment deposition rates for the No Action Alternative (and Managed Lake Alternative given the similarity).

<table>
<thead>
<tr>
<th>Location</th>
<th>No Action Alternative</th>
<th>Managed Lake Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olympia Yacht Club</td>
<td>1.7 (4.3)</td>
<td>1.7 (4.3)</td>
</tr>
<tr>
<td>Other West Bay Private Marinas and Marina Access</td>
<td>0.83 (2.1)</td>
<td>0.83 (2.1)</td>
</tr>
<tr>
<td>Port of Olympia/ Turning Basin</td>
<td>0.87 (2.2)</td>
<td>0.83 (2.1)</td>
</tr>
<tr>
<td>FNC (excluding Turning Basin)</td>
<td>0.04 (0.1)</td>
<td>0.04 (0.1)</td>
</tr>
</tbody>
</table>

The highest sediment deposition rate would occur at the Olympia Yacht Club (closest to the 5th Avenue Dam), decreasing northward throughout the east side of West Bay past the other private marinas to the Port of Olympia and southern end of the FNC and turning basin (see Figure 4.2.1). Sediment deposition rates within West Bay are expected to increase slowly over time as the settling capacity of Capitol Lake decreases over time.

4.2.2.2 Existing Maintenance Dredging

Under the No Action Alternative, maintenance dredging would continue to be conducted by separate entities to maintain navigation in West Bay. Through outreach conducted by the EIS Project Team, it was
identified that USACE and marina-led dredging is expected to occur along the eastern shore of West Bay within the next 10 years to maintain navigability, as required by the federal navigational servitude doctrine, and separately, as a requirement of marina lease renewals with DNR.

As such, the impact analysis assumes that an operable depth is obtained within a 10-year period. Maintenance dredging thereafter is projected at the frequencies provided in Table 4.2.2 for the different locations shown in Figure 4.2.1. For example, the Olympia Yacht Club would conduct maintenance dredging about once every 23 years or once within the 30-year project horizon, while the other private marinas, USACE, and the Port of Olympia may not need to conduct maintenance dredging at their facilities or within the channels and access areas to their facilities to avoid impacts during this time frame.

Table 4.2.2 No Action Alternative Maintenance Dredging in West Bay

<table>
<thead>
<tr>
<th>Estimated Dredge Frequency (years)</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>Olympia Yacht Club</td>
</tr>
<tr>
<td>42</td>
<td>FNC/Turning Basin/Port</td>
</tr>
<tr>
<td>47</td>
<td>Other Lower West Bay Private Marinas and Marina Access</td>
</tr>
</tbody>
</table>

Maintenance dredging at the Olympia Yacht Club under the No Action Alternative is expected to be completed at frequencies similar to past maintenance dredging and would focus on key areas of shoaling and sediment deposition, not the entire marina. Maintenance dredging may require slip vacancies for temporary periods of time. In tight spaces, piles or floats may need to be removed and boathouses temporarily relocated prior to dredging (in some instances a small hydraulic dredge, rather than a clamshell dredge, can be used in tight spaces to minimize disturbances of existing structures). This could result in a temporary disruption to navigation if careful scheduling and phasing is not incorporated (i.e., dredging only impacted areas and phase dredging of different areas of the marina so that a smaller percentage of vessels and boathouses would need to be temporarily relocated at any one time). Marinas often include this type of scheduling and phasing as part of their maintenance activities and plan for temporary vessel/boathouse relocation to minimize disruptions and slip vacancies.

How were dredging frequencies determined for the No Action Alternative?

Anticipated existing maintenance dredging frequencies under the No Action Alternative were developed using records from past dredging events, average sediment accumulation rates, and amount of sediment deposition that could be accommodated by the different facilities before an impact occurred. The duration between dredge events is expected to decrease over time as Capitol Lake slowly fills up with sediment and more passes through the 5th Avenue Dam to West Bay.
Figure 4.2.1 Navigational Resources in West Bay & Areas of Maintenance Dredging

Legend
- Olympia Yacht Club
- Other Nearby Marinas
- Marina Access Area
- Port Berth and Turning Basin (Portions of FNC)
- Federal Navigation Channel

Budd Inlet
West Bay
Fiddlehead Marina
Martin Marina
Olympia Yacht Club
Percival Landing (Dock D and E)
Fifth Avenue Dam

Ch. 4 – Long-Term Impacts, Benefits, & Mitigation
4.2.2.3 Impacts from Sediment Deposition

Under the No Action Alternative, the USACE, Port of Olympia, and private marinas would conduct maintenance dredging in West Bay to maintain navigation. Therefore, operational impacts on navigation under the No Action Alternative would be less than significant. However, sedimentation is currently impacting commercial navigation at the Port of Olympia, and coordination is underway with USACE to implement a needed maintenance dredge event. In the future, if dredging is delayed again, sediment deposition could result in a significant impact to navigation.

4.2.3 Are there long-term navigational impacts common to all action alternatives?

Potential impacts to navigation vary across the action alternatives. The location of sediment deposition and the approach to long-term maintenance dredging differs depending on whether the 5th Avenue Dam is retained or removed.

The variability of sediment deposition and associated potential impacts to navigation are described below. Under the Estuary and Hybrid Alternatives, the Port of Olympia and private marinas in West Bay may also be temporarily impacted by the long-term maintenance dredging proposed to reduce sediment accumulation.

4.2.4 What are the long-term impacts under the Managed Lake Alternative?

4.2.4.1 Sediment Deposition Rates

Under the Managed Lake Alternative, average annual sediment deposition rates for West Bay would be similar to those for the No Action Alternative, as shown in Table 4.2. Similar to the No Action Alternative, sediment that is suspended in the water column does pass through the 5th Avenue Dam and results in limited deposition in West Bay. The highest sediment deposition rate would occur at the Olympia Yacht Club, with progressively lower deposition rates along the east side of West Bay.

Numerical modeling of sediment transport indicates that the Managed Lake Alternative would result in slightly reduced sediment deposition within West Bay compared to the No Action Alternative. This is likely due to deepening of the North Basin under the Managed Lake.
Alternative, which would create a more effective settling basin for sediment.

**Maintenance Dredging**

Long-term maintenance dredging under the Managed Lake Alternative would occur in the North Basin, and not in West Bay. Therefore, dredging in West Bay would continue to be completed by separate entities, including the USACE, Port of Olympia, and private marinas.

**Impacts from Sediment Deposition**

Similar to the No Action Alternative, under the Managed Lake Alternative, the USACE, Port of Olympia, and private marinas would conduct maintenance dredging in West Bay to maintain navigation. Therefore, operational impacts on navigation under the Managed Lake Alternative would be less than significant. However, notably, sedimentation is currently impacting commercial navigation at the Port of Olympia, and coordination is underway with USACE to implement a needed maintenance dredge event. In the future, if dredging is delayed again, sediment deposition could result in a significant impact to navigation.

**4.2.5 What are the long-term impacts under the Estuary Alternative?**

**4.2.5.1 Sediment Deposition Rates**

Under the Estuary Alternative, sediment deposition within West Bay would be up to three times higher than the No Action and Managed Lake Alternatives given the removal of the 5th Avenue Dam. Average annual sediment deposition rates for West Bay under the Estuary Alternative would range from approximately 6.18 inches (15.7 centimeters) each year at the Olympia Yacht Club at the southern tip of the study area to approximately 0.1 inches (0.3 centimeters) each year for the portion of the FNC at the northern-most boundary of the study area. The projected rates of sediment deposition are presented in Table 4.2.3 and are compared to the No Action Alternative.
### Table 4.2.3 Average Annual Sediment Deposition in West Bay for the No Action & Estuary Alternatives (inch each year (cm each year))

<table>
<thead>
<tr>
<th>Location</th>
<th>No Action Alternative</th>
<th>Estuary Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olympia Yacht Club</td>
<td>1.7 (4.3)</td>
<td>6.18 (15.7)</td>
</tr>
<tr>
<td>Other West Bay Private Marinas and Marina Access</td>
<td>0.83 (2.1)</td>
<td>3.2 (8.2)</td>
</tr>
<tr>
<td>Port/Turning Basin</td>
<td>0.87 (2.2)</td>
<td>3.1 (7.8)</td>
</tr>
<tr>
<td>FNC (excluding Turning Basin)</td>
<td>0.04 (0.1)</td>
<td>0.1 (0.3)</td>
</tr>
</tbody>
</table>

The Estuary Alternative would increase sediment deposition in West Bay compared to the No Action Alternative because of the removal of the 5th Avenue Dam and transport of river-borne sediments into West Bay under high river flow events. Under low flow events, the river-borne sediments could settle within the North Basin and may not be transported into West Bay.

Sediment erosion/deposition patterns were assessed for two different flow events to provide a lower and upper bound:

1. Low-flow (Event A)—a 3-year simulation based on a 1-year river flow event occurring three times in a row.
2. High-flow (Event B)—a 3-year simulation based on a 115-year river flow event occurring three times in a row.

Table 4.2.4, Figure 4.2.2, and Figure 4.2.3 compare deposition and erosion patterns between the No Action, Managed Lake, Estuary, and Hybrid Alternatives for both events. The results indicate that annual erosion/deposition rates are generally higher for Event B than Event A because stronger flows will result in higher deposition and erosion rates. The removal of the 5th Avenue Dam increases sediment deposition to West Bay as sediments are transported farther downstream, as indicated by the deposition pattern shown for the Estuary and Hybrid Alternatives in Figure 4.2.3. Higher deposition rates would occur on the east side of West Bay due to a shallow intertidal habitat area on the west side of West Bay.
<table>
<thead>
<tr>
<th>Location</th>
<th>No Action Alternative: A (low) in/yr (cm/yr)</th>
<th>No Action Alternative: B (high) in/yr (cm/yr)</th>
<th>Managed Lake: A (low) in/yr (cm/yr)</th>
<th>Managed Lake: B (high) in/yr (cm/yr)</th>
<th>Estuary Alternative: A (low) in/yr (cm/yr)</th>
<th>Estuary Alternative: B (high) in/yr (cm/yr)</th>
<th>Hybrid Alternative: A (low) in/yr (cm/yr)</th>
<th>Hybrid Alternative: B (high) in/yr (cm/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olympia Yacht Club</td>
<td>0.0 (0.0)</td>
<td>2.6 (6.7)</td>
<td>0.04 (0.1)</td>
<td>2.5 (6.4)</td>
<td>0.1 (0.3)</td>
<td>8.54 (21.7)</td>
<td>0.433 (1.1)</td>
<td>11.3 (28.6)</td>
</tr>
<tr>
<td>Other West Bay Private Marinas and Marina Access</td>
<td>0.0 (0.0)</td>
<td>1.3 (3.3)</td>
<td>0.0 (0.0)</td>
<td>1.3 (3.3)</td>
<td>0.04 (0.1)</td>
<td>4.76 (12.1)</td>
<td>0.16 (0.4)</td>
<td>6.22 (15.8)</td>
</tr>
<tr>
<td>Port of Olympia/ Turning Basin</td>
<td>0.0 (0.0)</td>
<td>1.2 (3.1)</td>
<td>0.0 (0.0)</td>
<td>1.2 (3.1)</td>
<td>0.0 (0.0)</td>
<td>4.13 (10.5)</td>
<td>0.04 (0.1)</td>
<td>5.16 (13.1)</td>
</tr>
<tr>
<td>FNC (excluding Turning Basin)</td>
<td>0.0 (0.0)</td>
<td>0.04 (0.1)</td>
<td>0.0 (0.0)</td>
<td>0.04 (0.1)</td>
<td>0.0 (0.0)</td>
<td>0.16 (0.4)</td>
<td>0.0 (0.0)</td>
<td>0.2 (0.5)</td>
</tr>
</tbody>
</table>
Figure 4.2.2 Erosion/Deposition Pattern (cm/yr) for Event A with 0.61 meters of RSLR

The X and Y axes are showing coordinates (Easting, Northing) referenced to the Washington State Plane Horizontal Coordinate System. The Washington State Plane Horizontal Coordinate System is used to define and state the position or locations of points on the surface of the earth within the State of Washington.
Figure 4.2.3 Erosion/Deposition Pattern (cm/yr) for Event B with 0.61 meters of RSLR

The X and Y axes are showing coordinates (Easting, Northing) referenced to the Washington State Plane Horizontal Coordinate System. The Washington State Plane Horizontal Coordinate System is used to define and state the position or locations of points on the surface of the earth within the State of Washington.
4.2.5.2 Initial Dredging during Construction

A primary measure to reduce sediment transport into West Bay under the Estuary Alternative is to dredge the Capitol Lake Basin during construction, prior to removal of the 5th Avenue Dam. Initial construction dredging would remove approximately 526,000 cubic yards (400,000 cubic meters) of accumulated sediment from the North and Middle Basins during construction. This would reduce sediment that would be available for transport into West Bay during high flow events after construction. Modeling shows that this initial dredging would result in a 48% reduction in impacts to anticipated sediment deposition at the Olympia Yacht Club.

4.2.5.3 Long-Term Maintenance Dredging and Monitoring to Avoid Navigation Impacts

In addition to initial dredging, a long-term maintenance dredging program is proposed to address sediment deposition in West Bay. Maintenance dredging is proposed along the eastern shore of West Bay and is based on the sediment deposition patterns and rates that were projected by the numerical model, and from data collected from USACE, the Port of Olympia, and the private marinas. The anticipated dredge frequency and volume of material that would be dredged from West Bay under the Estuary Alternative is shown in Table 4.2. These frequencies assume that maintenance dredging would be conducted by the USACE, Port of Olympia, and private marinas within the next 10 years, and operable navigational depths would be obtained within West Bay before 5th Avenue Dam removal. Maintenance dredging is assumed and recommended at a frequency that would avoid significant impacts to navigation from sediment deposition.

Anticipated maintenance dredging frequencies and quantities under the Estuary Alternative were developed using sediment accumulation rates identified during numerical modeling and data gathered from past maintenance dredging events at West Bay facilities.

How were dredging frequencies determined for the Estuary Alternative?

The dredging frequencies presented in Table 4.2 are based on the following assumptions and projections:

- Before the 5th Avenue Dam is removed, authorized depths in West Bay would have been reestablished by dredging actions conducted by other entities. This removes accumulated sediment that is currently impacting navigation.
- The rate of sediment accumulation projected by the numerical model for the Estuary and Hybrid Alternatives was added to the surface left by the dredging actions conducted by others.
- Once the projected sediment deposition reached the amount of sediment deposition that has historically triggered the need for maintenance dredging, a maintenance dredge event conducted by the project was assumed.
### Table 4.2.5 Anticipated Maintenance Dredging in West Bay for the Estuary Alternative

<table>
<thead>
<tr>
<th>Years after Construction</th>
<th>Location</th>
<th>Potential Duration of Impact (1)</th>
<th>Estimated Amount (cubic yards (cubic meters))</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Olympia Yacht Club</td>
<td>2 months</td>
<td>21,600 (16,500)</td>
</tr>
<tr>
<td>12</td>
<td>Olympia Yacht Club</td>
<td>2 months</td>
<td>21,600 (16,500)</td>
</tr>
<tr>
<td>12</td>
<td>Other Lower West Bay Private Marinas</td>
<td>1 month</td>
<td>15,600 (11,900)</td>
</tr>
<tr>
<td>12</td>
<td>Port of Olympia/Turning Basin/FNC</td>
<td>9 months</td>
<td>247,800 (189,500)</td>
</tr>
<tr>
<td>18</td>
<td>Olympia Yacht Club</td>
<td>2 months</td>
<td>21,600 (16,500)</td>
</tr>
<tr>
<td>24</td>
<td>Olympia Yacht Club</td>
<td>2 months</td>
<td>21,600 (16,500)</td>
</tr>
<tr>
<td>24</td>
<td>Other Lower West Bay Private Marinas</td>
<td>1 month</td>
<td>15,600 (11,900)</td>
</tr>
<tr>
<td>24</td>
<td>Port of Olympia/Turning Basin/FNC</td>
<td>9 months</td>
<td>247,800 (189,500)</td>
</tr>
<tr>
<td>24</td>
<td>Marina Access</td>
<td>2 months</td>
<td>65,400 (50,000)</td>
</tr>
<tr>
<td>30</td>
<td>Olympia Yacht Club</td>
<td>2 months</td>
<td>21,600 (16,500)</td>
</tr>
<tr>
<td></td>
<td><strong>Total Dredged</strong></td>
<td></td>
<td><strong>700,200 (535,300)</strong></td>
</tr>
</tbody>
</table>

**Note:**
1. Maintenance dredging operations are assumed to be 10 hours a day, 5 days a week within the applicable in-water work window (July 16 through February 15 each year). Maintenance dredging could extend into more than one in-water work window if dredging were phased to minimize impacts to operations (e.g., many marinas avoid completing maintenance during busy summer months). This schedule assumes that only one dredge is used.

The rate of sediment accumulation is highly dependent on river flow conditions. Impacts to navigation would be significant if the dredging frequency is not adequate to address the actual rate of sediment accumulation based on environmental variables. Recognizing this, an annual sediment monitoring plan is included as mitigation to reduce impacts to navigation in West Bay to less than significant levels.

Annual sediment monitoring would allow the frequency of maintenance dredging to be reduced or increased within impacted areas of West Bay based on annual bathymetric data. For example, if...
sediment monitoring indicated heavy sediment deposition over a period of time as a result of high flow events, the frequency of maintenance dredging could be increased. Similarly, if a number of low flow events were observed for a period of time and low sediment deposition was observed, the time between maintenance dredging events could be extended.

When maintenance dredging occurs, it would require coordination with cargo vessel calls and/or call interruptions for months at a time during each dredge cycle. In tight spaces at marinas, piles or floats may need to be removed prior to dredging. Derrick barges, flat deck barges, and land equipment could be used to pull floats and piles from shoaled areas of the marinas if necessary. Boathouses located in shoaled areas requiring maintenance dredging may need to be temporarily relocated prior to maintenance dredging (a small hydraulic dredge can be used in tight spaces to minimize the need for infrastructure relocation). Any removed floats and piles would be reinstalled following dredging activities.

All dredged material would be sampled for chemical quality and for the presence of invasive species to ensure it is suitable for open-water disposal at an approved location in the Puget Sound. This is the assumed disposal scenario and would result in significant cost savings compared to upland disposal. If chemical quality does not meet state standards or if invasive species are present in the sediment, the dredged material will be transported to an upland disposal site.

Maintenance dredging would most likely be completed by mechanical means using water-based heavy marine equipment, such as derricks or excavators on flat barges, and dump scows. Maintenance dredging would be focused on areas of shoaling and sediment accumulation; maintenance dredging would likely not be needed across the entire FNC, vessel berth, or marina at any one time. With a coordinated long-term maintenance dredging program, the dredge events could be planned in advance and phased in a way that would reduce impacts to the facilities. Dredging could be timed to avoid peak periods of recreational use (i.e., summer months for the marinas) and around vessel call schedules at the Port of Olympia.

**What is the purpose of a monitoring plan?**

The purpose of a monitoring plan is to identify sediment accumulation early so the frequency of maintenance dredging events can be adjusted and scheduled prior to reaching levels of significance. A monitoring plan, in combination with the long-term maintenance dredging program, allows for a flexible and responsive approach. This could reduce significant impacts to navigation from sediment deposition to less than significant levels. Regular sediment monitoring, combined with scheduled, but adaptable maintenance dredging, provides for a consistent and coordinated management strategy that does not exist under the No Action Alternative.
Impacts on navigation in West Bay under the Estuary Alternative would be significant, but could be reduced to less than significant levels if consistent funding is available for the long-term maintenance dredging program, and with implementation of the sediment monitoring program that would support flexible and responsive dredging.

### 4.2.5.4 Impacts from Maintenance Dredging on Vessel Access and Berth or Slip Use

Under the Estuary Alternative, maintenance dredging in West Bay would occur at an assumed frequency of every 6 years. Refer to Table 4.2.5 for the assumed maintenance dredging schedule, which shows that dredging would rotate across the facilities—not every facility would need to be dredged during each dredge event.

Early coordination with USACE, Port of Olympia, and West Bay private marinas would be required to schedule berth and slip use around the dredge events. For example, maintenance dredging at the Port of Olympia and in the FNC will require coordination of cargo vessel calls and/or call interruptions for up to 9 months during each dredge cycle (assumed to occur every 12 years in this location).

Maintenance dredging at West Bay private marinas could require slip vacancies for temporary periods of time (up to 2 months during each dredge cycle; assumed to occur every 6 years at Olympia Yacht Club and every 12 years at other private marinas). In tight spaces at the marinas, piles or floats may be required to be removed during dredging activities. Boathouses located in shoaled areas requiring maintenance dredging may need to be temporarily relocated prior to maintenance dredging. These required accommodations can be disruptive.

Although dredging is disruptive, it is common practice for operating water-dependent facilities that require minimum water depths to operate. Many ports and marinas in Puget Sound are able to remain operational during maintenance dredging activities. The number of active port berths can be temporarily reduced. Marinas can often move vessels to different slips to accommodate dredging in one location, and then move those vessels back to work at another dock or access area. Dredging would only occur within shoaled, isolated areas at the marinas, which would be limited to approximately 10% of the marina to ensure that impacts do not reach significant levels.

**Are there potential beneficial effects under the Estuary and Hybrid Alternatives?**

Annual sediment monitoring and implementation of a responsive maintenance dredging program would reduce impacts to navigation to less than significant levels. Under the Estuary Alternative, if consistent funding is available, maintenance dredging would be completed with regularity. Maintenance dredging would also occur as part of a coordinated program across facilities. Maintenance dredging is not coordinated or conducted with regularity in West Bay under existing conditions. The long-term maintenance dredging is incorporated into the alternative itself and supplemented with a monitoring plan that would enable sediment accumulation conditions that could interrupt vessel access or berthing to be identified early. Long-term maintenance dredging and monitoring could provide a minor beneficial effect to navigation under the Estuary and Hybrid Alternatives.
Maintenance dredging at the Port of Olympia could be phased to avoid impacting more than one berth at a time, and care would be taken with scheduling to minimize the potential for cargo vessel call delays. Temporary relocation of vessels and boathouses to other open slips within West Bay private marinas would also minimize impacts. These measures would reduce the potential for significant impacts on vessel navigation from the long-term maintenance dredging plan under the Estuary Alternative to less than significant.

### 4.2.6 What are the long-term impacts under the Hybrid Alternative?

#### 4.2.6.1 Sediment Deposition Rates

With the Hybrid Alternative, sediment deposition within West Bay would be the highest of all alternatives. The projected rates of sediment deposition are presented in Table 4.2.6 and compared to the No Action and Estuary Alternatives. Average annual sediment deposition rates in West Bay under the Hybrid Alternative would range from approximately 7.64 inches (19.4 centimeters) each year at the Olympia Yacht Club at the southern tip of the study area to 0.1 inches (0.3 centimeters) within the portion of the FNC at the northern most boundary of the study area.

**Table 4.2.6 Average Annual Sediment Deposition in West Bay for the No Action, Estuary, & Hybrid Alternatives**

<table>
<thead>
<tr>
<th>Location</th>
<th>No Action Alternative in/yr (cm/yr)</th>
<th>Estuary Alternative in/yr (cm/yr)</th>
<th>Hybrid Alternative in/yr (cm/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olympia Yacht Club</td>
<td>1.7 (4.3)</td>
<td>6.18 (15.7)</td>
<td>7.64 (19.4)</td>
</tr>
<tr>
<td>Other West Bay Private Marinas and Marina Access</td>
<td>0.83 (2.1)</td>
<td>3.2 (8.2)</td>
<td>3.9 (9.9)</td>
</tr>
<tr>
<td>Port of Olympia/ Turning Basin</td>
<td>0.87 (2.2)</td>
<td>3.1 (7.8)</td>
<td>3.6 (9.1)</td>
</tr>
<tr>
<td>FNC (excluding Turning Basin)</td>
<td>0.04 (0.1)</td>
<td>0.1 (0.3)</td>
<td>0.1 (0.3)</td>
</tr>
</tbody>
</table>

The increased sediment deposition under the Hybrid Alternative would most likely be due to acceleration of river flow within the North Basin as it is forced to bend around the barrier wall of the reflecting pool. This acceleration of the flow would result in increased
erosion within the North Basin and increased deposition within West Bay compared to the Estuary Alternative.

Similar to the Estuary Alternative, sediment erosion/deposition patterns were also assessed for two different flow events: Event A, representing a low flow scenario; and Event B, representing a high flow scenario. Table 4.2.6, Figure 4.2.2, and Figure 4.2.3 compare deposition and erosion patterns between the No Action, Managed Lake, Estuary, and Hybrid Alternatives for both events. The results indicate that annual erosion/deposition rates are generally higher for Event B than Event A because stronger flows will result in higher deposition and erosion rates. Higher deposition rates would occur on the east side of West Bay due to a shallow intertidal habitat area on the west side of West Bay.

4.2.6.2 Initial Dredging during Construction

Similar to the Estuary Alternative, initial dredging would be conducted during construction to reduce a sediment source that would be available for transport into West Bay during high flow events after removal of the 5th Avenue Dam. Approximately 500,000 cubic yards (380,000 cubic meters) of sediment would be dredged from the North and Middle Basins during construction. Similar to the Estuary Alternative, numerical modeling shows that this initial dredging would result in a 48% reduction in impacts to sedimentation anticipated at the Olympia Yacht Club.

4.2.6.3 Long-Term Maintenance Dredging

The approach to recurring long-term maintenance dredging for the Hybrid Alternative would be similar to the Estuary Alternative but would vary based on the anticipated patterns and rates of accumulation. The frequency of maintenance dredging increases under the Hybrid Alternative (Table 4.2.7) compared to the Estuary Alternative.
## Table 4.2.7 Anticipated Maintenance Dredging in West Bay for the Hybrid Alternative

<table>
<thead>
<tr>
<th>Years after Construction</th>
<th>Location</th>
<th>Potential Duration of Impact</th>
<th>Estimated Amount (cubic yards (cubic meters))</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Olympia Yacht Club</td>
<td>2 months</td>
<td>21,600 (16,500)</td>
</tr>
<tr>
<td>10</td>
<td>Olympia Yacht Club</td>
<td>2 months</td>
<td>21,600 (16,500)</td>
</tr>
<tr>
<td>10</td>
<td>Other Lower West Bay Private Marinas</td>
<td>1 month</td>
<td>15,600 (11,900)</td>
</tr>
<tr>
<td>10</td>
<td>Port of Olympia/Turning Basin</td>
<td>9 months</td>
<td>247,800 (189,500)</td>
</tr>
<tr>
<td>15</td>
<td>Olympia Yacht Club</td>
<td>2 months</td>
<td>21,600 (16,500)</td>
</tr>
<tr>
<td>20</td>
<td>Olympia Yacht Club</td>
<td>2 months</td>
<td>21,600 (16,500)</td>
</tr>
<tr>
<td>20</td>
<td>Other Lower West Bay Private Marinas</td>
<td>1 month</td>
<td>15,600 (11,900)</td>
</tr>
<tr>
<td>20</td>
<td>Port of Olympia/Turning Basin</td>
<td>9 months</td>
<td>247,800 (189,500)</td>
</tr>
<tr>
<td>20</td>
<td>Marina Access</td>
<td>2 months</td>
<td>65,400 (50,000)</td>
</tr>
<tr>
<td>25</td>
<td>Olympia Yacht Club</td>
<td>2 months</td>
<td>21,600 (16,500)</td>
</tr>
<tr>
<td>30</td>
<td>Olympia Yacht Club</td>
<td>2 months</td>
<td>21,600 (16,500)</td>
</tr>
<tr>
<td>30</td>
<td>Other Lower West Bay Private Marinas</td>
<td>1 month</td>
<td>15,600 (11,900)</td>
</tr>
<tr>
<td>30</td>
<td>Port of Olympia/Turning Basin</td>
<td>9 months</td>
<td>247,800 (189,500)</td>
</tr>
<tr>
<td></td>
<td><strong>Total Dredged</strong></td>
<td></td>
<td><strong>985,200 (753,200)</strong></td>
</tr>
</tbody>
</table>

**Note:**

1. Maintenance dredging operations are assumed to be 10 hours a day, 5 days a week within the applicable in-water work window (July 16 through February 15 each year). Maintenance dredging could extend into more than one in-water work window if dredging were phased to minimize impacts to operations (e.g., many marinas avoid completing maintenance during busy summer months).
A sediment monitoring plan is also proposed for the Hybrid Alternative. Monitoring would reduce or increase the frequency of maintenance dredging within the identified resource areas in West Bay based on annual bathymetric data.

Maintenance dredging would be conducted according to the methods described for the Estuary Alternative. All dredged material is assumed to be suitable for open-water disposal, given the quality of the material moving downstream from the Deschutes River.

Impacts on navigation in West Bay under the Hybrid Alternative would be significant, but could be reduced to less than significant levels if consistent funding is available for the long-term maintenance dredging program, and with implementation of the sediment monitoring program that would support flexible and responsive dredging.

**4.2.6.4 Impacts from Maintenance Dredging on Vessel Access and Slip or Berth Use**

Under the Hybrid Alternative, maintenance dredging in West Bay would occur at an assumed frequency of every 5 years. Refer to Table 4.2.5 for the assumed maintenance dredging schedule, which shows that dredging would rotate across the facilities—not every facility would need to be dredged during each dredge event. This will require the USACE, Port, and West Bay private marinas to schedule and coordinate berth and slip use around these events. The movement or relocation of marine infrastructure (piles, floats, boathouses, etc.) can be a substantial disruption to marine operations. However, as described for the No Action Alternative and Estuary Alternative, maintenance dredging is only carried out at impacted areas and often ports and marinas are able to remain operational during maintenance dredging activities. Early coordination and scheduling would be necessary to minimize impacts on navigation.

Sediment monitoring and regular implementation of an adaptable maintenance dredging program would facilitate proactive scheduling and planning. These measures would reduce the potential for significant impacts from the maintenance dredging program on vessel navigation under the Hybrid Alternative to less than significant.
4.2.7 What mitigation measures would be recommended or required for the three alternatives?

Enterprise Services would avoid and minimize potential impacts by complying with regulations, permits, plans, and authorizations. These anticipated measures, and other mitigation measures that were evaluated and eliminated are described below.

4.2.7.1 Managed Lake Alternative

Mitigation measures that avoid and minimize impacts to vessel navigation are not proposed under the Managed Lake Alternative because impacts to navigation in West Bay are not anticipated.

4.2.7.2 Estuary Alternative

Two key project design features that avoid and minimize impacts to vessel navigation have been incorporated into the project under the Estuary Alternative:

- Initial dredging of Capitol Lake before the 5th Avenue Dam is removed was shown during numerical modeling to be effective in reducing sediment deposition in Budd Inlet. Sediment deposition at the Olympia Yacht Club, for example, reduces by approximately 48% when initial dredging is assumed.

- A maintenance dredging program would be implemented in impacted areas of West Bay. The purpose of this is to manage sediment accumulation in West Bay and minimize impacts to Port of Olympia and private marina facilities and access channels to less than significant levels.

In addition to the design features described above, the following mitigation measures are included in the project for the Estuary Alternative:

- A sediment monitoring plan would be developed and implemented to document initial conditions at the nearby southern portion of the FNC, the Port of Olympia, and West Bay private marinas and to observe when actual impacts occur. Sediment monitoring is especially important to document high flow events (i.e., storm surges), which influence sediment load. Monitoring would be conducted regularly and used to modify the
long-term maintenance dredging plan, as necessary. The use of sediment monitoring to implement the long-term maintenance dredging plan allows for an adaptive, flexible, and responsive approach to avoiding significant impacts to navigation from sediment deposition.

- As part of the maintenance dredging program, scheduling and phasing would be developed in coordination with the USACE, Port of Olympia, and private marinas to minimize impacts to the FNC and turning basin, Port of Olympia berths, and private marinas. This would include early coordination and scheduling with marina managers and vessel slip and boathouse tenants to identify the need for, and provide, temporary moorage as required (i.e., space at another marina or facility in West Bay, or the installation of a temporary dock to use during maintenance dredging).

A range of other mitigation measures were modeled to evaluate their ability to influence sediment deposition in Budd Inlet, and reduce impacts to navigation, including dredging of the shallow intertidal area, installation of a sediment control structure or trap, and dredging a deeper channel to connect the Capitol Lake Basin with West Bay. Following this evaluation, the sediment monitoring plan was determined to be the most effective measure to identify potentially impacted areas and ensure that impacts of sediment deposition do not reach significant levels. Refer to the Navigation Discipline Report (Attachment 6) for more detail.

**4.2.7.3 Hybrid Alternative**

Mitigation measures that avoid and minimize impacts to vessel navigation for the Hybrid Alternative are the same as those described for the Estuary Alternative in Section 4.2.7.2.

**4.2.8 What are the significant unavoidable adverse impacts to navigation?**

The project would result in no long-term change to vessel navigation under the Managed Lake, Estuary, or Hybrid Alternatives. Project measures will be implemented to address sediment-related impacts in West Bay; therefore, significant impacts are avoidable and there would be no significant unavoidable adverse impacts on vessel navigation.
4.3 WATER QUALITY

This section describes the potential long-term impacts of the Capitol Lake – Deschutes Estuary Long-Term Management Project on water quality in the project area. Improving water quality is one of the primary project goals. Also described are measures that would be used to avoid, minimize, or mitigate adverse project effects, and the potential for significant unavoidable adverse impacts. In addition to adverse impacts that are the common focus of a SEPA EIS, anticipated beneficial effects on water quality are discussed for each project alternative. The information presented here is summarized from the full analysis in the Water Quality Discipline Report (Attachment 7).

Key Findings: Long-Term Effects on Water Quality

Under the No Action Alternative, current water quality conditions and trends would persist, reflecting the predominant influence from the Deschutes River. Eventually, there would be a significant impact on the lake from aquatic plants. There would be no change to Budd Inlet because any changes in water quality in the lake basin would not be large enough to influence water quality conditions in the inlet.

As described below, water quality conditions would improve in varying ways under all long-term management alternatives; however, none of the alternatives would meet all water quality standards. Seasonal and occasional exceedances of water quality standards would occur under all long-term management alternatives.

Under the Managed Lake Alternative, the lake would experience minor to moderate beneficial effects from algae control and substantial benefits from aquatic plant management. Capitol Lake would continue to experience summertime algal blooms. Seasonal exceedances of water quality standards in Capitol Lake (temperature, dissolved oxygen, total dissolved gas, and pH) are likely to continue, and there would be no change in impact to water quality in Budd Inlet.

The Estuary and Hybrid Alternatives would create an estuarine environment in the existing lake basin that would have seasonally low dissolved oxygen, as is typical for South Puget Sound estuaries. This shift would be a significant impact when compared to existing conditions. However, estuarine water is inherently different than freshwater. Possible increases in algae blooms that might be expected due to the incoming tidal waters would be offset by Deschutes River flows; thus, overall algal blooms may be similar to existing conditions in the Capitol Lake Basin. The elimination of aquatic plants would be a substantial benefit by improving the aesthetic characteristics of water quality. Budd Inlet would experience minor to moderate benefits associated with improved dissolved oxygen, and algal blooms are expected to be largely the same as current conditions.

Under the Hybrid Alternative, the saltwater reflecting pool is expected to have better dissolved oxygen levels and less algae than the estuarine conditions throughout the North Basin, but would still not consistently meet water quality standards. If a freshwater reflecting pool were chosen over a saltwater reflecting pool, it would require active management to avoid impacts to public health and visual quality.

Implementing BMPs required by water quality permits would result in less than significant water quality impacts from maintenance dredging under all action alternatives.

Climate change (under all project alternatives) will result in increased water temperature in all three water bodies: the Deschutes River, Capitol Lake, and Budd Inlet. The increase in temperature is likely to result in increased algal blooms, increased pH, and decreased dissolved oxygen and related impacts on nutrient dynamics. None of the project alternatives considered will affect the magnitude or extent of these impacts.
4.3.1  What methods were used to assess long-term impacts to water quality?

Potential long-term adverse impacts and beneficial effects to water quality conditions under each project alternative were evaluated using a combination of information on long-term trends, current conditions, and model predictions of environmental factors affecting water quality. Adverse impacts and beneficial effects were evaluated for both the lake basin area (currently Capitol Lake) and Budd Inlet.

The water quality impact assessment focused on dissolved oxygen and algal blooms, as well as how changes in aquatic plants affect water quality aesthetics and dissolved oxygen. Dissolved oxygen is critical because low dissolved oxygen concentrations have been a long-term problem in Budd Inlet, and have been the focus of water quality improvement planning efforts for many years. Adequate dissolved oxygen concentrations are important to aquatic habitat, particularly for cold water fish. Algal blooms are important because they can directly impact dissolved oxygen concentrations and aesthetic qualities. Other water quality parameters (e.g., bacteria, pH, and temperature) are not addressed in this EIS because they are not helpful in differentiating between the long-term water quality effects of the project alternatives. Additional information on these parameters is included in the Water Quality Discipline Report (Attachment 7).

Evaluating the magnitude of beneficial effects and the significance of adverse impacts on water quality involved a qualitative evaluation of the ecological value of benefits or impacts. Water quality standards in Washington State are set to protect designated beneficial uses, including both aquatic life and recreational uses. A predicted benefit or impact needs to consider the magnitude as well as the temporal and spatial extents of changes as they are experienced by a biological endpoint (e.g., salmon sensitive to low dissolved oxygen) or people (e.g., park visitors observing algal blooms or masses of floating aquatic plants).

4.3.2  What are the long-term impacts under the No Action Alternative?

Under the No Action Alternative, Enterprise Services would continue to implement limited nuisance and invasive species management activities. In the absence of a long-term management project, funding and approvals to manage sediment, control aquatic plants, implement water quality protection measures, improve ecological...
functions, or enhance community use cannot be obtained. As a result, the lake basin would continue to fill with sediment, ultimately with a loss of open-water habitat around the perimeter and more riverine conditions along the flow path of the Deschutes River. Submerged aquatic plants would continue to dominate the habitat and slowly transition (over decades) to emergent wetland plants. The lake basin is currently overwhelmed with aquatic plant growth, and further loss of open-water areas is expected to result in a **significant impact** on water quality. Under the No Action Alternative, the lake’s capacity to store sediments eventually would be lost and then the river’s sediment load would pass directly to Budd Inlet.

Dissolved oxygen concentrations in the lake basin would more closely reflect the dissolved oxygen in the Deschutes River as Capitol Lake gradually fills with river sediment. Minor to moderate benefits on dissolved oxygen and algae concentrations in the lake basin can be expected to result from implementation of the Deschutes River Total Maximum Daily Load (TMDL), and the natural establishment of emergent wetlands around the lake perimeter may provide further pollutant buffering.

The quality of the water entering Budd Inlet would become increasingly similar to that of the Deschutes River as the lake becomes more river-like. There would be no change in dissolved oxygen and algae concentrations expected in Budd Inlet from gradual changes in the lake basin.

Climate change will result in increased water temperature in all project area waterbodies. The increase in temperature will likely result in increased algal blooms, increased pH, decreased dissolved oxygen, and impacts on TOC and other nutrient dynamics. Summertime low flows will increase in severity, which could exacerbate the temperature effects. Peak (flood) flows in the Deschutes River are expected to increase over time, therefore increasing flood impacts in the project area. Also, since sediment is transported mostly during flood events, total sediment delivery could increase over time and accelerate lake filling. The No Action Alternative would not provide opportunities for adaptation to these effects of climate change.

### 4.3.3 What are the long-term impacts common to all action alternatives?

Long-term impacts common to all action alternatives are associated with recurring maintenance dredging to maintain target depths in the
North Basin under the Managed Lake Alternative, or in impacted areas of West Bay under the Estuary and Hybrid Alternatives. The risk of water quality degradation from maintenance dredging is low because dredged sediment quality in both the lake basins and West Bay is expected to be uncontaminated (i.e., having concentrations of metals and organic contaminants below Sediment Management Standards (SMS) criteria following dredging completed as a separate action). Dredging BMPs would be implemented to reduce suspended sediments in the immediate dredge area and limit turbidity increases to within the temporary authorized mixing zone. Considering these factors, maintenance dredging for all action alternatives would have less than significant impacts on water quality.

Other long-term water quality impacts are expected from climate change. Climate change will result in increased water temperatures in the Deschutes River, Capitol Lake, and Budd Inlet. The increase in temperatures is likely to result in increased algal blooms, increased pH, decreased dissolved oxygen, and other water quality effects. Flood flows in the Deschutes River are expected to increase with climate change, resulting in greater flood impacts and sedimentation under any of the alternatives. Summertime low flows are also expected to decrease, which could exacerbate the temperature effects described above. However, none of the action alternatives would affect the magnitude or extent of climate change impacts. Differences may occur in the opportunities for adaptation to climate change, as described below.

### 4.3.4 What are the long-term impacts from the Managed Lake Alternative?

Under the Managed Lake Alternative, overall adverse impacts on water quality in Capitol Lake would be less than significant. Minor to substantial water quality benefits are also anticipated, depending on the water quality parameter and location of effect (Table 4.3.1). The North Basin would be maintained as open-water habitat through periodic dredging, while the Middle and South Basins would gradually transition to a mix of vegetated wetlands and shallow water habitat. Management of Capitol Lake would have no change in impacts to water quality in Budd Inlet.

Specific effects on water quality under the Managed Lake Alternative would depend on management techniques implemented under an adaptive management approach that would integrate water quality, aquatic plant, algae, invasive species, and habitat management. Management objectives for the lake could include:
• Meeting applicable water quality standards
• Controlling nuisance or toxic algal blooms
• Controlling aquatic plants to improve aesthetics and boating access, and reduce fall and winter nutrient release to Budd Inlet
• Controlling invasive species
• Supporting beneficial uses (fish and wildlife habitat, fishing, small nonmotorized watercraft, aesthetics, reflecting pool, and other noncontact recreation uses)
• Supporting ongoing work to reduce nutrients and contaminants as identified in the existing Deschutes River TMDL and future Budd Inlet TMDL
• Enhancing ecological value

Long-term impacts on water quality associated with the Managed Lake Alternative are listed and summarized in Table 4.3.1 and further described in this section.

**Table 4.3.1 Summary of Long-Term Water Quality Impacts: Managed Lake Alternative**

<table>
<thead>
<tr>
<th>Impact</th>
<th>Effect Finding</th>
<th>Measures to Reduce or Mitigate Significant Impacts</th>
<th>Significant &amp; Unavoidable Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turbidity or water contamination—Effects of maintenance dredging</td>
<td>Less than significant impact if permit conditions are followed</td>
<td>BMPs and other measures to avoid and minimize impacts (see Section 4.3.7)</td>
<td>No</td>
</tr>
<tr>
<td>Aesthetics—Effects of aquatic plant management and algal bloom controls</td>
<td>In Capitol Lake, minor to moderate beneficial effect from algae control and substantial benefit from aquatic plant management</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Localized stagnant pools of water—Effects of habitat creation in the Middle Basin</td>
<td>Less than significant impact</td>
<td>None</td>
<td>No</td>
</tr>
</tbody>
</table>
### Impact Effect Finding Measures to Reduce or Mitigate Significant Impacts Significant & Unavoidable Impact

<table>
<thead>
<tr>
<th>Impact</th>
<th>Effect Finding</th>
<th>Measures to Reduce or Mitigate Significant Impacts</th>
<th>Significant &amp; Unavoidable Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less bioavailable sediment phosphorus—Effect of initial dredging would remove phosphorus-rich sediments</td>
<td>Minor beneficial effect from removing sediments with higher concentrations of phosphorus otherwise available for aquatic plant growth</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Turbidity effects—Effects of lake management activities</td>
<td>Less than significant impact if permit conditions are followed</td>
<td>BMPs and water quality permit conditions</td>
<td>No</td>
</tr>
<tr>
<td>Low dissolved oxygen in Budd Inlet—Effects from possible decreased TOC loading from Capitol Lake</td>
<td>No change in impact as loading will be similar to current conditions</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

### 4.3.4.1 Lake Basin

An adaptive lake management plan would be developed to achieve water quality objectives and enhance beneficial uses. These management actions would include development of an action threshold for the summer mean concentration of total phosphorus. This threshold would be used to identify when management actions are needed to reduce the frequency and extent of recreation impacts from algae scum and cyanotoxins, aquatic life impacts from high pH and dissolved gas in shallow waters, and low dissolved oxygen in deeper waters. An aquatic plant management plan would be developed to maintain a healthy aquatic plant community that does not impair recreation or aquatic life uses. The adaptive lake management plan would specify water quality and aquatic plant monitoring procedures for evaluating whether the objectives are being met or need to be modified based on changes in water quality conditions or lake uses.

The adaptive lake management plan would include measures that are relatively modest (e.g., mechanical harvesting), because the existing water quality conditions are generally improving, as indicated by:
• The relatively low existing chlorophyll-a concentrations and occurrence of toxic algal blooms
• Dissolved oxygen conditions that support aquatic life and meet water quality criteria most of the time
• Reduced sediment phosphorus inputs by removing phosphorus-rich surface sediments from the North Basin
• Reduced watershed phosphorus inputs through implementation of the Deschutes TMDL and stormwater treatment
• Generally improving water quality trends that have been documented in recent years

As part of ongoing water quality management efforts throughout the basin, establishment of a lake-specific action threshold for phosphorus is expected to promote improvements in treatment of stormwater that enters the lake. These activities and continuing TMDL work in the Deschutes River Watershed would promote a continuing trend in water quality improvement. If the TMDL goal for total phosphorous in the Deschutes River is achieved, this would likely result in a substantive reduction in nutrients and accompanying reduced algae populations. However, achieving this goal will be difficult and take many years, likely not within the 30-year planning horizon of this project. Therefore, potential improvements are not expected to decrease lake nutrient concentrations enough to shift from eutrophic (nutrient-rich) to mesotrophic (moderate levels of nutrients). The lake would continue to be productive (eutrophic) and support an aquatic plant community that would be controlled through aquatic plant management activities, such as mechanized harvesting. Reducing aquatic plants through these additional control activities would provide a substantial aesthetic benefit.

Even with implementation of the adaptive management plan, Capitol Lake would continue to experience summertime algal blooms, occasional exceedances of state standards for dissolved oxygen, pH, and temperature, and frequent violations of total dissolved gas, as is typical of lake environments.

While there could be measurable decreases in the algae community and fewer occurrences of algal blooms due to decreased nutrients, the changes may not be noticeable to the public. This finding is supported by scenarios modeled by Ecology. Ecology evaluated potential impacts on lake quality from watershed improvements, dredging to 13 feet, and alum treatments; the modeling indicated
that these measures would not have a meaningful effect on lake water quality.

Creation of habitat areas in the Middle Basin would impact hydrodynamics and create localized areas of more stagnant water associated with the change to wetland conditions. This change could promote more algae and/or plant growth in isolated areas. However, these impacts in small areas would result in less than significant impacts on the overall water quality of the Middle Basin.

Initial dredging of the North Basin would remove aquatic plants and upper layers of sediments that contain substantially higher concentrations of bioavailable phosphorus (phosphorus available for algae and plant growth). Although internal loading of phosphorus from sediments was not identified as a major contributor to the lake’s phosphorus budget on an annual basis, it may be important seasonally. The lower concentrations of bioavailable phosphorus in the North Basin sediments that would be exposed after dredging may result in lower lake phosphorus concentrations and therefore a reduced nutrient supply for algal blooms. Less bioavailable phosphorus from the sediments could result in a minor benefit to water quality.

Activities commonly used to control aquatic plants, algae, or invasive species, such as application of approved aquatic herbicides, could have localized, short-term impacts. However, permit requirements (including BMPs) would minimize potential impacts. These lake management activities have been implemented on many other area lakes, and permit requirements are expected to result in less than significant impacts on water quality.

### 4.3.4.2 Budd Inlet

Water quality conditions in lower Budd Inlet would remain the same as existing conditions under the Managed Lake Alternative. Lake and watershed management activities may reduce nutrient loading from these sources to the inlet, including possible decreases in summer/fall TOC due to aquatic plant management activities. However, most nutrient loading to Budd Inlet is from Puget Sound tidal waters and inlet sediment flux, which would not be affected by the project. These existing nutrient sources from Puget Sound would continue to feed marine algal blooms and drive low dissolved oxygen conditions in the deeper waters, regardless of inputs from Capitol Lake. Although low dissolved oxygen concentrations are typical of inlets in South Puget Sound, a portion of the dissolved oxygen depletion that

### Managed Lake Alternative Impacts and Benefits to Water Quality

**Dissolved Oxygen**
- Capitol Lake: no change
- Budd Inlet: no change

**Algal Blooms**
- Capitol Lake: minor to moderate benefit
- Budd Inlet: no change

**Aquatic Plants**
- Capitol Lake: substantial benefit
- Budd Inlet: no change
Budd Inlet experiences has been attributed to Capitol Lake and the 5th Avenue Dam, and this lake/dam-derived depletion would continue to occur.

The Managed Lake Alternative would have no change to water quality in Budd Inlet compared to existing conditions because there would be no changes in dissolved oxygen or other habitat conditions for cold water fish, and no change in the extent or frequency of algal blooms. Budd Inlet would continue to experience low summer dissolved oxygen concentrations that do not meet minimum dissolved oxygen criteria, especially in the deeper waters.

4.3.5 What are the long-term impacts from the Estuary Alternative?

Long-term impacts or benefits from the Estuary Alternative include potential changes in the quality and nature of water in Budd Inlet and the existing lake basin, and recurring maintenance dredging of areas in West Bay (Table 4.3.2). The Estuary Alternative results in the greatest change from existing conditions, with effects that differ depending on their location. Therefore, the impacts on the lake basin and Budd Inlet are described separately in this section.

Table 4.3.2 Summary of Long-Term Water Quality Impacts: Estuary Alternative

<table>
<thead>
<tr>
<th>Impact</th>
<th>Effect Finding</th>
<th>Measures to Reduce or Mitigate Significant Impacts</th>
<th>Significant &amp; Unavoidable Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Turbidity or water contamination</strong>–Effects of West Bay maintenance dredging would resuspend sediments</td>
<td>Less than significant impact if permit conditions are followed</td>
<td>BMPs and other measures to avoid and minimize impacts (Section 4.3.7)</td>
<td>No</td>
</tr>
<tr>
<td><strong>Aesthetics</strong>–Effects of transition from freshwater to estuary on aquatic plants and algae</td>
<td><strong>Substantial beneficial effect</strong> in lake basin from reduction in aquatic plants</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Localized stagnant pools of water</strong>–Effects of habitat creation in the Middle Basin and development of tideflats result in localized areas with less water circulation</td>
<td>Less than significant impact because of localized, small areas of impact</td>
<td>None</td>
<td>No</td>
</tr>
</tbody>
</table>
### Impact

<table>
<thead>
<tr>
<th>Impact</th>
<th>Effect Finding</th>
<th>Measures to Reduce or Mitigate Significant Impacts</th>
<th>Significant &amp; Unavoidable Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low dissolved oxygen in lake basin</strong> – Effects of transition to an estuary, tidal effects result in lower dissolved oxygen</td>
<td>Significant impact (when a comparison is made to existing lake water quality, but estuarine water would be inherently different)</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Low dissolved oxygen in Budd Inlet</strong> – Effects from possible decreased TOC loading from Capitol Lake and altered water circulation after dam removal result in reduced algae, improved oxygenation from Deschutes River influence</td>
<td>Minor to moderate beneficial effect</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

### 4.3.5.1 Lake Basin

Under the Estuary Alternative, the existing lake basin would become part of the estuary, which by design would result in extensive changes in the water quality of the lake basin to conditions typical of an estuary. Compared to Capitol Lake where dissolved oxygen conditions are generally good throughout the basin, dissolved oxygen concentrations in this area would be very low under the Estuary Alternative during certain periods.

The water quality in the lake basin area would be an extension of what currently exists in West Bay, but with less dissolved oxygen. Therefore, the dissolved oxygen concentrations in the lake basin area would be lower than West Bay and below the minimum water quality criterion, resulting in a **significant impact** when compared to existing conditions. These low dissolved oxygen concentrations would coincide with marine algal blooms. Low dissolved oxygen concentrations are a common condition of narrow, shallow, tidal estuaries in the South Puget Sound; the continued influence of the Deschutes River would likely maintain better dissolved oxygen conditions than in neighboring inlets. Such changes are not expected to significantly impact fish (see Section 4.5, Fish and Wildlife).

Algal blooms would continue to occur in what is the existing lake basin under this alternative. The blooms would be made up of marine

**Estuary Alternative Impacts and Benefits to Water Quality**

**Dissolved Oxygen**
- Capitol Lake Basin: significant impact (when a comparison is made to existing lake water quality, but estuarine water would be inherently different)
- Budd Inlet: minor to moderate benefit

**Algal Blooms**
- Capitol Lake Basin: no change
- Budd Inlet: no change

**Aquatic Plants**
- Capitol Lake Basin: substantial benefit
- Budd Inlet: no change
algae communities that differ from the freshwater algae that currently exist in the basin. Possible increases in algal blooms that might be expected due to the quality of the incoming tidal waters would be offset by the Deschutes River flows. Therefore, algal blooms would generally appear similar to existing conditions in the basin, and there would be no change in impact on water quality aesthetics. The elimination of freshwater aquatic plants from the transition to an estuarine habitat would provide a substantial benefit to water quality aesthetics.

Creation of habitat areas and the formation of tideflats in the Middle and South Basins would impact water movement and may create small areas of more stagnant waters that promote algae, thereby causing localized areas of poorer water quality. These small areas would not substantially change the overall condition of water quality in the lake basin area, and the impacts on water quality would be less than significant.

4.3.5.2 Budd Inlet

In evaluating potential long-term impacts and benefits of the Estuary Alternative, this section reviews model predictions for improvements in Budd Inlet dissolved oxygen in light of more recent water quality monitoring data from Capitol Lake and the Deschutes River. Ecology’s modeling indicated that removal of the 5th Avenue Dam would result in improvements in Budd Inlet dissolved oxygen concentrations, predicting a dissolved oxygen gain of approximately 1 mg/L during the critical late-summer period in deeper waters throughout much of the inlet. Even greater improvements were predicted for East Bay. Even with the projected improvement, the model predicted continued problematic excursions (levels) less than the 5 mg/L minimum water quality criterion in surface and bottom waters of East Bay after the 5th Avenue Dam is removed.

Field observations and trends in water quality monitoring data (as summarized in Section 3.3, Water Quality) suggest uncertainties in these predicted dissolved oxygen improvements. Trends observed in nutrient monitoring data indicate that dissolved oxygen changes could range from no improvement to something less than the improvement predicted by the model. However, the predicted improvements in dissolved oxygen are not based solely on changes in nutrient dynamics but also on expected changes in flow and circulation patterns in Budd Inlet after dam removal. To account for uncertainties and exercise caution to not be overoptimistic, this analysis evaluated dissolved oxygen improvements after dam removal.
removal at half of what the model predicted, based on the lower TOC concentrations measured in 2019 compared to older data used in the model. Consistent with SEPA requirements, when there are data gaps or uncertainties, an analysis should identify a worst-case outcome (WAC 197-11-080). In this case, "worst-case" can mean lower levels of water quality improvement than predicted by other analyses.

Management scenarios, which had been identified and prioritized with stakeholders, were modeled by Ecology as potential management actions to address water quality concerns. All scenarios relied on establishing a “natural” condition as a baseline for comparing management scenarios, rather than comparing the scenarios to existing conditions. The “natural” condition was defined by assuming that nutrient concentrations and loadings from the rivers, tributaries, and Puget Sound are at background (pre-development) levels and that waste water treatment plant (WWTP) discharges and other pollutant sources, such as stormwater, are at natural background river concentrations.

The scenario directly relevant to the Estuary Alternative was removal of the 5th Avenue Dam. Based on daily minimum bottom water concentrations at critical locations, Ecology predicts that dissolved oxygen concentrations in West Bay would improve by approximately 1 to 1.5 mg/L without the dam. In East Bay the maximum dissolved oxygen improvements from dam removal were predicted to be greater, approximately 1.5 to almost 2 mg/L. Although dissolved oxygen is predicted to improve if the dam is removed, the numeric water quality criteria (i.e., 5 mg/L in inner Budd Inlet) would still not be met in either East Bay or West Bay, as stated by Ecology. The greater levels of dissolved oxygen depletion resulting from keeping the dam in place was attributed primarily to TOC loading from Capitol Lake, and the pulsed dam releases that alter Budd Inlet circulation were also identified as an important contributing factor.

Ecology predicted higher loads of dissolved inorganic nitrogen entering Budd Inlet during summer months without the dam, likely due to less freshwater algae and aquatic plant growth in the lake to consume nutrients. The water that enters Budd Inlet from the Deschutes River would also have lower TOC concentrations due to the decrease in algae growth that occurs in the Capitol Lake Basin. Because the Ecology model predicts that dam removal would improve dissolved oxygen in Budd Inlet, the implication is that the decreased TOC (predicted to occur with dam removal) and changes in

Nutrients and Budd Inlet

TOC loading to Budd Inlet is important to dissolved oxygen depletion because bacteria consume oxygen while decomposing the organic matter that settles on the bottom. Dissolved inorganic nitrogen loading is important as well because it is readily available to stimulate marine algae growth that also depletes oxygen during decomposition.

Hybrid Alternative Impacts and Benefits to Water Quality

Dissolved Oxygen
- Estuary: significant impact (when a comparison is made to existing lake water quality, but estuarine water would be inherently different)
- Reflecting Pool: significant impact
- Budd Inlet: minor to moderate benefit

Algal Blooms
- Estuary: no change
- Reflecting Pool: no change
- Budd Inlet: no change

Aquatic Plants
- Estuary: substantial benefit
- Reflecting Pool: substantial benefit
- Budd Inlet: no change
water circulation are more important to dissolved oxygen depletion in Budd Inlet than the increased dissolved inorganic nitrogen concentrations. Therefore, the TOC data and modeling results were examined closely.

Ecology predicted that, without the dam, the TOC concentration at the outflow from Capitol Lake would be substantively lower (2 mg/L) than with the dam (5 mg/L), under modeled conditions. Yet, field data from 2004 and 2019 indicate that TOC concentrations in the outflow are much less than 5 mg/L on average and trending downward; they were already less than 2 mg/L in 2019, except during fall aquatic plant dieback. Further, data collected from the lake in 2003 and 2004 and used to calibrate the model were not reflective of typical lake conditions due to a lake herbicide treatment that resulted in a mid-summer spike in TOC concentrations as well as the typical spike that occurred during fall plant die-off. Thus, the magnitude and seasonal relationships for nutrient and TOC discharges to Budd Inlet in 2004 would not have been typical. All considered, the monitoring data indicate uncertainty in model predictions of TOC and the effects of Capitol Lake on Budd Inlet dissolved oxygen depletion.

Comprehensive monitoring of the lake used by Ecology to make predictions under the TMDL was last completed over 15 years ago, and water quality has changed significantly over the past decades. The analysis of more recent data (i.e., 2004 to 2014, and 2019) indicates significant improvement in both the lake and river during that time. This information implies that the background conditions on which the model was developed likely have changed.

Overall, the inconsistency between predicted TOC concentrations and measured concentrations, the atypical year that was used to calibrate the model, and the improving trend in Capitol Lake water quality since model calibration contribute to uncertainty in the interpretation of TOC results. These uncertainties led to a conclusion of more modest expectations for dissolved oxygen improvements that could be gained by removal of the 5th Avenue Dam compared to those predicted by modeling efforts.

Overall, dissolved oxygen concentrations are expected to modestly improve in Budd Inlet under the Estuary Alternative but not substantially change the general conditions for cold water fish or meet minimum numeric water quality criteria for dissolved oxygen. The low dissolved oxygen concentrations that occur in Budd Inlet naturally occur in tidal estuaries in Puget Sound and such levels are
not expected to significantly impact fish (see Section 4.5, Fish and Wildlife).

With continued plentiful nutrient inflow from greater Puget Sound and the Deschutes River, Budd Inlet would continue to experience algal blooms of approximately the same extent and frequency as occur under existing conditions. In summary, the Estuary Alternative is expected to result in a minor to moderate benefit to dissolved oxygen concentrations in Budd Inlet and no change in water quality conditions related to algal blooms and aquatic plants.

4.3.6 What are the long-term impacts from the Hybrid Alternative?

Impacts or benefits from Hybrid Alternative operations would be essentially the same as described for the Estuary Alternative (see Section 4.3.5), except in the North Basin. In the North Basin, operational effects on water quality conditions within the smaller reflecting pool inside the barrier would be very different from the estuary outside the barrier wall.

In the estuary, water quality conditions would be similar to those described for the lake basin under the Estuary Alternative, but with greater influence from the river as it flows through a smaller area between the barrier and the western shoreline. Dissolved oxygen concentrations would be low but may be somewhat higher than described for the Estuary Alternative due to the increased influence of the river. Similar to the Estuary Alternative, the Hybrid Alternative would have significant impacts on water quality in the western portion of the existing lake basin compared to existing conditions. Although there would be a conversion from freshwater to marine algae, not much change is expected in terms of the overall areal extent or duration of algal blooms. Elimination of existing aquatic plants would be a substantial benefit and would result in a minor benefit to water quality aesthetics.

Within the saltwater reflecting pool, the water would be exchanged twice daily during high tides. With the tidal exchanges, the water would be higher quality; cooler, with more dissolved oxygen; and less algae than the water in the western portion of the basin. Dissolved oxygen concentrations would likely not meet the marine water quality criterion; however, the Hybrid Alternative would have a significant impact on dissolved oxygen in all areas of the lake basin compared to existing conditions. Elimination of existing aquatic plants in the saltwater reflecting pool would be a substantial benefit.
to water quality aesthetics. No active management of the saltwater reflecting pool is anticipated to be necessary to control algal blooms or aquatic plant growth.

If a freshwater reflecting pool were chosen over a saltwater reflecting pool, it would require active management to avoid impacts to public health and visual quality.

Long-term water quality effects of the Hybrid Alternative in Budd Inlet would be essentially the same as those described for the Estuary Alternative.

4.3.7 What avoidance, minimization, and mitigation measures would be implemented?

Enterprise Services would avoid and minimize potential impacts by complying with regulations, permits, plans, and authorizations. These anticipated measures, and other mitigation measures that could be recommended or required, are described in this section.

4.3.7.1 Managed Lake Alternative

No significant impacts were identified for the Managed Lake Alternative because it would replicate the existing condition with the inclusion of management approaches. However, modeling has indicated that the 5th Avenue Dam is an important aspect of the dissolved oxygen problem in Budd Inlet due partially to the pulsed nature of the flow over the dam and its impact on circulation. This issue would need to be considered during design of the dam repairs to determine whether modifications could be made to limit the pulsed nature of the discharge.

When aquatic plants in Capitol Lake die back in the fall, total organic carbon from the plants enter Budd Inlet and contribute to oxygen depletion. Late-season removal of aquatic plants should be considered to reduce this impact. Aquatic plant removal and other projects implemented under a lake management plan would require BMPs and other conditions in approved water quality permits.

4.3.7.2 Estuary and Hybrid Alternatives

Significant long-term adverse impacts have been identified for the lake basin under both the Estuary and Hybrid Alternatives because the freshwater lake basin would be converted from a well-oxygenated condition to one with very low oxygen conditions.
characteristic of inner Budd Inlet. However, these conditions are common in the shallow parts of inlets and embayments around South Puget Sound, and no measures are recommended to minimize or mitigate these impacts on aquatic habitat or other beneficial uses.

### 4.3.8 What are the significant unavoidable adverse impacts to water quality?

When the existing lake basin is opened to tidal waters under the Estuary or Hybrid Alternative, there would be a redistribution and transport of sediments. This activity would increase turbidity in both the lake basin and Budd Inlet until equilibrium is restored. This **significant unavoidable adverse impact** is addressed in more detail in Section 5.3, Water Quality, as it would occur during construction, and the impact could continue for 20 years before sediment distribution reaches a new equilibrium.

In the long-term, **significant unavoidable adverse impacts** to the lake basin would occur under the Estuary or Hybrid Alternative because the lake basin would be converted from a well-oxygenated freshwater lake to an estuary with low oxygen conditions that would not meet numeric water quality criteria. While these low oxygen conditions can be potentially harmful to cold water fish, these concentrations are common in South Puget Sound inlets and embayments, and salmon and other cold water fish species are adapted to such conditions (see Section 4.5, Fish and Wildlife, for more information).

### 4.4 AQUATIC INVASIVE SPECIES

This section describes the potential long-term impacts and benefits of the Capitol Lake – Deschutes Estuary Long-Term Management Project on AIS in the Project Area. The EIS focuses on the most important elements and conclusions of the analysis and, in particular, the differences among the four alternatives. Information presented in this section is summarized from the full analysis in the Aquatic Invasive Species Report (Attachment 8).

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**What are the goals for AIS management?**

The goal for AIS management under all action alternatives is to prevent the spread and further distribution of AIS.
Key Findings: Long-Term Aquatic Invasive Species Impacts

Under the No Action Alternative, Capitol Lake would remain closed to the public due to the New Zealand mudsnail and invasive aquatic plant species would continue to be contained and managed using methods aimed at maintaining low population densities. The risk for AIS spreading from Capitol Lake under the No Action Alternative is expected to be less than significant.

Under all action alternatives, Capitol Lake would be treated before construction to significantly reduce AIS populations within the waterbody. Under the Estuary and Hybrid Alternatives, the reintroduction of saltwater to the basin would flush AIS into West Bay. Purple loosestrife seeds and New Zealand mudsnails are salt tolerant/adaptable to lower salinity levels and could settle in shallow areas near freshwater streams or river mouths. However, transport of AIS occurs under existing conditions when sediment and other debris are discharged during high river flow events. The abundance of AIS in Budd Inlet and the surrounding areas is not expected to be great enough to significantly impact native species and there is no existing evidence of significant ecological harm from low density populations of New Zealand mudsnail that can exist in saline environments. Although there is some uncertainty, the Estuary and Hybrid Alternatives are expected to have less than significant impacts from AIS abundance and distribution. An AIS adaptive management plan would be prepared with measures to minimize potential impacts, including an approach to AIS monitoring.

The introduction of saltwater would have a substantial beneficial impact on freshwater AIS populations that are intolerant to higher salinities.

Under all action alternatives, boating and fishing in the Capitol Lake Basin would be reintroduced. Decontamination stations would be installed to prevent the spread of AIS by requiring recreationalists to decontaminate footwear, fishing gear, and nonmotorized vessels. Additionally, educational signs would be posted warning recreationalists of the presence of New Zealand mudsnails and other high-priority AIS, and their potential to spread. Effective use of education and decontamination stations is considered necessary to reduce impacts to less than significant levels for the spread of AIS.

Under all action alternatives, maintenance dredging will be conducted to maintain target depths, and BMPs would be implemented to minimize the potential for transport of AIS outside the Project Area. With these measures, maintenance dredging is expected to have no impact on abundance and distribution of purple loosestrife and New Zealand mudsnails.

4.4.1 What Methods were used to assess long-term impacts to aquatic invasive species?

To determine the potential long-term impacts of the action alternatives on AIS, the following primary operations were evaluated: dam removal and increased salinity, increased recreational use, and maintenance dredging.

Long-term adverse impacts and beneficial effects associated with AIS were evaluated using a combination of historical trends, current conditions, and future projections of environmental factors affecting AIS. Assessments of potential adverse and beneficial impacts were based on many factors, including:
• Anticipated changes in abundance and distribution for each species
• Relative potential for transport and establishment within and outside the study area
• Control priority, eradication potential, and potential management options of each species
• Relative effectiveness and nontarget species impacts of control measures
• Potential for short- and long-term recreational use restrictions

4.4.2 What are the long-term impacts under then No Action Alternative?

Under the No Action Alternative, Capitol Lake would remain closed to the public, and AIS would continue to be managed using containment and other methods aimed at maintaining low population densities. The New Zealand mudsnail population is not likely to substantially increase within the lake or move far outside the lake. Similarly, in the absence of intervention, the populations of other AIS invertebrates, fish, waterfowl, and mammals would be expected to continue to expand at current low rates. Based on this, under the No Action Alternative, the risk for AIS in Capitol Lake to spread to otherwise non-invaded water bodies is expected to be less than significant.

4.4.3 What are the long-term impacts common to all action alternatives?

The action alternatives have several long-term adverse impacts and beneficial effects in common. Active use of the Project Area would be restored under the action alternatives. The operation of the action alternatives has a greater potential to impact the distribution and abundance of aquatic invasive animals than the No Action Alternative due to active recreational use and maintenance dredging.

Potential impacts on AIS that are common to all action alternatives during long-term operations include:

- Pedestrian and bicycle use of boardwalks along the shoreline, and restored boating and fishing
- Habitat area maintenance

How were impacts to AIS assessed?

Operational impacts to AIS were assessed using an extensive review of available literature consisting of the following:

- Management plans (e.g., vegetation management, annual reports of aquatic weed treatments, New Zealand mudsnail management options, and recommendations for invasive species treatments
- Surveys that have been conducted to monitor the presence and distribution of AIS in Capitol Lake
- Relevant invasive species databases
- Research papers and studies that focused on detection, species biology, population fluctuations, transport and spread, and treatment options and effectiveness

What is the primary AIS of concern?

The New Zealand mudsnail is the primary AIS of concern. Eradication is not feasible under any of the project alternatives regardless of treatment, BMPs and mitigation measures implemented. Mudsnails are resistant to extreme environmental factors and treatment, and they can reproduce and establish new populations from a single survivor, particularly in freshwater environments.
• Recurring maintenance dredging to maintain target depths

Operation of the action alternatives is not likely to affect the abundance or distribution of aquatic invasive plants and animals in Capitol Lake or other lakes in the study area, provided that the measures outlined in a project-specific AIS adaptive management plan and BMPs are implemented, including use of decontamination stations, educational signage, and ongoing monitoring of AIS. Enterprise Services would continue to manage aquatic invasive plant and animal species, limiting their expansion.

4.4.3.1 Recreational Use

Under all action alternatives, portions of the basin would be open to pedestrian traffic along the boardwalks and dock, and to nonmotorized boating activity limited to watercraft carried by hand. The risk for exportation of existing plant AIS from boating in the Capitol Lake Basin would be low because boating would predominately occur in deeper water areas of the North Basin where plant AIS do not exist. Boating is not expected along the natural shorelines in the Middle and South Basins where AIS plants (including fragment and seeds) largely exist. Boating would also be limited to hand-carried watercraft launched from designated locations, to control access.

The increase in traffic and activity on the shoreline and in the water would increase opportunity for the New Zealand mudsnail to spread outside Capitol Lake. New Zealand mudsnails can survive for long periods of time on hard material, such as shoes, watercraft, and other recreational equipment.

To minimize the spread of AIS, decontamination stations would be installed, maintained, and operated at a boat launch in Marathon Park, Tumwater Historical Park, and at the Interpretive Center for decontaminating footwear, fishing gear, and nonmotorized vessels used in Capitol Lake. A decontamination station could also be operated in West Bay, if needed, under the Estuary and Hybrid Alternatives. Initially, the decontamination stations would be attended by trained personnel to educate users and ensure compliance. It is anticipated that the stations would be attended during daylight hours every day of the week except holidays. Decontamination has been proven effective in avoiding the spread of AIS.

What is considered a significant impact from AIS?

Significant increases in AIS populations or distribution by an alternative are considered to be an adverse impact, whereas significant decreases in AIS populations or distribution are considered a beneficial effect of the alternative.

How are AIS transported during recreational use?

Plant AIS are primarily imported and exported to water bodies by plant fragments and seeds that collect in motorboats and trailers.

Invertebrate AIS like New Zealand mudsnails, can survive for long periods of time on hard material, such as shoes, watercraft, and other recreational equipment.

The increase in boating, traffic, and activity on the shoreline and in the water would increase opportunities for plant and animal AIS to spread outside Capitol Lake.
To further avoid and minimize the spread of AIS, the action alternatives would include educational signs that warn recreational lake users of the presence of New Zealand mudsnails and other high priority AIS. Signage would also notify recreationalists that water access is only permitted in areas where a decontamination station is provided. While the educational signs would not entirely prevent further spread of New Zealand mudsnails, they would inform the public of the importance and requirement of using the decontamination stations.

Monitoring would also be conducted to confirm and track the use and effectiveness of attended stations. If monitoring indicates recreationalists are effectively using the stations and very few AIS are present on recreation equipment, then the stations may be converted to unattended stations in the future. Effective use of decontamination stations is considered necessary to reduce impacts to less than significant levels for the spread of AIS.

Hand-carried watercraft are not likely to transport a substantial amount of plant fragments and seeds, or invertebrate AIS like New Zealand mudsnail, especially with required inspection and decontamination. Also, any incidental motorboat access via West Bay under the Estuary or Hybrid Alternative would have limited contact with AIS present along the shoreline. As a result, operation of the action alternatives would have less than significant impacts on plant and invertebrate AIS because operations are not anticipated to substantially affect the abundance and distribution of invasive plant populations within or outside of the study area.

### 4.4.3.2 Habitat Areas

The constructed habitat areas would reduce the amount of open-water habitat and increase the amount of shallow-water habitat preferred by the New Zealand mudsnail and other invertebrates. The habitat areas would also increase the amount of forage and refuge habitat for nutria and Canada geese. However, the constructed habitat areas are small relative to the overall Project Area. As part of a habitat enhancement plan for the constructed habitat areas, aquatic invasive plants would be removed and adaptive management actions taken, as necessary, to ensure native plant survivability.

Given the small amount of shallow water habitat for invertebrate AIS and forage/refuge habitat for waterfowl and mammal AIS, habitat areas would have a less than significant impact on AIS abundance and distribution.
4.4.3.3 Maintenance Dredging

The risk of export from maintenance dredging is considered low because, prior to construction, the Capitol Lake Basin would be chemically or physically treated to substantially reduce and/or eradicate plant and invertebrate AIS. BMPs would be implemented to minimize the potential for transport of invertebrate AIS outside the Project Area. The handling of sediment dredged during maintenance dredging varies by alternative and is discussed in more detail in the following sections.

4.4.4 What are the long-term impacts under the Managed Lake Alternative?

Long-term impacts of the Managed Lake Alternative on AIS would generally be as described in Section 4.4.3. Compared to the Estuary and Hybrid Alternatives, there would be a larger population of AIS under the Managed Lake Alternative, particularly the New Zealand mudsnail.

Active use of the Project Area would be restored, with the following:

- Pedestrian and bicycle use of boardwalks along the shoreline, and restored boating and fishing
- Recurring maintenance dredging in the North Basin to maintain target depths for recreation

The long-term impacts on aquatic invasive plants and animals under the Managed Lake Alternative would be as described in Section 4.4.3. As a result, operation of the Managed Lake Alternative would have less than significant impacts on AIS because operations are not anticipated to substantially affect the abundance and distribution of invasive plant populations within or outside the study area.

4.4.4.1 Recreational Use

The impacts associated with increased recreational use would be as described for all action alternatives. Effective use of decontamination stations, educational signage, and monitoring would result in less than significant impacts on the spread of New Zealand mudsnails and other plant and invertebrate AIS to other freshwater bodies. Potential for new AIS to be introduced to Capitol Lake would be minimized by using decontamination stations upon both entry and exit from the lake.

How will AIS be managed under the action alternatives?

- Decontamination stations would be installed to prevent the spread of AIS.
- Before and after recreational lake use, there would be mandatory inspection at the decontamination stations to reduce spread of AIS.
- Educational signage would be posted to warn recreational users of AIS presence and need for decontamination.
- Monitoring would be conducted to ensure effectiveness of decontamination.
- During maintenance dredging BMPs would be employed to minimize transport of AIS.
- Dredged sediment that would be placed at an upland disposal site would be treated to prevent transport of live New Zealand mudsnails.
The reintroduction of fishing within Capitol Lake would have minor beneficial effects by reducing invasive fish species. This management approach is effectively used in other systems for controlling AIS populations. There would be no impact on waterfowl or mammal AIS.

### 4.4.4.2 Maintenance Dredging

Under the Managed Lake Alternative, maintenance dredging would occur in the North Basin. The sediment that is exported after maintenance dredge events would be chemically or physically treated, as required by AIS transportation requirements that would be defined in project permits, to prevent the export of live New Zealand mudsnails. During transport, sediments would be covered and only disposed of at an approved upland site, and not near waterbodies. The upland placement site may be monitored to ensure no AIS become established at the placement site. Material dredged from the Managed Lake would not be suitable for placement at an open-water disposal site in Puget Sound because of the presence of the New Zealand mudsnail and purple loosestrife seed, which are not expected to be eradicated from the freshwater environment. BMPs and compliance with AIS transportation regulations would result in less than significant impacts related to changes in abundance and distribution of plant AIS, New Zealand mudsnails, and other invertebrate AIS. Maintenance dredging activities would have no impact on the distribution or population size of fish, waterfowl, or mammal AIS.

### 4.4.5 What are the long-term impacts under the Estuary Alternative?

Long-term impacts of the Estuary Alternative on AIS would generally be as described in Section 4.4.3. The estuarine conditions would eliminate many of the AIS that currently exist in the Project Area and would continue to exist under the Managed Lake Alternative. Compared to the Managed Lake Alternative, there would also be a smaller population of AIS, but the distribution would be wider.

Impacts on AIS would be associated with the following:

- Removal of the 5th Avenue Dam, which would restore tidal influence to the entire Capitol Lake Basin
- Pedestrian and bicycle use of boardwalks along the shoreline, and restored boating and fishing
- Recurring maintenance dredging in impacted areas of West Bay
4.4.5.1 Aquatic Invasive Plants

Restored Tidal Influence

Removal of the 5th Avenue Dam could increase the long-term movement of seeds and plant fragments into Budd Inlet downstream of the study area. However, transport of AIS occurs under existing conditions when sediment and other debris are discharged over the 5th Avenue Dam during high river flow (about once per year). Despite this transport, the population and distribution of AIS have not measurably increased outside of the Project Area. Comparatively, under the Estuary Alternative, there will be fewer freshwater plant AIS populations due to saltwater affecting their abundance. Therefore, the abundance and distribution of aquatic invasive plants in Budd Inlet and the surrounding areas would not likely significantly increase from restored tidal flow compared to existing conditions, resulting in a less than significant impact to the distribution of freshwater plant AIS.

Purple loosestrife is the only freshwater plant AIS within Capitol Lake that has seeds that are salt-tolerant and could become plants if they settle near a freshwater stream or river mouth. Impacts may be avoided if the purple loosestrife population in Capitol Lake is dramatically reduced (or eradicated) during the early years of construction to eliminate viable seeds in sediments before dam removal (see mitigation measures described in Section 4.4.8).

The introduction of saline waters in the Estuary Alternative would likely have substantial beneficial effects related to decreased distribution and abundance of freshwater plant AIS, primarily saltwater-intolerant species.

Recreational Use

The impact of recreational access on aquatic invasive plants under the Estuary Alternative would be as described in Section 4.4.3. The risk for importation of new plant AIS or exportation of existing plant AIS from reintroduced boating in the Capitol Lake Basin would be low because boat launching would be limited to hand-carried watercraft at designated boat access locations. Decontamination stations would be provided and staffed at these locations. Also, if incidental motorboat or nonmotorized watercraft access was to occur, the vessels would have limited contact with plant fragments and seeds that exist along the shoreline in shallow water depths, which is not
conducive to boating. Thus, recreational access would result in less than significant impacts to plant AIS.

**Maintenance Dredging**

Maintenance dredging would have no impact on plant AIS because none would be present in the sediment dredged from deeper waters in West Bay.

**4.4.5.2 Aquatic Invasive Animals**

**Restored Tidal Influence**

Following the removal of the dam, several freshwater aquatic invasive animals that are tolerant of brackish water would continue to be present near freshwater sources in the lake basin, although with much more limited distribution and abundance. Restored tidal flow would increase the potential for suspended New Zealand mudsnails, either individually or attached to debris, to be washed into Budd Inlet by high river flow. There would be an initial high mortality rate of New Zealand mudsnails as they reached the higher salinity in Budd Inlet. However, New Zealand mudsnails can become acclimatized to the saline environment.

Due to treatment before construction and reduced freshwater habitat after construction, the New Zealand mudsnail population would be reduced to very low levels compared to the existing population. Although mudsnail-specific monitoring has not been conducted since 2015, the New Zealand mudsnail is not likely to have established significant populations in West Bay or other estuarine waters over the past decade despite their export from the lake during high flow events. While the mudsnail population may increase over time as they become acclimatized to estuarine waters under the Estuary Alternative, it is likely that an estuarine population would remain small due to the increased salinity and not have a significant impact on native estuarine species. They are not expected to spread vigorously given the impact of salinity. However, this cannot be easily studied, and uncertainty will remain. Given the apparent lack of downstream spread over the past 10 years and the significantly decreased abundance expected in the Estuary Alternative, the potential increase in transport and survival outside the study area by the dam removal is expected to have a less than significant impact on New Zealand mudsnail distribution and population. It is assumed that the resource agencies would consider this impact to be outweighed by the overall substantial beneficial improvements that the Estuary
Alternative would otherwise provide, and there are no known regulatory feasibility issues associated with this natural transport.

Nutria are found in brackish and saltwater environments and would tolerate the transition to an estuarine environment. Because their distribution is not limited by the 5th Avenue Dam, the dam removal would have no impact on nutria. For the impacts on other invertebrate, fish, and mammal AIS associated with the removal of the 5th Avenue Dam, refer to the Aquatic Invasive Species Discipline Report (Attachment 8).

**Recreational Use**

The impact of recreational access on aquatic invasive animals under the Estuary Alternative would be as described in Section 4.4.3. The increase in pedestrian and nonmotorized watercraft use would increase the potential for spread of invertebrate AIS outside the study area. Although the New Zealand mudsnail population would be significantly reduced by the conversion to a brackish environment, the increase in activity on and around the estuary would potentially increase spread of New Zealand mudsnails to other freshwater bodies by equipment (boots and boats) contacting estuary sediments. Incidental motorboat access from West Bay is not likely to import or export invertebrate AIS from the estuary because these vessels are not likely to contain invertebrate AIS upon entering the estuary or to contact nearshore sediments where the AIS may continue to be present within the estuary. Decontamination stations and educational signs described in Section 4.4.3 would dramatically reduce the potential spread to a less than significant impact on invertebrate AIS.

Recreational use of the estuary would have no impact on any remaining fish, waterfowl, or mammal AIS populations.

**Maintenance Dredging**

Maintenance dredging under the Estuary Alternative would occur in impacted areas of West Bay only, not within the Capitol Lake Basin. The New Zealand mudsnail is not expected to be within the sediment that would be dredged under the Estuary Alternative because of the salinity levels within West Bay and because maintenance dredging would occur in deeper water used for navigation. Although New Zealand mudsnails are tolerant to higher salinity levels that can be found in West Bay, very few, if any, living New Zealand mudsnails...
would be expected in deep waters because they prefer shallow water habitat.

Sediment dredged during the maintenance dredging events would be sampled for New Zealand mudsnail (and purple loosestrife seeds) to demonstrate suitability for placement at an open-water disposal site in Puget Sound.

Maintenance dredging activities would have no impact on distribution or abundance of invertebrate, fish, waterfowl, or mammal AIS because no animal AIS would likely be present in the dredging area.

4.4.6 What are the long-term impacts under the Hybrid Alternative?

Long-term impacts of the Hybrid Alternative on AIS would be as described for the Estuary Alternative in Section 4.4.5. Active use of the Project Area would be restored following construction with impacts on AIS primarily associated with the following:

- Removal of the 5th Avenue Dam, which would restore tidal influence to the entire Capitol Lake Basin
- Pedestrian and bicycle use of boardwalks along the shoreline, and restored boating and fishing
- Recurring maintenance dredging in impacted areas of West Bay

4.4.6.1 Aquatic Invasive Plants

The impacts to aquatic invasive plants associated with the operation of the Hybrid Alternative would be as described for the Estuary Alternative in Section 4.4.5.1. The introduction of saline waters in the Hybrid Alternative would likely have substantial beneficial effects on the distribution and abundance of freshwater plant AIS, primarily saltwater-intolerant species.

Implementation of decontamination stations and educational signage would dramatically reduce the potential spread to a less than significant impact on plant AIS.

Maintenance dredging and recreational access would result in less than significant impacts to plant AIS.
4.4.6.2 Aquatic Invasive Animals

The impacts associated with the operation of the Hybrid Alternative would be as described for the Estuary Alternative in Section 4.4.5.2. The potential increase in downstream transport of invertebrate AIS outside the study area from removal of the 5th Avenue Dam would have a less than significant impact on New Zealand mudsnails population and distribution, though uncertainty remains. Dam removal would have less than significant impacts on fish AIS, minor beneficial effects on Canada geese, and no impact on nutria.

Decontamination stations and educational signs would dramatically reduce the potential spread to a less than significant impact on invertebrate AIS. Recreational use of the estuary would have no impact on any remaining fish, waterfowl, or mammal AIS populations.

Maintenance dredging activities would have no impact on distribution or abundance of invertebrate, fish, waterfowl, or mammal AIS because no animal AIS would likely be present in the dredging area.

4.4.7 What avoidance, minimization, and mitigation measures would be implemented?

Enterprise Services would avoid and minimize potential impacts by complying with regulations, permits, plans, and authorizations. These anticipated measures, and other mitigation measures that could be recommended or required, are described below.

4.4.7.1 Measures Common to All Action Alternatives

AIS Adaptive Management Plan

An AIS adaptive management plan would be developed and implemented for the Preferred Alternative during the future phase and could include the following elements:

- Conduct monitoring of New Zealand mudsnails and purple loosestrife to identify their abundance within the study area.
- Determine which chemical treatment tests should be conducted and can be permitted and identify any treatment restrictions for reducing the New Zealand
mudsnail population before construction to reduce its potential spread during construction.

- Design and conduct New Zealand mudsnail treatment tests with chemicals known to be effective.
- Obtain experimental use authorization to apply and test effectiveness of select chemicals that are not included in the Aquatic Invasive Species Management Permit.
- Prepare and implement a New Zealand mudsnail treatment plan using the preferred methodology.
- Prepare and implement a purple loosestrife treatment plan with a goal of eradication before construction begins to avoid or minimize downstream migration of seeds during operations.
- Specify BMPs for avoiding or minimizing the export of AIS through the dam during construction, such as the use of turbidity curtains and AIS monitoring.
- Conduct long-term monitoring of New Zealand mudsnails and purple loosestrife in the study area and adjacent waters to track changes in abundance for adaptive management.
- Research and design attended or unattended decontamination stations and establish a maintenance and monitoring plan to ensure their continued effectiveness.
- Design and install educational signs at strategic locations to inform citizens of the AIS threat and requirements for preventing spread.

**Maintenance Dredging**

Transportation of AIS outside of Capitol Lake is prohibited by state law. To avoid the risk for AIS transport outside of Capitol Lake, WDFW-approved BMPs will be implemented during long-term maintenance dredging. Enterprise Services will follow all protocols established by WDFW before and after entering the lake and will ensure all vessels and equipment are decontaminated by removing visible plants, algae, and mud and rinsing with potable water.
4.4.7.2 Managed Lake Alternative

Potential treatment options outlined in the AIS adaptive management plan could be used to control New Zealand mudsnail abundance and distribution around Capitol Lake during long-term operations. Chemical treatments, including sodium chloride and Bayluscide, could be used, depending on New Zealand mudsnail distribution and density. However, chemical treatments can severely impact native species, and it may be difficult to permit their use. Therefore, the benefits and impacts of treatment would be carefully weighed during preparation of the AIS adaptive management plan.

While eradication is generally considered not to be feasible given the extent of the New Zealand mudsnail infestation and their resiliency, chemical treatment is a useful method for significantly reducing the population and limiting its spread outside the study area.

Chemical treatments may also target the high priority AIS plant species. Permitted aquatic herbicides could be used to control or eradicate purple loosestrife and Eurasian watermilfoil.

4.4.7.3 Estuary and Hybrid Alternatives

After the removal of the 5th Avenue Dam, the New Zealand mudsnail and other AIS populations would be controlled by the introduction of saltwater to the study area. However, due to the likely persistence of New Zealand mudsnails in upstream portions of the Estuary and Hybrid Alternatives, additional mitigation measures such as targeted chemical treatments may be needed to prevent potential significant impacts. Chemical treatments, including sodium chloride and Bayluscide, could be used, depending on New Zealand mudsnail distribution and density. However, chemical treatments can severely impact native species and it may be difficult to permit their use after native estuarine species become established. Therefore, the benefits and impacts of treatment would be carefully weighed in preparation of the AIS adaptive management plan.

4.4.8 What are the significant unavoidable adverse impacts to aquatic invasive species?

There would be no significant unavoidable adverse impacts related to AIS under any of the action alternatives.
4.5 FISH & WILDLIFE

This section describes the potential long-term impacts and benefits of the Capitol Lake – Deschutes Estuary Long-Term Management Project on fish and wildlife species and their habitat in the Project Area. The EIS focuses on the most important elements and conclusions of the analysis and, in particular, the differences among the four alternatives. Information presented in this section is summarized from the full analysis provided in the Fish and Wildlife Discipline Report (Attachment 9).

4.5.1 What methods were used to assess long-term impacts to fish and wildlife?

Operational impacts were analyzed by considering the projected outcome of each alternative and the changes to habitat and the corresponding effects to fish and wildlife species. The analysis also considered the anticipated changes in abundance or distribution of aquatic invasive species. Both long-term adverse impacts and beneficial effects associated with fish and wildlife are evaluated based on expected changes in ecological functions and processes within the study area. Additional details on the significance criteria are presented in the Fish and Wildlife Discipline Report (Attachment 9).

Key Findings: Long-Term Impacts on Fish and Wildlife

Under the No Action Alternative, habitat quality and habitat use by some fish and other aquatic species would continue to be affected by the presence of the dam and lack of active lake management. Under the Managed Lake Alternative, active lake management would have minor benefits to fish and other aquatic species, although fish and wildlife distribution and use patterns would remain similar to existing conditions.

Under the Estuary and Hybrid Alternatives, the conversion of freshwater lake habitat to a tidally influenced brackish estuary would substantially benefit anadromous fish and marine fish, potentially including ESA-listed Chinook salmon and steelhead trout, as well as shellfish. The loss of freshwater habitat that supports a foraging base for bats, however, would be a significant unavoidable adverse impact. Similarly, the elimination of habitat for native freshwater fish under the Estuary and Hybrid Alternatives from the conversion of freshwater deepwater habitat would be a significant unavoidable adverse impact. Other changes in habitat types under the action alternatives would provide minor benefits for other species, such as raptors, passerines, and shorebirds. All action alternatives would also create habitat areas with a mosaic of habitat types, a benefit to wildlife.
4.5.2 What are the long-term impacts under the No Action Alternative?

In the long term, the 5th Avenue Dam would remain in-place and minimal aquatic vegetation removal would occur (consistent with current management practices). The lack of active lake management to remove sediment and aquatic vegetation could continue to affect habitat quality and habitat use by some fish or other aquatic species. In general, and compared to existing conditions, impacts would be less than significant because the changes would occur incrementally and use of the basin by these species would still persist.

The goals associated with improving water quality, managing sediment accumulation and future deposition, and improving ecological functions in the study area would not be met under the No Action Alternative. The No Action Alternative would perpetuate habitat conditions that were historically altered due to conversion of the Capitol Lake Basin from a natural estuary to a freshwater lake. These conditions, at least to some degree, affect the ability of the aquatic system to fully support populations of anadromous fish. Specifically, the lack of a brackish water transition zone and the abrupt transition between freshwater and saltwater created by the 5th Avenue Dam has altered natural salinity gradients, which in turn can affect the biological functions involved in smoltification. This can alter the fitness of outmigrating juvenile salmonids and could potentially result in delayed saltwater mortality of smolts. The lake also may increase the chance of predation on juvenile salmonids, as freshwater predators, such as bass, are present in the system. The lake may also not provide the full range of prey sources generally found in estuarine habitats.

In general, the No Action Alternative would have less than significant impacts on most wildlife species. However, the slow and passive transition of the Middle and South Basins to a vegetated wetland would substantially reduce the ability of the area to support bats. *Yuma myotis* and little brown bats from the Woodard Bay colony regularly use the lake for foraging. Because of the size of the bat colony and its regional importance, and the dependence of the colony on Capitol Lake for foraging, the loss of foraging habitat from the transition of deepwater to wetland over time is considered a significant impact on this species group even though most of those impacts would be realized beyond the 30-year time horizon evaluated for this EIS.

### Smoltification

Smoltification is a complex series of physiological changes where young salmonid fish (smolts) adapt from living in freshwater to living in saltwater.

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**What is considered to have a significant impact or beneficial effect to fish and wildlife?**

Large-scale “take” of protected fish and wildlife species or loss of habitat that could result in the elimination of a species group or species of regional importance, are considered to be significant impacts.

Substantial increases in the quality and/or quantity of suitable or key habitats for fish and wildlife are considered a beneficial effect of the alternative.
4.5.3 What are the long-term impacts common to all action alternatives?

With all action alternatives, the conversion of some areas of deepwater to wetland habitats would provide a minor beneficial effect for some species, such as raptors and passerines.

Long-term adverse impacts on fish and wildlife from the action alternatives are mostly associated with the following:

- Recurring maintenance dredging to manage accumulated sediment, which can entrain aquatic organisms and increase turbidity levels
- The overwater and in-water structures associated with the boardwalks and the 5th Avenue Pedestrian Bridge, as well as the associated artificial lighting, which can reduce the quality of aquatic habitat and increase predation
- Changes in the types and distribution of specific habitats, which will adversely affect some species while benefitting others

Potential adverse impacts of the new overwater and in-water structures (as well as the associated artificial lighting) include changes to fish distribution migration patterns and increased predation; these impacts, however, would be minor and less than significant for all action alternatives.

Other potential adverse impacts on fish and wildlife species would vary by alternative, as summarized below. Recurring maintenance dredging would have short-term effects similar to those caused by initial maintenance dredging, as described in Section 5.5.2.

4.5.4 What are the long-term impacts under the Managed Lake Alternative?

Under the Managed Alternative (compared to existing conditions), impacts on fish and wildlife would range from minor beneficial effects to less than significant impacts. The North Basin would be maintained as deepwater habitat through recurring maintenance dredging, while the Middle and South Basins would continue to progress to a mix of vegetated wetlands and shallow water habitat over time after initial establishment of habitat areas. In general, the distribution and use patterns of fish and wildlife would be similar to existing conditions. Marine fish distribution would continue to be limited to areas downstream of the dam.
Reflecting the goals of the project to improve ecological functioning and water quality, the Managed Lake Alternative would benefit fish and wildlife in the study area, although not to the same extent as the Estuary and Hybrid Alternatives. Overall, there would be minor beneficial effects on fish, for both the anadromous and freshwater species groups due to changes in lake bathymetry and habitat conditions. Some Coho and Chinook salmon may experience a slight benefit from increased water depths and the removal of aquatic vegetation in the North Basin and the development of complex edge habitat in conjunction with a more riverine-like main channel in the Middle and South Basins.

Despite some improvements to ecological functioning, the configuration as a lake would continue to limit the ability of the habitat to provide the suite of ecological functions required to fully sustain populations of salmon, as discussed under the No Action Alternative. The presence of the lake likely affects the fitness of outmigrating juvenile salmonids and could potentially result in delayed saltwater mortality of smolts. The lake also may increase the chance of predation on juvenile salmonids, as fresh water predators, such as bass, are present in the system. The lake may also not provide the full range of prey sources generally found in estuarine habitats.

In the Middle and South Basins, the habitat change to a mix of vegetated wetlands and shallow water habitat over time would have minor beneficial effects for some wildlife species such as raptors and passerines because of increased hunting and foraging opportunities. The habitat changes would affect the habitat availability for use by other wildlife species, including dabbling ducks, shorebirds and wading birds, insectivorous birds, and bats. Any adverse impacts on wildlife species would be less than significant, as similar habitats that would be lost are readily available in the region.

The Managed Lake Alternative would involve the placement of a buttressing berm to improve stability of the earthen dam. This berm would be created by placing up to 25,000 cubic yards (19,115 cubic meters) of aggregate and riprap along approximately 0.5 acres (0.2 hectares) of the shoreline on the downstream (Budd Inlet) side of the earthen dam and adjacent to the dam along a portion of shoreline. The displacement of current native marine sediments by rock armoring would result in a reduction in the quality of the habitat and a minor reduction in habitat functions supporting the marine species groups. Specifically, the production of benthic macroinvertebrates would be affected where the rock material
displaced native sediments; however, the affected area includes only
a very small portion of Budd Inlet and reducing the invertebrate
population in this area would be, at most, limited to individual fish
and would not negatively affect fish populations or result in
measurable changes to species distributions or densities. Therefore,
impacts to marine fish species from the buttressing berm would be
less than significant.

Long-term impacts on fish and wildlife associated with the Managed
Lake Alternative are listed and summarized in Table 4.5.1.

**Table 4.5.1 Summary of Long-Term Impacts: Managed Lake Alternative**

<table>
<thead>
<tr>
<th>Impact</th>
<th>Impact Finding</th>
<th>Measures to Reduce or Mitigate Significant Impacts</th>
<th>Significant &amp; Unavoidable Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fish</strong> – Impacts on fish species, species group, or aquatic habitat associated with additional permanent overwater and in-water structures and artificial lighting elements</td>
<td>Less than significant impact</td>
<td>BMPs and other measures to avoid and minimize impacts (see Section 4.5.8)</td>
<td>No</td>
</tr>
<tr>
<td><strong>Fish</strong> – Alterations in lake bathymetry and water depths in the lake associated with dredging, for both the anadromous and freshwater species groups</td>
<td>Minor beneficial effect</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Fish</strong> – Alterations in sediment function associated with dam overhaul repairs, including the buttressing berm in Budd Inlet (for the marine species group)</td>
<td>Less than significant impact</td>
<td>BMPs and other measures to avoid and minimize impacts (see Section 4.5.8)</td>
<td>No</td>
</tr>
<tr>
<td><strong>Wildlife</strong> – Conversion of open-water habitat to wetland habitat areas for some species that utilize open-water habitat, such as diving/dabbling ducks, bats, and insectivorous birds</td>
<td>Less than significant impact</td>
<td>BMPs and other measures to avoid and minimize impacts (see Section 4.5.8)</td>
<td>No</td>
</tr>
<tr>
<td><strong>Wildlife</strong> – Alterations in lake bathymetry and water depths in the lake associated with maintenance dredging</td>
<td>Less than significant impact</td>
<td>BMPs and other measures to avoid and minimize impacts (see Section 4.5.8)</td>
<td>No</td>
</tr>
<tr>
<td><strong>Wildlife</strong> – Conversion of deepwater habitat to wetland habitat areas for some species that utilize wetland habitats for habitat or prey, such as raptors and passerines</td>
<td>Minor beneficial effect</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>
4.5.5 What are the long-term impacts under the Estuary Alternative?

Under the Estuary Alternative, some habitat zones would change and species would adapt to the altered habitat conditions and others would not be able to persist in a saltwater environment. The long-term impacts on fish and wildlife would range from beneficial to less than significant to significant, depending on the species. Compared to the other action alternatives, reestablishing estuarine conditions would provide greater benefits to native species that would have historically used the Project Area, better reflecting the goals of the project to improve ecological functioning.

The estuary habitat conditions reestablished by dam removal would result in **substantial beneficial effects** for salmon, other anadromous species, and marine fish. Due to historical declines, estuary habitat is a scarce and valued habitat in the region as compared to freshwater ponds and lakes, which remain relatively abundant.

The transition from a lake to an estuary would result in changes in salinity, sediment deposition patterns, aquatic plants, invasive species distribution, water temperature, and water quality.

The removal of the dam would improve migration for anadromous fish and aid in the transition between freshwater and saltwater. Although migration occurs under existing conditions and is not precluded, removal of the dam would restore natural conditions, including a gradual transition from saltwater to freshwater, and vice versa, which would benefit anadromous salmon, particularly juvenile fish. For juvenile salmon originating in the Deschutes River or Percival Creek, as well as adult salmon returning to those systems, the Estuary Alternative would provide a natural freshwater to saltwater salinity gradient that is physiologically favorable. These changes would likely translate to increased fitness of juvenile outmigrants, potentially increasing early-marine survival. The estuary habitat would also eliminate the chance of predation on juvenile salmonids by freshwater predators and would provide the full range of prey sources generally found in estuarine habitats.

The estuarine habitat that would be fully exposed to tidal exchange would provide productive habitat for salmon, other anadromous species, and marine fish in the area. Estuaries provide key habitat for Chinook salmon. Shallow water habitats with salt marsh vegetation along the water’s edge would provide preferred rearing habitat for juvenile salmon and productive epibenthic and terrestrial origin prey
for juvenile salmon. Habitat quality would improve over time as macroinvertebrate populations and saltwater-tolerant aquatic vegetation became established in the intertidal zone and marsh habitat areas. Estuaries support key ecological processes such as freshwater input, sediment transport, erosion and accretion of sediments, tidal flow, tidal channel formation and maintenance, distributary channel migration, movement of aquatic organisms, and detritus import and export. Estuarine habitat in the South Sound has experienced severe reductions in both the quantity and quality of such key habitats for fish. Because of this, the transition in habitat type from freshwater lake to estuary would be highly valuable.

Water quality in Budd Inlet is not expected to worsen compared to existing conditions, and dissolved oxygen in Budd Inlet may improve slightly under the Estuary Alternative. Due to the influence of water from Budd Inlet entering the Capitol Lake Basin, water quality in the basin would change with the transition from a freshwater system to a saltwater estuary. This could include a slight decrease in dissolved oxygen compared to existing freshwater dissolved oxygen conditions, and potential for (marine) algal blooms. The expected dissolved oxygen conditions are typical of South Puget Sound estuaries, and anadromous and marine fish species are adapted to such conditions. In addition, temperatures in the estuary may increase slightly from existing conditions due to the influence of saltwater at high tide cycles, but any such changes would be well within the tolerances for fish.

Aquatic invasive species that are intolerant to saltwater (e.g., New Zealand mudsnail, Eurasian watermilfoil, curly pondweed) would be largely eradicated from the area with the transition from freshwater to saltwater. This would benefit anadromous and marine fish by creating room for the establishment of native salt-tolerant vegetation or naturally unvegetated tideflats, depending on elevations relative to the tides.

The removal of in-water fill associated with the 5th Avenue Dam would increase available habitat at the dam location and improve fish access to upstream habitats. Even when considering the effects of additional overwater and in-water structures from the new 5th Avenue Pedestrian Bridge and boardwalks, anadromous and marine fish in the study area would experience moderate beneficial effects from a net increase in available habitat. Reestablishment of a functional estuary would also increase habitat for a variety of shellfish (particularly the more mobile species such as crabs), a moderate
beneficial effect. By enhancing the salmon production of the basin (through additional refuge habitat for juvenile salmon and increasing the estuarine benthic organism prey for salmon), there would be a corresponding minor beneficial effect for orcas (an ESA-listed species) that may occasionally visit Budd Inlet.

Brackish water in the North and Middle Basins, and to a lesser degree in the South Basin, that would result from the Estuary Alternative would not be suitable for freshwater fish species. While none of the freshwater fish species present in the basin are listed as federal- or state-listed species, there would be indirect mortality and/or displacement to native freshwater fish species. The elimination of a large amount of available habitat would negatively affect local populations of these fish. This constitutes a significant impact on the native freshwater species, although in some cases (e.g., bass, carp, and bullhead) the affected species are non-native species that prey on native species, such as salmonids.

For wildlife species, the change to an estuarine environment would eliminate the freshwater lake. This would be a significant impact on bats because of the size of the Woodard Bay colony, its regional importance, its dependence on the freshwater environment of the Capitol Lake Basin for emergent insects, and the elimination of this foraging base.

As with the Managed Lake Alternative, the conversion of deepwater habitat to wetland habitat areas would provide a minor beneficial effect for some wildlife species such as raptors and passerines by increasing hunting and foraging opportunities. Shorebirds and wading birds, such as heron, would experience a substantial beneficial effect from the conversion of freshwater to estuarine habitat, because of an increase in suitable habitat and changes in the types of prey available for this species group. Similarly, diving and dabbling ducks would likely experience a moderate beneficial effect because of an increase in foraging opportunities.

Maintenance dredging under the Estuary Alternative could result in impacts on aquatic resources by causing physical or behavioral responses, or by affecting aquatic habitat, and potentially affecting access to fishing areas within West Bay during maintenance dredging cycles. For species associated with bottom habitats, including burrowing species, a greater magnitude of impacts is anticipated, due to the fishes’ vulnerability to entrainment. However, no significant impacts are anticipated from dredging, based on the limited scope, scale, and timing of the maintenance dredging. For additional

Shellfish in Budd Inlet
Native shellfish are of high ecological, economic, cultural, and recreational value in Washington. Shellfish recorded by WDFW in Budd Inlet include scattered patches of Olympia oysters, green shore crab, native littleneck clam, geoduck, among others. Water quality conditions and low flushing restrict shellfish harvest in Budd Inlet.
information on the short-term impacts from dredging, see Section 5.5.2.

Long-term impacts on fish and wildlife associated with the Estuary Alternative are listed and summarized in Table 4.5.2.

**Table 4.5.2 Summary of Long-Term Impacts: Estuary Alternative**

<table>
<thead>
<tr>
<th>Impact</th>
<th>Impact Finding</th>
<th>Measures to Reduce or Mitigate Significant Impacts</th>
<th>Significant &amp; Unavoidable Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish – Aquatic habitat alterations related to dam removal (reduction in habitat for native freshwater fish due to transition from freshwater to brackish water in basin)</td>
<td>Significant impact</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>Fish – Conversion of freshwater lake habitat to a tidally influenced brackish estuary, specifically benefitting anadromous fish and marine fish, potentially including ESA-listed Chinook salmon and steelhead trout</td>
<td>Substantial beneficial effect</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Fish – Increase in available in-water habitat that would result from dam removal, specifically for anadromous fish and marine fish species, potentially including ESA-listed Chinook salmon and steelhead trout</td>
<td>Moderate beneficial effect</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Wildlife – Habitat alteration (impacts on bats)</td>
<td>Significant impact</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td>Wildlife – Increase in suitable habitat and changes in the types of prey available for shorebirds and wading birds from conversion to estuarine habitat</td>
<td>Substantial beneficial effect</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Wildlife – Large expansion of suitable habitat within the estuary for shellfish</td>
<td>Moderate beneficial effect</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Wildlife – Increased habitat available for raptors and passerines</td>
<td>Minor beneficial effect</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Wildlife – Potential for increased salmon prey base for ESA-listed orcas</td>
<td>Minor beneficial effect</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

Note:
No naturally reproducing native populations of Chinook salmon or steelhead trout are present within the Deschutes River Basin or Percival Creek, although use of the study area by these species may occur. Chinook salmon from the Tumwater Falls Hatchery are not listed under the ESA.
4.5.6 What are the long-term impacts under the Hybrid Alternative?

Under the Hybrid Alternative, impacts on fish and wildlife would range from beneficial to less than significant to significant, with the nature and scale of impacts similar to those for the Estuary Alternative. Reflecting the goals of the project to improve ecological functions and water quality, many of the changes would be beneficial, although somewhat muted compared to the Estuary Alternative. Some habitat zones would change and species would adapt to the altered habitat conditions.

For salmon, other anadromous species, and marine fish, the estuary provided in the Hybrid Alternative would result in moderate beneficial effects as the full range of estuarine functions would not be developed over the entire North Basin area. Conversely, the saline or brackish water in the North and Middle Basins, and to a lesser degree in the South Basin, that would result from the Hybrid Alternative would not be suitable for freshwater fish species. This would result in indirect mortality and/or displacement, same as the Estuary Alternative. There are anticipated to be significant impacts for native species within the group, although in some cases (e.g., bass, carp, and bullhead) the affected species are non-native species that prey on native species, such as salmonids.

The saltwater reflecting pool would provide only fair to moderate rearing habitat for salmonids, as the manipulated water levels at low tide and high tide would prevent the area from fully functioning as estuarine habitat. Fish movement between the pool and adjacent estuarine habitat would require locating and moving through the tide gate at a time when flow conditions allowed. Tide gate openings and water levels in the reflecting pool could be managed differently at different times of the year, which would affect fish access. In the summer, the water level in the reflecting pool would be allowed to drop to +5.75 feet NAVD 88, to allow for greater water exchange. In the winter, the low water level would be raised to +7 or +8 feet NAVD 88, to limit the amount of sediment transported in with the tidal exchange. During the summer water level management, considering typical tidal cycles in April when juvenile salmon are rearing and out-migrating, the tides would be high enough to allow fish movement into and out of the reflecting pool for roughly 8 hours out of every 24 hours. During the winter water level management period, this would be as few as 4 hours out of every 24 hours. For marine and anadromous fish, this would restrict or delay the

Freshwater Pool Option

If freshwater is used for the reflecting pool instead of saltwater from the estuary, some freshwater fish may survive in the pool, but not as many as supported by the current basin. A freshwater pool would not provide habitat for marine fish and would stress anadromous fish that enter and exit between the freshwater pool and the brackish water of the estuary. Because an enclosed freshwater pool would be less productive, raptors and other fish-eating birds would not be well-supported. Since bats feed on emerging insects that breed in freshwater, and not in saltwater of an estuary, a freshwater pool would provide some habitat benefit for bats compared to a saltwater pool.
movement or migration into and out of the reflecting pool because the tide gates would be closed for more than half the day.

As with the Estuary Alternative, the loss of the freshwater lake, which supports emergent insects fed upon by bats, would result in a **significant impact** on the regional bat population, and specifically on the Woodard Bay colony.

Under the Hybrid Alternative, the reflecting pool would offer some resting deepwater habitat for diving and dabbling ducks when the estuary portion of the project is at low tide, a moderate beneficial effect.

Long-term impacts on fish and wildlife associated with the Hybrid Alternative are listed and summarized in Table 4.5.3.

Table 4.5.3 Summary of Long-Term Impacts: Hybrid Alternative

<table>
<thead>
<tr>
<th>Impact</th>
<th>Impact Finding</th>
<th>Measures to Reduce or Mitigate Significant Impacts</th>
<th>Significant &amp; Unavoidable Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fish</strong> – Aquatic habitat alterations related to dam removal (reduction in habitat for native freshwater fish due to transition from freshwater to brackish water in basin)</td>
<td>Significant impact</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Fish</strong> – Conversion of freshwater lake habitat to a tidally influenced brackish estuary, benefitting anadromous fish and marine fish, potentially including ESA-listed Chinook salmon and steelhead trout</td>
<td>Moderate beneficial effects</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Fish</strong> – Increase in available in-water habitat that would result from dam removal, specifically for anadromous fish and marine fish species</td>
<td>Moderate beneficial effects</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Wildlife</strong> – Habitat alteration from loss of a freshwater lake that supports bat forage on the regional bat population</td>
<td>Significant impact</td>
<td>None</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Wildlife</strong> – Increase in suitable habitat and changes in the types of prey available for shorebirds and wading birds from conversion to estuarine habitat</td>
<td>Moderate beneficial effects</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>
### Table 4.5.7 Impact Finding, Measures to Reduce or Mitigate Significant Impacts, Significant & Unavoidable Impact

<table>
<thead>
<tr>
<th>Impact</th>
<th>Impact Finding</th>
<th>Measures to Reduce or Mitigate Significant Impacts</th>
<th>Significant &amp; Unavoidable Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wildlife – Large expansion of suitable habitat within the estuary for shellfish</td>
<td>Moderate beneficial effects</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Wildlife – Reflecting pool would offer some resting deepwater habitat for diving and dabbling ducks when the estuary portion of the project is at low tide</td>
<td>Minor beneficial effects</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Wildlife – Increased habitat available for raptors and passerines</td>
<td>Minor beneficial effects</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Wildlife – Potential for increased salmon prey base for ESA-listed orcas</td>
<td>Minor beneficial effects</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

### 4.5.7 What are the long-term impacts to tribal fishing resources?

Reintroducing tidal hydrology to the entire lake area would benefit many of the species of importance to local area tribes, specifically salmon and shellfish, and potentially other fish and wildlife, as well as plants. Maintenance dredging could also result in short-term and temporary impacts on tribal resources by causing physical or behavioral responses, or by affecting aquatic habitat, and potentially affecting access to fishing areas within West Bay during maintenance dredging cycles.

Under the No Action Alternative, the continuation of current, limited management practices would not benefit species of importance to the tribes, specifically salmon and shellfish. Under the Managed Lake Alternative, maintaining a freshwater lake system would not substantially benefit species of importance to the tribes. Under both the No Action and Managed Lake Alternatives, impacts on salmon related to habitat changes from continued deposition of sediment in Capitol Lake would likely not measurably affect fish available for harvest.

Under the Estuary and Hybrid Alternatives, reintroducing tidal hydrology to the Capitol Lake Basin would benefit many of the species of importance to the tribes. Compared to the Estuary Alternative, the Hybrid Alternative would have less of an overall increase in habitat availability and access due to the reflecting pool.
Making a determination of significance related to treaty-reserved rights is not part of this EIS. Mitigation associated with potential impacts on tribal resources would be addressed directly with the affected tribes during government-to-government consultations as part of the permitting, regulatory, and consultation processes for the selected alternative.

4.5.8 **What avoidance, minimization, and mitigation measures would be implemented for the project?**

4.5.8.1 **Measures Common to All Action Alternatives**

Enterprise Services would avoid and minimize potential impacts by complying with regulations, permits, plans, and authorizations. These anticipated measures, and other mitigation measures that could be recommended or required, are described below.

BMPs common to all action alternatives would include the following:

- During recurring dredging, use BMPs (for example, sediment curtains) to avoid unintentional impacts on habitat and water quality during dredging.

- Position lights on the new 5th Avenue Pedestrian Bridge to illuminate only the walkways or use other methods, such as hoods that prevent excess light from reaching the water surface.

- To the extent practicable, minimize the width of pedestrian boardwalks and utilize fish-friendly designs, utilizing grated decking and a minimum number of support piles.

Following the SEPA review process, and as part of the design and permitting of the selected alternative, the USACE would conduct its own review of the project and would consult under Section 7 of the federal ESA with the U.S. Fish and Wildlife Service and NOAA Fisheries. WDFW would also review the project under state Hydraulic Project Approval requirements. Additional measures may be identified under one or both of these processes that could further reduce potential impacts on fish and wildlife resources.
Habitat Enhancement Plan

A Habitat Enhancement Plan would be developed and implemented for the selected alternative during the future design phase. The plan would be developed in coordination with and approved by Ecology, WDFW, City of Olympia, City of Tumwater, other applicable local, state, and federal agencies, and tribes.

Elements of the plan would generally include:

- Specific habitat creation, restoration, and design treatments for each habitat area (e.g., upland, riparian, wetland, and aquatic).
- Specific performance standards for the habitat areas to measure the success of these areas.
- Adaptive management and maintenance measures to ensure that the performance standards are met.
- Measures to address nuisance and invasive species within the Project Area.

4.5.8.2 Managed Lake Alternative

No additional mitigation would be needed to address operational impacts to fish and wildlife from the Managed Lake Alternative.

4.5.8.3 Estuary and Hybrid Alternatives

Additional measures would include replacing trees removed to realign Deschutes Parkway based on City of Olympia’s tree protection ordinances and critical areas regulations.

4.5.9 What are the significant unavoidable adverse impacts to fish and wildlife?

As described above, most potential impacts on fish or wildlife from any of the alternatives would not rise to the level of significant. The analysis did, however, identify some potential significant unavoidable impacts, as summarized below by alternative.

4.5.9.1 Managed Lake Alternative

No significant impacts on fish or wildlife.
4.5.9.2 Estuary and Hybrid Alternatives

- **Operational Impacts on Fish from Aquatic Habitat Alterations:** The saline or brackish water in the North and Middle Basins, and to a lesser degree in the South Basin, that would result from the Estuary and Hybrid Alternatives is not suitable for freshwater fish species, resulting in indirect mortality and/or displacement of these species in the Capitol Lake Basin; this would be a **significant unavoidable impact** to native freshwater species.

- **Operational Impacts on Wildlife from Habitat Alterations:** The loss of the freshwater lake, which supports emergent insects fed upon by bats, would result in a **significant unavoidable impact** on the regional bat population, and specifically on the Woodard Bay bat colony.

4.6 WETLANDS

This section describes the potential long-term impacts and benefits of the Capitol Lake – Deschutes Estuary Long-Term Management Project on wetland resources in the study area. The EIS focuses on the most important elements and conclusions of the analysis and, in particular, the differences among the four alternatives. Information presented in this section is summarized from the full analysis provided in the Wetlands Discipline Report (Attachment 10).

**Key Findings: Long-Term Wetland Conditions**

Reflecting the project goals of improving ecological functions and water quality in the basin, the Estuary and Hybrid Alternatives would reintroduce valuable estuarine wetland and tideflat habitats, now rare in the region because of historical development patterns. The reestablishment of estuarine wetlands by reintroducing saltwater and tidal influences to the Capitol Lake Basin would provide a **substantial beneficial effect**.

Wetland habitat conditions under the Managed Lake Alternative would also improve with a transition from deepwater to vegetated freshwater wetlands and an increase in habitat complexity, providing a minor beneficial effect. Similar to the Managed Lake, wetlands habitat conditions under the No Action Alternative would improve as the system transitions to a more diverse complex of freshwater wetlands over time.

All action alternatives would create habitat areas with a mosaic of wetland habitats. With the habitat features included in the action alternatives and additional mitigation (if required by regulatory agencies), direct impacts from fill and indirect impacts from shade associated with the proposed rebuilt and new structures (e.g., dock and boardwalk) would be less than significant.
4.6.1 What methods were used to assess long-term impacts to wetlands?

Operational impacts are the long-term or permanent effects related to the operation of the project. These include the long-term or permanent loss of wetland habitat or functions. Depending on the alternative, the distribution and extent of estuarine and freshwater wetland types in the study area may be affected by changes in water depth, tidal fluctuations, circulation, velocity, salinity, installation of new structures, and maintenance dredging. Additional details on the significance criteria are presented in the Wetlands Discipline Report (Attachment 10).

As required by federal, state, and local laws, the project includes BMPs to avoid and minimize long-term wetland impacts (see Section 4.6.7). Potential impacts on wetland buffers were not considered in this analysis, as the size of the buffer varies and is established following wetland delineation and rating. This work will be completed during final design and permitting of the selected alternative.

4.6.2 What are the long-term impacts under the No Action Alternative?

Under the No Action Alternative, sediment management strategies would not be implemented, and the Capitol Lake Basin would continue to accumulate sediment. Deepwater habitat areas would gradually transition to emergent, scrub-shrub, and forested wetlands—but the full transition to these vegetation wetland types would extend beyond the 30-year time horizon evaluated for this EIS. Overall, there would be a net gain in wetland functions (such as water quality and habitat) for these freshwater vegetated wetland areas, which would be a minor beneficial effect.

4.6.3 What are the long-term impacts common to all action alternatives?

Long-term impacts and changes to wetlands from operation of the project under the action alternatives are mostly associated with the following:

- Permanent loss of wetlands from the placement of fill for various project elements (e.g., boardwalks, dock, boat launch, 5th Avenue Pedestrian Bridge)
• **Indirect impacts of shade** from new or rebuilt structures on wetland habitats (e.g., boardwalks, rebuilt dock, 5th Avenue Pedestrian Bridge)

• **Conversion of wetland area** from one wetland type to another wetland type (e.g., vegetated freshwater wetland to tideflat)

• **Periodic disturbance** related to maintenance dredging

All of the action alternatives would include a 5th Avenue Pedestrian Bridge, boardwalks along the shorelines in the Middle and South Basins, a rebuilt dock at the Interpretive Center, and a new boat launch at Marathon Park. These overwater and in-water structures would result in similar areas of shade and fill within wetlands, across the action alternatives. Indirect impacts from shade would be primarily on freshwater deepwater habitats under the Managed Lake Alternative, and to estuarine deepwater habitats or tideflats under the Estuary or Hybrid Alternatives.

Under all action alternatives, habitat areas would be constructed using dredge spoils from initial dredging to create greater habitat complexity. The habitat areas would include different elevations to support a diversity of wetland plant communities—emergent, scrub-shrub and forested—as well as some upland communities. The configuration of the habitat areas would be refined in the design phase for the selected alternative to maximize wetland habitat area and complexity.

The types of operational impacts vary by alternative (as described in the sections below) and could range from relatively minor impacts such as conversion of one wetland type to another, to more substantial impacts such as the conversion of wetlands/waters of the U.S. or state to non-wetland non-water status. For the alternative selected, the design would be refined to minimize the wetland loss and maximize habitat benefits. With the habitat features included in the action alternatives and additional mitigation (if required by regulatory agencies; see Section 4.6.7), direct impacts from fill and indirect impacts from shade under all action alternatives would be less than significant.

**4.6.4 What are the long-term impacts under the Managed Lake Alternative?**

Under the Managed Lake Alternative, Capitol Lake would remain a freshwater system. The North Basin would be dredged to maintain
the historic reflecting pool and would remain deepwater (freshwater) habitat. Habitat areas would be established in the Middle Basin, and the Middle and South Basins would transition over time from deepwater habitat to vegetated wetlands, similar to the No Action Alternative. There would be a net gain in wetland functions provided by the created emergent, scrub-shrub, and forested habitat areas and passive transition to vegetated wetlands. This effect would be similar to that described under the No Action Alternative and is a minor beneficial effect.

The area of freshwater wetlands that would be filled under the Managed Lake Alternative is estimated at 590 square feet (55 square meters), and indirect impacts from shade are estimated at 54,480 square feet (1.25 acres) (5,061 square meters [0.51 hectares]). The dam buttressing berm, on the north side of the earthen dam in West Bay, would fill up to 23,000 square feet (0.5 acre) (2,137 square meters [0.2 hectares]) of deepwater estuarine habitat. This area of fill within the Capitol Lake Basin is small relative to the overall extent of wetlands in the basin; as a result, the decreases in wetland functions related to water quality improvement, hydrologic function, and fish and wildlife habitat would be small. Additionally, the habitat type that would be affected the most (deepwater habitat) is relatively common in the region. With habitat improvements included in the Managed Lake Alternative and additional wetland mitigation (if required by regulatory agencies), direct impacts from fill and indirect impacts from shade under the Managed Lake Alternative would be less than significant.

Maintenance dredging in the North Basin would occur approximately 20 years after construction to maintain a lake-bed elevation similar to that produced by the initial dredging (initial dredging activities are described in Section 5.6.2); the duration between dredge events would decrease over time. With maintenance dredging, most of the North Basin would remain freshwater deepwater habitat, and functions would remain similar to existing conditions; vegetated scrub-shrub and emergent wetlands would remain along the perimeter of the North Basin.

Long-term impacts on wetlands associated with the Managed Lake Alternative are listed and summarized in Table 4.6.1.
Table 4.6.1 Summary of Long-Term Impacts: Managed Lake Alternative

<table>
<thead>
<tr>
<th>Impact</th>
<th>Impact Finding</th>
<th>Measures to Reduce or Mitigate Significant Impacts</th>
<th>Significant &amp; Unavoidable Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impacts on wetland area and/or function from direct fill and indirect shade impacts. No net loss of waters of the U.S. or state are anticipated from proposed structures.</td>
<td>Less than significant</td>
<td>BMPs and other measures to avoid and minimize impacts (see Section 4.6.7)</td>
<td>No</td>
</tr>
<tr>
<td>Improved hydrologic, water quality, and habitat functions with the creation of habitat areas and transition of the North and Middle Basins to a greater complexity of vegetated wetland types.</td>
<td>Minor beneficial effect</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

4.6.5 What are the long-term impacts under the Estuary Alternative?

Under the Estuary Alternative (as well as the Hybrid Alternative), the removal of the 5th Avenue Dam would restore saltwater and tidal influences to the Capitol Lake Basin, transforming it from a freshwater system to its historic condition as an estuarine system. Estuarine wetlands provide additional functions that are not available in freshwater deepwater habitats. Compared to freshwater wetlands, estuarine wetlands have been disproportionately affected by past development practices and are considered rare in the region.

Under the Estuary Alternative, changes in wetland habitat would occur from the reintroduction of saltwater and tidal flow, creation of habitat areas, slope stabilization along Deschutes Parkway, new recreational structures, and recurring maintenance dredging in West Bay. The removal of the 5th Avenue Dam would reestablish estuarine wetland habitats throughout the basin, which is considered a substantial beneficial effect. The removal of the 5th Avenue Dam structure would restore approximately 3.3 acres (1.3 hectares) of a water of the U.S.

The 5th Avenue Pedestrian Bridge, boardwalks, dock, and boat launch would fill an estimated 611 square feet (186 square meters) and indirectly shade 2.2 acres (0.89 hectares) of wetlands. Overall, a loss of area of waters of the U.S. or state is not expected as there would be a net decrease of fill with the removal of the 5th Avenue Dam. Thus, direct impacts from fill and indirect impacts from shade under the Estuary Alternative would be less than significant.
Future accumulations of sediment in the southern portion of West Bay would be removed through recurring maintenance dredging, approximately every 6 years. The impact of these dredging activities on deepwater habitat in West Bay would be minor and similar to existing conditions. Impacts from dredging would be less than significant.

Long-term impacts on wetlands associated with the Estuary Alternative are summarized in Table 4.6.2.

### Table 4.6.2 Summary of Long-Term Impacts: Estuary Alternative

<table>
<thead>
<tr>
<th>Impact</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Impacts on wetland area and/or function from direct fill and indirect shade impacts. No net loss of waters of the U.S. or state are anticipated from proposed structures.</td>
<td>Less than significant</td>
<td>BMPs and other measures to avoid and minimize impacts (see Section 4.6.7)</td>
<td>No</td>
</tr>
<tr>
<td>Improved hydrologic, water quality, and habitat functions given the reestablishment of a high-value estuarine system (with a gain of tideflat, low marsh, high marsh, and deepwater estuarine habitat), and construction of a habitat area.</td>
<td>Substantial beneficial effect</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

### 4.6.6 What are the long-term impacts under the Hybrid Alternative?

Like the Estuary Alternative, removal of the 5th Avenue Dam with the Hybrid Alternative would restore saltwater and tidal influences to the Capitol Lake Basin, and the basin would convert to an estuarine system similar to historic, predevelopment conditions. Estuarine wetlands provide water quality, hydrologic, and fish and wildlife functions that are generally rare in the region, and this conversion would be a substantial beneficial effect. The extent of beneficial effects, although still substantial, would be less than with the Estuary Alternative because the reflecting pool in the eastern portion of the North Basin would be a constructed deepwater habitat that would not provide as much benefit as an open estuarine system.

Changes to wetlands would occur under the Hybrid Alternative from the reintroduction of saltwater and tidal flow, creation of wetland habitat areas, slope stabilization along Deschutes Parkway, new
structures, and recurring maintenance dredging in the reflecting pool and West Bay.

The 5th Avenue Pedestrian Bridge, boardwalks, dock, and boat launch would fill an area of approximately 611 square feet (186 square meters) and shade 2.2 acres (0.89 hectares) of some wetland types, the same as the Estuary Alternative. The barrier wall in the Hybrid Alternative would also fill approximately 1.2 acres (0.49 hectares) of estuarine deepwater habitat. Like the Estuary Alternative, the removal of the 5th Avenue Dam structure would restore approximately 3.3 acres (1.3 hectares) of a water of the U.S. A net loss of waters of the U.S. is not expected; however, the barrier wall would result in more fill than the Estuary Alternative. Overall, habitat complexity would be increased, and water quality and hydrologic functions would improve compared to the No Action Alternative. The habitat type that would be most affected (freshwater deepwater habitat) is relatively common in the region and would be replaced with a rarer habitat type (estuarine deepwater). Thus, direct impacts from fill and indirect impacts from shade under the Hybrid Alternative would be less than significant.

The reflecting pool in the North Basin would be dredged about every 15 years if it is saltwater. Accumulated sediment in the lower portion of West Bay would be removed through the initial dredging (as described in Section 5.6.2), and subsequently managed through recurring maintenance about every 5 years. The impact of these maintenance dredging activities would be similar to existing conditions and would be less than significant.

Long-term impacts on wetlands associated with the Hybrid Alternative are listed and summarized in Table 4.6.3.

Table 4.6.3 Summary of Long-Term Impacts: Hybrid Alternative

<table>
<thead>
<tr>
<th>Impact</th>
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<tbody>
<tr>
<td>Impacts on wetland area and/or function from direct fill and indirect shade impacts. No net loss of waters of the U.S. or state are anticipated from proposed structures.</td>
<td>Less than significant</td>
<td>BMPs and other measures to avoid and minimize impacts (see Section 4.6.7)</td>
<td>No</td>
</tr>
<tr>
<td>Improved hydrologic, water quality, and habitat functions given the reestablishment of an estuarine system and construction of habitat areas.</td>
<td>Substantial beneficial effect</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>
4.6.7 What avoidance, minimization, and mitigation measures would be implemented for the project?

The project has been designed to minimize the permanent and temporary impacts of the action alternatives. Compensatory mitigation for the loss of a water of the U.S. would be required if an action alternative had impacts that could not be fully avoided or offset through design of habitat features or implementation of the Habitat Enhancement Plan (described below). For the alternative selected, the design would be refined to minimize the wetland loss and maximize habitat benefits. With consideration of improved habitat functions and self-mitigating functions of the alternatives, the need for compensatory mitigation may be reduced to zero.

Required mitigation would be determined during the permitting phase. Enterprise Services would work with regulatory agencies to achieve no net loss of waters of the U.S. or state.

4.6.7.1 Measures Common to All Action Alternatives

Enterprise Services would avoid and minimize potential impacts by complying with regulations, permits, plans, and authorizations. These anticipated measures, and other mitigation measures that could be recommended or required, are described below.

BMPs common to all action alternatives would include the following:

- For boardwalks, pin piles may be used to minimize wetland fill under any alternative.
- During recurring dredging, contractors would use BMPs (for example, sediment curtains) to avoid unintentional impacts on habitat and water quality during dredging.

A Habitat Enhancement Plan would be developed and implemented for the selected alternative during the future design phase. The plan would be developed in coordination with and approved by Ecology, WDFW, City of Olympia, City of Tumwater, other applicable local, state, and federal agencies, and tribes. Elements of the plan would vary depending on the alternative, and generally include the following:

- Specific habitat creation, restoration, and design treatments for each habitat area (e.g., upland, riparian, wetland, and aquatic).
• Specific performance standards for the habitat areas to measure the success of these areas.
• Adaptive management and maintenance measures to ensure that the performance standards are met.
• Measures to address nuisance and invasive species within the Project Area.

4.6.7.2 Managed Lake Alternative

Mitigation for direct and indirect impacts on wetlands from overwater structures would be compensated for at ratios determined by the permitting agencies, if it is determined that the Managed Lake Alternative is not self-mitigating.

4.6.7.3 Estuary and Hybrid Alternatives

The Estuary and Hybrid Alternatives would provide substantial ecological benefits through the conversion of freshwater wetland habitats to the rarer estuarine wetland system and a net reduction in fill. This ecological lift would be considered by agencies in determining mitigation requirements. If it is determined that the Estuary and Hybrid Alternatives are not self-mitigating, mitigation for the loss of waters of the U.S. or state would be compensated for using ratios similar to the Managed Lake Alternative.

4.6.8 What are the significant unavoidable adverse impacts to wetlands?

With mitigation (if required), there would no significant unavoidable adverse impacts on wetlands in the long term (i.e., during operation).

4.7 AIR QUALITY & ODOR

This section describes the potential long-term impacts and benefits of the Capitol Lake – Deschutes Estuary Long-Term Management Project on air quality and odor elements in the Project Area. The EIS focuses on the most important elements and conclusions of the analysis and, in particular, the differences among the four alternatives. Information presented in this section is summarized from the full analysis provided in the Air Quality and Odor Discipline Report (Attachment 11).

What is considered a significant impact related to odor, air pollutant emissions, and GHG emissions?

Significant impacts to odor would be any odors generated by an alternative that would have a combination of high frequency, high intensity, long duration, offensive characteristic, and/or have these characteristics in locations with significant populations, such that malodor issues may arise.

Air quality impacts are considered significant if the total tons of each pollutant emitted per year are greater than the general conformity de minimis thresholds.

Impacts are considered significant for GHGs if the total annual GHG emissions are greater than the state-mandatory GHG reporting rule threshold (10,000 MTCO₂e).
Key Findings: Long-Term Air Quality and Odor Impacts

**Odors:** There is a potential for odors from the No Action Alternative as algae grows and then decays on the lake, which may create earthy, musty odors. However, odor impacts are expected to be less than significant given that these odor changes would be infrequent, short in duration, and with low intensity. Any increase in odors under the Estuary and Hybrid Alternatives, even though naturally occurring from tideflats, may be considered a significant impact by a portion of the population with low tolerance to odor. For other portions of the population, naturally occurring odor from tideflats may not be objectionable. The variability in odor perception makes an impact determination subjective. In consideration of the variable frequency and duration, and low intensity, odor impacts from the Estuary and Hybrid Alternatives are expected to be less than significant. The Managed Lake Alternative is expected to have less algal growth than the No Action Alternative, resulting in lower odor production potential.

**Criteria Pollutants and GHG Emissions:** Under all action alternatives, the annual emissions for criteria pollutants and GHGs would be less than the general conformity *de minimis* thresholds and the annual GHG emissions reporting thresholds. Both the air quality and GHG emission impacts for the Managed Lake, Estuary, and Hybrid Alternatives are expected to be less than significant.

**Carbon Sequestration:** While carbon (a GHG) is typically sequestered in wetland environments, methane (another GHG) is released from marshes during certain anaerobic conditions. Because of the increased salinities, methane releases under the Estuary and Hybrid Alternatives would be lower than the No Action or Managed Lake Alternatives. While the Estuary and Hybrid alternatives would have the highest combined construction- and operation-related GHG equipment emissions, the vegetated marshes established under those alternatives would sequester more soil carbon than would be expected in open-water habitats. This would provide better consistency with goals of the Thurston Climate Adaptation Plan.

4.7.1 What methods were used to assess long-term impacts to air quality and odor?

For assessing the long-term air quality and odor impacts associated with the project, the emission sources of air pollutants, GHGs, and odor were considered within the bounds of the Project Area. The study area includes the surrounding ambient air that has the potential to be influenced by the project, based on the scope and nature of the post-construction air emissions, as well as the nature of the topography and meteorological conditions in the area. Due to the nature and quantities of the air pollutant emissions and potential odors generated by the project, the impacted area is not expected to extend far from the Project Area. The air quality impacts from long-term maintenance activities were assessed by calculating the total project emissions of each criteria pollutant (i.e., nitrogen oxides \([\text{NO}_x]\), sulfur dioxide \([\text{SO}_2]\), carbon monoxide \([\text{CO}]\), volatile organic compound \([\text{VOC}]\), \(\text{PM}_{10}\) particulate matter of 2.5 micrometers or less \([\text{PM}_{2.5}]\)) from equipment associated with maintenance dredging activities. Four categories of equipment were considered in
estimating emissions: harbor craft, dredging vessels, construction equipment, and on-road trucks.

Odors influence each person differently, but scientists broadly agree that consideration of five metrics is needed to assess the influence of odors: frequency, intensity, duration, offensiveness, and location. Within this study, these characteristics serve as the basis for assessing the significance of odors.

In contrast, impacts from air quality emissions were assessed by comparing estimated post-construction annual emission totals to the General Conformity de minimis thresholds, which are 100 tons each year for NOx, SO2, CO, VOC, PM10, and PM2.5. Additional details on the guidance documents and methods for determining emission totals are provided in the Air Quality and Odor Discipline Report (Attachment 11). Emission totals below the de minimis thresholds are assumed to be less than significant.

Under SEPA, there is currently no guidance for how to determine the significance of GHGs. Emission totals can be compared against statewide and international GHG emissions, but such comparisons do not provide a bright line for determining significance. All GHG emissions contribute to the long-term impacts of climate change. Therefore, the GHGs produced from combined construction and post-construction activity were compared against the threshold used for Ecology’s GHG reporting rule, 10,000 metric tons CO2 equivalents. Notably, Ecology is currently undertaking rulemaking to provide future guidance on GHGs for SEPA analyses (see Section 3.7.3).

**4.7.2 What are the long-term impacts under the No Action Alternative?**

Odor impacts may arise with the No Action Alternative due to continued algae growth on the lake. In certain situations, algal blooms can release odor-causing compounds that may result in an unpleasant earthy and musty odor. Unlike an estuary, the existing Capitol Lake Basin does not have tidal fluctuations, which can vary the exposure of odor-producing materials. Because of this, odors—when present due to algae growth—would not generally fluctuate during the course of a day. However, the odors produced from the No Action Alternative would have little change from existing conditions where impacts are infrequent, short in duration, and with low intensity, resulting in a less than significant impact.
The No Action Alternative would not result in any additional impacts associated with air quality or GHG emissions from maintenance activities. Vehicle trips and equipment use associated with limited, ongoing maintenance of the 5th Avenue Dam would produce negligible air emissions.

The No Action Alternative does not promote consistency with Guiding Principles in the 2017 Thurston Climate Adaptation Plan, which calls for identifying and leveraging climate change adaptation strategies and actions with mitigation co-benefits, such as reducing, capturing, and storing GHG emissions, along with enhancing resiliency for climate adaptation.

### 4.7.3 What are the long-term impacts common to all action alternatives?

Common air quality impacts associated with each action alternative following construction are related to maintenance dredging. Emissions would be from both the equipment used to perform the maintenance dredging (e.g., hydraulic or clamshell dredge) and the vehicles used to transport the dredged material to a disposal location (e.g., trucks, barge/tugs). Both upland and in-water disposal options, if feasible, were analyzed for each alternative. For upland disposal, the total miles traveled by haul trucks assumes a one-way trip distance of 250 miles (400 km), and total miles traveled for each on-road vehicle was scaled by the number of truck trips required. There are no permitted upland disposal locations within Thurston County that would take the dredged material, so a reasonable location farther from the Project Area was assumed. Emissions would differ by alternative and are addressed below for each alternative.

### 4.7.4 What are the long-term impacts under the Managed Lake Alternative?

#### 4.7.4.1 Odor

Potential odors associated with the Managed Lake Alternative would be similar to the existing conditions. No complaints have been logged with ORCAA over the past 5 years regarding odor from the Project Area, and the alternative would not increase the potential for odor generation. Algal blooms are expected to be less frequent under the Managed Lake Alternative than the No Action Alternative. As a result, there would be no increase in odors compared to the No Action Alternative and no new odor-related impacts.

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**No Action Alternative: Carbon Sequestration Potential**

Capitol Lake would remain a freshwater system under the No Action Alternative. The freshwater system under the No Action Alternative would likely have the highest net positive GHG emissions of any alternative because freshwater wetlands within the system would emit methane, have reduced capacity to sequester (store) soil carbon, and have low potential for biomass storage.
### 4.7.4.2 Air Quality

Air quality impacts would primarily be associated with maintenance dredging and the disposal of dredged material. For the Managed Lake Alternative, maintenance dredging would be required 20 years after project construction (and occurring with increased frequency thereafter). During the evaluated time horizon of 30 years, a total estimated volume of sediment removed during maintenance dredging is estimated at 472,000 cubic yards (361,000 cubic meters).

Based on the type of equipment anticipated to be used and the duration of the dredging activity, total annual emissions are summarized in Table 4.7.1. Because an in-water disposal option is not feasible for the Managed Lake Alternative, the emissions are only tabulated for an upland disposal scenario. The close proximity of the Olympia & Belmore Railroad, Inc., railroad offers an opportunity for the dredged material to be hauled away from the Project Area by rail, either instead of or in combination with hauling by truck. The feasibility of using rail would depend on a number of factors to be determined by the project contractor prior to construction. These factors include whether or not destinations of hauled materials are adequately served by rail. If all or a portion of the dredged materials were hauled by rail, there would likely be a reduction in emissions as shown in Table 4.7.1. The total emissions are less than the general conformity *de minimis* values and, therefore, air quality impacts associated with the post-construction phase of this alternative would be less than significant.

#### Table 4.7.1 Managed Lake Alternative’s Long-Term Impacts – Upland Disposal

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Project Emissions (tons each year)</th>
<th>General Conformity <em>De Minimis</em> Threshold (tons each year)</th>
<th>Greater Than <em>De Minimis</em>?</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>8.0</td>
<td>100</td>
<td>No</td>
</tr>
<tr>
<td>NO&lt;sub&gt;x&lt;/sub&gt;</td>
<td>26.5</td>
<td>100</td>
<td>No</td>
</tr>
<tr>
<td>VOC</td>
<td>1.7</td>
<td>100</td>
<td>No</td>
</tr>
<tr>
<td>SO&lt;sub&gt;2&lt;/sub&gt;</td>
<td>0.06</td>
<td>100</td>
<td>No</td>
</tr>
<tr>
<td>PM&lt;sub&gt;10&lt;/sub&gt;</td>
<td>1.8</td>
<td>100</td>
<td>No</td>
</tr>
<tr>
<td>PM&lt;sub&gt;2.5&lt;/sub&gt;</td>
<td>1.0</td>
<td>100</td>
<td>No</td>
</tr>
</tbody>
</table>
4.7.4.3 Greenhouse Gases

The EIS considers the combined GHG emissions produced during construction and post-construction (during operation of the project) in order to determine long-term impacts. The combined construction and post-construction emissions associated with construction activity and maintenance dredging were calculated on an annual basis over the 30-year time horizon evaluated for this EIS.

The Managed Lake Alternative is expected to produce about 32,308 MTCO$_2$e (Table 4.7.2) over the 30-year project time horizon. Annually, this corresponds to about 1,077 MTCO$_2$e, well below Ecology’s GHG reporting threshold of 10,000 MTCO$_2$e or more each year. The annual GHG emissions represents less than 0.01% of estimated annual 2015 GHG emissions within Washington, and much smaller percentages of worldwide emissions. However, any project involving construction and post-construction emissions contributes cumulatively to GHG emissions.

It is important to note that the scale of global climate change is so large that the impacts from one project, no matter the size, would almost certainly have no discernible effect on increasing or decreasing global climate change. In reality, any such effects can only be considered on a “cumulative” basis.

Table 4.7.2 Estimated GHG Emissions (MTCO$_2$e) – Managed Lake Alternative

<table>
<thead>
<tr>
<th>Project Emissions by Disposal Scenario</th>
<th>Life-span Emissions$^{(1)}$</th>
<th>Annual Emissions$^{(2)}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upland Disposal</td>
<td>32,308</td>
<td>1,077</td>
</tr>
</tbody>
</table>

Notes:
1. Estimated life-span emissions are based on an assumed average useful life of about 30 years.
2. Annual emissions estimates are based on dividing total emissions by assumed facility useful life span as indicated in note 1 above.

The GHG emissions associated with the Managed Lake Alternative would contribute to the cumulative carbon footprint of Thurston County, but the small contribution of GHG emissions from this alternative would be less than significant. Considering the cumulative contribution for this alternative, the Managed Lake Alternative generates the least construction- and operation-related GHG emissions of the action alternatives. Within the context of regional GHG emission goals described in the 2020 Thurston Climate...
Mitigation Plan to reduce GHG emissions 45% below 2015 levels by 2030 and 85% below 2015 levels by 2050, this alternative is the lowest long-term generator of GHG emissions from construction and operation activities.

The freshwater system under the Managed Lake Alternative is expected to capture and sequester slightly more carbon than the No Action Alternative, but would still have net positive GHG emissions. The Managed Lake Alternative provides somewhat more consistency than the No Action Alternative with Guiding Principles in the 2017 Thurston Climate Adaptation Plan by improving the ability to reduce, capture, and store GHG emissions. However, any improvement would be minimal and the Managed Lake Alternative would also not promote consistency with Guiding Principles in the 2017 Thurston Climate Adaptation Plan, capturing and storing GHG emissions.

4.7.5 What are the long-term impacts under the Estuary Alternative?

4.7.5.1 Odor

Approximately 152 acres (61.5 hectares) of new tideflats would be created under the Estuary Alternative. Oxygen-starved organic material in tideflat sediments can produce low levels of hydrogen sulfide, which can create odors that smell like rotten eggs. The potential frequency of these odors would be limited to times when the tidal areas are exposed (twice each day, though most of the North Basin would be submerged for the majority of the tidal cycle).

Based on ORCAA records, only a single odor complaint has been lodged across its jurisdiction that includes the word “tide,” and that complaint was not near a shoreline and occurred in 2007. While odor complaints are only one indication of possible odor issues, there is no other clear evidence that nearby estuaries promote deleterious odor conditions for the nearby communities. The presence of restaurants and other commercial activity along the waterfront further suggests that the naturally occurring odors are limited, or tolerated.

The average emission rate of hydrogen sulfide per unit area of a tideflat is, at a minimum, 10 times less than the rate for salt marshes. Given that the Estuary Alternative would primarily add tideflat area with some salt marsh areas, and the estuary at the Nisqually National Wildlife Refuge has over six times the acreage of combined tideflat and salt marsh, the odor generation of the Estuary Alternative is expected to be comparatively low. Odor emission rates are not
constant, and natural phenomena can occur that result in elevated hydrogen sulfide generation at times, but, on average, hydrogen sulfide-based odor generation from the tideflat is expected to be less than that of a combined tideflat and salt marsh of equal size, and considerably less than the odors produced by the Nisqually National Wildlife Refuge. Other variables such as geography and prevailing winds influence odor concentrations at these locations. However, regional stagnation events have not driven odor complaints associated with estuaries, based on odor complaints that have been filed with ORCAA.

The Capitol Lake Basin location is unique in that it is located in the downtown Olympia area where a larger population is present. While nearby estuaries, such as Mud Bay, include residential and commercial uses (e.g., waterfront restaurants), the areas adjacent to the estuaries do not have the same scale of urban and residential interface that is found in the Project Area. Also, tolerances for estuary odors might be higher in locations where estuarine conditions have been present and therefore, are not a new or changed condition. A tolerance for estuary odors in downtown Olympia or in nearby residential areas may be less than that of the nearby estuaries’ communities.

In considering (1) the variable tides and tidal range of Puget Sound, which would result in inconsistent odor production frequency and durations; (2) the low intensity of odors expected to be produced by the estuary, similar to estuaries elsewhere within Puget Sound; and (3) the naturally occurring character of the odor produced by estuaries, impacts would likely be less than significant. The odor perception of estuary odors is very subjective; some may find it objectionable, while others may find the odor of an estuary natural and pleasant. Even with the low and variable odor detection threshold of hydrogen sulfide, a portion of the population that perceives this odor may find it offensive and could consider any increase in estuary odors to be a significant impact.

Notably, historical anecdotal evidence of pre-dam odors is not reliable because they cannot be attributed to specific odor sources given the industrial activities, sewage management approaches, and other unknown contributors in the region at the time.

4.7.5.2 Air Quality

Long-term air quality impacts would primarily be associated with recurring maintenance dredging activities. For the Estuary
Alternative, maintenance dredging would occur within impacts areas of West Bay to avoid adverse effects from sedimentation to navigation. Maintenance dredging would occur at the Olympia Yacht Club, the Port of Olympia/turning basin, private marinas, and access areas. For each maintenance dredging event, all areas were conservatively assumed to be dredged concurrently, condensing most of the activity to one calendar year, which increases the estimated annual emissions. Most of this dredging is expected be completed within one in-water work window (7 months).

Two disposal scenarios were considered for this alternative: (1) in-water disposal, and (2) upland disposal. Although the dredged material is assumed to be disposed in-water, emissions were calculated for upland disposal to evaluate potential impacts to air quality and general conformity if the sediment was determined not suitable for in-water based on future sampling. These scenarios would produce different air emissions due to the distinct equipment used for the disposal process (i.e., tugged barges and trucks). Emissions associated with the disposal options are presented in Table 4.7.3 and represent the maximum annual emissions that could occur within a year.

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Project Emissions (tons each year) – In-Water Disposal</th>
<th>Project Emissions (tons each year) – Upland Disposal</th>
<th>General Conformity De Minimis Thresholds (tons each year)</th>
<th>Greater Than De Minimis?</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>14</td>
<td>22.9</td>
<td>100</td>
<td>No</td>
</tr>
<tr>
<td>NO\textsubscript{x}</td>
<td>75</td>
<td>99.6</td>
<td>100</td>
<td>No</td>
</tr>
<tr>
<td>VOC</td>
<td>0.8</td>
<td>3.3</td>
<td>100</td>
<td>No</td>
</tr>
<tr>
<td>SO\textsubscript{2}</td>
<td>0.04</td>
<td>0.12</td>
<td>100</td>
<td>No</td>
</tr>
<tr>
<td>PM\textsubscript{10}</td>
<td>1.2</td>
<td>3.7</td>
<td>100</td>
<td>No</td>
</tr>
<tr>
<td>PM\textsubscript{2.5}</td>
<td>1.2</td>
<td>2.4</td>
<td>100</td>
<td>No</td>
</tr>
</tbody>
</table>
While upland disposal would produce greater emissions, the maximum annual emissions for maintenance dredging with either the upland or in-water disposal scenarios would be less than the general conformity de minimis values. For the upland disposal scenario, however, emissions of NO\textsubscript{x} would be just shy of this threshold value. In consideration of these emission levels, air quality impacts associated with maintenance dredging and disposal are expected to be less than significant.

### 4.7.5.3 Greenhouse Gases

Combined construction and post-construction emissions were annualized over the 30-year time horizon to characterize the GHG footprint of the Estuary Alternative. The estimated GHG emissions are presented in Table 4.7.4 and indicate that emissions from the Estuary Alternative for either upland or in-water disposal would be less than Ecology’s GHG reporting threshold and are therefore considered less than significant.

Within the context of regional GHG emission goals described in the 2020 Thurston Climate Mitigation Plan, this alternative is less consistent than the Managed Lake or No Action Alternative in terms of reducing long-term GHG emissions associated with construction and operation activities.

However, the Estuary Alternative promotes the greatest level of consistency with Guiding Principles in the 2017 Thurston Climate Adaptation Plan.

**Table 4.7.4 Estimated GHG Emissions (MTCO\textsubscript{2}e) – Estuary Alternative**

<table>
<thead>
<tr>
<th>Project Emissions by Disposal Scenario</th>
<th>Life-span Emissions (1)</th>
<th>Annual Emissions (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upland Disposal</td>
<td>49,998</td>
<td>1,667</td>
</tr>
<tr>
<td>In-Water Disposal</td>
<td>26,316</td>
<td>877</td>
</tr>
</tbody>
</table>

Notes:
1. Estimated life-span emissions are based on an assumed average useful life of about 30 years.
2. Annual emissions estimates are based on dividing total emissions by assumed facility useful life span as indicated in note 1 above.
4.7.6 What are the long-term impacts under the Hybrid Alternative?

4.7.6.1 Odor

The Hybrid Alternative would include approximately 119 acres (48.2 hectares) of tideflats, compared to 152 acres (61.5 hectares) under the Estuary Alternative. Based on the smaller acreage of tideflats, the Hybrid Alternative would have a lower potential to generate odor compared to the Estuary Alternative, but still an increase when compared to the Managed Lake Alternative.

As with the Estuary Alternative, the potential for long-term odor impacts from the Hybrid Alternative is considered less than significant.

4.7.6.2 Air Quality

Long-term air quality impacts would also primarily be associated with recurring maintenance dredging activities in West Bay and in the saltwater reflecting pool. Similar to the Estuary Alternative, maintenance dredging would need to occur at four different resource areas within West Bay to avoid sedimentation impacts on navigation.

The total emissions associated with maintenance dredging in West Bay using either in-water or upland disposal scenarios would be the same as the Estuary Alternative (see Table 4.7.3). The only difference in assumptions between the Estuary and Hybrid Alternatives is that the peak dredge event would occur sooner and more often under the Hybrid Alternative because dredging happens more frequently under the Hybrid Alternative. As described for the Estuary Alternative, the total emissions would be less than the general conformity de minimis values and, therefore, the air quality impacts associated with the Hybrid Alternative using upland or in-water disposal are expected to be less than significant.

4.7.6.3 Greenhouse Gases

Combined construction and post-construction emissions were annualized over the lifetime of the project (30 years) to characterize the GHG footprint of the Hybrid Alternative. The estimated GHG emissions are presented in Table 4.7.5. The emissions associated with the Hybrid Alternative are the highest of the three action alternatives and would contribute to the cumulative carbon footprint of Thurston
County. However, the small contribution of GHG emissions from this alternative is expected to be less than significant.

Within the context of regional GHG emission goals described in the 2020 Thurston Climate Mitigation Plan to reduce GHG emissions 45% below 2015 levels by 2030 and 85% below 2015 levels by 2050, this alternative is the least consistent in terms of reducing long-term GHG emissions associated with construction and operation activities.

However, the Hybrid Alternative provides more consistency than the Managed Lake Alternative with Guiding Principles in the 2017 Thurston Climate Adaptation Plan by improving the ability to reduce, capture, and store GHG emissions, but less than the Estuary Alternative.

### Table 4.7.5 Estimated GHG Emissions (MTCO$_2$e) – Hybrid Alternative

<table>
<thead>
<tr>
<th>Project Emissions by Disposal Scenario</th>
<th>Life-span Emissions (1)</th>
<th>Annual Emissions (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upland Disposal</td>
<td>64,806</td>
<td>2,160</td>
</tr>
<tr>
<td>In-Water Disposal</td>
<td>31,495</td>
<td>1,050</td>
</tr>
</tbody>
</table>

Notes:
1. Estimated life-span emissions are based on an assumed average useful life of about 30 years
2. Annual emissions estimates are based on dividing total emissions by assumed facility useful life span as indicated in note 1 above.

### 4.7.7 What mitigation measures would be implemented for the project?

The only activity under any of the action alternatives that would have the potential to impact air quality during operation of the project is recurring maintenance dredging. The mitigation methods for maintenance dredging would be the same to those listed in Section 5.7.6 for construction impacts. No mitigation is needed or proposed for impacts related to odor or GHG emissions, all of which are less than significant.
4.7.8 What are the significant unavoidable adverse impacts to air quality and odors?

No significant unavoidable adverse impacts related to air quality or odor are expected during operation as a result of any of the action alternatives.

4.8 LAND USE, SHORELINES, & RECREATION

This section describes the potential long-term impacts and benefits of the Capitol Lake – Deschutes Estuary Long-Term Management Project on land use, shorelines, and recreation in the Project Area. The EIS focuses on the most important elements and conclusions of the analysis and, in particular, the differences among the four alternatives. The information presented in this section is summarized from the full analysis in the Land Use, Shorelines, and Recreation Discipline Report (Attachment 12).

Key Findings: Long-Term Land Use, Shorelines, and Recreation Impacts

None of the action alternatives would substantially change any land or shoreline uses. Under all action alternatives, uses would be consistent with plans and policies for the affected areas; therefore, adverse impacts would be less than significant. The Managed Lake Alternative would retain the existing appearance of Capitol Lake more than the other action alternatives, and may be seen as more consistent with the guidelines contained in the Design Element of the Olympia’s Downtown Strategy. Increased flooding is expected under all alternatives and could impact downtown land uses and low-lying parks. These impacts would be significant under the No Action Alternative and Managed Lake Alternative due to the higher maximum river flood elevations that would occur under those alternatives. The Estuary and Hybrid Alternative would reduce flooding effects from river floods, but increase flooding slightly for extreme tidal events. For all action alternatives, improved water quality, sediment management, improved ecological functions, and increased opportunities for community use are expected to have substantial beneficial effects and would allow the resumption of boating and fishing.

4.8.1 What methods were used to assess long-term impacts to land use, shorelines, and recreation?

The analysis of long-term land and shoreline use impacts included examining any direct changes to land use and potential indirect impacts due to effects on recreation (the predominant land use
adjacent to the project). The analysis also incorporated results from the Economics Discipline Report (Attachment 18).

Recreational impacts were assessed by considering whether recreational opportunities would be improved, impeded, or remain unaffected by each alternative (for example, physical changes in the amount of open space, length of trails, etc.). This was compared to information gathered through the recreation user survey and other information on existing conditions. Additional details are presented in the Land Use, Shorelines, and Recreation Discipline Report (Attachment 12).

4.8.2 What are the long-term impacts under the No Action Alternative?

Under the No Action Alternative, potential long-term impacts on land use, shorelines, and recreation would be related to the following:

- Limited ongoing maintenance of the 5th Avenue Dam
- Ongoing sedimentation of the Capitol Lake Basin (because no sediment management strategies would be implemented)
- The continued and increased extreme river flooding in the basin

4.8.2.1 Land Use and Shorelines

Under the No Action Alternative, Capitol Lake would be configured and operated largely as it is at present. Impacts of ongoing dam maintenance on land or shoreline use, if any, would be minimal.

As described in Section 4.1, Hydrodynamics and Sediment Transport, extreme river flooding is expected to increase under the No Action Alternative. In combination with RSLR, this would result in flood elevations in the downtown Olympia area that exceed the flood protection elevations included in the Olympia Sea Level Rise Response Plan for Heritage Park. The elevation of flood protection would have to be increased or new measures would have to be implemented to avoid impacts. Because a redesign or new improvements would be considered an action under SEPA, this mitigation is not considered for the No Action Alternative. Therefore, effects from extreme river flooding would not be mitigated under the No Action Alternative. More frequent and extreme flooding could result in displacement of existing uses, disinvestment, and economic

What land use, shorelines, and recreation long-term impacts were considered in the analysis?

The analysis considers if the alternatives could bring about major changes in the types or numbers of users and whether such changes would affect existing land use patterns. Expected or potential changes of use are compared for consistency with adopted land and shoreline use policies and plans.

What is considered a significant impact related to land use, shorelines, and recreation?

Impacts are considered significant if land and shoreline uses would be so adversely affected that an area would suffer from disinvestment and economic blight, or shoreline uses would be unable to operate. Impacts are considered significant if recreational lands would be permanently lost without replacement with another resource of similar value.
blight in areas of downtown Olympia. Therefore, there is a risk of significant impact on land use from the No Action Alternative.

4.8.2.2 Recreation

Dam maintenance could periodically cause a temporary closure of the trail connection on 5th Avenue SW that crosses the dam, affecting trail users. Any impacts are expected to be of short duration, similar to past temporary closures.

Flooding of parks around the entire perimeter of Capitol Lake would increase as a result of extreme river floods and predicted RSLR. This would cause a gradual reduction in the number of days when these flooded portions of parks would be usable, and would increase maintenance costs because of flood damage.

The current restrictions on swimming and boating are expected to remain. Other recreational activities and community events would continue much as they are at present. Continued sediment deposition and growth of emergent vegetation may affect the types of waterfowl and other wildlife that use the lake, but this would not likely affect the number or types of recreational users substantially. Capitol Lake would remain an urban respite for experiencing nature.

The No Action Alternative would not advance some of the community aspirations for improved recreational opportunities, as expressed in the user survey and through the Community Sounding Board. However, any changes in recreational activities under the No Action Alternative would be minor and, therefore, less than significant.

4.8.2.3 Consistency with Plans and Policies

The No Action Alternative would not change any land or shoreline uses, and the existing uses are generally consistent with current plans and policies. However, the No Action Alternative would not accomplish some of the goals in adopted plans applicable to the shoreline of Capitol Lake, including the 2020 Thurston Climate Adaptation Plan for enhancing resiliency to climate change.
4.8.3 What are the long-term impacts common to all action alternatives?

4.8.3.1 Land Use and Shorelines

The action alternatives would involve varying degrees of changes in the Capitol Lake Basin as a result of dredging, habitat area establishment, and, in the case of the Estuary and Hybrid Alternatives, reestablishing tidal flows into the basin. However, none of the action alternatives would result in long-term changes to land or shoreline use within the basin. The land use of the Capitol Lake Basin would remain open space.

All action alternatives would include recurring maintenance dredging to manage sediment, but at different locations and intervals. Maintenance dredging would maintain adequate water depth to keep areas accessible for boating. Maintenance dredging in the Project Area would be infrequent. It could inconvenience some recreation uses while it is occurring, but would not have long-term adverse impacts under any alternative.

Improved water quality and sediment management that would occur under all action alternatives is expected to allow the resumption of boating and fishing, which were once common in the Capitol Lake Basin. Resuming boating and fishing would affect some adjacent land uses, by stimulating interest in businesses that support these activities. For these reasons, water quality and sediment management actions are expected to have substantial beneficial effects on land and shoreline use for all action alternatives.

4.8.3.2 Recreation

The recreational experience of the Capitol Lake Basin would change, mostly through improvements in sediment management, water quality, ecological functions, and increased opportunities for community use. The types of improvements vary among the action alternatives. For some recreational users, changes in the appearance of the Capitol Lake Basin would be viewed as impacting their recreational experience, while other users would view the same changes as beneficially improving their experience. Aesthetic impacts vary among the alternatives and are described in Section 4.10, Visual Resources.

Will water quality be improved to allow for boating and fishing?

All action alternatives would improve water quality sufficiently so that nonmotorized boating and fishing could be allowed throughout the Capitol Lake Basin. None of the action alternatives would add facilities for motorized boats.
Resuming boating and fishing would likely increase use of the parks surrounding the basin, including more vehicles used to transport boats to the shore. Some recreational activities would disrupt others. For example, wildlife viewing or fishing could be disrupted by boaters entering an area. None of the action alternatives would add facilities for motorized boats.

The addition of boardwalks along the west shoreline of the South and Middle Basins under all action alternatives would promote walking, public gathering, wildlife viewing, and passive use, which are the most common existing uses of the Project Area. This could increase use of walkways at Tumwater Historical Park, the Interpretive Center, and Deschutes Parkway. Similarly, the 5th Avenue Pedestrian Bridge would improve the connection between the existing pathways at Heritage Park to existing pathways at Deschutes Parkway. It would better support the frequently used walking path around the North Basin. Because it would improve safety, particularly for bicycles, it could increase bicycle use around the North Basin, along West Bay and throughout the study area. All alternatives would maintain trail connectivity with existing and planned trails. Water-based recreation activities in West Bay would be similar to existing conditions.

For these reasons, improvements to sediment management, water quality, ecological functions, and increased opportunities for community use are expected to have **substantial beneficial effects** on recreation for all action alternatives.

### 4.8.3.3 Consistency with Plans and Policies

All action alternatives would promote the goals, policies, objectives, and priorities in adopted plans applicable to the shoreline of Capitol Lake that the No Action Alternative would not promote, including the following:

- **Olympia Shoreline Master Plan (SMP) goals for restoring ecological functions and improving water quality (SMP Section 2.2 A through C)**
- **Olympia SMP Restoration Plan priorities pertinent to Capitol Lake – Deschutes Estuary, including improvements to water quality, sediment transport, and other ecological functions, including fish passage**
- **Olympia SMP Restoration Plan priorities pertinent to Budd Inlet Estuary, including improving fish passage and restoring estuarine habitat and intertidal influence**
• Tumwater Comprehensive Plan Conservation Element includes Priority Goal 4 and Environmental Goal E-4, protecting and improving water quality and aquatic habitat areas

• Tumwater SMP policies calling for preservation and enhancement of shoreline ecological functions, water quality, and public access (Goals 4.1.B 1 through 3 and 4.6.B 1 through 3; Use Policies 5.3.B.a and b, 5.4.A 4)

None of action alternatives would directly conflict with adopted strategies or actions in the Olympia Downtown Strategy. Planning for RSLR is ongoing and would be addressed in the design of all action alternatives. Planning for improvements to the Olympia Waterfront Trail, which incorporates a portion of the Heritage Park waterfront trail, are ongoing. The project would not adversely affect the trail, and would provide an improved connection to the Deschutes Parkway Trail via the proposed 5th Avenue Pedestrian Bridge under all action alternatives. Aesthetic preferences about the appearance of Capitol Lake are not described in the Olympia Downtown Strategy, but the Design Element of the strategy suggests developing guidelines that reinforce the “existing landscape along Capitol Lake.” Aesthetic impacts of the action alternatives on the waterfront area of downtown Olympia would vary by alternative.

4.8.4 What are the long-term impacts under the Managed Lake Alternative?

4.8.4.1 Land Use and Shorelines

The Managed Lake Alternative would retain the 5th Avenue Dam and 5th Avenue Bridge in their current configuration, consistent with existing conditions. However, the 5th Avenue Dam would be overhauled to significantly extend the serviceable life of the structure (i.e., through electrical system and structural upgrades).

As described in Section 4.8.3, the overall existing land use of the Capitol Lake Basin would remain open space. Recurring maintenance dredging could inconvenience some recreation uses on the lake while it is occurring, but would be infrequent and temporary. The Managed Lake Alternative would result in no change or limited changes in land or shoreline uses, and any new uses would be consistent with planned uses for the affected areas; therefore, adverse impacts would be less than significant.
Flooding potential under the Managed Lake Alternative would be similar to the No Action Alternative, but slightly increased as described in the Hydrodynamics and Sediment Transport Discipline Report (Attachment 5). During extreme river floods, flooding of parks and other adjacent land uses would increase in extent and depth, causing a potentially significant impact in the downtown Olympia area. The Olympia Sea Level Response Plan includes creating a raised berm, floodwall, and floodgate in Heritage Park, which would partially mitigate this impact, but would not fully mitigate the effects under the most extreme river floods modeled for this project. Additional flood protection could be implemented, similar to those recommended in the Olympia Sea Level Response Plan to create a higher elevation berm to account for extreme river floods. With this mitigation, impacts on land and shoreline use could be reduced to less than significant levels.

As with all action alternatives, sediment management, water quality, habitat improvements, and increased opportunities for community use are expected to have substantial beneficial effects on land and shoreline use by maintaining and/or enhancing the beneficial uses of the lake. The Managed Lake Alternative would preserve a larger area of permanent open water than the Estuary or Hybrid Alternatives, but this would not likely influence upland land use.

### 4.8.4.2 Recreation

Recreational activities and community events would continue much as they are at present, with the addition of boating and fishing opportunities. Boating and fishing opportunities would differ from the Estuary and Hybrid Alternatives because the basins would remain freshwater and would support a different group of fish species and would not be subject to daily tides. Without tidal influence, boating would be possible during all daytime park hours. For community events, the certainty of having open water at all times could be beneficial for planning water-based events.

The open-water area would be larger under the Managed Lake Alternative than under the other alternatives, but would not be connected to Puget Sound. Some recreational users, including some boaters and anglers, would view a freshwater system as positive, whereas others would prefer an estuarine recreational experience. There would be no access to the Project Area for motorized boats. Restricting motorized boat access to the Middle and South Basins would conflict with WAC 200-210-020, which currently permits...
motorized boat use in those basins. It is anticipated that the WAC would need to be updated.

Maintenance dredging would restrict recreational activities on Capitol Lake during dredging work. Maintenance dredging would require the temporary use of Marathon Park approximately every 20 years after construction (and increasing in frequency thereafter); however, no structures or equipment would be left there permanently, and the area would be restored to its previous condition upon completion of maintenance activities. Noise and dredging activities could detract from users' enjoyment of the parks and trails while dredging is occurring, however, these impacts would be temporary.

The extent and depth of flooding in parks around the entire perimeter of the lake would increase, due to extreme river flood events, similar to the No Action Alternative.

Under the Managed Lake Alternative, recreational uses would continue in the same manner as before the project, or continue with modifications that would have equivalent beneficial recreational value; therefore, adverse impacts would be less than significant.

Long-term impacts on land use, shorelines, and recreation associated with the Managed Lake Alternative are listed and summarized in Tables 4.8.1 and 4.8.2. As with all action alternatives, sediment management, water quality, ecological improvements, and increased opportunities for community use are expected to have substantial beneficial effects on recreation.

4.8.4.3 Consistency with Plans and Policies

The Managed Lake Alternative would accomplish policy goals and objectives for ecological restoration and water quality improvement, as described in Section 4.8.3.3. However, it would have only minor benefits for fish and wildlife, and minor-to-moderate benefits for water quality (see Sections 4.3 and 4.5). The Managed Lake Alternative would not directly support the priorities of the Olympia SMP Restoration Plan for restoration of the Budd Inlet Estuary.

The Design Element of the City of Olympia’s Downtown Strategy suggests developing guidelines that reinforce the “existing landscape along Capitol Lake.” The Managed Lake Alternative would retain the existing appearance of the lake more than the other action alternatives, and may be seen as more consistent with this aspect of
the Downtown Strategy. As described in Section 4.7, Air Quality and Odor, the Managed Lake Alternative would not accomplish some of the goals in the adopted 2020 Thurston Climate Action Plan related to enhancing resiliency to climate change.

### 4.8.5 What are the long-term impacts under the Estuary Alternative?

#### 4.8.5.1 Land Use and Shorelines

No long-term change in land use would occur under the Estuary Alternative, with exception of a small area of land that would be needed for the new road connection between Deschutes Parkway and 4th Avenue W. This includes an undeveloped portion of two adjacent parcels zoned for single-family development. One parcel is developed with a residence but acquisition of this piece of land would likely occur as a lot line adjustment and would not affect the structure on that property and would not result in displacement or relocation. In addition, a portion of a railroad right-of-way would be acquired for placement of fill to support the road connection. This property, currently vacant, is no longer used for rail transportation. Enterprise Services would work with owners of identified properties to provide compensation in accordance with Washington’s Relocation Assistance law (RCW 8.26).

A group of single-family parcels along the east side of the Middle Basin extend into the lake. Only one of these parcels appears to have a dock on it. The land use on these parcels would not change, but the character of the submerged portions of these parcels would, due to the reintroduction of tidal influence in that portion of the estuary. The one dock and any other access improvements could be separated from the water at lower tide levels, which, while a minor impact, could be considered adverse by property owners with these amenities.

Sediment deposition in West Bay would be greater than under the No Action or Managed Lake Alternatives. As such, this alternative would have the greatest potential to affect the private marinas, Port of Olympia, and FNC on West Bay by restricting access to or use of the marinas. These uses are designated as preferred and priority uses in the Olympia SMP.

Maintenance dredging within impacted areas of West Bay is included as part of the Estuary Alternative to avoid potential sediment deposition impacts to private marinas and the Port of Olympia.
Impacts on these uses could affect the viability of their operations, depending on the severity of sediment deposition or during the recurring maintenance dredging operations. Impacts could be considered significant if project actions (annual monitoring and recurring maintenance dredging) do not fully avoid impacts to private marinas, Port or Olympia shipping facilities, and the FNC.

As described in Section 4.2, Navigation, sediment monitoring is proposed as mitigation to monitor sediment accumulation in order to establish the proper dredging frequency and schedule. With sediment monitoring included as mitigation for this alternative, it would be feasible to mitigate adverse sediment accumulation at the private marinas, Port of Olympia, and FNC. Therefore, impacts on these priority land uses would be reduced to less than significant, assuming monitoring and related maintenance dredging is implemented as proposed.

More frequent dredging in West Bay would mean that temporary measures to accommodate dredging activities would occur more often, requiring coordination with property owners to avoid impacts to shipping and to allow for temporary relocation of some vessels at marinas, similar to what has occurred during past dredging operations at these locations. This type of dredging has occurred in the past in these areas, and with proper coordination is not unusually disruptive to these operations. The increase in frequency is therefore not expected to endanger the viability of any of these priority uses.

Unlike the No Action and Managed Lake Alternatives, overland flooding under the Estuary Alternative is driven by extreme tide conditions (and RSLR) and not extreme river flooding. Under the Estuary Alternative, water levels within the Capitol Lake Basin would no longer be controlled by the 5th Avenue Dam and would rise and fall with the tides. Maximum water levels for the Estuary Alternative would be slightly (≤1 foot [≤0.3 meters]) lower than those of the No Action and Managed Lake Alternatives.

During extreme river floods (with 2 feet [0.61 meters] of RSLR), the Estuary Alternative would reduce the extent and intensity of flooding compared to the No Action and Managed Lake Alternatives. Substantially less flooding is predicted in Heritage Park, downtown Olympia, and at the Interpretive Center. Lower elevation of flooding is also predicted in Tumwater Historical Park and in Marathon Park for the Estuary Alternative.
During extreme tides (with 2 feet [0.61 meters] of RSLR), maximum water levels would be higher for the Estuary Alternative than the No Action and Managed Lake Alternatives. Additional flooding is predicted in all parks and in the parking lots associated with the Capitol Campus Powerhouse and the Old Brewery during extreme tides. The extent of flooding in the Estuary Alternative would also increase in Heritage Park, downtown Olympia, and Powerhouse Road SW areas. Flood elevations are predicted to slightly exceed 16 feet (4.9 meters) NAVD 88 in this area. Note that under the Olympia Sea Level Rise Response Plan, a raised berm, floodwall, and floodgate would be constructed in Heritage Park before 2 feet (0.61 meters) of RSLR is realized, which would prevent flooding via the existing lake for flood elevations up to 17 feet (5.2 meters) NAVD 88. Therefore, additional flooding predicted (beyond that in the No Action Alternative) in the Heritage Park area for the Estuary Alternative would be mitigated by the Sea Level Rise Response Plan actions.

Under the Estuary Alternative, the reduced potential for river flooding to adversely affect adjacent uses would result in minor beneficial effects for land use, particularly in the Heritage Park and downtown area. However, these would be offset by the increase in potential for flooding impacts from extreme tidal flooding (with RSLR) in other areas of the basin.

### 4.8.5.2 Recreation

The Estuary Alternative would modify some recreational experiences but provide similar recreational value to existing land-based recreational resources. For example, estuarine habitat restoration would present opportunities for observing different wildlife species than at present. Trails in the South Basin would be relocated but provide equivalent or better experience for trail users.

Nonmotorized boating access would be restored in the Capitol Lake Basin. Portions of the Capitol Lake Basin, particularly in the Middle and South Basins, would become tideflats and would not be accessible by boats during low tides. In contrast, much of the North Basin, particularly its eastern half (near Heritage Park) would remain inundated throughout the tide cycle. It is estimated that much of the North Basin would be submerged approximately 80% of the time at depths that would support shallow draft boating, such as kayaking. During most tides, boats with shallow draft would be able to move between West Bay and the North Basin. Although the project goals are to support nonmotorized boating access, additional recreational access from West Bay could result in occasional incidental use by...
motorized boats, though water depths in the Capitol Lake Basin would not promote such use. In these instances, motorized boats could be more disruptive to other recreationists and wildlife, because of noise and wakes.

Low tides and decaying vegetation could result in sulfuric odor because of biological activity in the sediments that are not exposed along the shoreline of Capitol Lake today, which some people would find objectionable. As described in Section 4.7, Fish and Wildlife, given the intensity, variability, and duration of odors expected from the Estuary Alternative, odor impacts would be less than significant.

With measures proposed to mitigate navigation impacts, including at recreational marinas, recreational boaters would not be adversely impacted. As described above, dredging frequency would increase the most at Olympia Yacht Club, to every 6 years as compared to every 23 years under the No Action Alternative. Each dredging operation would take approximately 2 months and affect about 20% of the moorage slips. At other marinas, dredging would occur over 1 month every 12 years. Recreational boaters using the marinas are expected to be accommodated with other marina slips or at other facilities while dredging occurred. As a result, impacts on recreational boaters are expected to be less than significant.

Under the Estuary Alternative, there would be qualitative differences in some recreational activities compared to the No Action Alternative or the Managed Lake Alternative. Most activities in the study area would remain the same, while some would continue with modifications that would have equivalent beneficial recreational value. Therefore, adverse impacts would be less than significant.

As with all action alternatives, water quality improvements, sediment management, habitat improvements, and increased opportunities for community use are expected have substantial beneficial effects on recreation.

4.8.5.3 Consistency with Plans and Policies

The Olympia SMP Restoration Plan addresses the Budd Inlet Estuary in two of its Priority statements. Section 6.5 of the SMP, Priority 5 - Reconnect Fish Passage to Budd Inlet, and Restore Mouths of Tributary Streams, discusses the importance of fish passage, specifically noting the dam, fish ladder, and tide gate on the Deschutes River as well as other upstream and downstream tributaries to Budd Inlet. Section 6.9 of the SMP, Priority 9 - Restore
Estuarine Transition Habitat and Intertidal Influence, discusses the importance of estuaries for a variety of ecological functions. These two sections of the Restoration Plan reflect the plan's overall vision for restoration of the Budd Inlet Estuary, which the Estuary Alternative would directly support, by creating a continuous estuary and improved fish passage.

The Estuary Alternative would accomplish policy goals and objectives for ecological restoration as described in Section 4.8.3.3. This alternative would have substantial benefits to fish and wildlife, compared to the No Action Alternative, and the greatest ecological benefits among the three action alternatives.

As described in Section 4.7, Air Quality and Odor, the Estuary Alternative would also promote consistency with goals in the 2020 Thurston Climate Action Plan related to enhancing resiliency to climate change.

The Estuary Alternative would open the possibility of incidental use by motorized boats entering the North Basin from West Bay. This would conflict with the current prohibition on motorboats in the North Basin in WAC 200-210-020. Relatedly, restricting motorized boat access to the Middle and South basins would also conflict with WAC 200-210-020, which permits motorized boat use in those basins. It is anticipated that the WAC would need to be updated to address the changed condition.

The Estuary Alternative would modify the appearance of the lake more than the Managed Lake Alternative, including changes in vegetation and inundation cycles along the Arc of Statehood, a component of the Olympia Waterfront Trail. These changes would be compatible with the existing landscape, however, and would not interfere with the Downtown Strategy. Some users may prefer the lake environment to an estuary environment, but others would prefer an estuary.

With maintenance dredging, including mitigation proposed to avoid impacts to navigation as described in Section 4.2, Navigation, potentially significant impacts on water-dependent land uses and recreation uses that are given priority in the City of Olympia SMP would be reduced to less than significant levels under the Estuary Alternative.
4.8.6 What are the long-term impacts under the Hybrid Alternative?

4.8.6.1 Land Use and Shorelines

Similar to the Estuary Alternative, downstream sediment deposition could affect priority water-dependent land uses in West Bay. Maintenance dredging within West Bay is also included as part of the Hybrid Alternative to avoid potential impacts to private marinas and the Port of Olympia. Impacts would be considered significant if project actions (recurring maintenance dredging) did not fully avoid impacts to private marinas, Port of Olympia shipping facilities, and the FNC. Impacts on these priority land uses would be reduced to less than significant, assuming monitoring and related maintenance dredging is implemented as proposed.

The Hybrid Alternative would have the same effects on the submerged portions of the single-family parcels on the east side of the Middle Basin as the Estuary Alternative. Also, as with the Estuary Alternative, there would be minor acquisition of private property for the realignment of Deschutes Parkway. Otherwise, there would be no change or limited changes in land or shoreline uses, and any new uses would be consistent with planned uses for the affected areas. Adverse impacts would be less than significant.

Unlike the maximum water levels modeled for the Estuary Alternative, which are addressed by measures included in the Olympia Sea Level Rise Response Plan, the potential for flooding in the Heritage Park and Powerhouse Road SW area under the Hybrid Alternative would be addressed by the protective presence of the barrier wall for the hybrid reflecting pool. Compared to the No Action Alternative, the reduced extent of overland flooding under the Hybrid Alternative would be a minor beneficial effect.

4.8.6.2 Recreation

Effects on recreation would generally be as described for the Estuary Alternative, with the following differences.
Under the Hybrid Alternative, a pathway would be constructed atop the reflecting pool barrier wall. This pathway would accommodate both pedestrians and bicycles, with views of the water but no physical access into the water. When combined with the existing walking path along the Arc of Statehood, it would create an approximately 1-mile (1.6-km) loop around the smaller reflecting pool. The loop trail around the entire North Basin would remain, including the 5th Avenue Pedestrian Bridge. Therefore, this alternative would substantially expand public access as compared to the No Action Alternative or the other action alternatives.

Compared to the Estuary Alternative, there would be a reduced area of tideflats established in the North Basin due to the presence of the reflecting pool. As described in Section 4.7, Air Quality and Odor, the potential for odor generation would be slightly less than the Estuary Alternative.

As with the other action alternatives, with improved water quality and sediment management, boating access would be restored. At high tides, boats with shallow draft, including potential incidental use by motorized boats, would be able to move between West Bay and the North Basin. As with the Estuary Alternative, motorized boats could enter the basin and could be more disruptive to other recreationists and wildlife. Boats would not be able to cross over the barrier wall to move between the reflecting pool and the estuary. The reflecting pool would generally be maintained at a depth where boating with small, hand-launched craft would be possible. Launching could occur informally from the Arc of Statehood steps, or other future-established launch point.

Under the Hybrid Alternative, there would be qualitative differences in some recreational activities compared to the No Action and Managed Lake Alternatives. Most activities in the study area would remain the same, while some would continue with modifications that would have equivalent beneficial recreational value. Therefore, adverse impacts would be less than significant. As with all action alternatives, improvements to sediment management, water quality and ecological functions, and increased opportunities for community use would result in substantial beneficial effects on recreation.

**4.8.6.3 Consistency with Plans and Policies**

The Hybrid Alternative would accomplish policy goals and objectives for sediment management, water quality, ecological functions, and community use as described for the Estuary Alternative. This
alternative would have moderate benefits to fish and wildlife, compared to the No Action Alternative, with some portions of the Capitol Lake Basin being adversely affected and some improving.

Impacts from this alternative would be similar to the Managed Lake Alternative with regard to the Arc of Statehood area, as this would remain an enclosed open-water area rather than being converted to an intertidal area as in the Estuary Alternative. It would result in a smaller enclosed water area, which may be perceived by some as less attractive than the larger waterbody that would be visible under the Managed Lake Alternative. These qualitative aesthetic differences would not substantially influence the success of the Downtown Strategy.

As described in Section 4.7, Air Quality and Odor, the Hybrid Alternative would also promote consistency with goals in the 2020 Thurston Climate Adaptation Plan related to enhancing resiliency to climate change, but to a slightly less extent than the Estuary Alternative.

4.8.7 What mitigation measures would be implemented for the project?

4.8.7.1 Managed Lake Alternative

Additional flooding predicted in the Heritage Park area could be mitigated in coordination with the Olympia Sea Level Rise Response Plan, through inclusion of design parameters for the flood protection design of the Heritage Park berm to account for extreme river flooding.

4.8.7.2 Estuary and Hybrid Alternatives

Section 4.2, Navigation, describes mitigation that would be necessary to avoid adverse impacts to navigation from the Estuary and Hybrid Alternatives; those measures are also listed here to mitigate adverse effects on priority shoreline uses. It is also assumed that a berm would be constructed in Heritage Park as included in the Olympia Sea Level Rise Response Plan to address flooding caused by higher tides due to RSLR. As noted for the Hybrid Alternative above, the reflecting pool barrier wall would effectively address flooding in the Heritage Park area due to extreme high tides and RSLR.

Additional measures to address potential adverse impacts are presented below:
• Work with owners of identified properties requiring acquisition and provide compensation in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended

• Implement monitoring to document initial conditions within West Bay and monitor sediment accumulation to identify when the FNC, turning basin, Port of Olympia, and private marinas are nearing the threshold that triggers maintenance dredging

• As part of the long-term maintenance dredging plan, implement scheduling and phasing to minimize impacts to existing Port of Olympia and private marina operations

• Continue to enforce restrictions on motorized boat use, including signage at the entry from West Bay to the North Basin

• If incidental motorized boat use occurs in the North Basin, establish a speed limit for motorized boat use to limit noise levels and promote safety among recreational users

• Establish rules such as no-wake, lower speed, or restricted access for motorized boats in areas frequented for wildlife viewing

4.8.8 What are the significant unavoidable adverse impacts to land use, shorelines, and recreation?

The project would result in no long-term change to land or shoreline uses, and existing uses are consistent with planned uses for the affected areas. With measures included in the project to address sediment-related impacts in West Bay, the viability of priority shoreline uses would not be adversely affected. If a monitoring plan and long-term maintenance dredging program are implemented under the Estuary and Hybrid Alternatives, no significant unavoidable adverse impacts to recreation are anticipated.

4.9 CULTURAL RESOURCES

This section describes the potential long-term impacts and benefits of the Capitol Lake – Deschutes Estuary Long-Term Management Project on cultural resources in the Project Area. The EIS focuses on the most important elements and conclusions of the analysis and, in particular, the differences among the four alternatives. The
information presented in this section is summarized from the full analysis in the Cultural Resources Discipline Report (Attachment 13).

### Key Findings: Long-Term Impacts on Cultural Resources

Recurring maintenance dredging in the North Basin or West Bay could intersect, remove, or compact unrecorded resources, and impacts would be **potentially significant** under any action alternative. Continued flooding could also impact cultural resources under the project alternatives and impacts would be **potentially significant** but would be greatest under the No Action and Managed Lake Alternatives given the higher water elevations.

For historic built environment resources, long-term changes from project actions (e.g., dredging and removal of the 5th Avenue Dam) are considered operational impacts. There would be greater potential for impacts to historic built environment resources under the Estuary and Hybrid Alternatives because the 5th Avenue Bridge, 5th Avenue Dam, and Olympic Street W Bridge would be removed and Deschutes Parkway would be realigned. The Managed Lake Alternative would retain historic views in the North Basin, whereas the Estuary and Hybrid Alternatives would remove the 5th Avenue Dam and 5th Avenue Bridge, eliminating or reducing the extent of the reflecting pool. If the recommended Des Chutes Basin Project Historic District is determined eligible for listing, this work would permanently diminish the integrity of the resource’s essential physical features, and would be a **significant impact**. However, the return of the estuary would reestablish its historic use patterns. Under the Hybrid Alternative, the barrier wall for the reflecting pool would mitigate impacts on historic resources related to the 5th Avenue Dam and 5th Avenue Bridge removal to less than significant levels.

Cultural resources will be considered during the Section 106 process.

### 4.9.1 What methods were used to assess long-term impacts to cultural resources?

For the analysis of archaeological resources, most impacts are associated with construction activities and are described in Section 5.9, Cultural Resources. Operational impacts are limited to recurring maintenance dredging and ongoing sedimentation and flooding impacts.

For the analysis of the historic built environment, long-term changes that result from dredging (both initial and recurring maintenance dredging) are considered operational impacts. Important factors in determining impacts on historic resources are whether or not there would be a permanent change to a property (such as demolition or physical alteration) and whether the property’s historic context and setting would change. Additional details on the significance criteria are presented in the Cultural Resources Discipline Report (Attachment 13).

### What cultural long-term impacts were considered in this analysis?

Recorded cultural resources, as well as potential unrecorded cultural resources, provided the basis for the evaluation of potential project impacts. An alternative would impact a cultural resource if it diminished the resource’s essential features that qualify it for listing in the NRHP or Washington State Heritage Register, and/or designation to the Olympia Heritage Register or Tumwater Register of Historic Places.
4.9.2 What are the long-term impacts under the No Action Alternative?

As described in Section 3.9.3, there are no documented Traditional Cultural Properties within the Project Area. Maintaining the status quo would not benefit many of the species of importance to local area tribes, including salmon and shellfish (see Section 4.5.7 for more information). Tribal values would continue to be adversely impacted by the continued loss of connection to the natural environment and anthropogenic harm to the balance and functions from natural ecosystems.

The long-term impacts of the No Action Alternative on archaeological resources and historic built environment resources are described below.

4.9.2.1 Archaeological Resources

Under the No Action Alternative, maintenance of the 5th Avenue Dam would occur within the footprint of the existing structure or immediately adjacent in areas previously disturbed during original dam construction. No impacts on protected archaeological resources are anticipated.

Sedimentation within Capitol Lake – Deschutes Estuary could eventually bury and obscure potentially protected archaeological resources, making them more difficult to detect. Alternately, flooding within the Capitol Lake – Deschutes Estuary due to continued and increased extreme river flooding could impact potentially protected archaeological resources if flooding results in erosion or inundation of areas containing such sites. If these sedimentations or flooding impacts did occur, there would be potentially significant impacts on archaeological resources.

4.9.2.2 Historic Built Environment Resources

The limited maintenance and repair activities for the 5th Avenue Dam would not diminish the integrity of the essential physical features in a way that would affect its eligibility for listing in a historic register. Impacts would be less than significant.
Sedimentation within the Capitol Lake – Deschutes Estuary would diminish the integrity of the reflecting pool in the North Basin such that it would no longer be able to convey significant character-defining features that contribute to its recommendation as eligible for listing as part of a potential Des Chutes Basin Project Historic District. View relationships between the potential Des Chutes Basin Project Historic District and both the Washington State Capitol and Olympia Downtown historic districts, and the visibility and setting of both the 5th Avenue Dam and Deschutes Parkway as design features of the Des Chutes Basin Project would be diminished. These would be **potentially significant impacts** on historic resources.

Continued and increased extreme river flooding within the Capitol Lake – Deschutes Estuary could result in the loss of integrity of materials, design, and workmanship from damage to individually listed and designated buildings and part of the Downtown Olympia Historic District. Flooding could also impact low-lying properties within the Tumwater Historic District, including the 1906 Brewery Building, resulting in the loss of integrity of materials, design, and workmanship. These would be **potentially significant impacts** on historic resources.

### 4.9.3 What are the long-term impacts common to all action alternatives?

In general, there are no long-term impacts common to all action alternatives. Long-term changes to historic resources as a result of constructed facilities and changes to Capitol Lake would vary by alternative, as described below. As noted above, impacts on archaeological resources would primarily occur during construction activities, but would have permanent, long-term impacts.

### 4.9.4 What are the long-term impacts under the Managed Lake Alternative?

As described in Section 3.9.3, there are no documented Traditional Cultural Properties within the Project Area. Maintaining a lake would not benefit many of the species of importance to local area tribes, including salmon and shellfish (see Section 4.5.7 for more information). The cultural value for tribes of the Managed Lake Alternative would be similar to conditions within the No Action Alternative. Tribal values would continue to be adversely impacted by the continued loss of connection to the natural environment and anthropogenic harm to the balance and functions from natural ecosystems.
The long-term impacts of the Managed Lake Alternative on archaeological resources and historic built environment resources are described below.

4.9.4.1 Archaeological Resources

Recurring maintenance dredging in the North Basin would have impacts similar to those anticipated during initial dredging and other construction activities (as described in Section 5.9, Cultural Resources). If dredging were to intersect, remove, or compact unrecorded, potentially protected resources that may be present within the basin, impacts would be potentially significant. No other ground-disturbing activities would occur during operation.

Similar to the No Action Alternative, continued and increased flooding from extreme river flood elevations could impact archaeological resources under the Managed Lake Alternative. Impacts would be potentially significant.

4.9.4.2 Historic Built Environment Resources

Recurring maintenance dredging in the North Basin would have substantial beneficial effects by maintaining historic views to resources such as the Washington State Capitol Historic District and the Olympia Downtown Historic District. Dredging would not diminish the integrity of the essential physical features for other resources that affect eligibility for listing in a historic register.

Establishing habitat areas in the Middle Basin would have no long-term impacts on historic resources such as the Washington State Capitol Historic District or the South Capitol Neighborhood Historic District, as well as the recommended eligible Des Chutes Basin Project Historic District.

The presence of the new boardwalks and the dock in the Middle and South Basins would not affect the Washington State Capitol Historic District. The boardwalks would diminish the design and feeling of the Middle Basin relative to its original design of standing water as part of the Des Chutes Basin Project; however, a context sensitive design could be considered for the boardwalk to minimize impacts. Doing this would retain the essential features of location, setting, materials, workmanship, and association. Boardwalks in the South Basin would be only partially within the Tumwater Historic District and would not impact the historic district.
The 5th Avenue Dam would be overhauled to significantly extend the serviceable life of the structure (i.e., through electrical system and structural upgrades). The overhaul repairs would not diminish the dam’s essential physical features or their ability to convey their significance.

Establishing the 5th Avenue Pedestrian Bridge along the south side of the 5th Avenue Bridge would reduce visibility of the dam from the North Basin and result in physical impacts on the shoulder elements of Deschutes Parkway where the bridge connects with the adjacent trail. The bridge would not diminish the essential physical features or their ability to convey their significance of the 5th Avenue Dam, 5th Avenue Bridge, or Deschutes Parkway.

With the types of design and other measures identified in Section 4.9.7 for the Managed Lake Alternative, none of these potential impacts (from maintenance dredging, establishing habitat areas, the presence of boardwalks and the dock, and the overhauled 5th Avenue Dam) would permanently diminish the integrity of the essential measures for which the historic resources are listed or are potentially eligible for listing, and are therefore, less than significant.

Similar to the No Action Alternative, the continued and increased flooding from extreme river flood elevations could affect low-lying historic resources under the Managed Lake Alternative. Without mitigation, impacts would be potentially significant.

4.9.5 What are the long-term impacts under the Estuary Alternative?

Impacts related to the establishment of habitat areas, boardwalks, dock, and the 5th Avenue Pedestrian Bridge would be the same as described for the Managed Lake Alternative (less than significant). Other impacts related to stormwater outfall replacements, bridge scour protection, and slope stabilization along Deschutes Parkway would also be less than significant, as described in the Cultural Resources Discipline Report (Attachment 13).

Removal of the dam and conversion back to an estuary environment would have beneficial effects for cultural, heritage, spiritual, and educational value for tribes. Reintroducing tidal hydrology to the Capitol Lake Basin would benefit many of the species of importance to local area tribes, including salmon and shellfish, and potentially other fish and wildlife, as well as plants (see Section 4.5.7 for more information).
The long-term impacts of the Estuary Alternative on archaeological resources and historic built environment resources are described below.

### 4.9.5.1 Archaeological Resources

Recurring maintenance dredging in West Bay could result in impacts on undiscovered, submerged archaeological resources. Although there are no recorded archaeological resources within the potential transload facility that could be established at the Port of Olympia, if upland disposal is needed, it is also possible that unrecorded, potentially protected resources are present. If maintenance dredging resulted in damage to unrecorded, potentially protected submerged archaeological resources, there would be a potentially significant impact.

### 4.9.5.2 Historic Built Environment Resources

Recurring maintenance dredging in West Bay would have no impacts on individually listed, designated, or unevaluated historic resources along the west side of West Bay.

Removal of the 5th Avenue Dam and 5th Avenue Bridge would have potential impacts on listed and recommended eligible resources in the study area. Removing the dam would re-establish pre-Des Chutes Basin Project tidelands and estuary functions associated with historic use patterns of the estuary. Impacts would range from less than significant to significant, depending on the resource. Impacts would be less than significant (or no impact) for the Washington State Capitol Historic District, Olympia Downtown Historic District, South Capitol Neighborhood Historic District, and individually listed, designated, and unevaluated historic resources along the west side of the Project Area. For these resources, this work would permanently return the North Basin to a state similar to what existed prior to the Des Chutes Basin Project. This would diminish the integrity of the view relationship established through the Des Chutes Basin Project between the reflecting pool in the North Basin and these historic resources, but would not diminish the essential physical features of the historic resources such that the resources are no longer able to convey the significance for which they are listed/designated or potentially eligible for listing/designation to a historic register.

Impacts would be potentially significant for the potential Des Chutes Basin Project Historic District, 5th Avenue Dam and 5th Avenue Bridge, and Deschutes Parkway. Removal of the 5th Avenue Dam

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**Historic Register Eligibility**

To determine potential impacts, the EIS analysis considered both listed historic resources and historic resources that the EIS Project Team evaluated and recommends as eligible for listing, as well as currently unlisted and unevaluated resources that may be eligible for listing in the NRHP and other historic registers. Potentially affected resources would be evaluated for eligibility as part of the Section 106 process. During the Section 106 process, the lead federal agency will make a determination of eligibility for the identified resources and forward that determination to DAHP in a letter with a request for concurrence on the determination(s).
would reopen the channel to near a pre-Des Chutes Basin Project state, eliminating the reflecting pool created within the North Basin that is an essential aspect to the design, setting, feeling, and association of the Capitol Lake – Deschutes Estuary. If the Des Chutes Basin Project Historic District is determined eligible for listing, this work would permanently diminish the integrity of the resource's essential physical features such that the resource is no longer able to convey its significance for which it is potentially eligible for listing in a historic register. If the 5th Avenue Dam and 5th Avenue Bridge are determined eligible for historic register listing, their removal would also be a significant impact.

Realignment of Deschutes Parkway at the north end would reroute the parkway to connect to the existing Olympia Way/4th Avenue W roundabout and replace the Olympic Street W Bridge. This work could have potentially significant impacts on Deschutes Parkway and the Olympic Street W Bridge as historic resources, depending on their eligibility. The work would have less than significant impacts on the recommended Des Chutes Basin Project Historic District as the realignment and bridge replacement would not diminish the integrity of the essential physical features that could affect its eligibility for listing.

For further information on potential impacts on historic built environment resources, see Section 5.5.2.2 of the Cultural Resources Discipline Report.

4.9.6 What are the long-term impacts under the Hybrid Alternative?

Under the Hybrid Alternative, long-term impacts would generally be the same as the Estuary Alternative, with differences in impacts related to the following:

- Reflecting pool barrier wall
- Recurring maintenance dredging in the reflecting pool (under a saltwater reflecting pool only)

Impacts related to recurring maintenance dredging in West Bay, the established habitat areas, boardwalks and dock, 5th Avenue Pedestrian Bridge, 5th Avenue Dam and 5th Avenue Bridge removal, the new 5th Avenue Bridge, Deschutes Parkway realignment and Olympic Street W Bridge replacement, and slope stabilization along Deschutes Parkway would be the same as the Estuary Alternative, as
described in Section 4.9.5 (no impact, to less than significant, to significant, depending on the resource).

Under the Hybrid Alternative, reintroducing tidal hydrology to a large portion of Capitol Lake Basin would benefit many of the species of importance to the tribes. Compared to the Estuary Alternative, the Hybrid Alternative would have less of an overall increase in habitat availability and access due to the reflecting pool (see Section 4.5.7 for more information).

4.9.6.1 Archaeological Resources

Under the Hybrid Alternative, operational impacts on archaeological sites would be the same as those described for the Estuary Alternative (see Section 4.9.5). Impacts on protected archaeological resources, if they were to occur, would be potentially significant.

4.9.6.2 Historic Built Environment Resources

For historic resources, the barrier wall for the reflecting pool could mitigate some of the impacts on historic resources related to the 5th Avenue Dam and 5th Avenue Bridge removal, described in Section 4.9.5 for the Estuary Alternative. Construction of a reflecting pool barrier wall in the North Basin that is compatible with the design and materials of the Des Chutes Basin Project and the Wilder & White and Olmsted Brothers design visions for a reflecting pool would retain the visual relationship between the West Capitol Campus and a reflecting pool.

Under the Hybrid Alternative, impacts would be less than significant for the recommended Des Chutes Basin Project Historic District, Washington State Capitol Historic District, Olympia Downtown Historic District, and potential historic resources on the west side of the Project Area. With the types of design and other measures identified in Section 4.9.7, none of the potential impacts would permanently diminish the integrity of the essential measures for which the resources are listed or are potentially eligible for listing in a historic register.

All other impacts would be the same as those described for the Estuary Alternative (Section 4.9.5), including potentially significant impacts should the 5th Ave Dam and 5th Avenue Bridge, Olympic Street W Bridge, and/or Deschutes Parkway be determined eligible for listing.
4.9.7 What mitigation measures would be implemented for the project?

4.9.7.1 Measures Common to All Action Alternatives

The project would comply with Section 106 of the NHPA. Mitigation for impacts on cultural resources, including “adverse effects” on historic properties, would be identified through consultation with the federal lead agency, affected tribes, DAHP, and other consulting parties. Mitigation measures for cultural resource impacts are designed to avoid, minimize, document, and/or interpret the impacted resource(s).

Mitigation measures for archaeological resources would generally be the same as described in Section 5.9.6.1 for construction impacts.

For historic resources, measures are proposed as part of the EIS, and are expected to be consistent with the requirements/recommendations that would come out of the Section 106 consultation process. The following measures would be proposed:

- Request an eligibility determination from DAHP for the Capitol Lake – Deschutes Estuary, 5th Avenue Dam, 5th Avenue Bridge, Olympic Street W Bridge, Residence (Property ID 481556), and the Northern Pacific Railway – Deschutes River Bridge.

- Prepare an Intensive Level inventory form for the Percival Creek Bridge and request an eligibility determination on this form from DAHP.

- Depending on the eligibility determination results, prepare a nomination submittal for the Des Chutes Basin Project Historic District to the City of Olympia Heritage Commission (per City of Olympia Municipal Code, Chapter 18.12 Historic Preservation) and the City of Tumwater Historic Preservation Commission (per City of Tumwater Municipal Code, Chapter TMC 2.62, Historic Preservation), since the historic resource spans both jurisdictions, for designation to the Olympia Heritage Register and the Tumwater Register of Historic Places.

- Obtain a Certificate of Appropriateness from the City of Olympia Heritage Commission (per City of Olympia Municipal Code, Chapter 18.12 Historic Preservation) and the City of Tumwater Historic Preservation Commission (per City of Tumwater Municipal Code, Chapter TMC 2.62, Historic Preservation).
Historic Preservation) for any work that changes, alters, modifies, remodels, removes/demolishes, or significantly impacts historic resources designated to the Olympia Heritage Register and the Tumwater Register of Historic Places.

- Complete a project design review with the Capitol Campus Design Advisory Committee (CCDAC; per RCW 43.34.080).
- Develop an access plan for review by DAHP, the City of Olympia Heritage Commission, and the City of Tumwater Historic Preservation Commission relative to construction haul routes.
- Consult with DAHP, the City of Olympia Historic Preservation Officer, and the City of Tumwater Historic Preservation Officer on any changes in the approved design to determine if design review by DAHP, the Olympia Heritage Commission, and/or the City of Tumwater Historic Preservation Commission is required to ensure project compliance with the Secretary of the Interior’s Standards for the Treatment of Historic Properties, the Secretary of the Interior’s Standards with Guidelines for the Treatment of Cultural Landscapes, and the City of Olympia and City of Tumwater historic preservation ordinances.
- Potentially develop an interpretive plan for the Capitol Lake – Deschutes Estuary in conjunction with the Interpretive Center that could be jointly led by the Olympia Heritage Commission and the Tumwater Historic Preservation Commission and undertaken in coordination with the Squaxin Island Tribe, the Nisqually Tribe, the Washington State Archives, the Washington State Historical Society, the Olympia Historical Society, and other stakeholders. This would support ongoing interpretive work at the Interpretive Center and existing parks and new work along the boardwalks within the South and Middle Basins.

### 4.9.7.2 Managed Lake Alternative

As described above, mitigation for adverse effects would be identified through the Section 106 process. In addition, several mitigation measures that could help to maintain the character-defining features of affected historic properties are included in
Section 5.7.2.1 of the Cultural Resources Discipline Report (Attachment 13). This includes developing a protection plan for Marathon Park, if determined to be eligible, and using compatible design choices to mitigate potential impacts on the character-defining features of other eligible or potentially eligible resources. This also includes designing a 5th Avenue Pedestrian Bridge that is compatible with the essential physical features of the 5th Avenue Bridge and 5th Avenue Dam.

4.9.7.3 Estuary Alternative

As described above, mitigation for adverse effects would be identified through the Section 106 process. In addition, several mitigation measures that could help to maintain the character-defining features of affected historic properties are included in Section 5.7.2.2 of the Cultural Resources Discipline Report (Attachment 13). This includes using compatible design choices to mitigate potential impacts on the character-defining features of eligible or potentially eligible resources.

4.9.7.4 Hybrid Alternative

As described above, mitigation for adverse effects would be identified through the Section 106 process. In addition, several mitigation measures that could help to maintain the character-defining features of affected historic properties are included in Section 5.7.2.3 of the Cultural Resources Discipline Report (Attachment 13). This includes designing the barrier wall for the reflecting pool that is compatible with the design and materials of the Des Chutes Basin Project and the Wilder & White and the Olmsted Brothers design visions.

4.9.8 What are the significant unavoidable adverse impacts to cultural resources?

4.9.8.1 Archaeological Resources

There is no feasible mitigation to completely avoid the potential to impact unrecorded, protected archaeological sites.

4.9.8.2 Historic Built Environment Resources

Managed Lake Alternative

Under the Managed Lake Alternative, there are no significant unavoidable adverse impacts on historic resources.
Estuary and Hybrid Alternatives

The significant unavoidable adverse impacts for the Estuary and Hybrid Alternatives would include the following:

- Loss of the potentially individually eligible 5th Avenue Dam through removal
- Loss of the potentially individually eligible 5th Avenue Bridge through removal
- Replacement of the potentially historic contributing Olympic Street W Bridge
- New 5th Avenue Bridge construction would permanently change the visual character of the space formerly occupied by the 5th Avenue Dam and 5th Avenue Bridge
- Deschutes Parkway realignment to connect with 4th Avenue W would permanently alter a portion of the original road alignment and circulation patterns, thus altering a portion of the essential physical features of the parkway

In addition, the Estuary Alternative would include the following significant unavoidable adverse impact:

- Loss of historic register eligibility for the potential Des Chutes Basin Project Historic District due to loss of the reflecting pool in the North Basin

4.10 VISUAL RESOURCES

This section describes the potential long-term impacts and benefits of the Capitol Lake – Deschutes Estuary Long-Term Management Project on visual resources. The EIS focuses on the most important elements and conclusions of the analysis and, in particular, the differences among the four alternatives. The information presented in this section is summarized from the full analysis in the Visual Resources Discipline Report (Attachment 14).
**Key Findings: Long-Term Visual Resource Impacts**

Additional view access provided by new boardwalks is expected to have substantial beneficial effects for all action alternatives. The Hybrid Alternative would also include a new walkway along the top of the reflecting pool barrier wall, adding nearly a mile (0.8 km) of additional view access.

The Managed Lake Alternative would retain the existing appearance of Capitol Lake more than the other action alternatives, but would include new habitat areas. Compared to the No Action Alternative, the Managed Lake Alternative would have minor beneficial effects related to the aesthetics associated with improved water quality and aquatic plant removal.

The Estuary Alternative would introduce tidal fluctuations in the water levels, a defined river channel, exposed tideflats, new habitat areas, and secondary channels between islands. This would change the appearance of the water body substantially, and also make it dynamic, with the basins filling and emptying twice each day. The landscape would remain unified and harmonious with the natural setting of the existing surroundings resulting in less than significant impacts.

Under the Hybrid Alternative visual impacts of the barrier wall would be severe. Although mitigation for the appearance of the wall could be provided, its sheer scale would result in a significant unavoidable impact.

Because the lake is already affected by aquatic algae and aquatic plant populations, the impacts on visual quality from continued and worsening vegetative growth impacts under the No Action Alternative would be less than significant.

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**4.10.1 What methods were used to assess long-term impacts to visual resources?**

To determine the potential long-term impacts of the action alternatives, key viewpoints (KVPs) were selected where the alternatives would be expected to have the highest potential for people to observe changes in visual character because of the project. The KVPs are in public places—parks, public rights-of-way, or the Capitol Campus. The locations were selected because they represent the following:

- Views experienced by a large number of viewers.
- Locations where the changes caused by the project alternatives would be highly visible.
- Locations that will also help the viewer understand the typical changes that would occur elsewhere in the Project Area as a result of the project alternatives.

The analysis next evaluated how the alternatives would affect the Landscape Similarity Zones within each basin. As described in Section 3.10.2, Landscape Similarity Zones are areas that have similar views and types of viewers within the basins. The visual quality of each Landscape Similarity Zone in each basin is described in terms of

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**What is considered a significant impact to visual resources?**

For this analysis, visual resource impacts were considered significant if the visual effects would be severe, would be incompatible with the unity of the landscape setting, and would affect a large number of viewers from a public place.
visual “unity.” Unity refers to the degree to which the landscape is composed of elements that are compatible with the dominant character of the landscape.

Visual effects resulting from the project alternatives were identified in terms of spatial dominance, scale and contrast, and compatibility. As described in Section 3.10, Visual Resources, these are key factors in evaluating visual impacts. A visual element may change substantially as a result of the project but remain compatible with its surroundings. Additional details on the significance criteria are presented in the Discipline Report.

This section includes visual simulation images that are examples of what the alternatives could look like from the selected KVPs. See Table 5.1 of the Visual Resources Discipline Report (Attachment 14) for additional viewpoints and summaries of expected changes by alternative.

4.10.2 What are the long-term impacts under the No Action Alternative?

Under the No Action Alternative, there would be a gradual expansion of vegetated wetlands in areas of the lake as sediment accumulates, primarily occurring in the southeast portion of the North Basin. Any additional shoreline vegetation in the North Basin would likely be similar in character to existing vegetation and would not dominate views in any Landscape Similarity Zone, and would have minimal impact on visual character.

Increased storm intensity due to climate change is expected to exacerbate flooding in the study area under the No Action Alternative. Flooding would primarily affect people’s access to trails, which provide visual access, and would cause temporary changes to the visual environment. These visual effects would be temporary and would have negligible impacts on visual resources.

There would likely be continued and worsening impacts to aesthetic values of the Capitol Lake Basin given the continued increase in algae and aquatic plant populations over time. The lake is already affected by floating algae and aquatic plant growth, and some people have expressed that this is aesthetically undesirable. The change under the No Action Alternative would be a minor increase over time; therefore, the visual impacts would be minor to moderate, depending on the degree of change that would occur. As a result, impacts on visual quality would be less than significant.
4.10.3 What are the long-term impacts common to all action alternatives?

Each action alternative would bring unique visual landscapes. There are no conditions common to all alternatives.

4.10.4 What are the long-term impacts under the Managed Lake Alternative?

Views in the North Basin would remain very similar to those under the No Action Alternative. The 775-foot-long (236-meter-long) 5th Avenue Pedestrian Bridge would be a new structure along the north shoreline and there would be minor changes to vegetation within the basin. Although the 5th Avenue Pedestrian Bridge would be a new structure along a shoreline that is dominated by open paths, trees, and other vegetation, it would be relatively low in scale and backed by the dam and the 5th Avenue and 4th Avenue Bridges. These changes would be minor in both scale and contrast and would be compatible with the landscape setting. The bridge can be seen in the photo simulation in Figure 4.10.1.

Views in the Middle Basin would change substantially, with some loss of views of open water where taller riparian vegetation would be introduced with the new habitat areas. As shown in the photo simulation in Figure 4.10.2, the habitat areas, while being relatively large in scale and dominance, do not contrast with the surrounding shorelines, which are vegetated with similar species. These changes are considered compatible and harmonious with the setting. The South Basin would change least of all, with the only change being the addition of boardwalks that would improve access to views. As a result, adverse impacts of the Managed Lake Alternative on visual quality would be less than significant.

Reductions in algae and aquatic plant growth from improved water quality and aquatic plant removal in the lake would be a minor beneficial effect. New boardwalks would improve access to views within the habitat areas and would be a substantial beneficial effect.
Figure 4.10.1 North Overlook Visual Simulation (KVP NB-2) — Managed Lake Alternative
Figure 4.10.2 Interpretive Center Visual Simulation (KVP MB-1) — Managed Lake Alternative
4.10.5 What are the long-term impacts under the Estuary Alternative?

The Estuary Alternative would affect visual resources primarily by replacing the lake with an estuary subject to daily tidal action.

Some viewers prefer the view of open water to that of an estuary that dynamically changes with the tides; and the reverse is true for other viewers. This analysis does not attempt to determine which of these groups of viewers is larger. Open water provides a more uniform surface than an intertidal area that is only partially filled with water. A uniform surface means more uniform light reflectance, including both the color of the sky and of shoreline features. When the wind is low, the mirror effect of open water can enhance views, such as those of the Capitol Dome. An intertidal area is preferred by other viewers because it changes. The cycles of the tide produce varied visual effects, at times exposing the channels that lie beneath the water and at other times filling those channels like a lake. For most of the day, the estuary would be partially submerged. When not submerged, tideflats would be exposed in the intertidal areas. Intertidal areas also accumulate marine debris that is deposited at low tide and then may or may not be removed by the next tide.

Policies support the preservation and enhancement of shoreline views, especially of natural shorelines, but do not express a preference for one or the other of these types of shoreline views. Therefore, this analysis does not place a higher value on one or the other of these shoreline types, but rather, considers the dominance, scale and contrast, and compatibility of the Estuary Alternative.

Views in the North Basin would change substantially from those under the No Action Alternative, due to the conversion of the basin to an estuary with a twice daily tidal exchange. See Figures 4.10.3, 4.10.4, and 4.10.5 for visual simulations of future conditions from the Eastern Washington Butte at various tides. See Figures 4.10.6 through 4.10.8 for similar visual simulations from the North Overlook at various tides. As with the Managed Lake Alternative, a 775-foot-long (236-meter-long) pedestrian bridge would also be constructed under this alternative as well as at the creation of habitat areas (as indicated in Figures 4.10.6 through 4.10.8). The most notable change in the North Basin would be the tidal fluctuations, with high tides filling the basin near to its current depth as a lake, and low tides leaving intertidal tideflats exposed. The scale of this change is large.
enough to be dominant, and it would be noticeably different from existing conditions at lower tide levels. While the basin would be visually different, the estuary would not contrast visually with its surroundings. Despite the scale of these changes, the landscape would remain natural in character and be visually compatible, unified, and harmonious with its setting among parks and a scenic drive.

**Tidal Conditions under the Estuary and Hybrid Alternatives**

Tidal conditions in the Capitol Lake Basin, under the Estuary and Hybrid Alternatives, would be similar to Budd Inlet. To determine the amount of time that the North Basin would be filled with water, an inundation curve was developed. The inundation curve represents a statistical analysis of predicted tides in Budd Inlet. The point at which the inundation curve and the average elevation in the North Basin meet is the amount of time that the North Basin would be inundated, or covered by water. (In this case, inundation does not mean flooding.) This inundation curve shows that the North Basin would have water in it (at varying depths) approximately 80% of the time. The amount of time that any other elevation would be inundated is the nexus, or point, at which the inundation curve and that elevation meet on this graph.

This cross section shows the average range of water elevations that would occur in the North Basin under the Estuary Alternative. Deschutes Parkway is off to the left and a proposed habitat area is shown between Deschutes Parkway and the main channel of the Deschutes River, which would flow through the middle of the North Basin. Secondary channels that would form across the tidal flats are also shown.
Views in the Middle Basin would also change substantially, with the introduction of tidal fluctuation and habitat areas. See Figures 4.10.9, 4.10.10, and 4.10.11 for visual simulations from the Interpretive Center at various tides. Due to the introduction of saltwater, the plant species that would occupy the new habitat areas would not include the taller trees that could grow on the habitat areas in the Managed Lake Alternative. The lower vegetation is not expected to block views of the basin from Deschutes Parkway. As with the Managed Lake Alternative, boardwalks would improve access to views within the habitat areas.

In the South Basin, tidal fluctuation would result in changes in vegetation due to the mixing of saltwater with freshwater. Because of its location at the upper end of the estuary, the South Basin would appear as a river environment most of the time and would only fill to water levels that create open water during daily high tides. The addition of boardwalks to the South Basin would also improve access to views.

In all three basins, the view would continue to be one of a unified and naturalistic waterbody and shoreline that is compatible with its surroundings. The natural landscape would remain visually unified and harmonious with its setting among parks and a scenic drive. Therefore, the impacts of the Estuary Alternative on visual quality would be less than significant.

New boardwalks would improve access to views within the habitat areas and would be a **substantial beneficial effect.**
Figure 4.10.3 Eastern Washington Butte at High Tide Visual Simulation (KVP NB-1) — Estuary Alternative
Figure 4.10.4 Eastern Washington Butte at Mean Tide Visual Simulation (KVP NB-1) — Estuary Alternative
Figure 4.10.5 Eastern Washington Butte at Low Tide Visual Simulation (KVP NB-1) – Estuary Alternative
Figure 4.10.6 North Overlook at High Tide Visual Simulation (KVP NB-2) – Estuary Alternative
Figure 4.10.7 North Overlook at Mean Tide Visual Simulation (KVP NB-2) – Estuary Alternative
Figure 4.10.8 North Overlook at Low Tide Visual Simulation (KVP NB-2) — Estuary Alternative
Figure 4.10.9 Interpretive Center at High Tide Visual Simulation (KVP MB-1) — Estuary Alternative
Figure 4.10.10 Interpretive Center at Mean Tide Visual Simulation (KVP MB-1) — Estuary Alternative
Figure 4.10.11 Interpretive Center at Low Tide Visual Simulation (KVP MB-1) — Estuary Alternative
4.10.6 What are the long-term impacts under the Hybrid Alternative?

The Hybrid Alternative would impact visual resources by replacing most of the lake with an estuary, and by adding a 2,600-foot-long (790-meter-long) barrier wall to retain a reflecting pool in the eastern portion of the North Basin. Other visual elements of the Hybrid Alternative would be the same as described in Section 4.10.4 for the Estuary Alternative.

Views in the North Basin would change substantially from those under the No Action Alternative, due to the addition of the barrier wall and tidal fluctuation in water levels that would expose tideflats. The barrier wall in the middle of the North Basin, bisecting two different water features, would be a large scale, visually dominant feature that would contrast with its surroundings, particularly as viewed from the west side. It would not be harmonious with or contribute to a unified landscape, particularly as viewed from Deschutes Parkway and Marathon Park. See Figures 4.10.12 and 4.10.13 for visual simulations of future conditions from Marathon Park at high tide and low tide.

When viewed from the North Overlook, the North Basin would appear similar to existing conditions (see Figure 4.10.14), since most of what would be visible is the reflecting pool. The barrier wall would be a conspicuous element but subordinate. The wall would be somewhat more prominent at low tides than at high tides, as shown on Figure 4.10.15.

Views within the Middle and South Basins would be affected in the same manner as described in Section 4.10.5 for the Estuary Alternative.

New boardwalks and the trail atop the barrier wall would improve access to views, and would be a substantial beneficial effect.

The adverse impacts on views in the North Basin, described above, could be reduced with mitigation described in Section 4.10.6.4, but would remain significant due to the presence of the barrier wall, which would not be harmonious with or contribute to a unified landscape.
Figure 4.10.12 Marathon Park at High Tide (KVP NB-3) — Hybrid Alternative
Figure 4.10.13 Marathon Park at Low Tide Visual Simulation (KVP NB-3) – Hybrid Alternative
Figure 4.10.14 North Overlook at High Tide Visual Simulation (KVP NB-2) — Hybrid Alternative
Figure 4.10.15 North Overlook at Low Tide Visual Simulation (KVP NB-2) – Hybrid Alternative
4.10.7 What mitigation measures would be implemented for the project?

4.10.7.1 Measures Common to All Alternatives

A number of project design features that minimize visual impacts have been incorporated into the project, including the following:

- Native plants to vegetate new habitat areas and disturbed areas would be used and would be compatible with existing native vegetation.
- New pedestrian walkways and boardwalks would enhance viewer access to the Capitol Lake – Deschutes Estuary.
- Design of park modifications/improvements could be developed with input from user groups, like the Community Sounding Board, to ensure design compatibility and maximize user enjoyment of views.
- Design of habitat areas and shoreline plantings could include the establishment of view corridors where the height of trees is limited so that they would remain open for long vistas.
- Lighting on the walkways could be placed as low as possible and directed onto the walkway surface only, to minimize the contrast that a lighted structure would have with the surrounding water.

4.10.7.2 Managed Lake Alternative

- Habitat areas in the Middle Basin could be designed with view corridors where tall tree species would not be planted, to permit more open views from key locations, such as along Deschutes Parkway.
- Maintenance dredging could be scheduled to minimize impacts on views from Marathon Park during the summer season.

4.10.7.3 Estuary Alternative

- A view corridor could be established from the realigned section of Deschutes Parkway and 4th Avenue W to maximize motorists’ views toward the water.
4.10.7.4 Hybrid Alternative

- The barrier wall could have a textured concrete surface to improve the appearance of the structure, especially from the estuary side of the wall where more of the wall would be exposed during low tides.

- The barrier wall design could be adjusted to better integrate with the long-term plans for the Eastern Washington Butte. It could meet the shore farther from the butte to reduce visual and spatial conflicts, or the height of the butte could be increased to take advantage of the higher elevation of the walkway approaches needed to connect to the barrier wall walkway.

- Guardrails on the barrier wall walkway could be designed to be as transparent as possible, to reduce the apparent height of the wall.

- Maintenance dredging within the reflecting pool could be scheduled in winter to avoid impacts on views from adjacent parks during the summer season.

4.10.8 What are the significant unavoidable adverse impacts to visual resources?

There would be significant unavoidable impacts under the Hybrid Alternative because of the scale and contrast imposed by the reflecting pool barrier wall. Even with design treatments, such as a mostly transparent guardrail and textured concrete surface treatment, this alternative would significantly disrupt the visual unity of the North Basin.

4.11 ENVIRONMENTAL HEALTH

This section describes the potential long-term impacts and benefits of the Capitol Lake – Deschutes Estuary Long-Term Management Project on environmental health in the study area. The EIS focuses on the most important elements and conclusions of the analysis and, in particular, the differences among the four alternatives. The sediment quality information is summarized from the full analysis in the Sediment Quality Discipline Report (Attachment 15).

The primary focus of the environmental health analysis was on sediment quality because the EIS focuses on the most important elements and conclusions of the discipline-specific analyses. The
analysis concluded that the sediment quality of Capitol Lake is generally good with the exception that high sulfides are present in surface and dredge layer sediments. As described in Section 3.0, Existing Conditions and Affected Environment, sulfides may be toxic to benthic organisms but do not pose a health risk to humans during recreational activities. Therefore, the long-term impacts associated with the alternatives are focused on impacts to sediment quality and effects on benthic organisms, not risks to humans. This section focuses on the potential operational impacts from the project, as well as the necessary context to interpret the conclusions.

This section also presents other environmental health considerations that were considered in the analysis. Section 4.11.10 summarizes potential changes in mosquito presence and toxic algae that could occur in the Project Area, and potential increased environmental health hazards from tideflats.

### Key Findings: Long-Term Sediment Quality Impacts

Under the No Action Alternative, there would be no construction- or operation-related impacts. There would be no changes to sediment quality. It is expected that the sediment inputs to the Capitol Lake Basin would remain as they are now, so the risk of reduced sediment quality is expected to be less than significant. Benthic organisms would continue to be affected by high sulfide concentrations.

For all action alternatives, the primary long-term sediment quality impact would result from recurring maintenance dredging to maintain target depths. The risk of sediment quality degradation from maintenance dredging is considered low because dredged sediment quality in both the lake basins and West Bay is expected to be similar to the high-quality conditions currently present in Capitol Lake surface sediments. Therefore, maintenance dredging for all action alternatives would have no adverse impacts on sediment quality because operations are not anticipated to substantially affect sediment quality within or outside the project area.

For the Estuary and Hybrid Alternatives, the export of sediment into West Bay would result in a decrease in sediment chemical and organic carbon concentrations in West Bay. This would provide natural recovery to most impacted areas within West Bay. Therefore, minor to substantial beneficial effects on sediment quality are expected in West Bay depending on the location, deposition rates, and chemical parameter.

**Substantial beneficial effects** on sediment quality would be expected for both the Estuary and Hybrid Alternatives, particularly where moderate to high deposition rates would cover existing high concentrations of sediment contamination for dioxins/furans and carcinogenic PAHs in areas of West Bay.
4.11.1 How does sediment quality change under the project alternatives?

The analysis examined the following sediment quality impacts: sediment transport, deposition of suspended sediment, and maintenance dredging.

4.11.2 What methods were used to assess long-term impacts to environmental health?

Long-term adverse impacts and beneficial effects associated with sediment quality for each of the four project alternatives were evaluated using a combination of current conditions, predicted rates and patterns of sediment transport, and future projections of environmental factors.

The long-term impacts of each alternative were assessed based on the potential of project alternatives to result in changes in sediment quality within or outside the Project Area from erosion/deposition or removal of sediment into or out of the Project Area. Impacts were considered less than significant if predicted increases in chemical concentrations would not increase the frequency of sediment cleanup criteria exceedance in the water body. Impacts were considered significant if there would be a substantial increased risk, relative to existing conditions, of exceeding sediment cleanup criteria.

4.11.3 What are the long-term impacts under the No Action Alternative?

Under the No Action Alternative, the lake would remain closed to the public for recreational use, there would be no changes to sediment quality, and sediment quality would remain consistent with current conditions. As described in Section 3.0, Existing Conditions and Affected Environment, data indicate that, overall, Capitol Lake has high quality (good) sediment, meeting nearly all applicable sediment criteria; therefore, there are no potential environmental health impacts to humans.

It is expected that the sediment inputs to the Capitol Lake Basin would remain consistent with existing conditions, so a change in sediment quality is expected to be unlikely, and impacts would be less than significant. There are no reasonably foreseeable future conditions that are expected to affect the sediment quality of Capitol Lake.
4.11.4 What are the long-term impacts common to all action alternatives?

With all action alternatives, long-term impacts are associated with recurring maintenance dredging to maintain target depths in the North Basin or West Bay. The risk of sediment quality degradation from maintenance dredging is considered low because the quality of dredged sediment in both the lake basins and West Bay is expected to be similar to the high-quality conditions currently present in Capitol Lake surface sediments (i.e., the dredged sediments in West Bay would consist of high quality sediment deposited there from the Deschutes River or lake basin—which is an improvement from current conditions in West Bay). Long-term maintenance dredging of a portion of West Bay would be performed for the Estuary and Hybrid Alternatives only and would consist of removing those sediments transported to West Bay from the Deschutes River and lake basins. Chemical concentrations in those dredged sediments are expected to be similar to the existing lake sediments, which are characterized as generally good. In addition, dredging BMPs would be implemented to reduce off-site transport of sediments.

As a result, maintenance dredging for all action alternatives would have no adverse impacts on sediment quality because operations are not anticipated to substantially affect sediment quality within or outside the Project Area.

For all alternatives, sediment from maintenance dredging would be transported for reuse in the Capitol Lake Basin or disposal outside of the Project Area. For the Estuary and Hybrid Alternatives, the ability to dispose of dredged sediments in-water is partially related to the quality of the sediment. It is expected that the sediment would be chemically suitable for in-water disposal based on the known quality of sediment that is representative of the sediment that would be dredged during maintenance dredging. For the Managed Lake Alternative, in-water disposal is not feasible and sediment must be disposed upland due to the presence of invasive species.

4.11.5 What are the long-term impacts under the Managed Lake Alternative?

As described in Section 4.11.4, the primary long-term sediment quality impact for the Managed Lake Alternative would result from maintenance dredging. Long-term impacts of the Managed Lake Alternative on sediment quality would be associated with long-term
maintenance dredging in the North Basin that would occur once in the 30-year time horizon of the project—20 years after construction completion—to maintain target depths. Maintenance dredging would have no adverse impacts on sediment quality because those operations are not anticipated to substantially affect sediment quality within or outside the Project Area, as described below.

High quality sediment is present throughout the lake within and below the planned dredge layer areas, except for elevated sulfides in the dredge layer, as described in Section 3.11.1. During long-term maintenance dredging, only minor amounts of sediments would be suspended, and those sediments would settle within the lake upon completion of dredging. The settled sediment would be of the same high quality as other sediment present in the lake.

The sediment removed during dredging would be placed on a barge and allowed to settle to remove water prior to transport to an upland reuse or disposal site. Water returned to the lake would contain very little suspended sediment because BMPs would be employed to reduce turbidity and ensure water quality permit compliance for the return water discharge. Sediment quality in the lake would not be changed. In addition, settling of minor amounts of suspended sediment in the return water discharge would not change sediment quality in the lake bed because it would be the same as that in the dredged sediments.

4.11.6 What are the long-term impacts under the Estuary Alternative?

The primary long-term change in sediment quality from the Estuary Alternative would be the deposition of Deschutes River sediment in West Bay. Additionally, as described in Section 4.11.4, sediment quality under the Estuary Alternative would also be affected by recurring maintenance dredging.

Under the Estuary Alternative, sediments in the Deschutes River and lake basin would be naturally transported into West Bay after removal of the 5th Avenue Dam. Table 4.11.1 presents average annual sediment deposition rates in areas of Budd Inlet for the Estuary and Hybrid Alternatives.
Table 4.11.1 Average Annual Sediment Deposition in Budd Inlet for Modeling without Relative Sea Level Rise (inches per year (cm per year))

<table>
<thead>
<tr>
<th>Location</th>
<th>No Action</th>
<th>Managed Lake</th>
<th>Estuary</th>
<th>Hybrid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olympia Yacht Club</td>
<td>1.7 (4.3)</td>
<td>1.7 (4.3)</td>
<td>6.2 (15.7)</td>
<td>7.3 (19.4)</td>
</tr>
<tr>
<td>Martin and Fiddlehead Marinas</td>
<td>0.83 (2.1)</td>
<td>0.83 (2.1)</td>
<td>3.2 (8.2)</td>
<td>3.9 (9.9)</td>
</tr>
<tr>
<td>Port of Olympia Terminal &amp; Turning Basin</td>
<td>0.87 (2.2)</td>
<td>0.83 (2.1)</td>
<td>3.1 (7.8)</td>
<td>3.6 (9.1)</td>
</tr>
<tr>
<td>FNC (excluding Turning Basin)</td>
<td>0.04 (0.1)</td>
<td>0.04 (0.1)</td>
<td>0.12 (0.3)</td>
<td>0.12 (0.3)</td>
</tr>
<tr>
<td>Rest of Budd Inlet</td>
<td>0.04 (0.1)</td>
<td>0.08 (0.2)</td>
<td>0.16 (0.4)</td>
<td>0.2 (0.5)</td>
</tr>
</tbody>
</table>

Sediment deposition throughout West Bay under the Estuary Alternative would increase up to three times compared to existing conditions.

As shown on Figure 4.11.1, most of West Bay is expected to receive 0.16 inches (0.4 centimeters) of sediment deposition each year, with greater accumulation (up to 6.2 inches each year [16 centimeters each year]) occurring at Olympia Yacht Club in the southeast portion of West Bay. Minimal sediment deposition (less than 0.1 inches each year [0.3 centimeters each year]) would occur along the western shoreline and north West Bay, with minimal to no sediment deposition in East Bay. As shown in Figure 4.11.1, deposition is anticipated to occur in areas where sediment contamination is currently present, although this sediment contamination is expected to be addressed through a separate regulatory process before long-term operation of the selected alternative. The approach or extent of the sediment cleanup is not known (and is not part of this project) but may include some combination of sediment removal and natural recovery where clean sediments, like those that would be deposited from the Deschutes River, slowly cover areas of known contamination.
Figure 4.11.1 Modeled Future Sediment Deposition & Existing Surface Contamination in Budd Inlet

Legend
- Federal Navigation Channel
- High TOC (>3.5%)
- High cPAHs (>100 μg/kg)
- High dioxins (>20 ng/kg)

Sediment Deposition Modeled for EIS
- High (>10 cm/yr)
- Moderate (1-10 cm/yr)
- Low (0-1 cm/yr)
As described in Section 3.11.1, sediment quality is better in the Capitol Lake Basin (sediment accumulated in the basin originated from the Deschutes River) than in West Bay, and it is expected that downstream deposition of sediment in the Estuary Alternative would improve sediment quality in West Bay. This sediment would decrease existing surface sediment concentrations for some contaminants (i.e., dioxins/furans and cPAHs) and organic carbon compared to existing conditions, or that may remain after a separate cleanup process. The change in chemical concentration is explained in more detail in the Sediment Quality Discipline Report (Attachment 15). Within 1 year, the top 4 inches (10 centimeters) of sediment in most of West Bay would consist of clean sediment deposited from the Deschutes River and restored estuary.

A decrease in existing sediment chemical and organic carbon concentrations would provide natural recovery to most impacted areas within West Bay. Therefore, the export of sediment into West Bay would have **minor to substantial beneficial effects** on sediment quality in West Bay depending on the location, deposition rates, and chemical parameter. **Substantial beneficial effects** on sediment quality would be expected, particularly where moderate to high deposition rates could cover high concentrations of sediment contamination in areas of West Bay, such as the Port of Olympia Peninsula Investigation area.

If sediment cleanup occurs in West Bay prior to this project being implemented, sediment quality would improve compared to existing conditions and would thereby reduce the beneficial effects of clean sediment deposition from implementation of the Estuary Alternative. Ecology has identified the locations around West Bay that will require future cleanups based on existing conditions. These sediment cleanups are being investigated only for the east portion of West Bay in the Port of Olympia Marine Terminal and Navigational Channel Turning Basin. In this scenario, the expected benefit under the Estuary Alternative would no longer be substantial compared to existing conditions, but continued deposition of clean sediment would not adversely impact sediment quality in areas where sediment had been remediated.

As presented in the *Hydrodynamics and Sediment Transport Discipline Report (Attachment 5)*, sediments would predominately erode from the estuary toward West Bay. Numerical modeling of hydrodynamics and sediment transport does show that a small amount of sediment may move upstream during incoming (flood) tides. However, the

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**Contaminants of Concern in West Bay**

Dioxins/furans and carcinogenic PAHs are chemicals that are widespread in urban environments and accumulate in the tissues of humans and wildlife. Dioxins/furans tend to be associated with historical industrial operations including wood treatment facilities and hog fuel burners. They are also formed naturally by forest fires and volcanoes. Carcinogenic PAHs are primarily formed during burning of fossil fuels, wood, or other organic substances. One of the most common sources for carcinogenic PAHs in the environment is exhaust from vehicles.
sediment that is moved upstream during those tides would be the surface layer sediment that had been transported downstream from the Deschutes River. Numerical modeling shows that there would not be an upstream movement of sediments from Budd Inlet that would significantly change sediment quality in the Capitol Lake Basin following dam removal. Therefore, no adverse impacts on sediment quality would be expected from minor amounts of West Bay sediments deposited in the restored estuary during flood tides.

Maintenance dredging of West Bay would have no adverse impacts on sediment quality because those operations are not anticipated to substantially affect sediment quality within or outside the study area. The risk of sediment quality degradation from maintenance dredging is considered low because dredged sediment quality in West Bay is expected to be similar to the high quality currently present in Capitol Lake surface sediments since dredged sediments would be the accumulated sediment that originated from the Deschutes River or lake basin. In addition, dredging BMPs would be implemented to reduce off-site transport of sediments (from turbidity) during dredging.

For the Estuary Alternative, all sediments dredged during maintenance dredging would be transported and disposed of outside of the Project Area under long-term management. Sediment disposal options could include either open-water disposal in Puget Sound or unrestricted upland reuse based on the anticipated high sediment quality of the removed materials expected from the lake sediment characterization. Based on the expected high sediment quality of the dredged sediment, it is likely that all sediments dredged during maintenance dredging could be disposed in-water, so long as the material was also free of invasive species.

4.11.7 What are the long-term impacts under the Hybrid Alternative?

As with the Estuary Alternative, the primary long-term change in sediment quality from the Hybrid Alternative would be the deposition of Deschutes River sediment in West Bay. Additionally, as described in Section 4.11.4, sediment quality under the Hybrid Alternative would also be affected by recurring maintenance dredging.

For the Hybrid Alternative, in addition to maintenance dredging of West Bay, there would also be recurring maintenance dredging in the reflecting pool every 15 years to maintain recreational depths, if the
reflecting pool was saltwater-fed. Maintenance dredging is not assumed for a freshwater reflecting pool.

Maintenance dredging of West Bay and the reflecting pool would have **no adverse impacts** on sediment quality because those operations are not anticipated to substantially affect sediment quality within or outside the study area, as described above in Section 4.11.6.

As described above for the Estuary Alternative (Section 4.11.6), lake sediment would be transported into West Bay after removal of the 5th Avenue Dam. As shown in Table 4.11.1, downstream deposition of both river sediment and sediment from the restored estuary is expected to occur at rates up to 7.3 inches each year (19 centimeters each year). As described for the Estuary Alternative, sediment quality is better in the lake (sediment accumulated in the basin originated from the Deschutes River) than in Budd Inlet, and it is expected that downstream deposition of both river sediment and eroded estuary sediment would improve sediment quality where it deposits in West Bay.

Similar to the Estuary Alternative, a decrease in surface sediment concentrations of dioxins/furans and cPAHs in West Bay would be expected based on sediment deposition from the estuary. This decrease in concentrations would provide natural recovery to areas within West Bay. Therefore, the export of sediment into West Bay would have **minor to substantial beneficial effects** on sediment quality in West Bay depending on the location, deposition rates, and chemical parameter. **Substantial beneficial effects** on sediment quality would be expected particularly where high deposition rates would cover high concentrations of contaminants and organic carbon concentrations, as described for the Estuary Alternative and shown in Figure 4.11.1. The decrease in chemical concentrations would occur within 1 year for most of West Bay.

### 4.11.8 What mitigation measures would be implemented for the project?

Enterprise Services would avoid and minimize potential impacts by complying with regulations, permits, plans, and authorizations. These anticipated measures, and other mitigation measures that could be recommended or required, are described below.
4.11.8.1 Measures Common to All Alternatives

In accordance with the environmental permits that would be obtained prior to maintenance dredging, BMPs for turbidity management and spill prevention would be implemented during construction and operational dredging activities to minimize and avoid impacts. The BMPs are nondiscretionary actions that are needed to maintain water quality standards throughout the work. They often include the following measures.

- Hydraulic dredging
- Closed dredge bucket
- Limiting barge overflow
- Slowing dredge rate
- Seasonal/migratory windows
- Tidal dredging
- Silt curtain

A water quality monitoring and protection plan (WQMPP) would also be prepared, approved by the regulatory agencies, and implemented throughout construction. This plan is intended to measure the performance of the BMPs implemented to maintain water quality standards, identify potential violations, and outline contingency measures that would be implemented if water quality standards were violated. The plan would include turbidity monitoring, inspection of spill control equipment, and actions required by the certification. Therefore, no specific sediment quality mitigation plans would be necessary for the project.

4.11.8.2 Managed Lake Alternative

No additional mitigation would be needed to address long-term sediment quality impacts of the Managed Lake Alternative.

4.11.8.3 Estuary Alternative

No additional mitigation would be needed to address long-term sediment quality impacts of the Estuary Lake Alternative.

4.11.8.4 Hybrid Alternative

No additional mitigation would be needed to address long-term sediment quality impacts of the Hybrid Alternative.
4.11.9 What are the significant unavoidable adverse impacts to sediment quality and environmental health?

There would be no significant unavoidable adverse impacts related to sediment quality or environmental health under any of the action alternatives.

4.11.9.1 What other environmental health considerations were evaluated for potential changes under long-term management?

The analysis also examined potential changes in mosquitoes and toxic algae in the Project Area, and potential increased environmental health hazards from tideflats.

4.11.9.2 Long-Term Impacts: No Action Alternative

Under the No Action Alternative, potential breeding habitat for mosquitoes would continue to include any stagnant freshwater present within Capitol Lake. The potential for freshwater mosquito habitat could increase under the No Action Alternative as continued sediment accumulation would result in shallower wetland conditions around the perimeter of the lake basins. This could promote stagnant freshwater conditions needed for breeding. Any changes in the availability of habitat conducive to mosquito breeding is expected to result in little to no change in exposure to mosquito or vector populations, or the spread of mosquito- or vector-borne illnesses within the study area, resulting in a less than significant impact.

Under the No Action Alternative, water quality in the Capitol Lake Basin would become increasingly similar to that found in the Deschutes River, resulting in fewer algae found throughout the basin. Therefore, algal blooms are not expected to result in impacts to human or environmental health (see Water Quality Discipline Report [Attachment 7]). As discussed in the Land Use, Shorelines, and Recreation Discipline Report (Attachment 12), recreational activities have not taken place on the lake since 2009. The continued absence of recreation on the lake under the No Action Alternative would reduce human exposure if toxic algae were to develop in the basin. As a result, no impacts are anticipated.
4.11.9.3 Long-Term Impacts: Managed Lake Alternative

In the Middle and South Basins, the Managed Lake Alternative would include conditions similar to those that would occur under the No Action Alternative, and may include additional areas around established habitat areas that could be conducive to mosquito habitat. However, the open-water conditions that would be maintained in the North Basin through initial and maintenance dredging would be less likely to support stagnant conditions that support mosquito breeding. Mosquito breeding opportunities in urban areas are ubiquitous. Any changes in the availability of habitat conducive to mosquito breeding from the Managed Lake Alternative is expected to result in little to no change in exposure to mosquito or vector populations, or the spread of mosquito- or vector-borne illnesses within the study area, resulting in a less than significant impact.

With the implementation of the adaptive management plan it is unlikely that toxic algae would develop and create water quality problems that threaten human health and safety. As a result, no impacts associated with toxic algal blooms are anticipated.

4.11.9.4 Long-Term Impacts: Estuary Alternative

The Estuary Alternative would convert substantial portions of the North and Middle Basins to tideflats, which would be submerged during high tides and exposed during low tides. The South Basin would only have a limited area of exposed tideflat at low tide. Tideflats can pose a hazard when people venture on to them, as there is the risk of becoming stuck and unable to return to shore. Signs cautioning the public of the dangers of traveling out on tideflats are currently found at several recreation areas in the South Sound. In 2017, the Olympia Fire Department Deputy Fire Chief reported to KOMO News that people get stuck in tideflats several times a year, requiring rescue. To address this potential hazard, signs would be posted at recreation areas around the basin warning the public of the dangers of tideflats if the Estuary Alternative is selected and implemented. With signs posted at recreation areas around the basin, this hazard would be reduced and potential impacts would be less than significant.

The mosquito species found in Thurston County with higher salinity tolerance, such as Ochlerotatus dorsalis, could establish breeding sites within higher salinity areas of the North and Middle Basins. Less saline conditions in the South Basin could result in the continued
presence of mosquito populations that require primarily freshwater conditions. Mosquito breeding opportunities in urban areas are ubiquitous. Any changes from the estuary alternative in the availability of habitat conducive to mosquito breeding is expected to result in little to no change in exposure to mosquito or vector populations, or the spread of mosquito- or vector-borne illnesses within the study area, resulting in a less than significant impact.

WDOH has issued a permanent shellfish harvest closure in inner Budd Inlet (including West Bay) due to the location of the Budd Inlet Treatment Plant outfall. There is also a permanent swimming advisory in areas of West Bay because of public safety risks associated with the treatment plant outfall, stormwater outfalls, and marinas. In previous years, WDOH has closed outer Budd Inlet to shellfish harvesting due to diarrhetic shellfish poison and domoic acid, as reported by Thurston County in 2015 and King 5 News in 2019. Under the Estuary Alternative, the presence of diarrhetic shellfish poison and domoic acid may spread to the North and Middle Basins as these areas become an extension of West Bay. The most common route of human exposure to these toxins is through consumption of contaminated shellfish. While the reintroduction of boating in the Capitol Lake – Deschutes Estuary would bring more people in contact with water that occasionally experiences toxic algal blooms, direct exposure would be limited due to extension of shellfish closures. As a result, impacts are anticipated to be less than significant.

4.11.9.5 Long-Term Impacts: Hybrid Alternative

Under the Hybrid Alternative, less of the North Basin would be converted to intertidal tideflats, compared to the Estuary Alternative, given inclusion of the reflecting pool. Potential hazards associated with exposed tideflats would be the same as described for the Estuary Alternative.

Potential environmental health hazards associated with toxic algal blooms would be the same as described for the Estuary Alternative. However, if a freshwater reflecting pool were implemented instead of a saltwater reflecting pool, the potential for toxic algal blooms would increase.
4.12 TRANSPORTATION

This section describes the potential long-term impacts and benefits of the Capitol Lake – Deschutes Estuary Long-Term Management Project on surface transportation elements in the Project Area. The EIS focuses on the most important elements and conclusions of the analysis and, in particular, the differences among the four alternatives. The information presented in this section is summarized from the full analysis in the Transportation Discipline Report (Attachment 16).
Key Findings: Long-Term Transportation Impacts

For all action alternatives, the primary long-term transportation impact would result from hauling dredged material associated with recurring maintenance dredging, with a frequency ranging from about 5 to 20 years depending on the alternative (with truck transport occurring for up to 6 or 7 months during the dredging cycles). If all dredged materials were transported by truck or rail, or a combination of both, it is likely that traffic operations at some intersections would degrade to LOS F during some times of the day. In this case, the impact on traffic operations is expected to be significant. For the Managed Lake Alternative, this is considered a significant unavoidable impact. For the Estuary and Hybrid Alternatives, this is also considered a significant but potentially avoidable impact if the dredged material is transported from the site by barge. In this latter disposal scenario, impacts on surface transportation could be eliminated or reduced to less than significant levels.

For all action alternatives, provision of a new 5th Avenue Pedestrian Bridge would support and improve pedestrian and bicycle travel and is considered a substantial transportation benefit. Under the Estuary and Hybrid Alternatives, replacement of the 5th Avenue Bridge (vehicular) is considered to provide a substantial transportation benefit because it would extend the design life of a major element of the City of Olympia’s transportation network and reduce overall maintenance needs related to the bridge.

For all action alternatives, any vehicle trips generated by recreational amenities provided by the project, or ongoing maintenance activities, would have a negligible effect on traffic operations or parking and are considered less than significant.

4.12.1 What methods were used to assess long-term impacts to transportation?

To determine the potential long-term impacts of the project alternatives on transportation, the characteristics of the transportation facilities within the study area were first identified. Potential disruptions of the vehicular, transit, pedestrian, or bicycle network after project completion (long-term) were determined by reviewing the overlap of each alternative footprint with the streets, pedestrian and bicycle facilities, transit routes, and rail facilities within the transportation study area. The effect of traffic and parking demand generated by each of the action alternatives was also evaluated.

As described in detail in the Transportation Discipline Report (Attachment 16), different criteria for determining significant impacts were established for vehicle operations, parking, transit, railroad operations, and pedestrian/bicycle use. The same criteria were considered both for construction (Section 5.12, Transportation) and for the recurring maintenance dredging that would occur under long-term operation. Details on the specific criteria are presented in the Discipline Report.

What is considered a significant transportation impact?

In general, significant impacts would occur if construction and maintenance dredging activities increased average vehicle delay, reduced parking supply, relocated a transit stop, disrupted rail operations, or removed a pedestrian/bicycle connection in a way that would either violate local regulatory standards or would substantially disrupt these activities.
4.12.2 What are the long-term impacts under the No Action Alternative?

Under the No Action Alternative, the 5th Avenue Dam and 5th Avenue Bridge would be retained in their current configuration with limited repair and maintenance activities. In the last 30 years, the repair and maintenance activities have been limited to emergency or high-priority actions.

The No Action Alternative would not include new facilities considered to be beneficial to the transportation network, such as a new 5th Avenue Pedestrian Bridge, replacement of the 5th Avenue Bridge, or boardwalks, but it would maintain the existing transportation network. Potential long-term impacts would be related to limited ongoing maintenance of the 5th Avenue Dam. These activities could infrequently generate a small number of vehicle trips that are expected to primarily occur during off-peak times of the day and would be consistent with the types of maintenance trips that currently occur. Vehicle trips associated with ongoing maintenance would have a negligible effect on traffic operations and are considered less than significant.

4.12.3 What are the long-term impacts common to all action alternatives?

With all action alternatives, the transportation system would be fully restored after construction, and no adverse long-term impacts on the multimodal transportation network would result. Provision of a new 5th Avenue Pedestrian Bridge would support many policies established by the City of Olympia that seek to support and improve pedestrian and bicycle travel throughout the city and is considered a substantial transportation benefit. Likewise, the presence of the new boardwalks in the South and Middle Basins would enhance the pedestrian environment, supporting the City of Olympia’s policies encouraging nonmotorized travel, and is considered a moderate transportation benefit.

Parking demand would continue to be supported by the existing parking supply at Marathon Park and on Deschutes Parkway. Any trips generated by new recreational amenities (e.g., the rebuilt dock and hand-carried boat launch) and ongoing maintenance activities would have a negligible effect on traffic operations or parking and are considered less than significant.
The primary long-term transportation impact for each of the three action alternatives would result from recurring maintenance dredging, ranging from about a 5- to 20-year frequency depending on the alternative, with truck transport occurring for up to 6 or 7 months during the dredging cycles. The quantity and duration of dredging activity would also vary among the three alternatives. For all three action alternatives, if all dredged material were transported by truck, rail, or a combination of both, it is likely that traffic operations at some intersections would degrade to LOS F during some times of the day. The close proximity of the Olympia & Belmore Railroad, Inc. railroad offers opportunity for the dredged material to be hauled away from the site by rail, either instead of or in combination with hauling by truck. The feasibility of using rail would depend on a number of factors to be determined by the project contractor prior to construction. These factors include whether or not destinations of hauled materials are adequately served by rail. One train load of dredged material is estimated to remove 72 truck trips from the street system. However, to haul dredged material entirely by rail would require an average of 4 to 5 train trips per weekday over the entire dredging period, which may be more than could be supported with the available rail infrastructure. Additionally, this level of train volume would also degrade vehicle traffic operations at the at-grade rail crossings. Therefore, it is expected that the effect of maintenance dredging on traffic operations would be significant with use of rail, or a combination of truck and rail, unless mitigated.

No long-term transportation mitigation measures would be needed for any of the alternatives, except to address traffic impacts resulting from recurring maintenance dredging. Prior to maintenance dredging, Enterprise Services will develop a Construction Traffic Management Plan (CTMP) that describes the mode of transport selected to move dredged material. For additional details on the CTMP, see Section 5.12.6.

4.12.4 What are the long-term impacts under the Managed Lake Alternative?

The Managed Lake Alternative would retain the 5th Avenue Dam and Bridge in their current configuration, consistent with existing conditions. However, the 5th Avenue Bridge would be overhauled to significantly extend the serviceable life of the structure (i.e., through electrical system and structural upgrades).

As described above under Long-term Impacts Common to All Action Alternatives, the primary long-term transportation impact for the
Managed Lake Alternative would result from recurring maintenance dredging, at an estimated 20-year frequency (see Table 4.12.1). If all dredged material were transported by truck, rail, or a combination of both, it is likely that traffic operations at some intersections would degrade to LOS F during some times of the day. Based on the volume of dredged material and the feasible transportation modes to export the material (see Table 4.12.1), this is a **significant unavoidable impact** on traffic operations.

**Table 4.12.1 Export Dredge Volume & Truck Trips Generated by Maintenance Dredging for the Managed Lake Alternative**

<table>
<thead>
<tr>
<th>Transportation-Related Elements of Maintenance Dredging</th>
<th>Maintenance Dredging Every 20 Years Assumed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Export Volume</td>
<td>472,000 cubic yards (361,000 cubic meters)</td>
</tr>
<tr>
<td>Estimated Total Truck Loads</td>
<td>29,500 truck loads</td>
</tr>
<tr>
<td>Estimated Duration of Activity</td>
<td>18 months</td>
</tr>
<tr>
<td>Estimated Average Truck Trips each week</td>
<td>800 trips</td>
</tr>
<tr>
<td>Estimated Average Truck Trips each day</td>
<td>160 trips</td>
</tr>
<tr>
<td>Estimated Average Truck Trips each hour</td>
<td>20 trips</td>
</tr>
<tr>
<td>Feasibility of Hauling by Rail</td>
<td>Feasible</td>
</tr>
<tr>
<td>Feasibility of Hauling by Barge</td>
<td>Not Feasible</td>
</tr>
</tbody>
</table>

Long-term impacts on transportation associated with the Managed Lake Alternative are listed and summarized in Table 4.12.2.

**Table 4.12.2 Summary of Long-Term Impacts: Managed Lake Alternative**

<table>
<thead>
<tr>
<th>Transportation-Related Elements of the Managed Lake Alternative</th>
<th>Impact Finding</th>
<th>Measures to Reduce or Mitigate Significant Impacts</th>
<th>Significant &amp; Unavoidable Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Pedestrian Bridge</td>
<td><strong>Substantial transportation benefit</strong></td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>New Boardwalks</td>
<td><strong>Moderate transportation benefit</strong></td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Traffic Generated by New Recreational Elements</td>
<td><strong>Less than significant impact</strong></td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>Traffic Generated by Ongoing Minor Maintenance</td>
<td><strong>Less than significant impact</strong></td>
<td>None</td>
<td>No</td>
</tr>
</tbody>
</table>
4.12.5 What are the long-term impacts under the Estuary Alternative?

Under the Estuary Alternative, the existing 5th Avenue Bridge would be removed and a new bridge would be built with the same configuration as the existing bridge (whereas the No Action and Managed Lake Alternatives would retain the existing bridge). Replacement of the bridge would provide a substantial transportation benefit because it would extend the design life of a major element of the City of Olympia’s transportation network and reduce the overall maintenance needs related to the bridge.

As described above in Section 4.12.3, the primary long-term transportation impact for the Estuary Alternative would result from recurring maintenance dredging, with an estimated 6-year frequency for this alternative. The quantity and duration of dredging activity would vary between the dredge events; depending on the dredge cycle, the number of truck trips needed could be either higher or lower than those of the Managed Lake Alternative. However, if all dredged material were transported by truck, rail, or a combination of both, it is likely that traffic operations at some intersections would degrade to LOS F during some times of the day. In this case, the impact on traffic operations is expected to be significant. Export dredge volume and the associated estimated truck trips generated by maintenance dredging for the Estuary Alternative are summarized in Table 4.12.3.

Table 4.12.3 Export Dredge Volume & Truck Trips Generated by Maintenance Dredging for the Estuary Alternative

<table>
<thead>
<tr>
<th>Transportation-Related Elements of the Managed Lake Alternative</th>
<th>Impact Finding</th>
<th>Measures to Reduce or Mitigate Significant Impacts</th>
<th>Significant &amp; Unavoidable Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truck/Rail Trips Generated by Maintenance Dredging</td>
<td>Significant impact (estimated 20-year frequency)</td>
<td>Implement a CTMP; see Section 5.12.6.</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maintenance Dredging Year 6, 18, 30</th>
<th>Maintenance Dredging Year 12</th>
<th>Maintenance Dredging Year 24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Export Volume</td>
<td>21,600 cubic yards (16,500 cubic meters)</td>
<td>285,000 cubic yards (218,000 cubic meters)</td>
</tr>
<tr>
<td>Estimated Duration of Activity</td>
<td>2 months</td>
<td>9 to 12 months</td>
</tr>
</tbody>
</table>

Table 4.12.3 Export Dredge Volume & Truck Trips Generated by Maintenance Dredging for the Estuary Alternative
Transportation-Related Elements of the Managed Lake Alternative

<table>
<thead>
<tr>
<th>Estimation</th>
<th>Maintenance Dredging Year 6, 18, 30</th>
<th>Maintenance Dredging Year 12</th>
<th>Maintenance Dredging Year 24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Total Truck Loads</td>
<td>1,350 truck loads</td>
<td>17,820 truck loads</td>
<td>21,910 truck loads</td>
</tr>
<tr>
<td>Estimated Average Truck Trips each week</td>
<td>550 trips</td>
<td>550 to 2,000 trips</td>
<td>550 to 3,350 trips</td>
</tr>
<tr>
<td>Estimated Average Truck Trips each day</td>
<td>110 trips</td>
<td>110 to 400 trips</td>
<td>110 to 670 trips</td>
</tr>
<tr>
<td>Estimated Average Truck Trips each hour</td>
<td>14 trips</td>
<td>14 to 50 trips</td>
<td>14 to 84 trips</td>
</tr>
<tr>
<td>Feasibility of Hauling by Rail</td>
<td>Feasible</td>
<td>Feasible</td>
<td>Feasible</td>
</tr>
<tr>
<td>Feasibility of Hauling by Barge</td>
<td>Feasible</td>
<td>Feasible</td>
<td>Feasible</td>
</tr>
</tbody>
</table>

With the Estuary Alternative, the location of maintenance dredging in West Bay offers the opportunity for the dredged material to be transported from the site by barge to an in-water disposal location, either entirely or in combination with some upland disposal, which would occur by truck and/or rail. Disposal at an in-water location would occur if the dredged material was determined suitable following sampling for chemical quality and invasive species; this disposal approach is expected to generate one to three barge trips from the site each day.

Impacts on surface transportation would be significant, but could be eliminated or reduced to less than significant levels if some or all dredged material is transported by barge. Therefore, for the Estuary Alternative, this impact would only be significant and unavoidable if open-water disposal (i.e., transport by barge) is found to be infeasible when the dredging is needed.

No additional mitigation beyond implementation of a CTMP during maintenance dredging would be needed to address long-term transportation impacts of the Estuary Alternative.

Long-term impacts on transportation associated with the Estuary Alternative are listed and summarized in Table 4.12.4.
Table 4.12.4 Summary of Long-Term Impacts: Estuary Alternative

<table>
<thead>
<tr>
<th>Transportation-Related Elements of the Estuary Alternative</th>
<th>Impact Finding</th>
<th>Measures to Reduce or Mitigate Significant Impacts</th>
<th>Significant Unavoidable Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>New 5th Avenue Bridge</td>
<td>Substantial transportation benefit</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>New 5th Avenue Pedestrian Bridge</td>
<td>Substantial transportation benefit</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>New Boardwalks</td>
<td>Moderate transportation benefit</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>Traffic Generated by New Recreational Elements</td>
<td>Less than significant impact</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>Traffic Generated by Ongoing Minor Maintenance</td>
<td>Less than significant impact</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>Truck/Rail Trips Generated by Maintenance Dredging Activity</td>
<td>Significant (estimated 6-year frequency)</td>
<td>Implementation of a CTMP. Use of barges to haul dredged material, if suitable.</td>
<td>No, if use of barge (for open-water disposal) is feasible. Yes, if use of barge (and in-water disposal) is not feasible.</td>
</tr>
</tbody>
</table>

4.12.6 What are the long-term impacts under the Hybrid Alternative?

As with the Estuary Alternative, replacement of the 5th Avenue Bridge would provide a substantial transportation benefit because it would extend the design life of a major element of the City of Olympia’s transportation network and reduce overall maintenance needs related to the bridge.

As described in Section 4.12.3, the primary long-term transportation impact for the Hybrid Alternative would result from recurring maintenance dredging in West Bay, at an estimated 5-year frequency for this alternative. The quantity and duration of dredging activity would vary between the dredge events. If all dredged material were transported by truck, rail, or a combination of both, it is likely that traffic operations at some intersections would degrade to LOS F during some times of the day. In this case, the impact on traffic operations is expected to be significant. Export dredge volume and
the associated estimated truck trips generated by maintenance
dredging for the Hybrid Alternative are summarized in Table 4.12.5.

Table 4.12.5 Export Dredge Volume & Truck Trips Generated by Maintenance Dredging for the
Hybrid Alternative

<table>
<thead>
<tr>
<th>Transportation-Related Elements of the Estuary Alternative</th>
<th>Maintenance Dredging Year 5, 15, 25</th>
<th>Maintenance Dredging Year 10, 30</th>
<th>Maintenance Dredging Year 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Export Volume</td>
<td>21,600 cubic yards (16,500 cubic meters)</td>
<td>285,000 cubic yards (218,000 cubic meters)</td>
<td>350,400 cubic yards (267,900 cubic meters)</td>
</tr>
<tr>
<td>Estimated Duration of Activity</td>
<td>2 months</td>
<td>9 to 12 months</td>
<td>9 to 14 months</td>
</tr>
<tr>
<td>Estimated Total Truck Loads</td>
<td>1,350 truck loads</td>
<td>17,820 truck loads</td>
<td>21,910 truck loads</td>
</tr>
<tr>
<td>Estimated Average Truck Trips each week</td>
<td>550 trips</td>
<td>550 to 2,000 trips</td>
<td>550 to 3,350 trips</td>
</tr>
<tr>
<td>Estimated Average Truck Trips each day</td>
<td>110 trips</td>
<td>110 to 400 trips</td>
<td>110 to 670 trips</td>
</tr>
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</tr>
<tr>
<td>Feasibility of Hauling by Rail</td>
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<td>Feasible</td>
<td>Feasible</td>
</tr>
<tr>
<td>Feasibility of Hauling by Barge</td>
<td>Feasible</td>
<td>Feasible</td>
<td>Feasible</td>
</tr>
</tbody>
</table>

As with the Estuary Alternative, the location of maintenance
dredging in West Bay offers an opportunity for the dredged material
to be transported from the site by barge to an in-water disposal
location, either instead of or in combination with hauling by truck
and/or rail. Impacts on surface transportation could be eliminated or
reduced to less than significant levels if some or all dredged material
is transported by barge. Therefore, for the Hybrid Alternative, this
impact would only be significant and unavoidable if use of barge
transport is found to be infeasible when the dredging is needed.

No additional mitigation beyond implementation of a CTMP during
maintenance dredging would be needed to address long-term
transportation impacts of the Hybrid Alternative.

Long-term impacts on transportation associated with the Hybrid
Alternative are listed and summarized in Table 4.12.6.
Table 4.12.6 Summary of Long-Term Impacts: Hybrid Alternative

<table>
<thead>
<tr>
<th>Transportation-related Elements of the Hybrid Alternative</th>
<th>Impact Finding</th>
<th>Measures to Reduce or Mitigate Significant Impacts</th>
<th>Significant Unavoidable Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>New 5th Avenue Bridge</td>
<td>Substantial transportation benefit</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>New 5th Avenue Pedestrian Bridge</td>
<td>Substantial transportation benefit</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>New Boardwalks</td>
<td>Moderate transportation benefit</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>Traffic Generated by New Recreational Elements</td>
<td>Less than significant impact</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>Traffic Generated by Ongoing Minor Maintenance</td>
<td>Less than significant impact</td>
<td>None</td>
<td>No</td>
</tr>
<tr>
<td>Truck/Rail Trips Generated by Maintenance Dredging Activity</td>
<td>Significant (estimated 5-year frequency)</td>
<td>Implementation of a CTMP. Use of barge to haul dredged material, if suitable.</td>
<td>No, if use of barge (for open-water disposal) is feasible Yes, if use of barge (and in-water disposal) is not feasible</td>
</tr>
</tbody>
</table>

4.12.7 What mitigation measures would be implemented for the project?

4.12.7.1 Measures Common to All Alternatives

No long-term transportation mitigation measures would be needed for any of the alternatives, except to address traffic impacts resulting from recurring maintenance dredging. The following measure would reduce traffic impacts during maintenance dredging, if dredged material were transported by truck or rail:

- CTMP for Maintenance Dredging. Prior to maintenance dredging, Enterprise Services would develop a CTMP that describes the mode of transport selected to move dredged material. For additional details on the CTMP, see Section 5.12.6.

4.12.7.2 Managed Lake Alternative

No additional mitigation would be needed to address long-term transportation impacts of the Managed Lake Alternative.
4.12.7.3 Estuary Alternative

No additional mitigation would be needed to address long-term transportation impacts of the Estuary Alternative. If the dredged material is determined suitable for open-water disposal, barges would be used to transport material from the site and impacts on surface transportation would be minimized or avoided.

4.12.7.4 Hybrid Alternative

As under the Estuary Alternative, no additional mitigation would be needed to address long-term transportation impacts of the Hybrid Alternative. If the dredged material is determined suitable for open-water disposal, barges would be used to transport material from the site and impacts on surface transportation would be minimized or avoided.

4.12.8 What are the significant unavoidable adverse impacts to transportation?

During the periods of future maintenance dredging for the three action alternatives, hauling dredged material by truck, rail, or a combination of truck and rail could result in congested operations during some periods of peak traffic demand, resulting in a significant traffic impact. Because barges would not be an option for the Managed Lake Alternative, this would be a significant unavoidable impact. For the Estuary or Hybrid Alternatives, this impact could be avoided through the use of barges to haul dredged material, so this impact would only be significant and unavoidable if open-water disposal (and use of barges) were found to be infeasible.

4.13 PUBLIC SERVICES & UTILITIES

This section describes the potential long-term impacts and benefits of the Capitol Lake – Deschutes Estuary Long-Term Management Project on public services and utilities in the Project Area. The EIS focuses on the most important elements and conclusions of the analysis and, in particular, the differences among the four alternatives. The information presented in this section is summarized from the full analysis in the Public Services and Utilities Discipline Report (Attachment 17).
Key Findings: Long-Term Impacts on Public Services and Utilities

In general, long-term, operational impacts on public services from the project would be less than significant. Under all of the action alternatives, any increases in demand for emergency response services because of visitation from the new recreational opportunities (e.g., the boardwalk, nonmotorized boating) would be minor. Impacts on utility infrastructure from saltwater exposure under the Estuary and Hybrid Alternatives would be significant but could be addressed through mitigation measures. Under the No Action and Managed Lake Alternatives, impacts on utility infrastructure from extreme river flooding would be significant but could also be addressed through mitigation measures. The reestablished estuarine conditions under the Estuary and Hybrid Alternatives would reduce the extent of overland flooding from river floods, a minor beneficial effect.

Under the No Action and Managed Lake Alternatives, impacts would be significant if Ecology requires LOTT and other dischargers to implement more stringent actions for stormwater and wastewater discharges to improve water quality and meet regulatory standards in the basin.

4.13.1 What methods were used to assess long-term impacts to public services and utilities?

The analysis of operational impacts considered the potential for project activities to result in long-term or permanent service disruptions. Impacts on response times of emergency services and other public services in the long term were also considered. The analysis also addressed how project alternatives could change how climate change and RSLR affect public services and utilities in the study area. RSLR projections were incorporated into the hydrodynamic numerical modeling as part of future conditions (see Section 4.1, Hydrodynamics & Sediment Transport).

The analysis also considered the potential for beneficial effects, primarily related to the potential for an alternative to result in decreased risk of flooding to utilities.

4.13.2 What are the long-term impacts under the No Action Alternative?

4.13.2.1 Public Services

The No Action Alternative would not result in any operational impacts on public services. This alternative would not create additional recreation facilities or uses in the study area and would not
attract additional visitors to the study area. As a result, it would not increase the demand for police services or other emergency responses, and there would be no impacts.

**4.13.2.2 Utilities**

Ongoing maintenance of the 5th Avenue Dam would not require any utility replacements or relocations. There would be no impacts on existing underground or overhead utilities as no relocations would be required.

As described in Section 3.3, Water Quality, Ecology has identified Capitol Lake and the 5th Avenue Dam as the primary cause of human-induced depletion of dissolved oxygen in Budd Inlet due to altered circulation caused by the 5th Avenue Dam, but more so due to loading of nutrients (carbon) from Capitol Lake. Other anthropogenic sources of nutrients in Budd Inlet identified by Ecology include WWTPs that discharge directly to Budd Inlet (such as LOTT), WWTPs that discharge in Puget Sound north of Budd Inlet, and other non-point pollution sources. As Ecology develops and implements its TMDL for the Deschutes River/Capitol Lake/Budd Inlet, it may modify allocations for major dischargers, which could result in more stringent permit requirements for LOTT and other dischargers. The issue of discharge allocations is complicated, and there is some uncertainty as to how Ecology would assign allocations in the future. If LOTT and other dischargers were required to implement additional measures as a result of Capitol Lake not meeting its future waste load allocations, the most stringent targets would be expected under the No Action Alternative because substantive improvements in water quality could not be expected in the absence of any long-term water quality management plan. This could result in LOTT and other dischargers being required to increase treatment effectiveness, beyond the current high levels of treatment. Increased nutrient removal and/or diversion of treated water would increase the costs for treatment of wastewater and stormwater discharges, which would be passed on to ratepayers, which would be a significant impact.

Overland flooding can either damage utilities or create service interruptions. Under the No Action Alternative (as well as all action alternatives), numerical modeling show that extreme river flooding in the Capitol Lake Basin would not only continue but increase, placing utility infrastructure at risk. Although this flooding would occur in low-lying areas along the entire perimeter of the Capitol Lake Basin, most of the utilities that could be affected are on the eastern shore of

**What is considered a significant impact related to utilities and public services?**

**Impacts on utilities are considered significant if the project has the potential to damage existing utilities, interrupt utility service, or modify access to existing utilities creating permanent or long-term interruptions to services.**

**Impacts on public services are considered significant if the project would create a demand for public services that substantially exceeds the capacity of public service agencies.**

**TMDL**

A TMDL is the maximum amount of a pollutant allowed to enter a waterbody in order for the waterbody to continue to meet water quality standards for that pollutant. A TMDL for a pollutant in a waterbody can be used to allocate load reductions among pollutant sources, such as contaminated sediment migration, stormwater, or transportation activities.

Exhibit 4.84 Flooding at Capitol Lake in December 2019
the North Basin, in the vicinity of Heritage Park and Powerhouse Road SW. Similarly, floodwaters in downtown Olympia can overflow stormwater infrastructure, discharging untreated wastewater directly to Budd Inlet. The City of Olympia, LOTT, and Port of Olympia have outlined measures that would be implemented at different RSLR projections as part of the City of Olympia Sea Level Rise Response Plan. However, overland flooding from Capitol Lake Basin for the extreme river flood event under the No Action Alternative would result in water surface elevations in the downtown area that exceed the flood protection elevations set in the Olympia Sea Level Response Plan. As a result, there could be significant impacts on stormwater and other utilities that could be affected during extreme river flood events under the No Action Alternative.

### 4.13.3 What are the long-term impacts common to all action alternatives?

Under all action alternatives, additional visitors could be attracted to the area as a result of enhanced recreational facilities and opportunities. Any increase in the demand for emergency response services as a result of increased use would be relatively minor, and impacts would be less than significant.

All action alternatives would include recurring maintenance dredging. Recurring maintenance dredging could require the use of temporary power, such as on-site generators or use of existing electricity. Decontamination stations would also require the extension of buried electric lines and water lines to the station locations, but would require only minor amounts of electricity and water to operate. None of these activities would damage utilities or create service interruptions. As a result, no impacts on utilities are anticipated.

The action alternatives are generally compatible with and do not conflict with any of the proposed design measures included in the Olympia Sea Level Rise Response Plan. Those measures could be implemented as part of any alternative.

Other potential long-term impacts on public services and utilities would vary by alternative, as described below.

### 4.13.4 What are the long-term impacts under the Managed Lake Alternative?

Like the No Action Alternative, the Managed Lake Alternative would retain the Capitol Lake Basin in its current configuration, although
the Managed Lake Alternative would include some additional management actions. If Ecology requires LOTT and stormwater dischargers to implement additional measures to improve water quality (e.g., nutrient loading) in the basin, the most stringent targets would be expected under the Managed Lake Alternative, and this would be a **significant impact** (similar to the No Action Alternative, described above).

As also described for the No Action Alternative, overland flooding of low-lying areas around the Capitol Lake Basin could damage utilities or interrupt service, especially in the vicinity of Heritage Park and Powerhouse Road SW. Based on results of the numerical model, maximum flood levels during extreme floods would be the highest under the Managed Lake Alternative, compared to all alternatives. This is most likely due to a net reduction in flood storage capacity for the Managed Lake Alternative due to the creation of habitat areas in the Middle Basin, despite the North Basin dredging.

As with the No Action Alternative, the predicted maximum water levels under the Managed Lake Alternative exceed the flood protection elevations set in the Olympia Sea Level Rise Response Plan. Therefore, flooding from extreme river flood events is also not mitigated by the current Olympia Sea Level Rise Response Plan under the Managed Lake Alternative. Impacts would be potentially **significant** on stormwater and other utilities that could be physically or operationally affected during extreme river flood events. This could potentially be mitigated with changes to the flood protection design including in the Olympia Sea Level Rise Response Plan.

**4.13.5 What are the long-term impacts under the Estuary Alternative?**

Under the Estuary Alternative, long-term impacts on public services and utilities would mostly be associated with restoring tidal hydrology to the Capitol Lake Basin, which would introduce saltwater into locations where existing utility infrastructure is vulnerable to saline conditions. Corrosion of metal utility lines is a risk when these objects are exposed to saltwater. Potentially vulnerable utilities include suspended utilities on the Olympia & Belmore Railroad, Inc., railroad crossing and buried ductile iron utility lines present in the area, including under Marathon Park. If exposed to groundwater with low levels of salinity, the life expectancy of the lines could be reduced. Corrugated metal (steel) pipe outfalls located within the Capitol Lake Basin would also likely deteriorate quickly in saltwater. Design measures are included to replace those existing metal
outfalls. Other low-lying utility lines would remain vulnerable. Given the potential for damage, impacts are considered significant. With mitigation measures to monitor utility lines for corrosion and replace the lines if corrosion starts to become considerable, impacts from saltwater exposure could be reduced to less than significant levels.

Under reestablished tidal conditions with the Estuary Alternative, Ecology may assign less stringent discharge reduction requirements for LOTT and stormwater dischargers compared to the No Action and Managed Lake Alternatives. As a result, no impacts are anticipated under the Estuary Alternative related to future waste load allocations associated with Capitol Lake.

Unlike the No Action and Managed Lake Alternatives, overland flooding under the Estuary Alternative is driven by extreme tide conditions (with RSLR) and not extreme river flooding. Under the Estuary Alternative, water levels within the Capitol Lake Basin would no longer be controlled by the 5th Avenue Dam and would rise and fall with the tides. Maximum water levels for the Estuary Alternative would be slightly (≤1 foot [≤0.3 meters]) lower than those of the No Action and Managed Lake Alternatives. Under the Estuary Alternative, the modeled flood elevations predicted in the Heritage Park area would be mitigated by the improvements planned under the Olympia’s Sea Level Rise Response Plan. Compared to the No Action Alternative, the reduced extent of overland flooding under the Estuary Alternative would have a minor beneficial effect on utilities.

4.13.6 What are the long-term impacts under the Hybrid Alternative?

For the Hybrid Alternative, the long-term impacts on public services and utilities would be similar to those described above for the Estuary Alternative. This includes potentially significant impacts on utility lines from saltwater exposure related to the restoration of tidal hydrology in the basin. With implementation of mitigation measures, impacts would be less than significant.

Unlike the maximum water levels modeled for the Estuary Alternative, which are addressed by measures included in the Olympia Sea Level Rise Response Plan, the potential for flooding in the Heritage Park and Powerhouse Road SW area under the Hybrid Alternative would be addressed by the protective presence of the barrier wall for the hybrid reflecting pool. Compared to the No Action Alternative, the reduced extent of overland flooding under the Hybrid Alternative would be a minor beneficial effect on utilities.
Ecology has not modeled water quality conditions under the Hybrid Alternative, so there is uncertainty about how this alternative would change waste load allocations. It is possible that the Hybrid Alternative could result in more stringent discharge reduction requirements for LOTT and stormwater dischargers than the Estuary Alternative. However, requirements for LOTT and stormwater dischargers would likely be less stringent than would occur under the No Action and Managed Lake Alternatives.

4.13.7 What avoidance, minimization, and mitigation measures would be implemented for the project?

Project design features have been incorporated into the Estuary and Hybrid Alternatives to minimize long-term impacts on public services and utilities, such as replacing outfalls and other infrastructure vulnerable to saltwater exposure. Additional measures to address adverse impacts are listed below, by alternative.

4.13.7.1 Managed Lake Alternative

- In coordination with the Olympia Sea Level Rise Response Plan, include design parameters for the flood protection design of the Heritage Park berm to account for extreme river flooding.

4.13.7.2 Estuary and Hybrid Alternatives

- During design, complete an evaluation of utilities within low-lying areas potentially vulnerable to flooding under future conditions with RSLR, and coordinate with public and private utility owners in developing a protection or replacement schedule.
- During design, complete an evaluation of utilities potentially vulnerable to seawater corrosion under future conditions, and coordinate with public and private utility owners in developing a monitoring, protection, or replacement schedule.

4.13.8 What are the significant unavoidable adverse impacts to public services and utilities?

For the Managed Lake Alternative, if Ecology requires LOTT and stormwater dischargers to implement additional measures to
improve water quality in the basin, this would be a **significant unavoidable impact**.

With the mitigation measures identified above, there would be no significant unavoidable adverse impacts on public services or utilities under either the Estuary or Hybrid Alternative.

### 4.14 ECONOMICS

This section describes the potential long-term impacts and benefits of the Capitol Lake – Deschutes Estuary Long-Term Management Project on economic value and economic activity in the study area for the project, as well as potential benefits. The EIS focuses on the most important elements and conclusions of the analysis and, in particular, the differences among the four alternatives. For more detailed information on the full analysis, refer to the Economics Discipline Report (provided as Attachment 18).

#### 4.14.1 What methods were used to analyze long-term economic impacts?

As described in Section 3.14, Economics, SEPA does not require economic analysis of a proposed action, and its rules and statutes do not provide specific guidance for what methods to use to analyze economic effects in an EIS. For this project, potential long-term economic impacts were assessed based on the potential for the action alternatives to result in changes in economic activity or economic value in the region. This assessment evaluated the long-term economic impacts (and potential beneficial effects) related to the four primary categories or topics: downstream economic activity, downtown development, demand for and value of recreation, and demand for and value of ecosystem services.

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**What criteria for long-term economic impacts were considered?**

For the other environmental elements, the EIS discipline reports present clearly defined criteria to assess the significance of potential adverse impacts (e.g., significant vs. less than significant). As SEPA does not provide guidance for how to conduct economic analyses (or require them for an EIS), this Economics section instead uses potential impact indicators to identify how the action alternatives would produce impacts. Impacts are qualitatively described as minor adverse impacts, adverse impacts, or substantial adverse impacts. Beneficial effects are also identified. The section is organized to reflect this approach.
Key Findings: Long-Term Impacts on Economic Value and Activity

**Downstream Economic Activity and Downtown Development:** The long-term impacts on economic activity and changes in economic value would be similar in type among the action alternatives.

Maintenance dredging would increase spending in the study area, and navigability would be maintained for marina and Port of Olympia activities.

The Managed Lake Alternative would cost the most, and thus generate the greatest amount of spending-related employment and income.

Effects on development in downtown Olympia would be beneficial, as long as the action alternatives are implemented in a way that is both attractive and accessible. Overall, other economic factors have more influence on market conditions for development.

**Demand for and Value of Recreation and Ecosystem Services:** The Estuary and Hybrid Alternatives may result in Ecology assigning less stringent discharge reduction requirements for LOTT and stormwater dischargers, likely resulting in reduced or avoided regulatory compliance costs compared to the No Action and Managed Lake Alternatives. The enhancements to trails, habitat areas, and restored water-based recreation would increase the value of recreation in the basin across all action alternatives. For ecosystem services, the action alternatives would improve habitats, visual aesthetics, and cultural, heritage, spiritual, and educational values, with the benefits—especially to tribes and people who value natural ecosystems—more pronounced for the Estuary and Hybrid Alternatives. Under the Managed Lake and No Action Alternatives, tribal values would be adversely impacted by the continued loss of connection to the natural environment and anthropogenic harm to the balance and functions from natural ecosystems. In some cases, changes in the environmental setting represent trade-offs in how an impact or effect is perceived. For example, the aesthetic impacts would vary based on individual preferences. In such cases, the distribution of benefits and costs would differ across different populations and groups of people and could be considered either a beneficial effect or an adverse impact.

Project benefits would not be realized under the No Action Alternative, which would be characterized by increased flood risk, increased costs for addressing water quality issues, lack of water access for recreation, and ongoing equity and social justice issues.

The assessment of long-term impacts related to these four topics required different methods, each considering the geographic extent, data sources, and analytical approach for assessing impacts. The analysis of changes in economic values and economic activity was based primarily on available data sources. Where possible, and when data were available, the analysis provided quantitative results. Where quantitative data were unavailable, the direction, magnitude, timing, and duration of the impacts were identified and described qualitatively. The assessment of economic impacts is also an exercise in identifying the trade-offs associated with the alternatives being considered, and describing both the potential beneficial effects and adverse impacts.

To calculate the economic contribution of the alternatives, the analysis used the 2018 version of IMPLAN, an input-output model that calculates the change in jobs, labor income, and economic value.
output that may arise from changes in construction spending related to the action alternatives. The quantitative results for costs and values represent planning-level estimates based on information available at this stage of the project for the conceptual action alternatives. However, the effects of spending and the resulting changes in economic activity are not economic benefits, costs, or measures of economic value because they do not evaluate changes in social welfare. Most data presented reflect pre-COVID conditions, and the pandemic has since disrupted typical economic conditions and patterns; projections of future conditions include a certain level of uncertainty associated with this disruption.

More details on the methodology for each component (including the study area for each topic) are presented in the Economics Discipline Report (Attachment 18).

### 4.14.2 What are the long-term conditions under the No Action Alternative?

Under the No Action Alternative, the limited actions to control invasive aquatic plants and other ongoing projects adjacent to the Capitol Lake Basin would continue, but a long-term management project would not be implemented. In the absence of a long-term management project, it is unlikely that Enterprise Services would be able to procure funding and approvals to manage sediment, manage or enhance water quality and related habitat and ecological functions, or enhance community use. Current conditions would continue, and in some cases would worsen over the long term. Over the long term, the lack of a lake management program could contribute to reduced amenity-related value of the Capitol Lake Basin and potentially lead to a less robust investment climate in downtown Olympia. It could also lead to lost or reduced opportunities to capitalize on restored recreation activity, and lost recreation-related value to both residents and visitors to the region. The long-term economic impacts from the No Action Alternative are summarized in Table 4.14.1.
Table 4.14.1 Summary of Long-Term Impacts: No Action Alternative

<table>
<thead>
<tr>
<th>Long-Term Impact</th>
<th>Impact Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downstream Economic Activity</td>
<td>No discernable economic effect on jobs, labor income, or economic output. <strong>Adverse Impact</strong> – Increased risk and potential cost from disruptions to economic activity in downtown Olympia and areas downstream during high-flow flood events. Costs related to disrupted economic activity could also materialize from increased frequency and magnitude of flooding. Increased flooding could increase maintenance costs associated with aging infrastructure, potentially increasing costs to taxpayers and utility ratepayers.</td>
</tr>
<tr>
<td>Downtown Development</td>
<td><strong>Minor Adverse Impact</strong> – The impacts of not taking action could result in potential deferred or displaced investment decisions for some developers, arising from uncertainty around future conditions of the Capitol Lake Basin. Larger market and economic trends are likely to be more influential in shaping the future of downtown development in Olympia.</td>
</tr>
<tr>
<td>Demand for and Value of Recreation</td>
<td><strong>Adverse Impact</strong> – People who want to access the water by boat in or from downtown Olympia would continue to access the water elsewhere, potentially at higher cost or lower value of the experience. Recreational value for trail, path, and park use would be impacted by potential temporary closures from flooding in future sea level rise scenarios. Repeat flood events could result in loss of investment in recreation infrastructure and reduced access or quality of recreation in the long run.</td>
</tr>
<tr>
<td>Demand for and Value of Ecosystem Services</td>
<td><strong>Adverse Impact</strong> – Potential utility and ratepayer costs associated with water quality regulation if new TMDL allocations shift additional nutrient reduction responsibilities to wastewater and stormwater dischargers. Potential small increased risk and cost of flooding associated with the diminished capacity to regulate floods of Deschutes River flows. <strong>Substantial Adverse Impact</strong> – Sustained equity and social justice issues related to ongoing diminished ecosystem services that produce commercial, subsistence, cultural, heritage, spiritual, and educational value for tribal populations.</td>
</tr>
</tbody>
</table>

4.14.3 What are the long-term impacts common to all action alternatives?

Long-term changes in economic conditions from operation of the project under the action alternatives are described for the following:

- Downstream economic activity
- Development in downtown Olympia
- Demand for and value of recreation
- Value of ecosystem services
4.14.3.1 Downstream Economic Activity

Long-term operation of the project would involve maintenance dredging, which would produce spending in the regional economy, spread out over 30 years. Capital expenditures on dredging sediment and other in-water work for maintenance could support regional economic activity (jobs and income) through the purchase of goods and services and labor in the study area. The Managed Lake Alternative would produce the most direct spending and largest effect on jobs and incomes in the study region because it is projected to have the highest costs associated with maintenance dredging (see Table 4.14.2). The Estuary Alternative would produce the least, for the opposite reason.

Most of the operational costs would be spent on goods and services acquired from outside the region. Thus, this spending would not meaningfully change aggregate spending levels or economic activities within the study region under any alternative. However, the spending could produce beneficial effects to those individuals, businesses, and industries that work on the project. Planning-level cost estimates for long-term maintenance dredging are summarized in Table 4.14.2. The construction costs (which are described in Section 5.14, Economics) are included for context, as they factor into the total long-term costs. Refer to Chapter 7.0, Planning-Level Costs, Funding Recommendations, and Other Considerations, for a more detailed description of the planning-level costs and primary assumptions.

Table 4.14.2 Planning-Level Cost Estimates by Alternative

<table>
<thead>
<tr>
<th>Project Alternative</th>
<th>Construction Costs ($M)</th>
<th>Maintenance Dredging ($M) over 30 Years</th>
<th>Total Costs ($M): Construction + Maint. Dredging over 30 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Action</td>
<td>$0</td>
<td>18</td>
<td>$18</td>
</tr>
<tr>
<td>Managed Lake</td>
<td>$89–$160</td>
<td>$248–$447</td>
<td>$337–$607</td>
</tr>
<tr>
<td>Hybrid</td>
<td>$177–$319M</td>
<td>$72–$144</td>
<td>$249–$463</td>
</tr>
</tbody>
</table>

Spending for the action alternatives would likely be funded using a mix of public dollars from a variety of sources, but the ultimate funding mechanisms and cost distributions have not yet been determined. Depending on the funding source (i.e., local versus state) and what the money might have been used on if the project were not implemented (opportunity cost), the impact on the region would
Funding for and distribution of project costs are being evaluated by the FGWG. Future work of the FGWG will identify a long-term governance and funding model to address the costs of implementation. This process is expected to conclude after a Preferred Alternative is identified; until that time, the question of who pays, and how that might affect the regional economy or individual entities, is unknown. Initial recommendations for funding are included in Chapter 7.0, Planning-Level Costs, Funding Recommendations, and Other Considerations.

4.14.3.2 Development in Downtown Olympia

Across all action alternatives, resolving long-term management uncertainties in the Capitol Lake Basin will likely increase the certainty that the area will continue to be a valuable amenity with benefits for current and future development in downtown Olympia, compared to the No Action Alternative. From the research conducted for this evaluation, there is no clear signal that implementing any action alternative, including the Estuary or Hybrid Alternative, would reduce demand for residential or commercial development in downtown Olympia. The City of Olympia’s plans for the redevelopment of downtown are long-range, and investment in residential and commercial development is projected to increase in intensity over the next decade.

The Estuary Alternative represents the most visual and environmental changes in the downtown area. These changes have the potential to create uncertainty, at least initially, among investors, developers, and residents in downtown Olympia. As designs are further developed and project elements associated with an attractive and functional estuary design are further identified, this alternative would be unlikely to produce a negative impact on downtown development compared to the other alternatives. The Hybrid Alternative would likely have a similar effect, although with less upfront risk because it would retain the reflecting pool as a familiar feature. The Managed Lake Alternative would represent the least amount of visual change compared to current conditions and is unlikely to increase uncertainty among potential investors about future conditions. In summary, all action alternatives are likely to produce benefits for downtown development, assuming they are implemented in a way that is attractive and accessible.
4.14.3.3 Demand for and Value of Recreation

All action alternatives would produce beneficial effects to recreation compared to the No Action Alternative by improving trails (e.g., adding boardwalks), increasing the diversity of vegetation and habitat areas, and restoring water-based recreation and access. Some people may experience losses in value if their preferred environmental setting (e.g., managed versus unmanaged or natural) is not implemented. Because of the status quo bias and the endowment effect, these losses would likely be felt more strongly by people in favor of a Managed Lake Alternative, should the Estuary Alternative be selected. Such perceived losses would likely diminish over time as people adjust to the new conditions. The overall economic value associated with recreation in the Hybrid Alternative could be higher than the Managed Lake and Estuary Alternatives, because it shares both predominant features, although data are unavailable to confirm this outcome.

Restored access within the Capitol Lake Basin for water-related recreation would expand the amenities offered to downtown residents and visitors, a beneficial effect of all action alternatives. Water access in the Capitol Lake Basin has been restricted since 2009. Despite being surrounded by water, direct opportunities for water-based interaction in the Project Area are limited, making new ones more valuable. Other than the public and private marinas in downtown Olympia, there are no nonmotorized boat access points or beaches in the immediate vicinity of downtown that offer a full range of nonmotorized water-based recreation. Restoring access would create new opportunities for enjoying different types of water-based recreation in a central location. While the types of boating available would differ among alternatives and the duration of boating access would be shorter under the Estuary and Hybrid Alternatives because of tidal influence, the differences would be minor, especially because water depth in the North Basin will be sufficient for water-based recreation during most of the tidal cycle. By restoring access to water-based recreation and enhancing vegetation throughout the Capitol Lake Basin, the value of the amenities it provides to people would increase. These amenities benefit both downtown development economic value as well as the value of recreational experiences. All recreation enhancements would increase in value over time as the downtown residential market continues to grow.
The distributional implications of choosing one alternative over another are potentially important, especially from an equity and social justice perspective. Status quo bias may favor the Managed Lake Alternative. To the extent that the Managed Lake Alternative would sustain a managed environment for recreation and preclude expansion of a more natural recreational setting, it would produce both beneficial effects and adverse impacts for future recreational users, depending on individual preference.

4.14.3.4 Value of Ecosystem Services

Differences among the action alternatives over the long term arise from changes in habitat that provide ecosystem services related to water quality, habitat, flood regulation, visual aesthetics, and cultural, heritage, spiritual, and educational services. The differences are in the costs/avoided costs for ratepayers and distributional and equity concerns arising from changes in habitat provision, visual aesthetics, and cultural services, especially for tribal populations. The action alternatives would create long-term changes in habitat quality and distribution, with a greater diversity of habitat types, including tideflats and estuarine wetlands under the Estuary and Hybrid Alternatives compared to the Managed Lake Alternative, which would have primarily freshwater wetlands and deep freshwater habitat types.

The Managed Lake Alternative would be similar to the No Action Alternative in terms of water quality and regulatory compliance (as described in more detail in Section 4.3, Water Quality). As Ecology develops and implements its TMDL for the Deschutes River/Capitol Lake/Budd Inlet, it may modify allocations for major dischargers, which could result in more stringent permit requirements for LOTT and other dischargers. The issue of discharge allocations is complicated, and there is some uncertainty as to how Ecology would assign allocations in the future. However, if LOTT and other dischargers were required to implement additional measures as a result of Capitol Lake not meeting its future waste load allocations, the most stringent targets would be expected under the No Action and Managed Lake Alternatives. This would be an adverse impact.

The Estuary and Hybrid Alternatives may modestly improve the ecosystem’s ability to attenuate wastewater discharges in Budd Inlet. This may result in Ecology assigning less stringent discharge reduction requirements for LOTT and stormwater dischargers, likely reducing or avoiding the costs of regulatory compliance compared to the No Action and Managed Lake Alternatives. This would be a
beneficial effect for utilities and their ratepayers compared to the No Action and Managed Lake Alternatives.

The increased diversity of habitat would be a beneficial effect under all action alternatives, as well as the water quality improvements that would benefit native species. The overall economic value of increased habitat and diversity would likely be higher for the Estuary and Hybrid Alternatives, which would provide better habitat quality for species of commercial, recreational, and cultural value, especially salmon. These effects would specifically benefit local tribes, which rely on salmon for subsistence, commercial, and cultural value. Not all species would benefit under the Estuary and Hybrid Alternatives; some freshwater fish and freshwater vegetation communities would not survive in the saltwater-dominant Estuary and Hybrid Alternatives, resulting in adverse impacts for people who derive value from these ecosystems and resources.

The Estuary and Hybrid Alternatives would enhance cultural values for populations that prefer the restoration of naturally functioning ecosystems, including tribes. Restoration would enhance opportunities for local tribes to exercise culturally important traditions. The No Action and Managed Lake Alternatives would preserve values for some people who prefer maintaining the recent historical conditions. All action alternatives would maintain the educational use value of Capitol Lake – Deschutes Estuary, but the Estuary and Hybrid Alternatives would substantially expand opportunities for research and discovery, with potential beneficial applications to increase the success and cost-effectiveness of future restoration projects.

There are distributional and social justice implications associated with maintaining the status quo conditions of a freshwater lake ecosystem under the No Action and Managed Lake Alternatives. The status quo conditions perpetuate historic inequities, particularly for tribal populations that have experienced ongoing adverse impacts from changes to the ecosystem since nonindigenous settlement of the region occurred. Improvements to culturally and economically important species and habitat functions in the Estuary and Hybrid Alternatives, particularly from the removal of the 5th Avenue Dam, have the potential to result in substantial beneficial effects for tribes.

The Estuary and Hybrid Alternatives would reduce the risk of riverine flood impacts in the Capitol Lake Basin, through improved flood regulation capacity. This would produce a beneficial effect by slightly
lowering flood risk and associated disruption and damage to property and infrastructure, compared to the No Action and Managed Lake Alternatives.

Changes in the value of visual aesthetics would depend on individual preferences for the different conditions created by the action alternatives. Some people may prefer the status quo visual conditions, while others may prefer the estuarine environment (for more information see Section 4.10, Visual Resources). Because of this trade-off, the result could either be a **beneficial effect or an adverse impact**, depending on viewer preference.

The action alternatives also have differences in GHG emissions and carbon sequestration potential over the long term. The Managed Lake Alternative would reduce GHG emissions slightly compared to the No Action Alternative, but overall the freshwater system does not provide much opportunity for reducing, capturing, or storing GHG emissions. The Estuary and Hybrid Alternatives would provide more opportunity for carbon sequestration and less methane emissions than the Managed Lake Alternative, with the Estuary Alternative providing slightly more storage capacity than the Hybrid Alternative. Both the Estuary and Hybrid Alternatives would have a **beneficial effect** because they are better aligned with local climate adaptation goals compared to the Managed Lake Alternative. For more information on greenhouse and carbon sequestration, see Section 4.7, Air Quality and Odor.

### 4.14.4 What are the long-term impacts under the Managed Lake Alternative?

Like the No Action Alternative, the Managed Lake Alternative would retain the Capitol Lake Basin in its current configuration, although the Managed Lake Alternative would include some additional management actions. The long-term impacts are described in Section 4.14.2 as part of the comparison of all action alternatives. The long-term impacts on economics associated with the Managed Lake Alternative are listed and summarized in Table 4.14.3.
Table 4.14.3 Summary of Long-Term Economic Impacts: Managed Lake Alternative

<table>
<thead>
<tr>
<th>Long-Term Impact</th>
<th>Impact Summary</th>
</tr>
</thead>
</table>
| Downstream Economic Activity     | **Minor Beneficial Effect** – Recurring maintenance dredging in the North Basin would generate additional spending during the operation period. Additional local spending would not meaningfully change aggregate spending levels or other economic activities within the region. Depending on the source of funding (which is still undetermined), these benefits could be offset by opportunity costs.  
**No Effect** – Ongoing dredging by other entities is expected to maintain navigability downstream, preserving the economic value of marina and Port of Olympia activities. |
| Downtown Development             | **Minor Beneficial Effect** – Long-term impacts on downtown development would likely be positive under the Managed Lake Alternative (as with all action alternatives), as long as they are implemented in a way that is attractive and accessible. Uncertainty is lowest under the Managed Lake Alternative because it most closely resembles current conditions. Overall, other economic factors likely have more influence on market conditions for development in downtown Olympia than changes in the Capitol Lake Basin. |
| Demand for and Value of Recreation| **Beneficial Effect** – Enhancements to trails, habitat areas, and restored water-based recreation would increase the value of recreation in the Capitol Lake Basin. Economic opportunities may arise to capture some increased value as revenue through new business ventures.  
The aesthetic impacts on the recreational experience for visitors would vary based on individual preferences. People who prefer the status quo will likely prefer the Managed Lake Alternative relative to the other action alternatives. The Managed Lake Alternative offers boating opportunities that are more consistent and more easily accessible compared to the Estuary and Hybrid Alternatives. |
| Demand for and Value of Ecosystem Services | **Beneficial Effect** – Improvements in habitat for some species, visual aesthetics, and cultural, heritage, spiritual, and educational value arising from enhanced habitat areas would all be beneficial effects under the Managed Lake Alternative. Expanded recreation infrastructure and restored in-water use would also be benefits.  
**Adverse Impact** – As with the No Action Alternative, potential utility and ratepayer costs associated with water quality regulation would occur if new TMDL allocations shift additional responsibilities for nutrient reduction to wastewater and stormwater dischargers. There is also a potential small increased risk and cost associated with reduced capacity to regulate floods for Deschutes River flows. |
Equity and Distributional Impacts

- Disproportionate Adverse Impacts on Tribal Populations – The cultural value for tribes of the Managed Lake Alternative would be similar to conditions under the No Action Alternative. Tribal values would continue to be adversely impacted by the loss of connection to the natural environment and anthropogenic harm to natural ecosystems. The lack of access to water resources, presence of the 5th Avenue Dam, and impacts on species and natural functions have created costs in the form of reduced value to tribes, which would continue under the Managed Lake Alternative.

- An equitable consideration of cultural value would need to consider the past inequities associated with management of the Capitol Lake Basin. Many, if not all, cultural services for tribes are defined by place, tradition, and continuity of use and practice.

4.14.5 What are the long-term impacts under the Estuary Alternative?

Under the Estuary Alternative, long-term impacts on economics would mostly be associated with restoring tidal hydrology to the Capitol Lake Basin. The long-term impacts are described in Section 4.14.3 as part of the comparison of all action alternatives. Long-term impacts on economics associated with the Estuary Alternative are listed and summarized in Table 4.14.4.

<table>
<thead>
<tr>
<th>Table 4.14.4 Summary of Long-Term Impacts: Estuary Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Long-Term Impact</strong></td>
</tr>
<tr>
<td>Downstream Economic Activity</td>
</tr>
<tr>
<td>Downtown Development</td>
</tr>
<tr>
<td>Long-Term Impact</td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td>Demand for and Value of Recreation</td>
</tr>
<tr>
<td>Demand for and Value of Ecosystem Services</td>
</tr>
<tr>
<td>Equity and Distributional Impacts</td>
</tr>
</tbody>
</table>
4.14.6 What are the long-term impacts under the Hybrid Alternative?

For the Hybrid Alternative, the long-term impacts on public services and utilities would be similar to that described above for the Estuary Alternative. Long-term impacts on economics associated with the Hybrid Alternative are listed and summarized in Table 4.14.5.

Table 4.14.5 Summary of Long-Term Impacts: Hybrid Alternative

<table>
<thead>
<tr>
<th>Long-Term Impact</th>
<th>Impact Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downstream Economic Activity</td>
<td><strong>Minor Beneficial Effect</strong> – Recurring maintenance dredging in the North Basin would generate additional spending during the operation period. Additional local spending would not meaningfully change aggregate spending levels or other economic activities in the region. Depending on the source of funding (which is still undetermined), these benefits could be offset by opportunity costs. <strong>No Effect</strong> – Ongoing dredging would maintain navigability downstream, preserving the economic value of marina and Port of Olympia activities.</td>
</tr>
<tr>
<td>Downtown Development</td>
<td><strong>Minor Beneficial Effect</strong> – Long-term impacts on downtown development would be positive under the Hybrid Alternative (as with all action alternatives), as long as they are implemented in a way that is attractive and accessible. Uncertainty associated with environmental conditions and implementation risks may materialize but is likely to resolve once construction begins. Overall, other economic factors likely have more influence on market conditions for development in downtown Olympia than changes in the Capitol Lake Basin.</td>
</tr>
<tr>
<td>Demand for and Value of Recreation</td>
<td><strong>Beneficial Effect</strong> – Enhancements to trails, habitat, and restored water-based recreation would increase the value of recreation in the Capitol Lake Basin. Economic opportunities may arise to capture some increased value as revenue through new business ventures. The aesthetic impacts on the recreational experience for visitors would vary based on an individual’s preferences. The barrier wall would provide an additional pathway for pedestrians and bicyclists, which would provide a new perspective on the basin compared to other paths in the study area. This may attract new visitors to the area and potentially generate somewhat higher levels of economic value compared to the Estuary and Managed Lake Alternatives.</td>
</tr>
</tbody>
</table>
Long-Term Impact | Impact Summary
--- | ---
Demand for and Value of Ecosystem Services | **Beneficial Effect** – Improvements in habitat, visual aesthetics, and cultural value from the enhanced habitat areas and habitat provision for native and commercially important species including salmonids, expanded recreation infrastructure, and restored in-water use would be similar to those described for the Estuary Alternative and would have beneficial effects. Regulatory compliance costs associated with revised discharge allocations associated with Deschutes River/Capitol Lake/Budd Inlet TMDL could also potentially be avoided or minimized. There would also be a potentially reduced risk of flooding and avoided cost from improved ecosystem flood regulation capacity compared to the No Action and Managed Lake Alternatives.

**Substantial Beneficial Effect** – The Hybrid Alternative would enhance commercial, subsistence, cultural, heritage, spiritual, and educational values associated with ecosystem restoration for tribal populations, addressing equity and social justice impacts of existing conditions.

**Minor Adverse Impact** – The Hybrid Alternative would create a potential loss in aesthetic value associated with the reflecting pool wall, especially for those experiencing the estuary environment at water level. The alternative could also diminish cultural, heritage, spiritual, and educational values for people who prefer a different setting.

Equity and Distributional Impacts | **Beneficial Effect for Tribal Populations** – Tribal populations would experience the beneficial effects of restoring the Capitol Lake Basin to an estuarine system, but to a lesser degree than under the Estuary Alternative. The presence of the reflecting pool and barrier wall would not fully restore the North Basin to estuarine conditions.

4.14.7 What mitigation measures would be recommended or required for the three alternatives?

The impacts on economic resources from the action alternatives would likely be largely positive and not require avoidance, minimization, and mitigation measures beyond those described for other resources (Sections 4.1 through 4.13). In addition, this economic analysis does not identify significant impacts that would require mitigation.

Under the Estuary and Hybrid Alternatives in particular, there is the potential to increase levels of uncertainty in future conditions compared to the Managed Lake Alternative, because they represent a dramatic change from current conditions. Transitioning from a managed lake to an estuary, if implemented without sufficient attention to appearance, could result in minor adverse impacts on the market for development in downtown Olympia. This risk can be minimized by:
• Recognizing the importance of incorporating aesthetically pleasing and functional elements into project design and effectively implementing them, with input and feedback from local residents and developers.

• Ensuring that adequate funding is available to fully implement all project elements successfully and timely, with a priority on those elements that engage people in the environment and provide access to the water. Enterprise Services, in cooperation with the FGWG, is exploring the options for fully funding upfront construction.

• Ensuring that a long-term plan for functional governance, funding, and adaptive management is in place to quickly and productively address potential issues that may arise that compromise the amenity value of the resource. The FGWG process is underway to create a plan for future stable funding and governance.

The ongoing evaluation of public preferences about perceived and real changes in value will also help ensure that future design and implementation plans maximize economic outcomes. The distribution of benefits and costs across different populations and groups of people will also be considered in the long term, to identify and address potential equity and social justice concerns.
5.0 Short-Term Impacts & Mitigation

This chapter describes short-term (construction) impacts that could result from construction of the action alternatives. The construction duration would range from 4 to 8 years, depending on the alternative. Construction impacts are temporary in nature, even if the extended duration does not seem short term.

This EIS intentionally focuses on the most important elements and conclusions of the analysis and, in particular, the differences among the four project alternatives. See Attachments 5 through 18 for the full impact analysis, including additional tables, figures, and supporting discussion.

Many of the construction elements would occur under all action alternatives. In this way, they are more similar than different. For this reason, this chapter provides a summary of potential construction impacts for each environmental discipline that are common to all action alternatives, and then describes impacts that would be specific to each action alternative. Construction impacts were considered less than significant or significant for each resource based on objective criteria established in the discipline reports.

Under the No Action Alternative, the project would not be constructed; therefore, there are no construction impacts and the No Action Alternative is not evaluated in this chapter.

5.1 HYDRODYNAMICS & SEDIMENT TRANSPORT

Hydrodynamic and sediment transport changes that would result from the action alternatives would occur after construction. The long-term effects are addressed in Section 4.1, Hydrodynamics and Sediment Transport.
5.2 NAVIGATION

Construction of the action alternatives would not impact vessel navigation in West Bay because construction activities do not extend north of the 5th Avenue Dam, where commercial and recreational navigation occurs. There would be no construction impacts to navigation under the Managed Lake, Estuary, or Hybrid Alternatives. The long-term effects of sediment deposition and maintenance dredging are addressed in Section 4.2, Navigation.

5.3 WATER QUALITY

This section describes the potential impacts from project construction on water quality in the study area. The information presented in this section is summarized from the full analysis in the Water Quality Discipline Report (Attachment 7).

Key Findings: Water Quality Construction Impacts

Under any of the action alternatives, construction impacts on water quality would be largely related to the sediment disturbance from hydraulic dredging, habitat construction, and building recreational amenity structures. The sediment disturbance would occur over several successive years during the allowable in-water work window, which is expected to extend from June 1 through August 15 and November 15 through February 15 each year (together these months are considered one, annual work window in this EIS). Temporary water quality impacts from sediment and plant disturbance would include increased suspended sediment and turbidity, decreased dissolved oxygen, and release of nutrients and contaminants from the sediment to the water. With implementation of BMPs, short-term impacts on water quality can be confined within the allowable mixing zone and, therefore, would be less than significant. The No Action Alternative would not result in construction impacts on water quality because the project would not be built.

5.3.1 What methods were used to analyze construction impacts?

Potential construction impacts on water quality were evaluated by considering sediment disturbance typical for similar construction activities and information reported in the Sediment Quality Discipline Report (Attachment 15) on the quality of sediments in the Project Area. Information on sediment quality included concentrations of nutrients and contaminants in sediment layers that would be disturbed, as well as laboratory tests that predict the concentrations of metal contaminants that could occur during dredging (i.e., elutriate tests). Other potential construction water quality impacts,
such as leaks or spills of fuel or lubricants used by construction machinery, are routinely addressed by permit requirements and do not require site-specific evaluation in this EIS.

5.3.2 What are the construction impacts common to all action alternatives?

Project construction would last 4 to 8 years, depending on the alternative, and would entail multiple in-water work windows. This construction period for the Hybrid Alternative is the longest at 8 years and the Managed Lake Alternative is the shortest at 4 years. To meet federal, state, and local laws, the project would include BMPs and other permit conditions to avoid and minimize construction impacts on water quality.

Each action alternative, would include the following primary construction elements that could affect water quality:

- Initial dredging in the North Basin, or North and Middle Basins
- Construction of habitat areas in the Middle Basin, or North and Middle Basins
- Construction of recreational amenities (boardwalks, dock, boat launch, and 5th Avenue Pedestrian Bridge)
- Repair or removal of the 5th Avenue Dam and 5th Avenue Bridge
- Construction staging and access throughout the Capitol Lake Basin (including vegetation clearing, temporary fill, and lowering of water levels)

5.3.2.1 Construction Impacts from Initial Hydraulic Dredging and Habitat Construction

Under all action alternatives, hydraulic dredging would be conducted in the Capitol Lake Basin over several successive years during the allowable in-water work window (i.e., from June 1 through August 15, and from November 15 through February 15). Dredging would occur 12 hours a day, 5 days a week. Hydraulic dredging would suspend the lake bottom sediments, nutrients, and metals present in the sediments, and remove aquatic plants rooted in the sediments. The suspended sediments would result in temporary and localized increased turbidity, decreased dissolved oxygen (due to increased BOD from suspended and dissolved organic matter), and the reintroduction of nutrients and metal contaminants to the water. The
areal extent and expected duration of initial dredging and habitat construction in the lake basin would vary by alternative (Table 5.3.1). No initial dredging would occur in Budd Inlet as part of any project alternative.

Each action alternative also includes the placement of dredged sediments into containment cells constructed to create habitat areas. The sediment–water slurry would be placed within temporary sheetpiles installed to contain the slurry and allow the sediment to settle. During the process of sediment placement and when the sheetpiles are removed, similar water quality impacts as described for dredging would occur, including sediment disruption and the resultant increase in turbidity and nutrients.

### Table 5.3.1 Comparison of Construction Impacts from Initial Dredging

<table>
<thead>
<tr>
<th>Dredging Action</th>
<th>Managed Lake Alternative</th>
<th>Estuary Alternative</th>
<th>Hybrid Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dredging Location</td>
<td>North Basin</td>
<td>North and Middle Basins</td>
<td>North and Middle Basins</td>
</tr>
<tr>
<td>Dredging Volume (cubic yards)</td>
<td>348,000</td>
<td>526,000</td>
<td>499,000</td>
</tr>
<tr>
<td>Months of Dredging (approximate)</td>
<td>12</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>In-Water Work Windows Required for Dredging</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Habitat Area Formation from Dredge Spoils</td>
<td>Use all dredged sediments to cover ~35% of Middle Basin</td>
<td>Use 97% of dredged sediments to cover ~30% of Middle and North Basins + &lt;5 acres at dam location</td>
<td>80% sediments used and less North Basin habitat built, otherwise like Estuary Alternative</td>
</tr>
</tbody>
</table>

All dredging and other in-water construction activities would be regulated under a water quality permit, which would define required BMPs, set allowable mixing zones for compliance with water quality standards, and specify monitoring requirements. For dredging activities in the lake basin, the mixing zone for rivers and streams would apply, which is 300 feet as described in the Water Quality Discipline Report (Attachment 7). Typically, a water quality permit would allow temporary exceedances of water quality criteria within the mixing zone during construction activities, and require compliance with all water quality criteria at and beyond the boundary of the mixing zone.
As described in the Water Quality Discipline Report (Attachment 7), a pilot study of hydraulic dredging impacts in Lake Lawrence in Thurston County was conducted in the 1990s. During that study, water quality measurements were taken from mid-depth in the water column approximately 5 feet from the dredge. Measurements were made during dredging and 1 hour after dredging ceased. Turbidity increased from 2.4 to 14 nephelometric turbidity units (NTU) during dredging, but decreased to 6 NTU within 1 hour. There was no measured impact on dissolved oxygen. These results suggest that the impacts of dredging and habitat construction would not visibly persist for more than a few hours after dredging operations have stopped each day, and that the plume of impact is likely to be well within the 300 feet that would be allowed by the permit. BMPs such as turbidity curtains could be implemented to further reduce impacts, if real-time turbidity monitoring indicates they are necessary to meet permit requirements.

Studies indicate that increases in turbidity would be confined within the permitted mixing zone, visible plumes of turbidity within the mixing zone would not persist for more than a few hours after construction, there would be no measurable impact on dissolved oxygen, sediment disturbance would not release dissolved phosphorus or induce algal blooms, and lead or other contaminants released from disturbed sediments are not expected to harm fish or other aquatic life.

Regarding the potential for construction activities to increase phosphorus available for algae growth, sample analyses found that less than 1% of the sediment phosphorus is dissolved and therefore readily available. Hydraulic suction dredging of nearshore, PCB-contaminated surface sediments in 2019 did not result in a significant increase in algal growth even though dredging resulted in increased lake total phosphorous concentrations. These results suggest that dredging and other sediment disturbance from construction would not induce excessive algae growth in the lake.

Sediment suspension may result in temporary water quality impacts due to elevated concentrations of dissolved lead within the boundary of the mixing zone. However, the laboratory test overestimates the release of dissolved lead that would occur during construction because the test is performed at a much lower pH (i.e., more acidic condition for metals extraction) than is found in Capitol Lake. Because of the higher pH and greater dilution compared to the sediment tests, dredging in Capitol Lake is not likely to result in...
significant impact on water quality from dissolved lead. Fish and other wildlife would avoid the dredging area, which also reduces the potential for impact.

Considering the above information, water quality limits can be met with the effective implementation of permit requirements and BMPs, and water quality would experience less than significant impacts during initial dredging and habitat construction, with no measurable effects outside the mixing zone.

### 5.3.2.2 Impacts of Constructing Recreational Amenities

Construction of the 5th Avenue Pedestrian Bridge would take 4 to 5 months to complete and would occur in stages, so the area of disturbance in any particular year would be limited to the extent that could be completed within the in-water work window. Construction of the boardwalks would occur over 4 to 6 months and would be staged from land or water. The dock and boat launch would be completed within one in-water work window.

Construction of these structures would produce minor, temporary, and localized increases in turbidity and sedimentation. These types of temporary impacts would be reduced by implementing BMPs specified in the water quality permit. If concrete is used, it would be subject to typical permit requirements to eliminate high pH concerns. Because sediment disturbance during construction of the boardwalks, dock, and boat launch would be much less than during dredging and habitat construction, and because BMPs would be required and monitored during construction activities, impacts on water quality would be less than significant during construction of recreational amenities.

Permit monitoring requirements would be implemented to determine BMP effectiveness and compliance with water quality standards and permit limits.

### 5.3.3 What are the construction impacts under the Managed Lake Alternative?

In addition to the water quality impacts common to all action alternatives, construction impacts on water quality from the Managed Lake Alternative would be associated with overhaul/repairs of the 5th Avenue Dam. This additional construction would last 6 months and include work on the control house, spillway, and earthen dam. Because dam repair activities would occur at the
northernmost part of the basin with water movement toward Budd Inlet, and assuming effective implementation of construction site BMPs and adherence to permit limits, water quality impacts in Capitol Lake are expected to be less than significant.

Construction activities from dam maintenance and repair would alter dam operations and water releases that affect the hydrodynamics of Budd Inlet. These alterations could temporarily reduce dissolved oxygen in Budd Inlet if inflow from the lake is reduced. However, repair times would be relatively short (4 weeks) and periodic, with at least one gate open to allow for continual water release. Placement of the buttressing berm armored with aggregate and riprap along the shoreline and in-water on the seaward side of the dam would temporarily increase turbidity when the material is placed. However, water quality impacts from both of these activities are expected to be minor due to required construction site BMPs. All in-water work would occur within the allowable work period.

Construction at the dam could also have adverse impacts on water quality from site runoff. Additionally, placement of the buttressing berm armored with aggregate and riprap along the shoreline and in-water on the seaward side of the dam would temporarily increase turbidity. However, these impacts would be minor due to required construction site BMPs. Permit monitoring requirements would demonstrate BMP effectiveness and compliance with water quality standards and permit limits.

Considering the short duration of in-water work, requirements for BMPs, and water quality monitoring to demonstrate BMP effectiveness, construction activities for the 5th Avenue Dam would have less than significant impacts on Budd Inlet water quality.

5.3.4 What are the construction impacts under the Estuary Alternative?

In addition to the water quality impacts common to all action alternatives, construction impacts on water quality from the Estuary Alternative are primarily associated with the removal of the 5th Avenue Dam.

Following the completion of initial dredging and construction of habitat areas, the 5th Avenue Dam would be removed, allowing the Capitol Lake Basin to become partially filled with marine water and creating an estuary within this basin. Therefore, the applicable water quality criteria for this geographic area would transition to those that
apply to inner Budd Inlet. By design, the dam removal would create a dramatic shift in water quality as the basin transitions from freshwater to saltwater. The change in hydrodynamics and flushing patterns would redistribute and transport existing sediments, which would increase turbidity in the lake basin until an equilibrium is restored. The Capitol Lake Basin would experience significant impacts on water quality during this transition period due to dramatic shifts in environmental conditions and a temporary increase in turbidity exceeding water quality criteria. The transition to an estuary in the basin would result in tidal fluctuations that influence water quality, changes in water chemistry (e.g., increased salinity, decreased dissolved oxygen), the loss of aquatic plants that remain after dredging and habitat construction, changes in planktonic (i.e., algae and invertebrates suspended in the water) and benthic invertebrate communities, and other impacts on aquatic life. Water quality impacts during construction and the transition from freshwater to saltwater would last several days to a few weeks before a new equilibrium is established.

Removal of the 5th Avenue Dam would alter discharge patterns, which would impact the hydrodynamics and water quality of Budd Inlet. Impacts from dam demolition would be contained within a sealed cofferdam to prevent the spread of sediment beyond the mixing zone established by the water quality permit. When the cofferdam is removed and estuary waters first enter the lake, a substantial amount of disturbed sediment, organic matter, and nutrients from the lake basin would be transported into Budd Inlet. Budd Inlet would experience a significant impact on water quality and would not meet water quality criteria during and immediately following dam removal due to: (1) increased sediment that may be transported outside the established mixing zone, (2) increased TOC load to Budd Inlet that contributes to oxygen depletion, and (3) increased nutrient availability for algal uptake. These temporary impacts would diminish after sediments from the lake basin are flushed out of the system, which may take several days to a few weeks.

Other construction activities would include a new 5th Avenue Bridge and Deschutes Parkway realignment, slope stabilization along Deschutes Parkway, stormwater outfall replacement along Deschutes Parkway and the Arc of Statehood, and culvert replacement at the Interpretive Center. These construction activities would produce minor, temporary, and localized increases in turbidity and sedimentation. These types of temporary impacts would be
reduced by implementing BMPs specified in the water quality permit. If concrete is used, it would be subject to typical permit requirements to eliminate high pH concerns. These disturbances would have less impact than dredging and habitat construction, and because BMPs would be required and monitored during construction activities, impacts on water quality would be less than significant.

5.3.5 What are the construction impacts under the Hybrid Alternative?

Construction impacts of the Hybrid Alternative on water quality would generally be as described above for the Estuary Alternative and impacts common to all action alternatives. However, the Hybrid Alternative would also include impacts associated with construction of a barrier wall and pedestrian concrete walkway on top of the wall that would separate the estuary from a smaller reflecting pool.

As described for the Estuary Alternative, the change in hydrodynamics and flushing patterns would result in redistribution and transport of existing sediments, which would increase turbidity in the lake basin until equilibrium is restored. The Capitol Lake Basin would experience significant impacts on water quality during this transition period due to the shift from freshwater to saltwater conditions and a temporary increase in turbidity.

Construction of the reflecting pool barrier wall would have a similar level of impacts as those described for impacts common to all alternatives for construction of habitat areas and recreational amenities. Construction of the barrier wall would require similar permits and BMPs, resulting in less than significant impacts to water quality.

As described for the Estuary Alternative, water quality impacts in Budd Inlet would have a significant impact during and immediately following dam removal due to increased sediment that may be transported outside the established mixing zone, increased TOC loading to Budd Inlet that would contribute to oxygen depletion, and increased nutrient availability for algal uptake. These impacts would diminish after disturbed sediments from the lake basin are flushed out over several days to a few weeks.

As with the Estuary Alternative, other construction activities include a new 5th Avenue Bridge and Deschutes Parkway realignment, slope stabilization along Deschutes Parkway, stormwater outfall replacement along the Deschutes Parkway and the Arc of Statehood,
and culvert replacement at the Interpretive Center. These construction activities would produce minor, temporary, and localized increases in turbidity and sedimentation. These types of temporary impacts would be reduced by implementing BMPs specified in the water quality permit. If concrete is used, it would be subject to typical permit requirements to eliminate high pH concerns. These disturbances will have less impact than dredging and habitat construction, and because BMPs would be required and monitored during construction activities, impacts on water quality would be less than significant.

5.3.6 What avoidance, minimization, and mitigation measures would be implemented for the project?

During construction of any action alternative, standard overwater and in-water construction and demolition BMPs would be implemented in accordance with permit requirements for in-water work. Compliance with regulations, permit conditions, plans, and authorizations would avoid and minimize potential construction impacts on water quality. These anticipated requirements and other mitigation measures that could be recommended or required are described in this section.

5.3.6.1 Measures Common to All Alternatives

A WQMPP would be prepared, approved by the regulatory agencies, and implemented throughout construction. The WQMPP would measure the performance of the BMPs implemented to maintain water quality standards, identify potential exceedances of water quality permit limits, and outline contingency measures to be implemented if water quality standards are exceeded. The plan would include real-time monitoring of turbidity within the established mixing zone of 300 feet from the dredging and material placement areas during construction. The WQMPP would also include inspection of spill control equipment and actions required by the water quality permit.

BMPs would be implemented, in accordance with the WQMPP and project permits, to avoid and minimize potential construction impacts on water quality, including those related to turbidity management and spill prevention. The BMPs are nondiscretionary actions that are needed to maintain water quality standards throughout the work. Standard BMPs may include:

- Using hydraulic dredge rather than bucket dredge
- Limiting dredged material overflow
- Slowing dredge rate
- Using turbidity curtains
- Implementing temporary erosion and sediment control measures and measures included in a stormwater management and pollution prevention plan
- Implementing Spill Prevention and Control Plan requirements
- Using containment measures during demolition and construction activities
- Using cofferdams to isolate work areas from open water

To reduce potential dissolved oxygen impacts to Budd Inlet during dredging, an additional mitigation strategy could be to modify dam operations to restrict lake outflow during dredging and increase lake outflow at night. This strategy would be most important to implement during the June 1 to August 15 period of allowable in-water work when river flows are low and bottom water dissolved oxygen concentrations are lowest in Budd Inlet. Dredging activities during the winter months (November 15 to February 15) when dissolved oxygen concentrations are higher would not need to be constrained.

Dam repair or removal is also a part of all action alternatives. To reduce potential dissolved oxygen impacts to Budd Inlet, an additional mitigation strategy could be to modify dam operations to restrict lake outflow during construction activities (daytime) and increase lake outflow at night. This strategy would be easiest and most important to implement during the summer months (June through August) when river flows are low and bottom water dissolved oxygen concentrations are lowest in Budd Inlet.

5.3.6.2 Managed Lake Alternative

No additional mitigation would be needed to address construction impacts to water quality from the Managed Lake Alternative.

5.3.6.3 Estuary Alternative

No additional mitigation would be needed to address construction impacts to water quality from the Estuary Alternative.
5.3.6.4 **Hybrid Alternative**

No additional mitigation would be needed to address construction impacts to water quality from the Hybrid Alternative.

5.3.7 **What are the significant unavoidable adverse impacts to water quality?**

Under the Estuary and Hybrid Alternatives, in the few weeks after construction is complete and the existing lake basin is opened to tidal waters, a transition period would result in redistribution and transport of existing sediments. This is expected to increase turbidity in both the lake basin and Budd Inlet until equilibrium is restored, resulting in a **significant unavoidable adverse impact**.

5.4 **AQUATIC INVASIVE SPECIES**

This section describes the potential impacts from project construction on distribution and population of aquatic invasive species in the study area. The information presented in this section is summarized from the full analysis in the Aquatic Invasive Species Discipline Report (Attachment 8).

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### Key Findings: Aquatic Invasive Species Construction Impacts

Under any of the action alternatives, construction would impact AIS in the study area. Construction activities including initial dredging, placement of dredged material for habitat areas, export of sediment dredged, and dam repair or removal could have potentially spread existing AIS to other water bodies.

With pre-treatment of AIS in Capitol Lake to reduce AIS populations, implementation of BMPs to reduce turbidity that could otherwise spread AIS, avoidance of construction areas by some AIS, and upland placement and subsequent AIS monitoring, impacts on distribution and population of AIS from construction would be avoided or minimized; thus, construction impacts would be less than significant.

5.4.1 **What methods were used to analyze construction impacts?**

To determine the potential construction impacts of the action alternatives on AIS, the following three primary operations were evaluated: initial sediment dredging, placement for constructing habitats or export of sediments dredged during construction, and dam repair or removal.
These activities have the potential adverse impact of spreading existing AIS in Capitol Lake to other water bodies if the following occur:

- AIS associated with suspended sediment and debris are not contained
- Construction equipment is not properly decontaminated before it leaves the lake
- Dredged material is not properly treated before it leaves the lake
- Equipment is not properly decontaminated before use in the lake, leading to the introduction of new AIS
- Construction area is not properly contained during repair or removal of the 5th Avenue Dam

### 5.4.2 What are the construction impacts common to all action alternatives?

The common goal for AIS under all action alternatives is containment to prevent the spread and further distribution of AIS. The New Zealand mudsnail is the primary AIS of concern and eradication of New Zealand mudsnails is not feasible under any of the action alternatives regardless of the BMPs and mitigation measures implemented. This is because of their resistance to extreme environmental factors and treatment, and their ability to reproduce and establish new populations from a single survivor, as described in Section 3.4.3. Therefore, protocols would be followed during construction to prevent the spread of these AIS, or the introduction of new AIS into the waterbody.

Prior to construction of all action alternatives, Capitol Lake would be treated to significantly reduce some AIS populations within the waterbody and reduce the risk of potential spread once construction activities began.

#### 5.4.2.1 Initial Dredging

Dredging and other construction activities will occur for all action alternatives in the North and Middle Basins. Most or all dredged material would be used within the basin to create habitat areas; this is a key design element to avoid or minimize the transport of AIS species from the Project Area.
BMPs to reduce and contain turbidity during dredging would minimize the potential for substantial transport of invertebrate AIS over the 5th Avenue Dam and into Budd Inlet during construction. Turbidity levels would be less than existing conditions during large storm events so it is reasonable to conclude that invertebrate AIS would be contained through construction.

Dredging would occur in places where few Eurasian watermilfoil plants, purple loosestrife, and other invasive plants are located, which is along the southern shorelines of the Middle Basin and within the South Basin, and would not likely affect the abundance of these species in the lake. Based on pre-treatment of AIS throughout Capitol Lake, implementation of BMPs to reduce turbidity, and the small portion of the populations located within the construction areas, initial dredging of any action alternative would have less than significant impacts on AIS populations and distribution.

Dredging and placement of dredged materials in the habitat areas may have minor beneficial effects due to removal and burial of some aquatic plant and invertebrate animal AIS.

5.4.2.2 Export of Sediment

Some dredged material would be transported out of the study area for the Estuary and Hybrid Alternatives, but export is not assumed under the Managed Lake Alternative. Thus, dredge sediment export would provide a potential vector for transmission of purple loosestrife seeds and invertebrate AIS outside the Capitol Lake Basin for two of the three alternatives. However, sediments exported from the Capitol Lake Basin during construction would be treated prior to transport to prevent export of living New Zealand mudsnails. Treatment methods may include chemical (e.g., salt or Bayluscide) or physical (e.g., desiccation, heating, or freezing) techniques that would need to be proven effective prior to transport. The sediment would only be disposed of at an approved upland site, and the upland placement site would be monitored to ensure no New Zealand mudsnails are present and no purple loosestrife plants become established. Project permit conditions would outline additional specific measures, as needed, to avoid risk of spreading AIS from sediment export. Therefore, there would be a less than significant impact on AIS outside the Capitol Lake Basin from export of sediment dredged during construction.

Construction of the action alternatives would have no impacts on fish, waterfowl, and mammal AIS because these animals would avoid
construction activities and would not be transported outside the Capitol Lake Basin.

### 5.4.3 What are the construction impacts under the Managed Lake Alternative?

In addition to impacts common to all action alternatives, construction impacts of the Managed Lake Alternative on AIS would primarily be associated with repairing the 5th Avenue Dam. Potential impacts from the other construction activities would be as described in Section 5.4.3.

**Repair of 5th Avenue Dam**

There would be no impacts to AIS associated with repairing the 5th Avenue Dam because all repair work would be contained within the spillways, conducted overwater, or conducted on the Budd Inlet side of the dam where no known AIS are present. All construction equipment would be appropriately decontaminated before entering and leaving the site to prevent import or export of AIS.

### 5.4.4 What are the construction impacts under the Estuary Alternative?

In addition to impacts common to all action alternatives, construction impacts of the Estuary Alternative on AIS would primarily be associated with removal of the 5th Avenue Dam, which would restore tidal flow to the Capitol Lake Basin. The impacts of dam removal are discussed as a part of long-term impacts in Section 4.4, Aquatic Invasive Species.

### 5.4.5 What are the construction impacts under the Hybrid Alternative?

In addition to impacts common to all action alternatives, construction impacts of the Hybrid Alternative on AIS would primarily be associated with removal of the 5th Avenue Dam, which would restore tidal flow to the Capitol Lake Basin. The impacts of dam removal are discussed as a part of long-term impacts in Section 4.4, Aquatic Invasive Species.

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**Invasive Species Management**

The goal for all action alternatives is containment of AIS to prevent their spread and further distribution, with New Zealand mudsnails being the primary species of concern. The eradication of New Zealand mudsnails is assumed to be not feasible under any of the action alternatives because of their resistance to extreme environmental factors and treatment, and their ability to reproduce and establish new populations from a single survivor.
5.4.6 What avoidance, minimization, and mitigation measures would be implemented for the project?

Enterprise Services would avoid and minimize potential impacts by complying with regulations, permits, plans, and authorizations. These anticipated measures, and other mitigation measures that could be recommended or required, are described in this section.

5.4.6.1 Measures Common to All Action Alternatives

An AIS Adaptive Management Plan would be developed and implemented for the selected alternative, as described in Section 4.4.7.1. Under all alternatives, Capitol Lake would be treated prior to construction to significantly reduce the population of AIS. This is a critical measure to avoiding or minimizing the spread of AIS during and after construction.

To avoid the risk for AIS transport outside of Capitol Lake, WDFW-approved BMPs would be implemented during construction. Enterprise Services would follow all protocols established by WDFW before and after entering the lake and would ensure all vessels and equipment are decontaminated by removing visible plants, algae, and mud and rinsing with potable water.

5.4.6.2 Managed Lake Alternative

No additional mitigation would be needed to address construction impacts to AIS from the Managed Lake Alternative.

5.4.6.3 Estuary Alternative

No additional mitigation would be needed to address construction impacts to AIS from the Estuary Alternative.

For the Estuary and Hybrid Alternatives, the AIS Management Plan would be followed during transport and upland disposal of material dredged during construction.

5.4.6.4 Hybrid Alternative

No additional mitigation would be needed to address construction impacts to AIS from the Hybrid Alternative.
5.4.7 What are the significant unavoidable adverse impacts to aquatic invasive species?

There would be no significant unavoidable adverse impacts related to AIS under any of the action alternatives.

5.5 FISH & WILDLIFE

This section describes the potential impacts from project construction on fish and wildlife and their habitats in the study area. The information presented in this section is summarized from the full analysis in the Fish and Wildlife Discipline Report (Attachment 9).

Key Findings: Fish & Wildlife Construction Impacts

Under any of the action alternatives, construction would impact fish and wildlife in the study area. Construction activities from initial dredging, creating habitat areas, clearing vegetation, placement of temporary fill, and use of staging areas and access could produce localized turbidity and sedimentation and temporarily disrupt ecological functions of aquatic and terrestrial habitats. With implementation of BMPs and other permit conditions (in particular, adherence to the established in-water work window), impacts on fish and wildlife from construction would be avoided or minimized; thus, construction impacts would be less than significant.

5.5.1 What methods were used to assess construction impacts?

Potential construction impacts were determined by evaluating known occurrences of species, or species groups, and indicator species in the study area, life history requirements, and the potential temporary changes in habitat condition under each alternative. The analysis considered construction timing, duration, methods, and BMPs and their relative implication for species and habitats under each alternative. Construction impacts were estimated based on the conceptual design for each alternative.

Pursuant to federal, state, and local laws, the project must include BMPs to avoid and minimize construction impacts. Following construction, the affected habitats would generally return to their pre-construction condition either through natural processes or active restoration, or some combination. Long-term habitat alterations, such as the conversion of a freshwater lake to an estuary, are discussed in Chapter 4.0, Long-Term Impacts, Benefits, and Mitigation; however, the general duration of recovery following construction is also considered in the impact analysis.

What construction impacts were considered in the fish and wildlife analysis?

Construction impacts are the temporary effects related to construction disturbance. Construction impacts were analyzed based on the known relationships between construction elements (e.g., turbidity and construction noise) and the effects on fish and wildlife (e.g., avoidance, decreased foraging activity).
5.5.2 What are the construction impacts common to all action alternatives?

The primary construction elements that could affect fish and wildlife include the following:

- Initial dredging in the North Basin; or North and Middle Basins
- Construction of habitat areas in the Middle Basin; or North and Middle Basins
- Construction of recreational amenities (boardwalks, dock, boat launch, and 5th Avenue Pedestrian Bridge)

Initial dredging activities would generate localized increases in suspended sediments and increase in-water turbidity levels. Dredging can injure or kill fish captured or entrained in the sediment and associated water removed during the activity, as well as result in mortality to fish eggs and larvae in the benthic environment.

All of the action alternatives include dredging, either in the North Basin or in the North and Middle Basins, as well as the placement of dredged sediments into temporary constructed containment cells to create habitat areas. Dredging and dredged material placement to establish habitat areas both present a risk of entrainment and injury or mortality, although these impacts would be localized and limited to the dredging time frame. Dredged material placement can also bury fish and other organisms. However, the implementation of fish exclusion and fish removal/relocation would substantially reduce the potential of any such impacts on both anadromous and resident freshwater fish. The magnitude and extent of these potential effects would depend on the type of dredge equipment and areal extent of dredging, which vary by alternative (Table 5.5.1).

Table 5.5.1 Comparison of Construction Impacts from Initial Dredging

<table>
<thead>
<tr>
<th>Dredging Action</th>
<th>Managed Lake Alternative</th>
<th>Estuary Alternative</th>
<th>Hybrid Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dredging Location</td>
<td>North Basin</td>
<td>North and Middle Basins</td>
<td>North and Middle Basins</td>
</tr>
<tr>
<td>Dredging Volume (cubic yards (cubic meters))</td>
<td>350,000 (270,000)</td>
<td>525,000 (400,000)</td>
<td>500,000 (380,000)</td>
</tr>
<tr>
<td>Months of Dredging (approximate)</td>
<td>12</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>In-Water Work Windows Required for Dredging</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>
Dredging Action | Managed Lake Alternative | Estuary Alternative | Hybrid Alternative
--- | --- | --- | ---
Habitat Area Formation from Dredged Sediment | Yes | Yes | Yes
Sheetpiling for Dredged Material Containment Cells (linear feet (linear meters)) | 32,000 (9,800) | 34,000 (10,000) | 24,000 (7,300)

Dredging impacts would be localized to the immediate area of dredging at any given time, and adherence to state and federal timing restrictions on in-water work would ensure that there would be no direct impacts on anadromous salmon, including outmigrating juvenile salmon in the spring and early summer. Smaller anadromous (e.g., stickleback) and resident freshwater fish would have the greatest potential for impact. BMPs would be used during dredging to minimize turbidity and to reduce the potential for entrainment impacts on fish. The implementation of fish exclusion, such as turbidity curtains, and fish removal/relocation would substantially reduce the potential for impacts on both anadromous and resident freshwater fish in locations where such measures are feasible. Standard spill prevention and containment measures would also be implemented to prevent accidental spills of hazardous materials.

Habitat areas would be created by placing dredged material into containment cells formed by the temporary installation of sheetpiling. The sheetpile walls would be installed (and removed) using vibratory methods, with the length of sheetpiling varying by alternative. Vibratory pile driver hammers use an oscillatory motion and heavy weight to force the pile into the substrate. They typically produce substantially lower sound levels than do impact hammers, with a slower rise time (the time for the noise wave form to rise from 10 to 90% of its highest peak) and lower sound frequencies. As a result, the pile-driving sound levels from the vibratory hammer are less intense and spread over a longer time period, thereby minimizing the potential to harm aquatic organisms. Studies have found that the use of vibratory hammers for pile installation are not likely to have a significant impact on migrating salmon behavior, because infrasound produced by vibratory pile driving is short in duration and because of the relatively short range of the component of the total sound field to which salmon show an avoidance response. No mortality of fish or substantial behavioral impacts are expected to occur from the sheetpile installation.

**What is the allowable in-water work window?**

The allowable in-water work window for the protection of fish is expected to be from **June 1 to August 15 and November 15 to February 15** each year, based on early coordination with the regulatory agencies.
Under any action alternative, impacts from initial dredging and containment cell installation would be temporary, with a 12- to 15-month total duration at any specific location. With the use of BMPs and adherence to approved work windows, widespread impacts would be avoided. Work windows are established to coincide with the times that species of concern have a low likelihood of being present in the area. With these measures, impacts on anadromous fish (including salmon) as well as resident freshwater fish from habitat disturbance and noise and vibration would be less than significant.

In-water work to construct new structures (boardwalks, 5th Avenue Pedestrian Bridge, rebuilt dock at Interpretive Center, new boat launch) would include the placement of foundation piles and minor grading. These activities would result in localized and temporary increases in both turbidity and in-water noise and vibration during construction. No substantial impacts on fish from in-water noise associated with auguring piles for boardwalk construction are anticipated; however, the use of impact hammers to construct the 5th Avenue Pedestrian Bridge could cause impacts on fish, including injury and mortality. Impact hammers use various mechanical methods to pound the piles into the substrate. The risk of injury or mortality for aquatic species and fish associated with impact pile driving noise is generally related to the effects of rapid pressure changes. Most fish within the North Basin could be disturbed to some degree by the impact pile-driving activities; however, these potential impacts would be minimized by the application of BMPs to dampen the sound levels and/or enhance the attenuation rate of the sound levels generated by the pile driving, such as air bubble curtains.

Curing concrete can contribute to high pH (alkaline) conditions in the water column if the concrete source has been recently cast and not allowed adequate curing times. Where the pH effects are of a large magnitude, the pH of the water column can rise to the point where deleterious effects to fish and wildlife could occur. However, no such effects are anticipated, considering the minimal number of concrete piles (20) associated with the project and the BMP of delaying installation of pre-cast concrete piles until the concrete has completely cured.

Terrestrial wildlife species that would be most likely affected by construction include great blue heron, dabbling ducks, shorebirds, and some passerine birds. Although terrestrial wildlife species would likely avoid active construction areas, substantial portions of the
Project Area would still be available for foraging. Wildlife that use the lake margins or wetlands in or near active construction areas, would avoid these sites during construction. Wildlife avoidance would be temporary, and similar habitats exist nearby that would be available to wildlife, including within areas of Capitol Lake that would not be undergoing construction.

In summary, under all action alternatives, impacts on fish, aquatic habitat, and wildlife would be less than significant, including impacts associated with fish entrainment and direct mortality, water quality, turbidity and sedimentation, and noise and vibration. Although individual fish or wildlife could be affected, the number of injured or killed individuals would be small and species avoidance of the work areas would reduce exposure. As a result, these impacts would not measurably affect their local populations. Impacts would be minimized through adherence to the agency-approved in-water work period and implementation of standard overwater and in-water construction BMPs in accordance with environmental regulatory permit requirements (as described in Section 5.5.6).

5.5.3 What are the construction impacts under the Managed Lake Alternative?

In addition to construction activities that are common to all alternatives, the Managed Lake Alternative would include the following:

- 5th Avenue Dam overhaul repairs

Most of the work associated with dam repair would not involve in-water work within either Capitol Lake or Budd Inlet. However, construction of a buttressing berm to improve stability of the earthen dam includes placement of up to 25,000 cubic yards (19,114 cubic meters) of aggregate and riprap placed along approximately 0.5 acres (0.2 hectares) of the shoreline on the downstream (West Bay) side of the earthen dam and adjacent to the dam along a portion of shoreline. This work, which would take approximately 4 weeks to complete, would result in some temporary turbidity and sedimentation in West Bay, which could have minor effects on aquatic life. Appropriate BMPs would be implemented for the buttressing and other dam overhaul work, such as the use of containment devices where appropriate, and in-water work timing restrictions would apply. Based on the temporary nature of the repairs and the available BMPs that would be implemented for the
protection of aquatic life, construction of the dam overhaul repairs would have less than significant impacts on fish species.

Wildlife species groups most likely affected by dam repair activities would be waterfowl that forage or rest near the dam. During repair activities, wildlife that use the north end of the lake or West Bay would likely avoid the area because of noise and increased human activity. Once construction is complete, the waterfowl would return to using this area. On the marine side of the dam, harbor seals may be disturbed by the construction noise and choose to use areas away from such noise. Because other areas of the lake and West Bay are available for wildlife to forage or rest in during repair activities, impacts on wildlife would be less than significant.

5.5.4 What are the construction impacts under the Estuary Alternative?

As shown in Table 5.5.1, the Estuary Alternative would involve the largest quantities of dredged material, and the most linear feet of sheetpiling for construction of habitat areas. However, the fish and wildlife impacts of these activities would be generally the same as described for impacts common to all action alternatives. In addition to construction activities that are common to all action alternatives, construction impacts of the Estuary Alternative would primarily be associated with the following:

- 5th Avenue Dam and 5th Avenue Bridge removal
- Construction of a new 5th Avenue Bridge for vehicles and Deschutes Parkway realignment
- Slope stabilization along Deschutes Parkway
- Stormwater outfall replacement (along the Deschutes Parkway and the Arc of Statehood)
- Culverts replacement at the Interpretive Center

The primary potential impacts on fish from dam and bridge removal are associated with in-water work, including increased turbidity and in-water noise. Approximately 64,000 cubic yards (48,931 cubic meters) of material would be removed over a footprint area of about 145,000 square feet (13,470 square meters), with a construction duration of approximately 4 to 6 weeks. To maintain water quality and reduce turbidity during removal of the earthen and structural dam components, coffercells with sealed interlocks would be installed around the earthen dam structure. The coffercells would isolate the in-water work area from fish and limit turbidity in the
construction area, and would be used to remove the earthen portion of the dam, prior to being repositioned to remove the concrete spillway. Once the coffercell installation is completed (during the approved regulatory in-water work window and including fish removal), excavation and demolition work can occur within the cells, as turbid water would be isolated from Capitol Lake and Budd Inlet. Because of the use of the coffercells, the application of appropriate BMPs, and adherence to in-water work windows, impacts from turbidity on all fish species groups potentially present in the work area, including both freshwater and marine, would be minor.

Likewise, although saw-cutting and micro-blasting would be used to remove the spillway structures, the work area would be isolated from the water column by the coffercells, and appropriate BMPs and micro-blasting methods would be implemented to eliminate waste materials entering the lake or bay, and to minimize vibration and overpressure that could harm fish. Demolition of the concrete spillway would use a combination of land- and marine-based equipment, with BMPs implemented for any marine barges or work boats, to minimize or eliminate grounding or propeller wash impacts on fish and fish habitat.

Construction of the coffercells would require the installation of sheetpiles using vibratory methods. Land-based pile installation equipment, stationed on the existing dam, would take approximately 8 to 10 weeks to construct the coffercells. As described for impacts common to all alternatives, in-water vibratory pile installation would have minimal impacts on fish.

Foundation piling for the new 5th Avenue Bridge, consisting of concrete columns supported by drilled shafts, would be installed within coffercells. Installing drilled shafts does not create in-water noise or sound pressures that have the potential to kill or injure fish and, in addition, this work would be conducted in the isolated coffercells.

Other construction activities that could temporarily affect fish and aquatic habitat, although on a much smaller scale, include replacing stormwater outfalls along Deschutes Parkway and the Arc of Statehood, replacing culverts at the Interpretive Center, and coating the concrete at the Arc of Statehood. With implementation of avoidance and minimization measures, such as containment of all overwater debris from entering the water column and minimization of the impacts from the use of work barges during bridge construction, removal of the 5th Avenue Bridge and 5th Avenue Dam,
construction of the new 5th Avenue Bridge, and construction of other work elements would result in temporary and minor direct impacts on fish, and would have less than significant impacts on all fish species groups.

Construction disturbances would cause wildlife that use the Capitol Lake Basin to avoid areas of active construction, as described for impacts common to all alternatives. Diving and dabbling ducks would be most affected as they regularly use the open-water and lake margin habitat.

Other species that use the lake, such as bald eagle, osprey, and river otter, would also avoid the area during active construction. River otter would continue to use the area in the evening when construction was not occurring. Passerine birds that use the upland and riparian habitat adjacent to the lake would avoid areas of active construction, such as along Deschutes Parkway during realignment activities. There would be minimal impacts on wildlife from replacing culverts; this is a relatively small construction project that would occur over the course of several weeks. Harbor seals that use West Bay at higher tides close to the dam and bridge would also avoid the area during the construction period.

Construction impacts on wildlife are considered less than significant because construction disturbances would not reduce the regional population of these common species, and foraging habitat is not limited and is available elsewhere for these relatively common species.

Several trees in a mixed forested area would need to be removed to construct the embankment for the realigned Deschutes Parkway. Trees would be surveyed as part of design and permitting of the selected alternative, and any removed trees would be replaced in accordance with City of Olympia’s tree protection ordinance.

5.5.5 What are the construction impacts under the Hybrid Alternative?

In addition to construction activities that would occur under the Estuary Alternative and those that are common to all action alternatives, the Hybrid Alternative includes the following:

- Barrier wall construction in the North Basin

Construction impacts on fish and fish habitat under the Hybrid Alternative are nearly identical to those described for the Estuary
Alternative, including effects from turbidity and in-water noise associated with the 5th Avenue Dam removal, new 5th Avenue Bridge construction, Deschutes Parkway stabilization, and other minor construction elements. However, construction of the 2,600-foot-long (790-meter-long) sheetpile barrier wall to create a reflecting pool would lead to additional in-water noise and vibration impacts.

The reflecting pool barrier wall would require the construction of approximately 130 sheetpile tail walls to support the barrier wall. The sheetpiling for the structure would be installed using a barge-based vibratory hammer and constructed prior to dam removal to provide a consistent water level for the barge. Vibratory pile driving impacts on fish would be relatively minor, and impacts have not been shown to result in mortality or injury in previous studies. Although the wall installation would take approximately 15 months of work over three in-water work windows, the in-water noise levels from vibratory pile driving would not have a significant adverse impact on fish. An impact hammer may be needed to drive some of the sheetpiles, since the barrier wall will serve as a load-bearing structure. Impact pile driving produces in-water noise levels that can negatively impact fish, including lethal and sublethal effects. Although the sound levels from impact installation of sheetpiles are somewhat less than large-diameter steel piles, monitoring of previous sheetpile installations has shown that sound levels at, or near, threshold for fish injury have occurred. The use of impact pile driving would increase the magnitude of adverse impacts on fish; however, with the use of noise attenuation devices (e.g., bubble curtains), it is unlikely that injury or mortality to fish would occur, and adherence to the in-water work timing requirement would further reduce the potential for impacts on any anadromous and freshwater resident fish species present during construction.

The type of construction impacts on wildlife would be the same as for the Estuary Alternative. With construction of the barrier wall, the magnitude of impacts on wildlife would be slightly greater than those described for the Estuary Alternative.

With adherence to approved in-water work windows and standard construction BMPs, impacts on fish and wildlife would be less than significant.
5.5.6 What avoidance, minimization, and mitigation measures would be implemented for the project?

5.5.6.1 Measures Common to All Alternatives

During construction of any action alternative, standard overwater and in-water construction and demolition BMPs would be implemented in accordance with permit requirements. In-water work would only occur within the allowable work window to minimize potential impacts to fish and wildlife from piledriving and other construction activities. The anticipated in-water work window for the Capitol Lake Basin, from June 1 to August 15 and November 15 to February 15 each year, would generally protect both outmigrating juvenile salmon and returning adults. In addition to standard BMPs, a key design measure has been included in all action alternatives. Dredged sediments would be beneficially reused to create habitat areas within the Capitol Lake Basin. This would substantially minimize the need for off-site disposal of dredge sediment, which would reduce the potential spread of invasive species outside of the lake basin.

BMPs that would be implemented to avoid or minimize impacts to fish and wildlife include:

- Where feasible, the project will utilize vibratory pile installation methods for all pile installation, including both sheetpile and round piles. Impact driving methods will only be used if geotechnical conditions require such methods for achieving required loading requirements, and where feasible, will be limited to pile proofing only.

- Appropriate BMPs and sound attenuation methods (e.g., bubble curtains) would be developed in coordination with the regulatory agencies and permitting processes to minimize potential impacts of any impact pile driving activities.

- Suspended tarps, or similar containment measures, would be used to contain falling debris during construction of the new 5th Avenue Bridge, 5th Avenue Pedestrian Bridge, and boardwalks.

- Cofferdams or other appropriate measures would be used to isolate work areas from open-water areas for the removal of the existing 5th Avenue Dam and construction of the new 5th Avenue Bridge.
• Cleared upland areas would be restored to preconstruction grades and the areas would be replanted with appropriate native herbaceous and woody species.

• Temporary erosion and sediment control measures and a stormwater management and pollution prevention plan would be implemented.

• A Spill Prevention and Control Plan would be implemented.

5.5.6.2 Managed Lake Alternative

Installation of the buttressing berm would be timed to occur at low tide as feasible. No additional mitigation would be needed to address construction impacts to fish and wildlife from the Managed Lake Alternative.

5.5.6.3 Estuary Alternative

No additional mitigation would be needed to address construction impacts to fish and wildlife from the Estuary Alternative.

5.5.6.4 Hybrid Alternative

No additional mitigation would be needed to address construction impacts to fish and wildlife from the Hybrid Alternative.

5.5.7 What are the significant unavoidable adverse impacts to fish and wildlife?

With the implementation of BMPs, minimization measures, and mitigation, there would be no significant unavoidable adverse impacts on fish and wildlife during construction.

5.6 WETLANDS

This section describes the potential temporary impacts from project construction on wetland resources in the study area. Long-term changes to wetlands are described in Section 4.6, Wetlands. The information presented in this section is summarized from the full analysis in the Wetlands Discipline Report (Attachment 10).
Key Findings: Wetlands Construction Impacts

Under any of the action alternatives, construction would impact wetlands in the study area. Construction activities from initial dredging, creating habitat areas, clearing vegetation, placement of temporary fill, and use of staging areas and access would produce localized turbidity and sedimentation and temporarily disrupt ecological functions of wetlands. With implementation of standard construction BMPs, however, all impacts on wetlands from construction would be avoided or minimized; thus, construction impacts would be less than significant.

5.6.1 What methods were used to assess construction impacts to wetlands?

Potential construction impacts were evaluated based on how construction activities would affect ecological functions of wetlands, including water quality (nutrient cycling, turbidity), hydrologic functions (alteration of flood flows, groundwater recharge), and habitat (disturbed habitat and species avoidance). Construction impacts were estimated based on the conceptual design for each alternative.

Pursuant to federal, state, and local laws, the project must include BMPs to avoid and minimize construction impacts. Following construction, the affected areas and habitats would generally return to their pre-construction condition following completion of the project either through natural processes, active restoration, or some combination; however, the general duration of recovery following construction is also considered in the impact analysis. Long-term wetland alterations, such as the conversion of a freshwater wetlands to saltmarsh and tideflats, are discussed in Chapter 4.0, Long-Term Impacts, Benefits, and Mitigation.

5.6.2 What are the construction impacts common to all action alternatives?

The types of construction impacts that would occur are similar among the action alternatives and include the following:

- Initial dredging in the North Basin; or North and Middle Basins
- Construction of habitat areas in the Middle Basin; or North and Middle Basins
- Construction of recreational amenities (boardwalks, dock, boat launch, and 5th Avenue Pedestrian Bridge)
• Repair or removal of the 5th Avenue Dam and 5th Avenue Bridge

• Construction staging and access throughout the Capitol Lake Basin (including vegetation clearing, temporary fill, and lowering of water levels)

All of the action alternatives include initial dredging of the lake bed and deepwater areas to remove sediments that have accumulated since construction of the 5th Avenue Dam. The location, volume, and duration of the initial dredging would vary by alternative, with the Estuary and Hybrid Alternatives having a longer overall duration and dredging volume than the Managed Lake Alternative. Dredged material would be used to create habitat areas in the Middle Basin under all of the action alternatives; some habitat areas would also be created in the North Basin for the Estuary and Hybrid Alternatives. Dredging and habitat area construction would occur with the existing 5th Avenue Dam in place and would occur during the in-water work windows allowed by the regulatory agencies.

Dredging would likely be conducted in stages, so the area of disturbance in any particular year would be limited to the extent that could be completed within a work window or within 1 year. Dredging would directly remove aquatic vegetation, where present, in deepwater habitats. It is expected that aquatic vegetation would regrow within the growing season if disturbed by temporary construction activities.

The primary temporary construction impacts of dredging and habitat area construction would be direct disturbance of wetland habitats, and localized turbidity and sedimentation, which can negatively affect wetland vegetation growth or smother plants. Dredging would directly remove aquatic vegetation in deepwater habitats. However, aquatic vegetation that is affected by dredging would likely regrow between the allowable in-water work windows.

Construction of the 5th Avenue Pedestrian Bridge, boardwalks, dock, and boat launch could cause minor, temporary impacts on wetlands if the clearing of vegetation and/or the placement of temporary fill materials in wetlands is needed to allow construction access. Construction may also require lowering of the lake level for a few months to allow equipment to work in dry conditions. Lowering the lake would temporarily dewater wetlands along the perimeter of the basins and could harm plant growth and reduce habitat quality.
Construction of these structures would produce localized turbidity and sedimentation that could temporarily affect water quality.

Under all of the action alternatives, Marathon Park would be used as the primary construction staging and water access point for the duration of the project. Other potential temporary staging areas include Tumwater Historical Park and an area near the 5th Avenue Bridge. All of these sites are primarily upland areas but do contain some adjacent wetland areas, including fringing vegetated wetlands and deepwater. Use of these staging areas could damage vegetation and compact soils of emergent and scrub-shrub wetlands along the edge of the basins, but the staging and access areas would be sited and constructed in a way to avoid and minimize wetland impacts. Turbidity and sedimentation may also occur in deepwater habitats.

Under all action alternatives, the impact of dredging and habitat area creation in deepwater habitats would be limited in duration, and the temporarily disturbed areas would return to pre-construction condition. Given this, and considering that the types of temporary impacts on wetlands from other construction elements can typically be reduced through site-specific mitigation measures, temporary construction impacts on wetlands under all action alternatives are considered less than significant. BMPs will be implemented to avoid or minimize impacts on wetlands, and these measures will be specified in project permits (see Section 5.6.6 for more detail).

5.6.3 What are the construction impacts under the Managed Lake Alternative?

In addition to construction activities that are common to all alternatives, the Managed Lake Alternative would include the following:

- 5th Avenue Dam overhaul repairs

Most of the work associated with dam repairs would not involve in-water work within either Capitol Lake or Budd Inlet. However, construction of a buttressing berm to improve stability of the earthen dam includes placement of up to 25,000 cubic yards (19,114 cubic meters) of aggregate and riprap placed along approximately 0.5 acres (0.2 hectares) of the shoreline on the downstream (West Bay) side of the earthen dam and adjacent to the dam along a portion of shoreline. Construction may affect scrub-shrub wetlands adjacent to the dam, and in-water work associated with the buttressing berm would result in localized turbidity and effects from sedimentation on
deepwater habitat. Appropriate BMPs to avoid impacting vegetated scrub-shrub wetlands adjacent to the dam would be implemented. Based on the location and short-term nature of the repairs, any construction impacts on wetlands would be minor and temporary, and therefore less than significant.

**5.6.4 What are the construction impacts under the Estuary Alternative?**

In addition to wetland impacts that are common to all alternatives, the Estuary Alternative has the following construction activities:

- 5th Avenue Dam and 5th Avenue Bridge removal
- Construction of a new 5th Avenue Bridge for vehicles and Deschutes Parkway realignment
- Slope stabilization along Deschutes Parkway
- Stormwater outfall replacement (along the Deschutes Parkway and the Arc of Statehood)
- Culverts replacement at the Interpretive Center

Vegetated wetlands and deepwater freshwater and deepwater estuarine habitats would be temporarily affected during construction. The removal of the 5th Avenue Dam and 5th Avenue Bridge, construction of the new 5th Avenue Bridge, and realignment of Deschutes Parkway would be the most intensive of the additional construction activities that would occur under the Estuary Alternative. Some of the structures would take multiple years to construct; however, all in-water work would be constructed within dry cofferdams, limiting the duration of potential impacts on wetlands. Construction would be conducted in stages, so the area of disturbance in any particular area would be limited to the extent that could be completed within a work window or within 1 year. In other construction areas, wetland soils may be compacted and vegetation removed by the movement of construction equipment and materials. Construction activities may also release sediment into the deepwater habitat, affecting wetland vegetation. Potential construction impacts from slope stabilization, stormwater, and culvert replacement would likely be similar, potentially temporarily disrupting scrub-shrub and emergent wetlands along the shoreline.

With adherence to standard construction BMPs to minimize disturbance and turbidity and sedimentation effects, wetland impacts from these construction activities would be less than significant.
5.6.5 What are the construction impacts under the Hybrid Alternative?

For the Hybrid Alternative, construction impacts and the duration of impacts would be the same as those described under the Estuary Alternative, but would also include the installation of a barrier wall to create the new, smaller reflecting pool. The 2,600-foot-long (790-meter-long) sheetpile barrier wall would take approximately 15 months to construct, over three in-water work windows. Wall installation could create turbidity and impacts to adjacent wetlands and deepwater habitat, similar to the construction work described for the Estuary Alternative.

With adherence to standard construction BMPs to minimize disturbance and turbidity and sedimentation effects, wetland impacts from these construction activities would be less than significant.

5.6.6 What avoidance, minimization, and mitigation measures would be implemented for the project?

5.6.6.1 Measures Common to All Alternatives

BMPs would be implemented, in accordance with project permits, to minimize potential construction impacts on wetlands. Standard BMPs may include:

- Changing water access points to avoid wetland areas
- Fencing or marking wetland areas and construction limits
- Using erosion and sediment control methods and plans
- Using silt curtains to control turbidity
- Using steel plates or mats to minimize soil compaction from construction equipment
- Refueling vehicles at least 100 feet (30 meters) away from wetlands

5.6.6.2 Managed Lake Alternative

Installation of the buttressing berm would be timed to occur at low tide as feasible. No additional mitigation would be needed to address construction impacts to wetlands from the Managed Lake Alternative.
5.6.6.3 **Estuary Alternative**

No additional mitigation would be needed to address construction impacts to wetlands from the Estuary Alternative.

5.6.6.4 **Hybrid Alternative**

No additional mitigation would be needed to address construction impacts to wetlands from the Hybrid Alternative.

5.6.7 **What are the significant unavoidable adverse impacts to wetlands?**

With the implementation of BMPs, minimization measures, and mitigation, there would be no significant unavoidable adverse impacts on wetlands during construction.

5.7 **AIR QUALITY & ODOR**

This section describes the potential impacts from project construction on air quality and odor elements in the Project Area. The information presented in this section is summarized from the full analysis in the Air Quality and Odor Discipline Report (Attachment 11).

**Key Findings: Air Quality and Odor Construction Impacts**

For all action alternatives, air quality and odor impacts would result from construction-related activities, including initial dredging. Of the action alternatives, the Managed Lake Alternative would generate the lowest construction emissions and the Hybrid Alternative would generate the most construction emissions. For all action alternatives, the annual emissions for criteria pollutants are estimated to be less than the general conformity de minimis thresholds. The combined construction and post-construction emissions are also less than the GHG reporting threshold, as described in Section 4.7, Air Quality and Odor. Both the air quality and GHG impacts for the Managed Lake, Estuary, and Hybrid Alternatives would be less than significant.

5.7.1 **What methods were used to assess construction impacts?**

The air quality impacts from the construction phase of the project were assessed by calculating the total project emissions of each criteria pollutant (i.e., NO\textsubscript{x}, SO\textsubscript{2}, CO, VOC, PM\textsubscript{10}, PM\textsubscript{2.5}) from equipment associated with construction phase activities. Four categories of equipment were considered in estimating emissions: harbor craft, dredging vessels, construction equipment, and on-road...
trucks. For all action alternatives, the annual emissions of criteria pollutants are compared against the general conformity *de minimis* thresholds—emission thresholds designed to serve as a check on whether emissions are prone to degrading a region’s ambient air quality. Additional details on the guidance documents and methods for determining emission totals are provided in the Air Quality and Odor Discipline Report (Attachment 11).

Construction GHG emissions were combined with the long-term (operational) emissions, as described in Section 4.7, Air Quality and Odor. All GHG emissions would contribute to the long-term impacts of climate change.

Odor impacts associated with construction (i.e., earthwork or equipment exhaust) would be intermittent over the 4 to 8 years of construction. Odors would generally be limited in duration and frequency such that any odors are unlikely to rise to a level that would be considered a nuisance or be characterized as significant. Long-term odor impacts were assessed based on the final configuration for each alternative and are discussed in Section 4.7, Air Quality and Odor.

### 5.7.2 What are the construction impacts common to all action alternatives?

The primary construction elements that would affect air quality include the following:

- Exhaust from operation of construction equipment, primarily associated with construction dredging, but also other vessel and vehicle construction for other construction activities

The construction-related emissions rely on the equipment use estimated for completing each of the alternatives. The hours of operation for dredging would depend on the material removal rates for a given alternative. Much of the dredged material would be beneficially reused on-site to establish the habitat areas, and would not generate emissions from truck trips to haul to an off-site disposal site. Disposal of any excess sediment or other materials from construction would be restricted to upland disposal given the presence of invasive species. The construction activity would, like most construction, create localized dust, exhaust, and associated odors that may be noticeable in near proximity to the activity.

Construction impacts would differ by alternative, as described below.
5.7.3 What are the construction impacts under the Managed Lake Alternative?

Construction dredging would be the primary source of air pollutants and air quality impacts associated with the Managed Lake Alternative. Among the action alternatives, the Managed Lake Alternative involves comparatively less equipment and operating hours due to the lower dredge operating duration and volume, which results in lower emissions of each pollutant. The calculated air pollutant emission rates are summarized in Table 5.7.1. The total annual emissions of each pollutant would be less than the general conformity de minimis thresholds; therefore, the air quality impacts associated with the construction phase of this alternative would be less than significant.

The Managed Lake Alternative would generate lower levels of construction-related GHG emissions than the Estuary or Hybrid Alternatives (see Section 4.7, Air Quality and Odor, for information on combined construction and operation GHG emissions). The GHG emissions are much less than reporting thresholds but would contribute to GHG emissions cumulatively.

Table 5.7.1 Construction Air Pollutant Emission Results: Managed Lake Alternative

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Project Emissions (tpy (mtpy))</th>
<th>General Conformity De Minimis Threshold (tpy (mtpy))</th>
<th>Greater Than De Minimis?</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>14 (13)</td>
<td>100 (91)</td>
<td>No</td>
</tr>
<tr>
<td>NO\textsubscript{x}</td>
<td>65 (59)</td>
<td>100 (91)</td>
<td>No</td>
</tr>
<tr>
<td>VOC</td>
<td>1 (0.91)</td>
<td>100 (91)</td>
<td>No</td>
</tr>
<tr>
<td>SO\textsubscript{2}</td>
<td>0.04 (0.036)</td>
<td>100 (91)</td>
<td>No</td>
</tr>
<tr>
<td>PM\textsubscript{10}</td>
<td>0.91</td>
<td>100 (91)</td>
<td>No</td>
</tr>
<tr>
<td>PM\textsubscript{2.5}</td>
<td>1 (0.91)</td>
<td>100 (91)</td>
<td>No</td>
</tr>
</tbody>
</table>

Abbreviations: mtpy = Metric tons per year, tpy = Tons per year

5.7.4 What are the construction impacts under the Estuary Alternative?

While construction dredging would be the primary source of air pollutant emissions, the Estuary Alternative includes considerably more construction activity than the Managed Lake Alternative with the removal of the 5th Avenue Bridge and 5th Avenue Dam, as well as the realignment of Deschutes Parkway. The calculated air pollutant
emission totals are summarized in Table 5.7.2. The total annual emissions of each pollutant would be less than the general conformity \textit{de minimis} thresholds; therefore, the air quality impacts associated with the construction phase of this alternative would be less than significant.

The Estuary Alternative would generate greater levels of GHG emissions during construction than the Managed Lake Alternative. The GHG emissions are much less than reporting thresholds but would contribute to GHG emissions cumulatively. Over the long term, carbon sequestration would help to offset these contributions, as described in Section 4.7, Air Quality and Odor.

Table 5.7.2 Construction Air Pollutant Emission Results – Estuary Alternative

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Project Emissions (tpy (mtpy))</th>
<th>General Conformity De Minimis Thresholds (tpy (mtpy))</th>
<th>Greater Than De Minimis?</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>18 (16)</td>
<td>100 (91)</td>
<td>No</td>
</tr>
<tr>
<td>NO\textsubscript{x}</td>
<td>84 (76)</td>
<td>100 (91)</td>
<td>No</td>
</tr>
<tr>
<td>VOC</td>
<td>1 (0.91)</td>
<td>100 (91)</td>
<td>No</td>
</tr>
<tr>
<td>SO\textsubscript{2}</td>
<td>0.05 (0.045)</td>
<td>100 (91)</td>
<td>No</td>
</tr>
<tr>
<td>PM\textsubscript{10}</td>
<td>2 (1.8)</td>
<td>100 (91)</td>
<td>No</td>
</tr>
<tr>
<td>PM\textsubscript{2.5}</td>
<td>1 (0.91)</td>
<td>100 (91)</td>
<td>No</td>
</tr>
</tbody>
</table>

5.7.5 What are the construction impacts under the Hybrid Alternative?

Initial construction dredging would be the primary source of air pollutant emissions. The Hybrid Alternative, like the Estuary Alternative, also includes considerably more construction activity than the Managed Lake Alternative with the removal of the 5th Avenue Bridge and 5th Avenue Dam, as well as the realignment of Deschutes Parkway. The calculated air pollutant emission totals from initial dredging are estimated to be almost the same as the Estuary Alternative, although emissions of NO\textsubscript{x} would be slightly higher (see Table 5.7.3). Because these emissions would be below the general conformity \textit{de minimis} thresholds, air quality impacts associated with the construction phase of this alternative would be less than significant.
Table 5.7.3 Construction Air Pollutant Emission Results – Hybrid Alternative

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Project Emissions (tpy (mtpy))</th>
<th>General Conformity De Minimis Thresholds (tpy (mtpy))</th>
<th>Greater Than De Minimis?</th>
</tr>
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<tbody>
<tr>
<td>CO</td>
<td>18 (16)</td>
<td>100 (91)</td>
<td>No</td>
</tr>
<tr>
<td>NO\textsubscript{x}</td>
<td>86 (78)</td>
<td>100 (91)</td>
<td>No</td>
</tr>
<tr>
<td>VOC</td>
<td>1 (0.91)</td>
<td>100 (91)</td>
<td>No</td>
</tr>
<tr>
<td>SO\textsubscript{2}</td>
<td>0.05 (0.045)</td>
<td>100 (91)</td>
<td>No</td>
</tr>
<tr>
<td>PM\textsubscript{10}</td>
<td>2 (1.8)</td>
<td>100 (91)</td>
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<td>1 (0.91)</td>
<td>100 (91)</td>
<td>No</td>
</tr>
</tbody>
</table>

Of the three action alternatives, the Hybrid Alternative would generate the greatest levels of GHG emissions during construction. The GHG emissions are much less than reporting thresholds but would contribute to GHG emissions cumulatively. As described for the Estuary Alternative, carbon sequestration would help to offset these emissions over the long term.

5.7.6 What mitigation measures would be implemented for the project?

5.7.6.1 Measures Common to All Alternatives

Although construction would not significantly affect air quality, construction contractors would be required to comply with all relevant federal, state, and local air quality rules. In addition, implementation of BMPs would reduce emissions related to the construction phase of the project. Management practices for reducing the potential for air quality impacts during construction include measures for reducing both exhaust emissions and fugitive dust. The Washington Associated General Contractors Guide to Handling Fugitive Dust from Construction Projects suggest a number of methods for controlling dust and reducing the potential exposure of people to emissions from diesel equipment. A list of the control measures that would be considered to minimize air quality impacts from construction are as follows:

- Require model year 2007 or newer engines for heavy duty vehicles (except trucks that are operated less than 100 hours each year on this job)
- Require the use of biofuel B20, or offer contractor incentive for this fuel
• Require contractor to have idle reduction plan or ensure that project specifications have a maximum idle time of 5 minutes; however, if equipment requires, in the colder months, idle times may be extended to achieve adequate equipment performance.

• Require all off-road machinery to have emission reduction equipment (e.g., require participation in Puget Sound Region Diesel Solutions, a program designed to reduce air pollution from diesel, by project sponsors and contractors).

• Use carpooling or other trip-reduction strategies for construction workers.

• Spray exposed soil with water or other suppressant to reduce emissions and deposition of particulate matter.

• Pave or use gravel on staging areas and roads that would be exposed for long periods.

• Cover all trucks transporting materials, wetting materials in trucks, or providing adequate freeboard (space from the top of the material to the top of the truck bed), to reduce emissions and deposition of particulate matter during transport.

• Provide wheel washers to remove particulate matter that would otherwise be carried off-site by vehicles to decrease deposition of particulate matter on area roadways.

• Cover dirt, gravel, and debris piles as needed to reduce dust and wind-blown debris.

5.7.6.2 Managed Lake Alternative

No additional mitigation would be needed to address construction impacts to air quality and odors from the Managed Lake Alternative.

5.7.6.3 Estuary Alternative

No additional mitigation would be needed to address construction impacts to air quality and odors from the Estuary Alternative.

5.7.6.4 Hybrid Alternative

No additional mitigation would be needed to address construction impacts to air quality and odors from the Hybrid Alternative.
5.7.7 What are the significant unavoidable adverse impacts to air quality and odor?

No significant unavoidable adverse impacts associated with air quality or odors are expected during construction as a result of any of the action alternatives.

5.8 LAND USE, SHORELINES, & RECREATION

This section describes the potential construction impacts from project construction on land use, shorelines, and recreation. The information presented in this section is summarized from the full analysis in the Land Use, Shorelines, and Recreation Discipline Report (Attachment 12).

Key Findings: Land Use, Shorelines, and Recreation Construction Impacts

During construction, public access to parks and other public facilities would be reduced, in some areas for several years. Most of the recreation resources in the Project Area would remain open. However, most of Marathon Park would be closed for 4 to 8 years, depending on the alternative, and several areas around the lake would be partially closed for periods of time. There would also be construction noise and visual disturbance during the periods of dredging and construction within Capitol Lake. This disruption would reduce the value of the area for some popular recreation activities, such as walking, running, and biking. The Estuary and Hybrid Alternatives would have the longest duration of closures and disturbance, and the Hybrid Alternative would have the most intensive construction activity due to construction for the reflecting pool. Impacts to Marathon Park from staging and impacts on recreational use related to noise and other disruptions could not be fully mitigated and would be a significant unavoidable impact under all action alternatives.

5.8.1 What methods were used to assess construction impacts?

This analysis focused on construction impacts that would have the greatest potential to impact adjacent land and shoreline uses and recreational users. Impacts could occur when access to portions of recreation areas may be temporarily restricted or recreational enjoyment disrupted due to noise or other construction activity.

5.8.2 What are the construction impacts common to all action alternatives?

All action alternatives have construction impacts associated with the following:

- Initial dredging in the North Basin; or North and Middle Basins

What construction impacts were considered in the land use, shorelines, and recreation analysis?

Construction impacts include temporary disruption of adjacent land and shoreline uses, exclusion of public use from public recreation areas for safety purposes, and reduction in the quality of recreational resources due to construction noise, dust, or other factors.
• Construction of habitat areas in the Middle Basin; or North and Middle Basins
• Construction of recreational amenities (boardwalks, dock, boat launch, and 5th Avenue Pedestrian Bridge)
• Repair or removal of the 5th Avenue Dam
• Construction staging and access throughout the Capitol Lake Basin

In terms of land use, temporary disruptions from construction, staging, and construction access would not change any existing use into a different use, or create substantial land use conflicts. While creating inconveniences for some, these land use impacts would be less than significant.

Public access to parks and other public facilities would be reduced or restricted in certain areas during construction (Figure 5.8.1). Construction schedules provide a 4- to 5-year duration for construction of the Managed Lake Alternative, and a 7- to 8-year duration for construction of the Estuary and Hybrid Alternatives. Recreational use and enjoyment would be diminished in some locations because of equipment noise, full or partial closures of parks and trails, disruption of vegetation, and other aesthetic effects.

The Project Area has 165 acres (67 hectares) of park space. Of this, approximately 4.5 acres (1.8 hectares) would be temporarily directly impacted by construction staging for up to 8 years. Activities along Deschutes Parkway would require temporary closures of portions of the trail. Construction activities within the basin, such as dredging and habitat area establishment, would indirectly impact shoreline parks adjacent to Capitol Lake from noise and other disturbances.

All action alternatives involve the use of Marathon Park as the primary construction staging and contractor waterfront access point for the duration of project construction. Access around Marathon Park, including access to the existing pedestrian bridge that crosses the lake, would be allowed during construction, but use of the entire park would be otherwise restricted during the approximate 4- to 8-year construction period, depending on the alternative. Another construction access point would be established at Tumwater Historical Park for equipment needing to access the Middle Basin. Partial closures of a portion of Tumwater Historical Park are anticipated when this site was being used as an access point. Construction staging would also occur around the 5th Avenue Dam.
during construction of the 5th Avenue Pedestrian Bridge. Construction staging and access areas would be returned to their previous conditions after construction.

Recreational users would experience noise and would see dredging equipment for several months each year, including during the peak summer recreational season, which may detract from the recreational experience for some users. The containment cells that would be installed to support dredging and to develop habitat areas would remain in water for the majority of the construction duration and would not be removed after each in-water work window.

Most park users surveyed indicated that walking was one of the activities they came to the park for; noise and construction activity could detract from these users’ enjoyment of the parks and trails. Some recreationists may also find the construction activities to be interesting to observe. Construction activity could also disrupt wildlife use of areas temporarily, reducing its value for recreational users.

On the south side of the 5th Avenue Bridge, a pedestrian bridge would be constructed, connecting existing pathways along Heritage Park and Deschutes Parkway, a popular loop trail around the North Basin. The 5th Avenue Pedestrian Bridge would not be constructed until after dam repair or removal is complete, which would mean that under all action alternatives there would be a temporary closure of this pathway connection. This connection would be closed for a period of approximately 4 years under the Estuary and Hybrid Alternatives, and only intermittently over a 6-month period of dam repair under the Managed Lake Alternative. To minimize this impact, Enterprise Services would evaluate the feasibility of constructing the 5th Avenue Pedestrian Bridge prior to removal or repair of the 5th Avenue Bridge in order to maintain a consistent trail loop connecting Heritage Park and Deschutes Parkway. Alternatively, a temporary trail trestle could be constructed.

Construction of other common elements, such as the new dock and boat launch, could include temporary park and trail closures or detours, noise, and dust. Nearby pedestrian and bicycle facilities could be affected areas while construction is occurring.
Figure 5.8.1 Construction Staging for Action Alternatives

Legend
- Orange: Staging Area for Action Alternatives
- Green: Staging Area for Estuary and Hybrid Alternatives
- Light Blue: In-Water Staging and Construction Activities for Action Alternatives

Staging Area for Estuary and Hybrid Alternatives
Primary Staging Area throughout Construction
Temporary Construction Activities for Estuary and Hybrid Alternatives
Temporary Staging Area for Access

Scale in Feet
0 500 1,000 2,000

Ch. 5 – Short-Term Impacts & Mitigation

Page 542
Most of the recreation resources in the study area would remain open and continue to operate. However, a substantial portion of Marathon Park would be closed for 4 to 5 years, and many areas around and within Capitol Lake would be subject to 4 to 8 years of intermittent construction noise and other disturbances during the periods when dredging and other construction would occur, substantially reducing the value of the area for popular recreation activities, such as walking and wildlife viewing. For these reasons, construction impacts on recreation are considered significant for all action alternatives.

5.8.3 What are the construction impacts under the Managed Lake Alternative?

In addition to construction activities that are common to all alternatives, the Managed Lake Alternative would include the following:

- 5th Avenue Dam overhaul repairs

The existing 5th Avenue Dam and 5th Avenue Bridge provide a pedestrian and bicycle connection between Deschutes Parkway and Heritage Park. The dam overhaul repair work would take 6 months, as compared to the 4.5-year duration of dam removal and bridge construction under the Estuary and Hybrid Alternatives. As described for impacts common to all action alternatives, this connection would be closed intermittently over the 6-month period. To minimize this impact, Enterprise Services would evaluate the feasibility of constructing the 5th Avenue Pedestrian Bridge prior to removal or repair of the 5th Avenue Bridge in order to maintain a consistent trail loop connecting Heritage Park and Deschutes Parkway. Alternatively, a temporary trail trestle could be constructed.

All other construction impacts under the Managed Lake Alternative would be as generally described for activities common to all action alternatives. Construction of the Managed Lake Alternative would include dredging activities, temporary staging areas in parks, trail closures, and construction-related noise and dust, which could adversely affect land use, shoreline use, or recreation.

Most of the recreation resources in the study area would remain open and continue to operate. However, a substantial portion of Marathon Park would be closed for 4 to 5 years, and many areas around Capitol Lake would be subject to up to 5 years of construction noise during the periods when dredging and other construction would occur, substantially reducing the value of the area for popular recreation
activities, such as walking and wildlife viewing. For these reasons, construction impacts on recreation are considered significant.

5.8.4 What are the construction impacts under the Estuary Alternative?

In addition to construction activities that are common to all alternatives, the Estuary Alternative would include the following:

- 5th Avenue Dam and 5th Avenue Bridge removal
- Construction of a new 5th Avenue Bridge for vehicles and Deschutes Parkway realignment
- Slope stabilization along Deschutes Parkway
- Stormwater outfall replacement (along the Deschutes Parkway and the Arc of Statehood)
- Culvert replacements at the Interpretive Center

With these additional elements and work limited to the in-water work windows, construction is expected to take up to 8 years, 3 years longer than the Managed Lake Alternative.

Initial construction dredging for this alternative would be in the Middle and North Basins and would occur seasonally over 5 years during the anticipated in-water work windows, a slightly longer duration than under the Managed Lake Alternative.

An additional temporary staging area would be established at the northwestern edge of the North Basin during construction of Deschutes Parkway realignment, dam removal, and construction of the 5th Avenue Bridge and 5th Avenue Pedestrian Bridge.

Demolition of the dam and construction of the 5th Avenue Bridge would be the most notable differences during construction of this alternative, compared to the Managed Lake Alternative. The trail connection between Deschutes Parkway and Heritage Park would be closed for a period of approximately 4 years. Its closure for this period would affect a large number of park users. These recreationalists would still be able to access other portions of the trail around the lake, but following a loop path would not be possible without a substantial detour using 4th Avenue W, or early construction of the 5th Avenue Pedestrian Bridge, which is a minimization measure being evaluated by Enterprise Services.
The Estuary Alternative also involves arming and replacement of stormwater outfalls along Deschutes Parkway, which would cause more temporary trail closures than the Managed Lake Alternative. Staging and construction would also progress along Deschutes Parkway as it is armored. Portions of the trail along the lake would be subjected to rolling closures for approximately 3 months as the construction progressed.

Most of the recreation resources in the study area would remain open and continue to operate. However, a substantial portion of some highly used resources would be closed for 5 to 8 years, including most of Marathon Park (5 years) and the north section of the loop trail around the North Basin. Many areas around the lake would be subject to up to 8 years of intermittent construction noise, particularly during the in-water works window, substantially reducing the value of the area for popular recreation activities, such as walking and wildlife viewing. For these reasons, construction impacts on recreation are considered significant.

5.8.5 What are the construction impacts under the Hybrid Alternative?

Construction impacts of the Hybrid Alternative would generally be as described for the Estuary Alternative and for impacts common to all alternatives, except that the Hybrid Alternative would include the following:

- Barrier wall construction in the North Basin

The 2,600-foot-long (790-meter-long) barrier wall would be constructed in the North Basin to create the new, smaller reflecting pool. The construction period would be the same duration as for the Estuary Alternative (seasonally, over approximately 7 to 8 years), but would include more intensive construction activity and noise during the 2 to 3 years of barrier wall construction. As such, this alternative would be more disruptive to recreationists using the parks adjacent to the North Basin. The overall duration of temporary trail and park closures would be the same as the Estuary Alternative.

Most of the recreation resources in the study area would remain open and continue to operate. However, a substantial portion of the resources would be closed for 5 to 8 years, including most of Marathon Park and the north section of the loop trail around the North Basin. Many areas around Capitol Lake would be subject to up to 8 years of construction noise, particularly during the in-water work
window, substantially reducing the value of the area for popular recreation activities, such as walking and wildlife viewing. For these reasons, construction impacts on recreation are considered significant.

5.8.6 What mitigation measures would be implemented for the project?

5.8.6.1 Measures Common to All Alternatives

Enterprise Services would evaluate the feasibility of constructing the 5th Avenue Pedestrian Bridge prior to removal or repair of the 5th Avenue Bridge in order to maintain the trail loop connecting Heritage Park and Deschutes Parkway during construction. Alternatively, Enterprise Services could consider construction of a temporary trail trestle.

In order to limit disruption of or interference with recreation activities during construction, the following additional measures should be considered:

• Use BMPs to minimize noise, dust, and other disturbances to visitors to recreation sites during construction, as well as in areas used for informal recreation (e.g., along roads).

• Coordinate with potentially affected park districts/departments, to ensure that the public is well-informed of upcoming construction activities, and to plan construction to minimize conflicts with park events to the extent feasible.

• Provide alternative access points to recreation sites and trail detours.

• Provide signage along trails or park entrances at least 1 week prior to closures.

• Clearly mark pedestrian and bicycle access routes as well as locations of detour signage and other wayfinding elements.

• Restore recreation sites or trails after construction.

• Schedule construction activities in a way that minimizes or avoids impacts to major festival days, whenever feasible.

• Coordinate with festival and event planners when conflicting construction activities and closures cannot be
avoided. This could include planning for detours, signage, media notifications, and similar actions.

- Limit construction hours to avoid high-use times in parks, such as weekends and festival hours.
- Given the duration of construction, provide interpretative signage in adjacent parks to explain how the work meets project goals, adding interest for some users.
- Provide a 24-hour hotline to address complaints or safety concerns that may arise during construction.

5.8.6.2 Managed Lake Alternative

There are no additional mitigation measures to offset land use, shorelines, and recreational impacts for the Managed Lake Alternative beyond those described for all action alternatives.

5.8.6.3 Estuary Alternative

There are no additional mitigation measures to offset land use, shorelines, and recreational impacts for the Estuary Alternative beyond those described for all action alternatives.

5.8.6.4 Hybrid Alternative

In order to limit disruption during sheetpile placement for the barrier wall, extent of impact piledriving should be limited and the use of vibratory piledriving should be maximized.

5.8.7 What are the significant unavoidable adverse impacts to land use, shorelines, and recreation?

There would be significant unavoidable impacts on recreation under any of the action alternatives during construction of the project given the duration of anticipated construction (4 to 8 years).

Trail access impacts could be reduced through mitigation, such as use of detours or a temporary trestle (under the Estuary and Hybrid Alternatives). However, impacts to Marathon Park from staging and impacts on recreational use related to noise and other disruptions could not be fully mitigated to less than significant levels.
5.9 CULTURAL RESOURCES

This section describes the potential indirect impacts from temporary, project construction activities on archaeological and historic built environment resources in the Project Area. Direct impacts that would permanently impact historic resources are addressed in Section 4.9, Cultural Resources. The information presented in this section is summarized from the full analysis in the Cultural Resources Discipline Report (Attachment 13).

Key Findings: Cultural Resources Construction Impacts

Construction impacts on archaeological resources are irreversible and permanent because these resources are nonrenewable and any impact on the depositional integrity (i.e., context) would be significant. Initial construction dredging in the North Basin and other construction activities could intersect, remove, or compact unrecorded archaeological resources, and impacts would be potentially significant. The Estuary and Hybrid Alternatives would have a greater risk of encountering unrecorded archaeological sites due to greater ground disturbance compared to the Managed Lake Alternative.

Construction impacts on historic resources would occur from temporary construction activities and could reduce a resource’s historic register eligibility or reduce the ability of the resource to convey its historic significance. Construction would generate traffic congestion, noise, dust, and access limitations. While these impacts may inconvenience residents and visitors, and temporarily diminish the integrity of historic resources, they would be reversible and would not permanently diminish the ability for a historic resource to convey its historical significance. Measures to reduce construction impacts would be implemented, and impacts from temporary construction activities would be less than significant.

5.9.1 What methods were used to assess construction impacts?

To determine the potential construction impacts of the project alternatives on cultural resources, the characteristics of archaeological resources and historic built environment resources within the study area were first identified. Archaeological resources are nonrenewable, and any impact on the depositional integrity (i.e., context) of a protected archaeological resource is considered a significant impact. Analysis of historic built environment resources focused on the potential impacts on a resource’s integrity (i.e., location, design, setting, materials, workmanship, feeling, and association).
5.9.2 **What are the construction impacts common to all alternatives?**

All action alternatives would have construction impacts associated with the following:

- Initial dredging in the North Basin; or North and Middle Basins
- Construction of habitat areas in the Middle Basin; or North and Middle Basins
- Construction of recreational amenities (boardwalks, dock, boat launch, and 5th Avenue Pedestrian Bridge)
- Construction staging and access throughout the Capitol Lake Basin

5.9.2.1 **Archaeological Resources**

The construction activities associated with the action alternatives could result in ground disturbance or compaction of soil that impacts archaeological resources.

As described in Section 3.9, Cultural Resources, there are recorded archaeological sites adjacent to all three basins. In the North Basin area, there are two recorded precontact sites immediately west of Deschutes Parkway, and one precontact site east of Deschutes Parkway; it is also possible that remains associated with these sites extend into the basin itself. Landforms in the vicinity of the 5th Avenue Dam are known to contain historic-era archaeological sites, including bottle and refuse dumps, as well as bridge and piling structural ruins. Additionally, the roadbed of the historic Olympia and Chehalis Valley Railroad runs generally along Deschutes Parkway in the Middle Basin.

Construction has the potential to intersect, remove, or compact unrecorded, potentially protected resources that may be present within the basins. Ground disturbance and the placement of fill for habitat areas also have the potential to damage unrecorded, potentially protected archaeological resources through compaction. Construction of structures within the Middle Basin (e.g., boardwalks, rebuilt dock) could impact submerged archaeological resources, including unrecorded upland sites that extend downslope into the basins.
There are no recorded archaeological resources within the proposed construction staging area and water access point at Marathon Park, and since the park landform was created using fill material, the park is considered to have a low potential to contain intact archaeological sites. Although use of the park for staging and water access has a low potential to damage unrecorded archaeological resources, it is possible that unrecorded sites are present. Similarly, there are no recorded archaeological sites within Tumwater Historical Park, which is also proposed for construction staging. The park landform was substantially modified with creation of the park, and the park is considered to have a low potential to contain intact archaeological sites. However, it is possible that unrecorded sites are present within Tumwater Historical Park.

Construction impacts on recorded and unrecorded, protected archaeological sites from ground disturbance or compaction of soil would be irreversible and permanent; therefore, if they were to occur, impacts would be potentially significant.

5.9.2.2 Historic Built Environment Resources

In addition to the permanent changes to historic resources that are described in Section 4.9, Cultural Resources, construction activities could result in indirect and temporary impacts that reduce a resource’s historic register eligibility or reduce the ability of the resource to convey its historic significance. All action alternatives would involve construction activities in or near eligible or potentially eligible historic resources.

During construction, the presence and activity of barges, pile drivers, temporary sheetpiles, containment cells, trucks, and materials would have temporary impacts on historic resources. These impacts would be typical of large-scale construction projects, such as noise, vibration, dust, visual impacts, and tracking of dirt and mud. There would also be short-term access limitations and traffic congestion. While these construction impacts may inconvenience residents and visitors, and temporarily diminish the integrity of historic resources, these impacts would be reversible and would not permanently diminish the ability for a historic resource to convey its historical significance.

Construction staging and access could have more than a temporary impact on a historic resource’s integrity. Truck trips could damage historic roadways and bridges, depending on volume, weight, and frequency; and construction activities could damage features in
Marathon Park, and this would constitute an impact if the park was eligible for listing and if the features were character-defining. These impacts could be mitigated through design or BMPs, such as an access plan to assess and avoid any potential damage. With these measures, impacts are expected to be less than significant.

5.9.3 **What are the construction impacts under the Managed Lake Alternative?**

In addition to the construction activities that are common to all alternatives, the Managed Lake Alternative would include the following:

- 5th Avenue Dam overhaul repairs

**5.9.3.1 Archaeological Resources**

5th Avenue Dam overhaul repairs would occur within the footprint of the existing structure or immediately adjacent, in areas previously disturbed during original dam construction. In particular, jet grouting along the earthen dam would involve considerable ground disturbance. Because jet grouting would be accomplished in the deep subsurface without visual contact, any impacts on archaeological resources could not be assessed. Removal, disturbance, and/or compaction of unrecorded, potentially protected archaeological resources could also occur. No construction impacts on archaeological resources beyond those common to all action alternatives are anticipated. Construction impacts on recorded and unrecorded, protected archaeological sites from ground disturbance or compaction of soil would be irreversible and permanent; therefore, if they were to occur, impacts would be potentially significant. The Managed Lake Alternative would have less overall ground disturbance than the Estuary and Hybrid Alternatives. Because of this, the Managed Lake Alternative would have less risk of encountering protected archaeological sites.

**5.9.3.2 Historic Built Environment Resources**

Overhaul repairs would occur in various places in and along the 5th Avenue Dam and would include work on the electrical components within the control house, appurtenances outside of the control house and spillways, and to components of the concrete spillways. Repair work would cause temporary impacts during construction, but would not diminish the integrity of the essential physical features for which the resource is potentially eligible for listing in a historic register, and are, therefore, less than significant.
All other construction impacts associated with the Managed Lake Alternative are the same as those described for impacts common to all action alternatives.

5.9.4 What are the construction impacts under the Estuary Alternative?

In addition to construction activities noted for impacts common to all action alternative, the Estuary Alternative has the following construction activities:

- 5th Avenue Dam and 5th Avenue Bridge removal
- Construction of a new 5th Avenue Bridge for vehicles and Deschutes Parkway realignment
- Slope stabilization along Deschutes Parkway
- Stormwater outfall replacement (along Deschutes Parkway and the Arc of Statehood)
- Culvert replacement at the Interpretive Center

5.9.4.1 Archaeological Resources

The Deschutes Parkway corridor in particular has a very high risk for precontact archaeological sites, and there are recorded sites along both sides of the parkway. It is possible that construction of the parkway actually bisected sites that originally were contiguous. The following activities have a potential to expose, damage, or remove archaeological sites:

- Use of upland areas along Deschutes Parkway for staging could impact recorded as well as unrecorded archaeological sites through grading, leveling, compaction, and other ground disturbances. Known sites include two precontact archaeological sites, as well as the roadbed of the historic Olympia and Chehalis Valley Railroad.

- Placement of fill for slope stabilization along Deschutes Parkway would cover one recorded precontact site as well as any unknown sites. Placement of fill as part of slope stabilization would impact sites by covering them further and making them more difficult to detect. The weight of material could compact sites also and deform or crush fragile artifacts such as shell, bone, and wood.
• Depending on depths and methods employed, habitat area construction immediately east of Deschutes Parkway could impact recorded as well as unrecorded sites.

Landforms in the vicinity of the 5th Avenue Dam are notable for the presence of historic-era archaeological sites such as bottle and refuse dumps, and ruined structural bridge and piling remains. Precontact sites are also possible. While removal of the 5th Avenue Dam itself is unlikely to intersect archaeological sites, road revisions to Deschutes Parkway, utility revisions, and other ground disturbances to landforms at each end of the dam could expose, damage, and remove archaeological sites.

Construction impacts on recorded and unrecorded archaeological sites would be irreversible and permanent; therefore, construction impacts on protected archaeological sites, if they were to occur, would be significant. The Estuary Alternative, as well as the Hybrid Alternative, would have a greater risk of encountering unrecorded archaeological sites due to greater ground disturbance compared to the Managed Lake Alternative.

5.9.4.2 Historic Built Environment Resources

Construction of the Estuary Alternative would involve direct impacts on eligible or potentially eligible historic resources, and would result in permanent impacts on those resources. These long-term impacts are described in Section 4.9, Cultural Resources.

Construction activities under the Estuary Alternative would cause the same type of indirect and temporary impacts on potentially eligible historic resources as described for impacts common to all action alternatives; however, construction under the Estuary Alternative would involve more activities and would cover more areas. These potential impacts could be mitigated through an access plan developed by the contractor prior to construction (see Section 5.9.7). As a result, impacts are expected to be less than significant.

5.9.5 What are the construction impacts under the Hybrid Alternative?

5.9.5.1 Archaeological Resources

Under the Hybrid Alternative, construction impacts on archaeological sites would be the same as those described for the Estuary Alternative. Impacts on protected archaeological resources, if they
were to occur, would be significant. Construction of the reflecting pool barrier wall would present a similar level of risk of encountering buried archaeological sites as the Estuary Alternative.

5.9.5.2 Historic Built Environment Resources

Under the Hybrid Alternative, construction impacts on historic resources would be the same as those described for the Estuary Alternative. Construction of the reflecting pool barrier wall would not introduce new types of construction impacts on the historic resource. Impacts would be less than significant.

5.9.6 What mitigation measures would be implemented for the project?

5.9.6.1 Mitigation Measures Common to All Action Alternatives

Mitigation for impacts on archaeological resources and historic built environment resources, including “adverse effects” on historic resources, would be identified through consultation under Section 106 with the federal lead agency, affected tribes, DAHP, and other consulting parties.

Additional mitigation measures may be separately developed through consultation with DAHP, affected tribes, the City of Olympia, the City of Tumwater, and other stakeholders. Additionally, an Archaeological Site Alteration and Excavation Permit may be required if impacts on a protected archaeological resource could not be avoided and would contain conditions and stipulations. Potential mitigation measures identified below can be adopted voluntarily by Enterprise Services and/or imposed as conditions as part of the permit process.

Archaeological Resources

- DAHP may request and recommend archaeological survey and/or monitoring of all areas that will be impacted by construction. A variety of approaches, including terrestrial shovel probing, terrestrial auger probing, terrestrial geoprobing, and in-water geoprobing and/or sonar, could be evaluated for use.

- Delineate recorded sites to determine if they can be avoided.
• Conduct archaeological monitoring during geotechnical and other ground-penetrating studies.

• Conduct archaeological review of all available geotechnical logs.

• Conduct all ground-disturbing work under the terms of an Archaeological Resources Inadvertent Discovery Plan and/or Archaeological Resources Monitoring Plan.

• Develop BMPs to minimize compaction of unpaved surfaces to the extent possible.

• Conduct archaeological monitoring during construction under the terms of an Archaeological Resources Inadvertent Discovery Plan and/or Archaeological Resources Monitoring Plan.

**Historic Built Environment Resources**

During construction, Enterprise Services would protect the historic and physical integrity of historic structures, properties, and districts through the avoidance, minimization, and mitigation measures developed for other elements of the environment. Formal documentation following DAHP mitigation standards will be completed for historic resources that will be demolished due to construction.

**5.9.6.2 Mitigation Measures for the Managed Lake Alternative**

Avoidance, minimization, and mitigation measures for construction of the Managed Lake Alternative are the same as those common to all alternatives.

**5.9.6.3 Mitigation Measures for the Estuary Alternative**

Mitigation would be the same as described for all action alternatives, with the following additions:

• Develop a protection and monitoring plan for historic resources adjacent to the Deschutes Parkway realignment work.

• Monitor construction work adjacent to the Deschutes Parkway realignment work as needed based on the protection and monitoring plan for historic resources.
5.9.6.4 Mitigation Measures for the Hybrid Alternative

Mitigation would be the same as described for all action alternatives and for the Estuary Alternative.

5.9.7 What are the significant unavoidable adverse impacts to cultural resources?

5.9.7.1 Archaeological Resources

There is no feasible mitigation to completely avoid the potential to impact unrecorded, protected archaeological sites.

5.9.7.2 Historic Built Environment Resources

With implementation of measures to reduce potential temporary impacts during construction, including BMPs and mitigation measures, there would be no significant indirect and temporary impacts on historic built environment resources. However, as described in Section 4.9.7.2, there would be significant unavoidable impacts as a result of permanent changes to historic built environment resources in the study area.

5.10 VISUAL RESOURCES

This section describes the potential impacts from project construction on visual resources in the study area.

Key Findings: Visual Quality Construction Impacts

Under all action alternatives, construction staging areas would be established in nearby parks. Public access to these parks and other public facilities would be reduced or restricted, in some areas for several years, as described in Section 5.8, Land Use, Shorelines, and Recreation. Most of Marathon Park would be closed for 4 to 8 years, depending on the alternative, during which time visual access to the shoreline would be obstructed. In addition, it is expected that construction equipment/materials, such as coffercells, would remain in place in the water of the Capitol Lake Basin for several years. These visual disruptions would substantially reduce the value of the area for some popular recreation activities, such as walking and wildlife viewing. The Estuary and Hybrid Alternatives would have the longest duration of closures at Marathon Park. Given the duration of construction-related staging at Marathon Park and in-water construction and staging, construction impacts on visual resources are considered a significant unavoidable impact for all action alternatives.
5.10.1 What methods were used to assess construction impacts?

The project is expected to cause temporary impacts, changes, and modifications to visual quality, due to the presence of construction equipment and staging in the Project Area, and temporary changes to the landscape during construction, such as grading, clearing, and replanting. The scale, proximity, and duration of construction activities determine the intensity of potential impacts.

5.10.2 What are the construction impacts common to all action alternatives?

All action alternatives would have construction impacts associated with the following:

- Initial dredging in the North Basin; or North and Middle Basins
- Construction of habitat areas in the Middle Basin; or North and Middle Basins
- Construction of recreational amenities (boardwalks, dock, boat launch, and 5th Avenue Pedestrian Bridge)
- Construction staging and access throughout the Capitol Lake Basin

Construction of all action alternatives would impact visual quality on a temporary, but extended, duration (4 to 8 years). Construction activities would be visible to recreationalists, workers, residents, commuters, and visitors. Visible elements of the project during construction include construction equipment on the lake and heavy machinery occupying staging and construction areas. The scale and duration of construction activities would vary among the action alternatives.

Staging areas would be the most prominent features of the project during construction. All action alternatives would use Marathon Park as the primary construction staging and contractor waterfront access point for the duration of project construction. Access around Marathon Park, including access to the pedestrian bridge across the lake, would be allowed during construction. The park would be otherwise closed during the approximate 4- to 8-year construction period, depending on the alternative. Visual access to the lake from Marathon Park would be obstructed for an extended period, and large numbers of viewers would be affected. Another construction
access point would be established at Tumwater Historical Park for equipment needing to access the Middle Basin.

Dredging within the lake would involve floating equipment, as well as coffercells, where the dredged material would be placed. Dredging activities would be visible from many locations surrounding the basins for up to 5.5 months of the year, over a 4- to 5-year period. Dredging would temporarily increase turbidity in the water. Muddy-colored water would affect the visual quality for viewers; however, these impacts would be of relatively short duration and would not severely affect the visual quality for viewers in any of the basins. Coffercells would remain in place beyond the limited in-water work window each year, and until all dredging and habitat creation was completed.

All action alternatives would include the construction of new boardwalks and a dock and boat launch. These construction activities would contrast with the normally placid visual character of the lake, but would be relatively small in scale and would not dominate views from any of the shorelines.

Visual access to the lake along 5th Avenue SW may be reduced during construction of dam repairs or dam removal, depending on the alternative. Construction staging would also occur around the 5th Avenue Dam during construction of the 5th Avenue Pedestrian Bridge. The 5th Avenue Dam staging area would be adjacent to the existing path and scenic Deschutes Parkway and would be visible for many viewers, both in vehicles and on the path.

Many visual impacts during construction would be small in scale, occur intermittently, and shift location around the basins, and are therefore not considered significant. However, a substantial portion of Marathon Park would be closed for 4 to 5 years, eliminating or obstructing visual access to a portion of the North Basin for numerous users. In addition, coffercells would be present year-round in the North and Middle Basins for 4 to 5 years, creating a long-duration disturbance in the visual landscape. Considered together with the intermittent disruptions to visual access that would occur over the 4- to 8-year period, large numbers of viewers may find the visual quality of the lake diminished during construction of any of the action alternatives. For these reasons, construction impacts on visual resources are considered significant for all action alternatives (though some viewers may find the construction activities to be interesting to observe).
5.10.3 What are the construction impacts under the Managed Lake Alternative?

In addition to the construction activities that are common to all alternatives, the Managed Lake Alternative would include the following:

- 5th Avenue Dam overhaul repairs

Dam overhaul repairs would require approximately 6 months of major maintenance work concurrent with construction dredging. This could involve heavy equipment and restricted public access around the dam. Impacts on visual resources from construction of this alternative would primarily be associated with the presence of heavy equipment, temporary in-water structures, and in-water equipment.

These construction activities, while minor, would contribute to the overall construction impacts described for all action alternatives, which were determined to be significant because of the duration of impacts on Marathon Park.

5.10.4 What are the construction impacts under the Estuary Alternative?

In addition to construction impacts that are common to all alternatives, the Estuary Alternative has the following construction activities:

- 5th Avenue Dam and 5th Avenue Bridge removal
- Construction of a new 5th Avenue Bridge for vehicles and Deschutes Parkway realignment
- Slope stabilization along Deschutes Parkway
- Stormwater outfall replacement (along Deschutes Parkway and the Arc of Statehood)
- Culvert replacements at the Interpretive Center

Removal of the 5th Avenue Dam would begin with roadway realignment at Deschutes Parkway, demolition and excavation, followed by construction of the new 5th Avenue Bridge. Overall construction would take approximately 4.5 years. Construction impacts on visual resources specific to this alternative would primarily be associated with the presence of heavy equipment, temporary in-water structures, and in-water equipment. Visual impacts would be minor to moderate in scale depending on where they are viewed from.
Constructing the shoreline stabilization would involve placing material along the base of the slope on the east side of Deschutes Parkway. The visual impacts include clearing this area of vegetation and having equipment alongside the road to place the material. Stormwater outfall and culvert replacement would involve similar visual impacts, but at specific locations along the Arc of Statehood, Heritage Park, and within the Interpretive Center. Construction at any given location would be for a limited period of time only, but cumulatively, parkway and park users would see construction next to the roadway and within discrete locations within parks for about 2.5 months.

These construction activities would contribute to the overall construction impacts described for all action alternatives, which were determined to be significant.

5.10.5 What are the construction impacts under the Hybrid Alternative?

Construction impacts of the Hybrid Alternative would generally be as described for the Estuary Alternative and for impacts common to all alternatives, except that the Hybrid Alternative would also include the following:

- Barrier wall construction in the North Basin

The barrier wall would be constructed in an arc across the North Basin, from north to south, for a distance of approximately 2,600 feet (790 meters).

Construction of the barrier wall would involve barges, pile-driving equipment, and any temporary in-water structures that may be needed, and would occur concurrently with initial dredging. This construction equipment would be relatively small in scale compared to the basin but would be conspicuous because it would be in the middle of open water and would contrast with the otherwise calm water body.

Construction activities specific to the Hybrid Alternative, while minor or moderate, would contribute cumulatively to the overall construction impacts described for all action alternatives, which were determined to be significant.
5.10.6 What mitigation measures would be implemented for this project?

5.10.6.1 Measures Common to All Alternatives

All action alternatives could include the following measures to minimize construction impacts:

- The staging area in Marathon Park could be minimized during periods of no construction to allow visual access where feasible.
- Project areas in parks and along Deschutes Parkway could be planted as soon as feasible to minimize the duration of construction disturbance.
- In-water construction equipment, other than coffercells, could be removed from the lake between construction seasons.

5.10.6.2 Managed Lake Alternative

No additional mitigation would be needed to address construction impacts to visual resources from the Managed Lake Alternative.

5.10.6.3 Estuary Alternative

No additional mitigation would be needed to address construction impacts to visual resources from the Estuary Alternative.

5.10.6.4 Hybrid Alternative

No additional mitigation would be needed to address construction impacts to visual resources from the Hybrid Alternative.

5.10.7 What are the significant unavoidable adverse impacts to visual resources?

Although mitigation measures described in this report could avoid or minimize some adverse visual quality impacts for the construction, there would be significant unavoidable visual quality impacts under any of the action alternatives during construction of the project given the scale of construction, the contrast it would have with the park setting, and the duration of anticipated construction staging at Marathon Park.
5.11 ENVIRONMENTAL HEALTH

This section describes the potential impacts from construction on environmental health in the Project Area.

The primary focus of the environmental health analysis is sediment quality because the EIS focuses on the most important elements and conclusions of the discipline-specific analyses. The analysis concludes that sediment quality of Capitol Lake is generally good with the exception that high sulfides are present in surface and dredge layer sediments. As described in Chapter 3.0, Existing Conditions and Affected Environment, sulfides may be toxic to benthic organisms but do not pose a health risk to humans during construction activities. Therefore, impacts associated with construction of the alternatives focus on impacts to sediment quality and effects on benthic organisms, not risks to humans. The information presented in this section is summarized from the full analysis in the Sediment Quality Discipline Report (Attachment 15) and focuses on the potential construction-related impacts from the project, as well as the necessary context to interpret the conclusions.

Key Findings: Sediment Quality Construction Impacts

Sediment dredging and placement of dredged sediments in constructed habitat areas would have no adverse impacts on sediment quality because high sediment quality is present throughout the lake within and below the planned dredge areas.

For all action alternatives, dredging would not change sediment quality in the lake basin, although it would uncover sediment with lower sulfide concentrations, which would result in minor beneficial effects on sediment quality in Capitol Lake.

For the Estuary and Hybrid Alternatives, there would be no adverse impacts to sediment quality associated with removing the 5th Avenue Dam because all dam demolition would be contained within a coffer cell to prevent the spread of sediment beyond the mixing zone established by the water quality permit. Sediment quality in the immediate vicinity of the dam is not known but is expected to be good because sediment samples collected nearby did not exceed applicable criteria.

5.11.1 What methods were used to assess construction impacts?

To determine the potential construction impacts of the action alternatives on environmental health, the following three primary activities were evaluated:

- Initial dredging in the North Basin; or North and Middle Basins
• Construction of habitat areas in the Middle Basin; or North and Middle Basins
• Off-site disposal of a limited quantity of dredged sediments for the Estuary and Hybrid Alternatives

Impacts are considered less than significant if they would not increase the risk of exceeding sediment cleanup criteria. Sediment cleanup criteria are established to protect human health and ecological health. Impacts are considered significant if there would be a substantial increased risk to exceeding sediment cleanup criteria.

5.11.2 What are the construction impacts common to all action alternatives?

Construction-related impacts common to all action alternatives are associated with initial construction dredging and placement or export of dredged sediments.

Sediment dredging and placement of dredged sediments in constructed habitat areas would have no adverse impacts on sediment quality because high sediment quality is present throughout the lake within and below the planned dredge areas. For all action alternatives, dredged sediments would not be expected to settle outside the dredge areas because dredging would be performed using a hydraulic dredge that does not suspend a significant amount of sediment at its intake.

Dredged sediments would be placed in temporary sheetpile containment cells to contain sediment and allow it to settle within the constructed habitat area. BMPs could be employed to reduce turbidity and ensure water quality permit compliance. Water quality impacts from sediment suspension are addressed in the Water Quality Discipline Report (Attachment 7).

The only parameter of concern for sediment quality impacts from dredging would be total sulfides, which is toxic to benthic organisms but would have no impacts to human health based on the concentrations in Capitol Lake, as described in Chapter 3.0, Existing Conditions and Affected Environment. Because sulfides and other chemical concentrations are similar in surface and dredged sediments based on the 2020 sediment sampling, initial dredging and placement of dredged sediments in the habitat areas would slightly improve sediment quality in Capitol Lake.
Sulfide concentrations are much lower in the deeper samples so lake sediments uncovered by dredging would have low sulfide concentrations that would result in minor beneficial effects on sediment quality (i.e., a decrease of sulfides in sediment) in Capitol Lake. The extent of these beneficial effects would vary by dredge area, ranging from approximately 50 acres (20 hectares) for the Hybrid Alternative to 127 acres (51 hectares) for the Managed Lake Alternative.

Some initial dredged sediments would be transported for disposal or reuse outside of the study area for the Estuary Alternative (13,000 cubic yards [9,900 cubic meters]) and Hybrid Alternative (98,000 cubic yards [75,000 cubic meters]) because of limited space available for habitat areas relative to the total dredge volume. Sediment export is not assumed under the Managed Lake Alternative because the lower dredge volume could be accommodated within the habitat areas. Therefore, potential impacts from off-site disposal or reuse of sediments are addressed below for the Estuary and Hybrid Alternatives.

Vehicles and equipment used for construction activities (and subsequent operations) would include the use of fuels, oils, lubricants, and other petroleum-related projects within the Project Area. These potentially hazardous materials would be subject to applicable local, state, and federal regulations and guidance pertaining to use, handling, and storage. Construction can result in the release of hazardous materials to the environment if proper protective measures are not followed. Fuel spills can occur during mobile fueling of heavy equipment. Hydraulic oil leaks are not uncommon on large construction sites. Spill prevention and response planning is typically conducted prior to the start of construction to prevent, and if needed, respond to such spills. The potential risk of spills continues throughout the duration of construction given the continued presence of construction equipment and construction-related activities. For the Managed Lake Alternative, construction would take approximately 4 years. For the Estuary and Hybrid Alternatives, construction would take approximately 8 years.

5.11.3 What are the construction impacts under the Managed Lake Alternative?

In addition to impacts common to all action alternatives, construction impacts of the Managed Lake Alternative on sediment quality would primarily be associated with the dredging in the North Basin and using dredged sediments to create habitat areas in the Middle Basin.
Impacts from initial dredging and other construction activities would be consistent with those common to all alternatives. Dredging generally would not change sediment quality in the North Basin except it would uncover 127 acres (51 hectares) of sediments with lower sulfide concentrations resulting in a *minor beneficial effect* on sediment quality in the lake. Implementation of BMPs during dredging would limit the transport of sediment out of the lake, resulting in no adverse impacts to sediment quality in Budd Inlet during construction.

There would be no adverse impacts to sediment quality associated with repairing the 5th Avenue Dam because all repair work would be contained with spillways, conducted overwater, or conducted on the Budd Inlet side of the dam, using appropriate containment BMPs. Sediment quality in the immediate vicinity of the dam is not known but is expected to be good because sediment samples collected nearby did not exceed applicable criteria. Minor amounts of sediment may be suspended during dam repair but it is anticipated that those suspended sediments would not travel far from the dam on either side of the dam because BMPs would be required to reduce turbidity impacts.

### 5.11.4 What are the construction impacts under the Estuary Alternative?

Construction impacts of the Estuary Alternative on sediment quality would generally be consistent with those common to all alternatives. **No adverse impacts** to sediment quality would occur during dredging in the North Basin and Middle Basin, and dredged sediments would be used to create habitat areas in both basins. Reusing dredged sediments within the system is a key design element that avoids or minimizes the disposal of sediments outside the Project Area.

Dredging generally would not change sediment quality in the lake basin except it would uncover approximately 60 acres (24 hectares) of sediments with lower sulfide concentrations resulting in a *minor beneficial effect* on sediment quality (meaning, less sulfide exposure to benthic organisms) in the dredge areas. As noted for the Managed Lake Alternative, the required implementation of BMPs during dredging and placement of dredged materials in habitat areas would limit the transport of sediment out of the lake, resulting in no adverse impacts to sediment quality in Budd Inlet during construction.

A small portion (less than 3%) of the dredged sediments would be transported off-site for upland reuse or landfill disposal because of

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**Initial Dredging and Placement**

**Managed Lake Alternative**
Approximately 348,000 cubic yards (270,000 cubic meters) dredged from the entire 127 acres (51 hectares) of the North Basin. All dredged sediments would be placed over approximately 35% of the 147-acre Middle Basin to construct habitat areas.

**Estuary Alternative**
Approximately 526,000 cubic yards (400,000 cubic meters) dredged from 30 acres of the North Basin, 30 acres (12 hectares) of the Middle Basin, and less than 5 acres at the opening at the 5th Avenue Bridge. All but 3% of the dredged sediments would be placed in other areas of the North and Middle Basin to construct habitat areas covering approximately 30% of each basin. In addition, approximately 20 acres of the west shoreline of each basin would be filled with dredged material to stabilize Deschutes Parkway.

**Hybrid Alternative**
Initial dredging for the Hybrid Alternative would be similar to that described for the Estuary Alternative except less sediment would be dredged from the North Basin and placed in the North Basin for habitat construction. The estimated dredge volume for the Hybrid Alternative is approximately 499,000 cubic yards (380,000 cubic meters), with 20% of that being exported compared to 3% for the Estuary Alternative.
the limited area for constructing habitat areas, as these sediments would not be suitable for in-water disposal due to the presence of aquatic invasive species. All dredged sediments are expected to be suitable for unrestricted upland disposal.

There would be no adverse impacts to sediment quality associated with removing the 5th Avenue Dam because all dam demolition would be contained to prevent the spread of sediment beyond the mixing zone established by the water quality permit. Sediment quality in the immediate vicinity of the dam is not known but is expected to be good because sediment samples collected nearby did not exceed SMS criteria.

5.11.5 What are the construction impacts under the Hybrid Alternative?

Construction impacts of the Hybrid Alternative on sediment quality would generally be as described for all alternatives and the Estuary Alternative. No adverse impacts to sediment quality would occur for the initial dredging of the North Basin and Middle Basin, and dredged sediments would be used to create habitat areas in both basins. Reusing dredged sediments within the system is a key design element that avoids or minimizes the disposal of sediments outside the Project Area. Implementation of BMPs during dredging and placement of dredged sediments in habitat areas would limit the transport of sediment out of the lake.

In addition, minor beneficial effects of reduced sulfide concentrations in dredge areas common to all action alternatives would occur as described in Section 5.11.2.

A small portion of the dredged sediments would be transported off-site for upland disposal, and not to an open-water disposal site due to the presence of aquatic invasive species. All dredged sediments are expected to be suitable for unrestricted upland disposal, but may need to be treated for invasive species.

There would be no adverse impacts to sediment quality associated with removing the 5th Avenue Dam because all dam demolition would be contained to prevent the spread of sediment beyond the mixing zone established by the water quality permit. Sediment quality in the immediate vicinity of the dam is not known but is expected to be good because sediment samples collected nearby did not exceed SMS criteria.
5.11.6 What mitigation measures would be implemented for this project?

Enterprise Services would avoid and minimize potential impacts by complying with regulations, permits, plans, and authorizations. These anticipated measures, and other mitigation measures that could be recommended or required, are described below.

5.11.6.1 Measures Common to All Alternatives

In accordance with the environmental permits that would be obtained prior to dredging, BMPs for turbidity management and spill prevention would be implemented during construction and operational dredging activities to minimize and avoid impacts to sediment quality, as related to environmental and ecological health. The BMPs are nondiscretionary actions that are needed to maintain water quality standards throughout the work. They often include the following measures.

- Use of a hydraulic dredge or closed bucket dredging
- Limiting the amount of dredged sediment on the receiving barge
- Slowing the rate of dredging to minimize turbidity
- Working within the in-water work window to avoid impacts to migrating salmonids
- Installing a silt curtain to contain turbidity within the immediate dredge area

A WQMPP would also be prepared, approved by the regulatory agencies, and implemented throughout construction. This plan is intended to measure the performance of the BMPs implemented to maintain water quality standards, identify potential violations, and outline contingency measures that would be implemented if water quality standards were violated. The plan would include turbidity monitoring, inspection of spill control equipment, and actions required by the certification. Therefore, no specific sediment quality mitigation plans would be necessary for the project.

5.11.6.2 Managed Lake Alternative

No additional mitigation would be needed to address construction impacts to sediment quality from the Managed Lake Alternative.
5.11.6.3 *Estuary Alternative*

No additional mitigation would be needed to address construction impacts to sediment quality from the Estuary Alternative.

5.11.6.4 *Hybrid Alternative*

No additional mitigation would be needed to address construction impacts to sediment quality from the Hybrid Alternative.

5.11.7 **What are the significant unavoidable adverse impacts to environmental health?**

There would be no significant unavoidable adverse impacts related to sediment quality under any of the action alternatives.

5.12 **TRANSPORTATION**

This section describes the potential impacts from project construction on surface transportation elements in the study area. The information presented in this section is summarized from the full analysis in the Transportation Discipline Report (Attachment 16).

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**Key Findings: Transportation Construction Impacts**

Construction for all action alternatives would include a period in which the 5th Avenue Bridge is closed. For the Managed Lake Alternative, the bridge would be narrowed or closed for approximately 7 weeks for repairs and overhaul work. For the Estuary and Hybrid Alternatives, the bridge would be closed for approximately 4.5 years for replacement. Although mitigation measures would minimize adverse traffic impacts, traffic increases along the 4th Avenue detour route still could result in congested operations during some periods of peak traffic demand, resulting in a **significant unavoidable impact** during the times that it occurs.

For all other construction activities, implementation of a Construction Traffic Management Plan (CTMP) and Traffic Control Plan is expected to reduce impacts from the temporary narrowing of streets, sidewalks, or bike lanes; construction-generated truck trips; and construction employee trips and parking to less than significant levels.

5.12.1 **What methods were used to assess construction impacts?**

To determine the potential construction impacts of the action alternatives on transportation, the characteristics of the transportation facilities within the study area were identified. Truck trips generated by construction activity were estimated by applying typical truck capacities to earthwork (for expected off-site hauling
only), demolition, and delivery estimates, assuming averages over the anticipated duration of construction activities. Estimates of construction worker trips and parking demand were based on the peak number of construction workers expected to be at the site. The traffic effects (vehicular and nonmotorized) of temporary removal of the 5th Avenue Bridge during construction of the Estuary or Hybrid Alternative were evaluated through review of traffic operational standards, policies, and available traffic data from the Cities of Olympia and Tumwater.

**5.12.2 What are the construction impacts common to all action alternatives?**

Under all action alternatives, construction impacts would be associated with the construction activities described in Chapter 2.0, Project Alternatives and Construction Approach. These construction activities would contribute to the following potential impacts on the transportation network:

- Street capacity, sidewalk, or bike lane restrictions
- Construction worker trips and parking
- Truck trips generated by mobilization and deliveries
- Truck trips generated by the export of dredged or demolition material
- Vehicle traffic operations during the potential 5th Avenue Bridge closure
- Rail operations
- Transit during potential 5th Avenue Bridge closure
- Pedestrian and bicycle traffic during the 5th Avenue Bridge closure
- Pavement degradation due to construction traffic

Construction activities for the action alternatives include the delivery of equipment and materials to the site, and transporting of dredged or demolished material away from the site. All three action alternatives would reuse dredged material to build habitat areas, which would substantially reduce or eliminate the amount of material that would need to be transported off-site. As described below, the quantity of dredged material transported off-site (and therefore the number of truck trips required) would vary by alternative. Potential truck haul routes are shown in Figure 5.12.1.
An average of five truck trips or fewer each hour would be generated, primarily occurring during off-peak times of day (outside of commuter peak hours). Although these trips may be noticeable to nearby residents and businesses, they would cause very small increases in the average delay at intersections along the truck haul routes but would not change the LOS at intersections in the study area. There would also be times during the overall 4- to 8-year construction duration when there would be no truck trips generated by the project. Project construction could also result in temporary narrowing or closure of streets, sidewalks, or bicycle facilities adjacent to construction activities. These temporary closures, and the small amount of delay added by truck trips, would have a less than significant impact on traffic operations.

In addition, construction workers would generate commute trips and parking demand at the project site. Construction worker commute trips would vary depending on the construction activity occurring on any given day (expected to range between 15 and 40 trips inbound in the morning prior the beginning of the workday and outbound in the evening after the workday is completed). Based on typical construction shifts, most construction employee commute trips would occur during off-peak times of day, with morning trips occurring before the start of the peak morning commute period and afternoon trips occurring before the beginning of the peak evening commute period.

Enterprise Services would prepare a CTMP and Traffic Control Plan, as a primary BMP, prior to construction. Implementation of the CTMP and Traffic Control Plan is expected to reduce impacts resulting from the temporary narrowing of streets, sidewalks, or bike lanes, construction-generated truck trips, and construction employee trips and parking to less than significant levels.
Figure 5.12.1 Potential Truck Haul Routes

Legend
- Construction Staging Area
- Project Area
- Potential Truck Haul Route (Via Designated Truck Streets)
- Potential Truck Haul Route (Via Non-Designated Truck Street)

Scale in Feet
0 625 1,250 2,500
Because the project site is directly served by railroad, it may be possible to use rail to support construction activities. The feasibility of using rail would depend on a number of factors and would be determined by the project contractor prior to construction. Although the use of trucks for construction activities would have a small impact on traffic operations, the use of rail to support some or all of the construction activities would reduce truck trips and lower traffic operational impacts along the truck haul routes. Because the train volumes associated with construction activities would be consistent with existing activity on the tracks, the impact on traffic operations at crossings would be less than significant.

Construction of all action alternatives would include a period in which the 5th Avenue Bridge would be closed, with the length of closure ranging from about 7 weeks to 4.5 years, depending on the alternative. Vehicle traffic that currently uses the bridge would need to be detoured during the closure. The detour route (Figure 5.12.2) would be determined in coordination with the City of Olympia, but with a connection provided between 4th Avenue W and Deschutes Parkway, the detour would likely utilize the 4th Avenue Bridge. Some drivers may choose alternate routes (i.e., other than the signed detour) around the south end of the waterway, particularly if they are traveling to or from the area west of the Middle Basin. Based on the analysis of existing and projected future conditions described in the Transportation Discipline Report (Attachment 16), most intersections within the study area have the capacity to accommodate additional traffic that would be generated by the detours, and it is expected that with mitigation in place to manage traffic, they would continue to operate within the City of Olympia and City of Tumwater standards during most times of the day. However, this impact is still considered potentially significant because the analysis indicates that during some peak conditions (and taking future traffic growth into consideration), traffic increases could be high enough that some downtown intersections would degrade to a congested condition (i.e., LOS F).

To reduce impacts associated with the bridge closure, the CTMP would establish the vehicular and nonmotorized detours during the period that the 5th Avenue Bridge would be closed and traffic control measures to be implemented along the detour route (and potentially along other alternate routes that could experience traffic increases). These, and other potential measures during bridge closure, are discussed below in Section 5.12.6.
Although mitigation measures would avoid or minimize adverse traffic impacts identified for construction of the three action alternatives, during periods when the 5th Avenue Bridge would be closed, traffic increases along the 4th Avenue W detour route still could result in congested operations during some periods of peak traffic demand, resulting in a significant unavoidable impact during the times that it occurs.

Construction impacts on transportation common to all action alternatives are listed and summarized in Table 5.12.1.
Figure 5.12.2 Potential Traffic Detours During 5th Avenue Bridge Closure

Legend
- Orange: Expected Signed Detour
- Forest Green: Potential Alternate Routes
- Red: Bridge Closure
- White: Project Area
- Blue: Study Area

Scale in Feet: 0, 625, 1,250, 2,500
### Table 5.12.1 Summary of Construction Impacts Common to All Action Alternatives

<table>
<thead>
<tr>
<th>Impact</th>
<th>Impact Finding</th>
<th>Measures to Reduce or Mitigate for Significant Impacts</th>
<th>Significant &amp; Unavoidable Impacts</th>
</tr>
</thead>
</table>
| Truck Trips Generated by Mobilization and Deliveries                   | Less than significant impact                        | In addition to implementation of a CTMP with measures described in Section 5.12.6, the following additional measures could be considered:  
• Apply time-of-day restrictions for construction trips  
• Use rail to reduce truck trips | No                                               |
| Truck Trips Generated by Export of Dredged or Demolition Material      | Less than significant impact (differs by action alternative; see Sections 5.12.3 through 5.12.5) | In addition to implementation of a CTMP with measures described in Section 5.12.6, the following additional measures could be considered:  
• Apply time-of-day restrictions for construction trips  
• Use rail to reduce truck trips | No                                               |
| Vehicle Traffic Operations During Potential 5th Avenue Bridge Closure  | Significant impact (differs by action alternative; see Sections 5.12.3 through 5.11.5) | In addition to implementation of a CTMP with measures described in Section 5.12.6:  
• Coordinate with City of Olympia to establish and sign traffic detour, which is expected to use the 4th Avenue Bridge and new connection to Deschutes Parkway that would be constructed with the project  
• Develop and implement a public communications strategy, to encourage alternative transportation choices and reduce overall volumes crossing the waterway | Yes, potentially during some periods of peak traffic demand (also see additional analysis for Managed Lake Alternative) |
| Street Capacity, Sidewalk, or Bike Lane Restrictions                   | Less than significant impact                        | Implement a CTMP and Traffic Control Plan with measures described in Section 5.12.6                                | No                                               |
| Construction Worker Trips and Parking                                 | Less than significant impact                        | In addition to implementation of a CTMP with measures described in Section 5.12.6:  
• Prohibit construction employee parking in residential neighborhoods, Capitol Campus, and downtown streets | No                                               |
| Rail Operations                                                        | Less than significant impact                        | Coordinate with rail owner to ensure that construction activities do not interfere with scheduled rail trips across the Project Area | No                                               |
### Impact

**Impact During Potential 5th Avenue Bridge Closure**

**Impact Finding**

**Measures to Reduce or Mitigate for Significant Impacts**

**Significant & Unavoidable Impacts**

<table>
<thead>
<tr>
<th>Impact</th>
<th>Impact Finding</th>
<th>Measures to Reduce or Mitigate for Significant Impacts</th>
<th>Significant &amp; Unavoidable Impacts</th>
</tr>
</thead>
</table>
| Transit During Potential 5th Avenue Bridge Closure | **Significant impact** *(differs by action alternative; see Sections 5.12.3 through 5.12.5)* | In addition to implementation of a CTMP with measures described in Section 5.12.6:  
- Coordinate with Intercity Transit to reroute affected bus routes to the 4th Avenue Bridge  
- Move bus stops for 5th Avenue SW routes to 4th Avenue W, about 300 to 500 feet (91 to 150 meters) away | Yes  
(potentially for Managed Lake Alternative)  
No (for Estuary and Hybrid Alternatives) |
| Pedestrian and Bicycle Traffic During 5th Avenue Bridge Closure | Less than significant impact | In addition to implementation of a CTMP with measures described in Section 5.12.6:  
- Construct the pedestrian bridge prior to closure of the 5th Avenue Bridge  
- Alternatively, construct a temporary trail trestle during the time the 5th Avenue Bridge is closed | No |
| Pavement Degradation Due to Construction Traffic | Less than significant impact | Restore pavement after construction is completed | No |

### 5.12.3 What are the construction impacts under the Managed Lake Alternative?

Under the Managed Lake Alternative, the 5th Avenue Bridge would be overhauled to significantly extend the serviceable life of the structure (i.e., through electrical system and structural upgrades). While jet grouting occurs, the bridge would be narrowed or closed for up to about 7 weeks (the shortest closure time among the action alternatives). With the Managed Lake Alternative, all dredged material generated during construction would be transferred and used on-site and there would be no off-site hauling of dredged material during construction (unlike the other action alternatives).

For the Managed Lake Alternative, if closure of the 5th Avenue Bridge was needed during some or all of the period jet grouting occurs, and a temporary connection between 4th Avenue W and Deschutes Parkway was not constructed, all detoured vehicles and buses would be required to use the routes around the south end of the Middle Basin. This would substantially increase travel time between the east and west sides of the waterway and likely degrade operations along
the detour routes to LOS F during peak times of day, resulting in significant unavoidable impacts on both traffic operations and transit service. Without a connection between 4<sup>th</sup> Avenue W and Deschutes Parkway, this would be a significant and unavoidable impact during all periods of the day. The remaining impacts on surface transportation from construction of the Managed Lake Alternative would be less than significant.

5.12.4 What are the construction impacts under the Estuary Alternative?

Under the Estuary Alternative, bridge reconstruction would require work in the area for up to about 4.5 years, during the period of roadway realignment, removal, and reconstruction of the new 5<sup>th</sup> Avenue Bridge.

During the 4.5-year period when the 5<sup>th</sup> Avenue Bridge was closed and a 4<sup>th</sup> Avenue W detour was in place, traffic increases along the detour route could result in congested operations during some periods of peak traffic demand. For the Estuary Alternative, this would be a significant unavoidable impact on vehicle traffic operations during the times that it occurred. The remaining impacts on surface transportation from construction of the Estuary Alternative would be less than significant.

5.12.5 What are the construction impacts under the Hybrid Alternative?

The Hybrid Alternative would have the most dredged material transported off-site (via truck trips) because it would have less habitat constructed with the addition of the reflecting pool.

As with the Estuary Alternative, during the 4.5-year period when the 5<sup>th</sup> Avenue Bridge was closed and a 4<sup>th</sup> Avenue detour was in place, traffic increases along the detour route could result in congested operations during some periods of peak traffic demand. For the Hybrid Alternative, this would be a significant unavoidable impact on vehicle traffic operations during the times that it occurred. The remaining impacts on surface transportation from construction of the Hybrid Alternative would be less than significant.
5.12.6 What mitigation measures would be implemented for this project?

5.12.6.1 Measures Common to All Alternatives

All action alternatives include the following BMP commitments to manage vehicular and nonmotorized transportation during project construction.

- **CTMP and Traffic Control Plan.** Enterprise Services would develop a CTMP that includes a Traffic Control Plan in accordance with City of Olympia and City of Tumwater requirements. The CTMP would establish the vehicular and nonmotorized detours during the period that the 5th Avenue Bridge would be closed, and determine traffic control measures to be implemented along the detour route (and potentially along other alternate routes that could experience traffic increases). Traffic control would follow the guidelines of the WSDOT Standard Specifications. All barricades, signs, coning, and flagging should conform to the requirements of the Manual on Uniform Traffic Control Devices. In addition to the standard requirements, the CTMP would detail truck haul routes and the parking plan for construction workers. Haul routes would utilize streets designated as truck routes to the greatest extent possible and would be established in coordination with the Cities of Olympia and Tumwater. The CTMP and Traffic Control Plan would be submitted to and approved by the Cities with jurisdiction prior to the start of construction. Implementation of the CTMP and Traffic Control Plan is expected to reduce impacts resulting from temporary narrowing of streets, sidewalks, or bike lanes, construction-generated truck trips, and construction employee trips and parking to less than significant levels.

- **Pavement restoration.** After completion of construction activities, any pavement damaged or degraded by construction-generated trucks would be restored to pre-construction condition or better.

The following additional mitigation measures have been identified for all action alternatives:

- **Construction trip restrictions.** Avoid creating additional delay at intersections by restricting construction trips
during the commuter peak periods when traffic volumes on the street system would be highest. The CTMP measures could vary based on seasonal fluctuations in traffic and parking patterns as appropriate.

- **Construction vehicle parking.** Provide adequate off-street parking areas at designated staging areas for construction-related vehicles. Prohibit construction employee parking in nearby residential neighborhoods, the Capitol Campus, and on downtown streets with either unrestricted or metered parking.

- **Use of rail for hauling materials to or from project site.** Reduce truck trips by using rail to haul materials to or from the project site. Depending on the train volumes that would be generated, measures may be needed in the CTMP to manage traffic at at-grade railroad crossings (e.g., the use of flaggers or temporary signals).

The following measures are identified to address the transportation impact of closure of the 5th Avenue Bridge during construction:

- To reduce impacts on vehicle traffic operations, coordinate with the City of Olympia to establish and sign the traffic detour, which is expected to utilize the 4th Avenue Bridge and new connection to Deschutes Parkway that would be constructed with the project.

- To encourage alternative transportation choices and reduce overall volumes crossing the waterway, develop and implement a public communication strategy.

- To reduce impacts on transit, coordinate with Intercity Transit to reroute affected bus routes to the 4th Avenue Bridge. Move bus stops for 5th Avenue SW routes to 4th Avenue E and 4th Avenue W, about 300 to 500 feet (91 to 150 meters) away.

- To reduce impacts on pedestrian and bicycle traffic, construct the 5th Avenue Pedestrian Bridge prior to closure of the 5th Avenue Bridge. Alternatively, construct a temporary trail trestle during the time the 5th Avenue Bridge is closed.

These measures are summarized from the full mitigation measures included in the Transportation Discipline Report (Attachment 16).
5.12.6.2 Managed Lake Alternative

No additional transportation mitigation would be needed during construction of the Managed Lake Alternative.

5.12.6.3 Estuary Alternative

No additional transportation-related mitigation would be needed during construction of the Estuary Alternative.

5.12.6.4 Hybrid Alternative

No additional transportation-related mitigation would be needed during construction of the Hybrid Alternative.

5.12.7 What are the significant unavoidable adverse impacts to transportation?

Although mitigation measures described in this EIS would avoid or minimize adverse traffic impacts identified for construction of the three action alternatives, the following impacts would still be considered significant and unavoidable.

- For both the Estuary and Hybrid Alternatives, when the 5th Avenue Bridge was closed and a 4th Avenue W detour was in place, traffic increases along the detour route could still result in congested operations during some periods of peak traffic demand, resulting in a significant unavoidable impact during the times that it occurred.

- For the Managed Lake Alternative, if closure of the 5th Avenue Bridge was needed during some or all of the period when jet grouting occurs, and a temporary connection between 4th Avenue W and Deschutes Parkway was not constructed, all detoured vehicles and buses would be required to use the routes around the south end of the Middle Basin. This would substantially increase travel time between the east and west sides of the waterway during all times of day and likely degrade operations along the detour routes to LOS F during peak times of day, resulting in significant unavoidable impacts on both traffic operations and transit service.

5.13 PUBLIC SERVICES & UTILITIES

This section describes the potential impacts from project construction on public services and utilities in the study area. The
information presented in this section is summarized from the full analysis in the Public Services and Utilities Discipline Report (Attachment 17).

**Key Findings: Public Services and Utilities Construction Impacts**

Under all action alternatives, accidental damage to utility lines during project construction could temporarily disrupt utility services. However, with measures to locate utility lines and to coordinate final construction plans with affected utilities, the potential impact on utilities would be less than significant. Under the Managed Lake Alternative, closure of the 5th Avenue Bridge for repairs would be temporary and short (about 7 weeks), so impacts related to increased emergency response time and travel time in the corridor would be less than significant. The bridge closure would be much longer (about 4.5 years) under the Estuary and Hybrid Alternatives, which could have a **significant impact** on emergency service response times. With development of a CTMP and additional coordination with the local jurisdictions, impacts could be reduced to less than significant levels and ensuring that emergency services are not compromised.

5.13.1 What methods were used to assess construction impacts?

Potential construction impacts were determined by considering whether project activities could temporarily interrupt utility service during relocation or replacement, or as a result of accidental disruption, or create longer response times for emergency response and other public services on a temporary basis. This analysis qualitatively assessed where construction impacts would have the greatest potential to impact utilities adjacent to the Project Area and public services in the area.

Project construction would last 4 to 8 years, depending on the alternative, and would entail initial dredging, creation of habitat areas, and construction of a new 5th Avenue Pedestrian Bridge, boardwalks, dock, and boat launch.

5.13.2 What are the construction impacts common to all action alternatives?

The types of construction impacts that would occur are similar among the action alternatives and include the following:

- Initial dredging in the North Basin; or North and Middle Basins
- Construction of habitat areas in the Middle Basin; or North and Middle Basins
• Construction of recreational amenities (boardwalks, dock, boat launch, and 5th Avenue Pedestrian Bridge)
• Construction staging and access throughout the Capitol Lake Basin

During construction of these common elements, public services would be affected by a nominal increase in traffic congestion, and delays on the primary roads affected by construction and on roads around the construction area. Truck trips from project construction could result in nominal increases in both response times for emergency service providers and travel times for other services (e.g., solid waste collection, postal services, and school buses). With implementation of traffic control plans and proper notifications (as described in Section 5.13.6), potential impacts on response times and existing services associated with these elements would be less than significant.

All action alternatives would require the temporary use of power during construction for trailers and equipment. Construction crews would likely use on-site generators or existing electricity infrastructure provided by Puget Sound Energy. This would be unlikely to result in interruptions in service and would not affect any other existing utilities.

Although no public utilities have been identified within the areas of the Capitol Lake Basin proposed for initial dredging, habitat area creation, or boardwalk/dock/launch construction, several utilities cross the Project Area or are adjacent to construction sites. Streets, roads, and bridges in the Project Area serve as utility corridors. As much as possible, piers associated with the new 5th Avenue Pedestrian Bridge would be located to avoid conflicting with underground utilities.

Under all action alternatives, accidental damage to utility lines during project construction could temporarily disrupt utility services. Overhead utility poles and lines could be susceptible to accidental damage when moving large construction equipment and vehicles throughout the Project Area. Similarly, accidental damage to utility lines during project construction could temporarily disrupt utility services. The construction contractors would be required to confirm the location of existing utilities and mark the confirmed locations accurately on the final construction drawings; work with utility service providers to minimize the risk of damage to existing utility lines and ensure prompt reconnection of service in the event of a
service disruption; and take special precautions when working near high-risk utility lines, including tailgate meetings with contractor staff on days when work will occur near high-risk utilities. With implementation of measures to locate and confirm utility locations and to coordinate final construction plans with affected utilities, the potential impact on utilities would be less than significant.

Other potential construction impacts on public services and utilities would vary by alternative, as described in the sections below.

5.13.3 What are the construction impacts under the Managed Lake Alternative?

For the Managed Lake Alternative, if closure of the 5th Avenue Bridge were needed for jet grouting and a temporary connection between 4th Avenue W and Deschutes Parkway were not constructed, all detoured vehicles would be required to use routes around the south end of the Middle Basin. While this would likely increase response times for emergency vehicles through this east-west corridor during peak times of day, impacts would be less than significant given the short-term duration of closure (7 weeks).

The overhaul repairs to the 5th Avenue Dam would require the replacement or overhaul of electrical systems within the dam; however, no utility conflicts are anticipated, and no utilities would be relocated. As a result, there would be no impacts on public services or utilities.

In general, construction-related impacts under the Managed Lake Alternative would be less disruptive than under the Estuary or Hybrid Alternative, given the much shorter closure of the 5th Avenue Bridge (7 weeks versus about 4.5 years). Based on the location and short-term nature of the repairs, any impacts on public services and utilities would be minor and temporary, and therefore less than significant.

5.13.4 What are the construction impacts under the Estuary Alternative?

The Estuary Alternative would require closing the 5th Avenue Bridge for an extended duration (about 4.5 years) during its removal and reconstruction. Ongoing construction activities could result in temporary lane closures, increased truck traffic, and other roadway effects. Response times and access for public services and utility providers may be temporarily affected by detours during this time. Based on their locations in downtown Olympia (Fire District 1) and
West Olympia (Fire District 2), service calls within those districts typically do not require an east–west crossing of the 5th Avenue Bridge. However, during multiple concurrent or large-scale events, any fire district can respond, which could require travelling east–west. Emergency response times for emergency vehicles that would need to respond through the area would likely be increased for an estimated 4.5 years, and would potentially be a significant impact given the extended duration.

Trenching or excavation associated with replacing outfalls and stabilizing Deschutes Parkway could result in utility conflicts and disruptions. In most cases, service disruptions would be temporary and would not exceed 1 day. An accidental rupture of or damage to utility lines during project construction could also temporarily disrupt utility services. The potential for impact would be minimized with implementation of measures to locate and confirm utility lines and coordination of final construction plans with utilities.

Construction impacts on utilities under the Estuary Alternative would mostly be associated with the removal/demolition of the 5th Avenue Bridge. Existing utility lines on the 5th Avenue Bridge (including potable water, sewer line, and natural gas line) would need to be relocated. Utility lines would likely be relocated to the 4th Avenue Bridge, under the 5th Avenue Pedestrian Bridge, or directionally drilled under the opening. The methods for relocating utilities would be identified during the design phase of the project. Service disruptions would be minimal as utility lines would be relocated prior to removal of the bridge. Replacing the stormwater outfalls along Deschutes Parkway and along the Arc of Statehood would avoid temporary impacts on stormwater conveyance either by timing construction to avoid times when stormwater flow would occur, or by providing temporary diversions. With measures to minimize utility disruptions, impacts would be less than significant.

With implementation of measures to mitigate for impacts on public services and utilities, temporary construction impacts from these activities are considered less than significant.

5.13.5 What are the construction impacts under the Hybrid Alternative?

For the Hybrid Alternative, construction impacts and the duration of impacts would be the same as those described for the Estuary Alternative, with potential impacts related to the 4.5-year closure of the 5th Avenue Bridge and the need for utility replacement.
Emergency response times for emergency vehicles that would need to respond through the area would likely increase for that period, which would potentially be a significant impact. As described for impacts common to all alternatives, measures will be implemented to mitigate for impacts on public services and utilities (see Section 5.13.6). With implementation of these measures, impacts on public services and utilities from the Hybrid Alternative would be less than significant.

5.13.6 What avoidance, minimization, and mitigation measures would be implemented for this project?

5.13.6.1 Measures Common to All Action Alternatives

- Prior to construction, consult with local police, fire, and emergency response to develop and implement emergency response plans, establish emergency vehicle routes, and ensure that general emergency management services are not compromised.

- Prior to the completion of final project construction plans, individual utility agencies with utilities located within or adjacent to areas of construction activity shall be contacted to determine the extent and type of temporary protective measures that must be implemented to prevent construction damage to surface and subsurface utilities.

- Coordinate with utility companies and other relevant agencies before construction to locate existing utilities and avoid damage. Avoid the relocation of utilities whenever possible. Provide notification of any potential interruptions in services to the appropriate agencies.

- Stage utility relocations to minimize interruptions in service.

- Require contractors to prepare traffic control plans for construction activities that may affect road rights-of-way. Measures typically used in traffic control plans include advertising of planned lane closures, warning signage, a flag person to direct traffic flows when needed, and methods to ensure continued access by emergency vehicles. (For more details on the CTMP, see Section 5.12.6.)
5.13.6.2 Managed Lake Alternative

No additional mitigation would be needed to address construction impacts to public services and utilities from the Managed Lake Alternative.

5.13.6.3 Estuary Alternative

No additional mitigation would be needed to address construction impacts to public services and utilities from the Estuary Alternative.

5.13.6.4 Hybrid Alternative

No additional mitigation would be needed to address construction impacts to public services and utilities from the Hybrid Alternative.

5.13.7 What are the significant unavoidable adverse impacts to public services and utilities?

With the implementation of BMPs, minimization measures, and mitigation, there would be no significant unavoidable adverse impacts on public services and utilities during construction.

5.14 ECONOMICS

This section describes the potential construction impacts of the Capitol Lake – Deschutes Estuary Long-Term Management Project on economic activity and economic value in the study area. The EIS focuses on the most important elements and conclusions of the analysis and, in particular, the differences among the three action alternatives. For more detailed information on the full analysis, see the Economics Discipline Report (Attachment 18).

Key Findings: Economic Construction Impacts

Effects from the project on economic activity and economic value in the study area would primarily be long-term impacts, as described in Section 4.14, Economics. During construction, initial dredging, creation of habitat areas, and construction of a new 5th Avenue Pedestrian Bridge, boardwalks, dock, and boat launch would generate spending that would temporarily support jobs, labor income, and economic output. Construction activities are unlikely to affect current or future development in downtown Olympia in any measurable way. Some recreation facilities (especially trails) would be closed or blocked during construction, causing people to recreate elsewhere or choose other lower-preference activities, although some people might enjoy watching the construction activities. Construction would also disrupt some ecosystems and values, but the effects would be localized and temporary. Because of its shorter construction window, impacts from the Managed Lake Alternative would be less than those of the Estuary and Hybrid Alternatives. The No Action Alternative would not result in construction impacts on economics because the project would not be implemented.
5.14.1 What methods were used to assess construction impacts on economics?

As described in Section 3.14, Economics, SEPA does not require economic analysis of a proposed action, and its rules and statutes do not provide specific guidance for what methods to use to analyze economic effects in an EIS. Consistent with the analysis of long-term impacts, the analysis of construction impacts also considered four main economic categories: downstream economic activity, development in the City of Olympia, demand for and value of recreation, and demand for and value of ecosystem services. The analysis examined these impacts (and potential beneficial effects) for the three action alternatives. The No Action Alternative would not result in construction impacts on economics because the project would not be implemented.

As described in Section 4.14, Economics, the assessment of impacts for each of these four topics required different methods, each considering the geographic extent, data sources, and analytical approach for assessing impacts. The analyses entailed both qualitative and quantitative components, including use of the IMPLAN input-output model to calculate the change in jobs, labor income, and economic output that may arise from changes in spending related to constructing the infrastructure required to support the action alternatives. More details on the methodology for each component (including the study area for each topic) are presented in the Economics Discipline Report (Attachment 18).

5.14.2 What are the construction impacts common to all action alternatives?

Construction activities that could contribute to economic effects include all activities that have an associated monetary cost, such as spending on labor, equipment, and materials. Project construction would last 4 to 8 years, depending on the alternative, and would entail initial dredging; creation of habitat areas; construction of a new 5th Avenue Pedestrian Bridge, boardwalks, dock, and boat launch; and use of construction staging and access areas.

The project could begin construction as soon as 2026 or 2028, pending funding, and be completed within 4 to 8 years, depending on the selected alternative. Capital expenditures on building new infrastructure, dredging sediment, and other in-water work could support regional economic activity (jobs and income) through the purchase of goods and services and labor in the study area.
Table 5.14.1 summarizes the planning-level estimates for upfront construction costs.

### Table 5.14.1 Planning Level Costs for Design, Permitting, & Construction

<table>
<thead>
<tr>
<th>Project Alternative</th>
<th>Design, Permitting, &amp; Construction Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Action</td>
<td>$0</td>
</tr>
<tr>
<td>Managed Lake</td>
<td>$89–$160M</td>
</tr>
<tr>
<td>Estuary</td>
<td>$131–$235M</td>
</tr>
<tr>
<td>Hybrid</td>
<td>$177–$319M</td>
</tr>
</tbody>
</table>

#### 5.14.2.1 Downstream Economic Activity

Under all action alternatives, much of the construction spending would be to purchase goods and services from outside the region, given the greater presence of in-water construction companies and equipment farther north. Spending at the local level is not directly proportional to total costs, and would vary by alternative depending on how construction activities are implemented. Local expenditures would be estimated at about $37.7 million over a 5-year period for the Managed Lake Alternative, $56.7 million over a 7-year period for the Estuary Alternative, and $84.4 million over a 7-year period for the Hybrid Alternative. Most local spending would be for transportation services, with smaller amounts for construction services, machinery rental, landscape and horticultural services, and architectural and engineering services.

#### 5.14.2.2 Development in Downtown Olympia

More than 450 local businesses and 1,900 residents are currently located in the downtown Olympia study area. Impacts on development in downtown Olympia from construction activities are unlikely to differ based on the alternative selected, and temporary disruption from construction is unlikely to have a meaningful effect on the market for downtown development. No impact is anticipated from construction activities on current or future development in downtown Olympia.
5.14.2.3 Demand for and Value of Recreation

Construction of the action alternatives would temporarily disrupt recreation activity and potentially reduce the quality of recreational experiences, particularly in the parts of the study area with the highest levels of use (e.g., around the North Basin and at Marathon Park). Closure of the loop trail around the North Basin would disrupt existing patterns of recreational use. In the Managed Lake Alternative, this disruption would last about 6 months, imposing a temporary cost on users. In the Estuary and Hybrid Alternatives, disruption from dam removal and construction of the pedestrian bridge would last up to 4 years. In the Hybrid Alternative, recreational trail access would be disrupted for up to 7 years, with major construction of the barrier wall in the North Basin also occurring during that time and lasting 2 to 3 years. The Estuary and Hybrid Alternatives would produce more substantial disruptions and costs to recreational users compared to the Managed Lake Alternative, potentially causing people to choose substitute sites, at a higher travel cost or lower value. These effects would result in adverse impacts stemming from lost recreation value. As described in Section 5.8.7, actions could be implemented to reduce the disruption and restore connectivity along trails via detours and temporary structures, but impacts from using Marathon Park as a staging site for dredging activities would be unavoidable.

Construction activity is inherently disruptive to some people and interesting to others (and potentially both disruptive and interesting to some people). It is possible that construction activity may actually serve as a draw or enhance the experience and value some users obtain from recreating in the Capitol Lake Basin during the construction period, producing a beneficial effect that could potentially offset some of the adverse impacts on recreation.

5.14.2.4 Value of Ecosystem Services

Construction of the action alternatives would temporarily affect the value of ecosystem services generated in the study area, as water quality, habitat provision, and visual aesthetic values are disrupted. As the effects would be temporary and relatively short in duration, they would be minor adverse impacts for all action alternatives.

The construction impacts on economic activity and economic value are summarized by alternative in the subsections below.
5.14.3 What are the construction impacts under the Managed Lake Alternative?

In general, construction-related impacts under the Managed Lake Alternative would be less disruptive than under the Estuary or Hybrid Alternative, given the much shorter time frame for the closure of the 5th Avenue Bridge (7 weeks versus about 4.5 years). The construction impacts are described as part of the comparison of all action alternatives. Construction impacts on economics associated with the Managed Lake Alternative are listed and summarized in Table 5.14.2.

Table 5.14.2 Summary of Construction Impacts: Managed Lake Alternative

<table>
<thead>
<tr>
<th>Impact</th>
<th>Impact Finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downstream Economic Activity</td>
<td><strong>Minor Beneficial Effect</strong> – Temporary short-run increases in jobs, labor income, and economic output would occur in the region from construction spending, the local share of which (an estimated $39 million) ranks second behind the Hybrid Alternative. A funding plan for construction spending is under development; depending on how the project is funded, the net effect in the economy of project-related spending may be smaller if diverted from other locally productive investments.</td>
</tr>
<tr>
<td>Downtown Development</td>
<td><strong>No Impact</strong> – Construction activities are unlikely to affect current or future development in downtown Olympia.</td>
</tr>
<tr>
<td>Demand for and Value of Recreation</td>
<td><strong>Adverse Impact</strong> – The Managed Lake Alternative would have the shortest duration of the action alternatives for closures and disturbance of recreational amenities. As such, reductions in economic value from the loss of access and temporary nuisances would be lowest compared to the other action alternatives. <strong>Minor Beneficial Effect</strong> – Some people may derive value from observing construction activities, which may partially offset the losses associated with construction disturbance.</td>
</tr>
<tr>
<td>Demand for and Value of Ecosystem Services</td>
<td><strong>Minor Adverse Impact</strong> – The Managed Lake Alternative would temporarily disrupt ecosystem functions and water quality regulation, habitat provision, visual aesthetics, and cultural, heritage, spiritual, and educational values. The effects would be temporary and shorter in duration compared to the Estuary and Hybrid Alternatives.</td>
</tr>
</tbody>
</table>

5.14.4 What are the construction impacts under the Estuary Alternative?

The Estuary Alternative would require closing the 5th Avenue Bridge for an extended duration (about 4.5 years) during its removal and reconstruction. The construction impacts are described as part of the comparison of all action alternatives. Construction impacts on
economics associated with the Estuary Alternative are listed and summarized in Table 5.14.3.

**Table 5.14.3 Summary of Construction Impacts: Estuary Alternative**

<table>
<thead>
<tr>
<th>Impact</th>
<th>Impact Finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downstream Economic Activity</td>
<td><strong>Minor Beneficial Effect</strong> – Temporary short-run increases in jobs, labor income, and economic output would occur in the region from construction spending, the local share of which (an estimated $27 million) is lowest in this alternative compared to the other alternatives. Depending on the source of funding, which is still undetermined, this could be offset by opportunity costs.</td>
</tr>
<tr>
<td>Downtown Development</td>
<td><strong>No Impact</strong> – Construction activities are unlikely to affect current or future development in downtown Olympia.</td>
</tr>
</tbody>
</table>
| Demand for and Value of Recreation | **Adverse Impact** – The Estuary Alternative would have a longer duration for closures and disturbance of recreational amenities compared to the Managed Lake Alternative. This could cause people to substitute recreation at other sites, at a higher travel cost and lower value.  
**Minor Beneficial Effect** – Some people may derive value from observing construction activities, which may partially offset the losses associated with construction disturbance. |
| Demand for and Value of Ecosystem Services | **Minor Adverse Impact** – The Estuary Alternative would temporarily disrupt ecosystem functions and water quality regulation, habitat provision, visual aesthetics, and cultural, heritage, spiritual, and educational values. The effects would be temporary and shorter duration compared to the Hybrid Alternative. |

**5.14.5 What are the construction impacts under the Hybrid Alternative?**

For the Hybrid Alternative, construction impacts and the duration of impacts would be the same as those described for the Estuary Alternative, with potential impacts related to the 4.5-year closure of the 5th Avenue Bridge. The construction impacts are described as part of the comparison of all action alternatives. Construction impacts on economics associated with the Hybrid Alternative are listed and summarized in Table 5.14.4.
Table 5.14.4 Summary of Construction Impacts: Hybrid Alternative

<table>
<thead>
<tr>
<th>Impact</th>
<th>Impact Finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downstream Economic Activity</td>
<td><strong>Minor Beneficial Effect</strong> – Temporary short-run increases in jobs, labor income, and economic output would occur in the region from construction spending, the local share of which (an estimated $97 million) is highest in this alternative. Depending on the source of funding, which is still undetermined, this could be offset by opportunity costs.</td>
</tr>
<tr>
<td>Downtown Development</td>
<td><strong>No Impact</strong> – Construction activities are unlikely to affect current or future development in downtown Olympia.</td>
</tr>
</tbody>
</table>
| Demand for and Value of Recreation    | **Adverse Impact** – The Hybrid Alternative would have the longest duration of the action alternatives for closures and disturbance of recreational amenities. This could cause people to substitute recreation at other sites, at a higher travel cost and lower value.  
**Minor Beneficial Effect** – Some people may derive value from observing construction activities, which may partially offset the losses associated with construction disturbance. |  
| Demand for and Value of Ecosystem Services | **Minor Adverse Impact** – The Hybrid Alternative would temporarily disrupt ecosystem functions and water quality regulation, habitat provision, visual aesthetics, and cultural, heritage, spiritual, and educational values. The effects would be the longest compared to the other action alternatives. |

5.14.6 What avoidance, minimization, and mitigation measures would be implemented for the project?

The impacts on economic resources from construction of the action alternatives would largely be minor and temporary, and not require avoidance, minimization, and mitigation measures beyond those described for other resources (i.e., Sections 5.1 through 5.13). As described in Section 5.8.7, unavoidable impacts on recreation such as temporary trail and access closures and disruption from staging at Marathon Park could be minimized by detours and other design features. No avoidance, minimization, or mitigation measures specifically designed for economic impacts from construction are recommended or proposed.
6.0 Cumulative Effects

This chapter considers the incremental potential effects of the addition of the Capitol Lake – Deschutes Estuary Long-Term Management Project when considered with other proposed projects.

SEPA requires cumulative effects to be evaluated as part of environmental review per WAC 197-11-060 and 197-11-792. However, cumulative effects are not defined in the SEPA rules; thus, for this analysis, the NEPA definition was used as a guide. A cumulative effect is the “impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions” (40 CFR Part 1508; although this definition was removed in 2019, it is still used to describe cumulative effects for the purposes of this EIS).

6.1 WHAT IS THE STUDY AREA & TIME HORIZON FOR THIS ANALYSIS?

The study area used for each environmental discipline is also used for the cumulative effects analysis, and is therefore different for each resource. These were described in Chapter 3.0, Affected Environment.

Capitol Lake was formed in 1951 following construction of the 5th Avenue Dam. Historically, local tribes used the Deschutes Estuary for subsistence and ceremonial purposes. The past temporal boundary is approximately the 1830s when nonindigenous people began to settle in the area. The future temporal boundary for this analysis is 2050, the time horizon for the project.
6.2 WHAT WAS THE APPROACH TO ANALYZE CUMULATIVE EFFECTS?

This analysis generally follows the guidance developed by the Council on Environmental Quality (CEQ) for assessing cumulative effects. Based on CEQ guidance (1997, 2005), the following guidelines were used to evaluate the cumulative effects of construction and operation of the proposed project:

- Identify the environmental disciplines with the potential to be adversely affected by the proposed project, as discussed in the discipline reports prepared for this EIS.
- Consider other actions in relation to the geographic scope of the proposed project (i.e., those actions that would have effects in the same area as the proposed project).
- Consider other actions in relation to the temporal period of the proposed project (i.e., those actions that would have effects during the same time as the proposed project).
- Rely on the best available data at the time of analysis.

6.3 WHAT ARE THE POTENTIAL ADVERSE IMPACTS OF THE PROJECT?

The cumulative effect analysis focuses on those environmental disciplines that could be substantially affected by the project in combination with other reasonably foreseeable projects. In general, if the impacts of the project’s action alternatives are minor or less than significant, they are assumed not to contribute to cumulative effects unless other reasonably foreseeable future actions could cause substantial effects.

Table 6.3.1 lists which resources identified through the analysis in this EIS have a potential significant adverse impact as a result of construction or operation of one or more of project’s action alternatives. Notably, implementation of the Capitol Lake – Deschutes Estuary Long-Term Management Project would not preclude construction and operation of these other reasonably foreseeable projects.
### Table 6.3.1 Potential Adverse Impacts

<table>
<thead>
<tr>
<th>Environmental Discipline</th>
<th>Potential for Significant Adverse Impact during Construction?</th>
<th>Potential for Significant Adverse Impact during Operation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrodynamics and Sediment Transport¹</td>
<td>NA(¹)</td>
<td>NA</td>
</tr>
<tr>
<td>Navigation</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Water Quality</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Wetlands</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Fish and Wildlife</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Air Quality and Odor</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Land Use, Shorelines, and Recreation</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Cultural Resources</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Visual Resources</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Environmental Health</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Transportation</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Public Services and Utilities</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Note:**

1. Potential adverse impacts from hydrodynamics and sediment transport are incorporated into the evaluations of the other disciplines.

For economics, cumulative effects are generally associated with the implications of additional development downtown. These cumulative effects were considered as part of the economics analysis and are not further described here (see Section 4.14, Economics, and the Economics Discipline Report [Attachment 18]).

### 6.4 WHAT PAST ACTIONS OCCURRED IN THE WATERBODY?

Historically, the Deschutes River formed a broad estuary as it flowed into Budd Inlet in the area that is now Capitol Lake. The historic delta consisted of river deposits, with braided channels and scattered tidal marshes. This area is located within the traditional territory of the Southern Coast Salish cultural group, which includes, but is not limited to, the Steh-chass, Nusehchatl, Squaxin, and Nisqually peoples; see the Cultural Resources Discipline Report for more information (Attachment 13).
An early survey in the 1870s shows the Deschutes Estuary as a waterway, with the first constriction in the estuary mouth near the 4th Avenue Bridge (Figure 6.4.1). Subsequent surveys performed during the next few decades, but prior to the installation of the 5th Avenue Dam, show extensive tideflats as well as encroachment by railroad trestles. In 1929, the BNSF Railway Trestle was constructed across the mouth of the Deschutes River, separating what is now the North Basin and Middle Basin, and a railway was installed at the mouth of Percival Creek, creating Percival Cove. Around 1942, the 5th Avenue Bridge was constructed using earthen fill.

Construction of the 5th Avenue Dam in 1951 blocked the tidal exchange between the Deschutes River and Budd Inlet and created Capitol Lake. Capitol Lake is now a freshwater lake in Olympia and Tumwater, formed by this damming of the mouth of the Deschutes River. The 5th Avenue Dam, which was intended to form a reflecting pool for the State Capitol Building, has altered the morphology and ecology of the lower river system.

In 1956, the construction of the I-5 bridge filled additional area and separated the Middle and South Basins. More fill was placed in the North Basin to construct Deschutes Parkway and Marathon Park in the 1970s, and additional armoring and fill were placed in 1999 for the construction of Heritage Park.

Although different from their historic condition, Capitol Lake Basin, lower Deschutes River, and West Bay now include wetlands that provide habitat for a range of birds, fish, bats, aquatic and semiaquatic mammals, and dozens of invertebrate species. The Deschutes River basin includes commercial forestry in the upper basin and agriculture and rural residential in the middle of the watershed. Urban land uses in the lower watershed include portions of the Cities of Tumwater and Olympia.

### 6.5 WHAT FUTURE PROJECTS ARE REASONABLY FORESEEABLE?

To determine reasonably foreseeable future projects, Enterprise Services engaged the Technical Work Group, described in Chapter 1.0, Introduction, Project Background, and History. Members of the Technical Work Group were asked to provide lists of potential projects that may overlap in space and time with the Capitol Lake – Deschutes Estuary Long-Term Management Project. Reasonably foreseeable future projects are those that are likely or probable, but do not include those that are merely possible. The
projects listed in Table 6.5.1 are the reasonably foreseeable future projects used for the analysis in this chapter. See Chapter 8.0, Engagement with Work Groups, Community Sounding Board, and State Government, for more information about the Technical Work Group. Land use planning documents and agency websites were also reviewed.

Figure 6.4.1 Historical Condition of the Capitol Lake Basin
### Table 6.5.1 Reasonably Foreseeable Projects

<table>
<thead>
<tr>
<th>Project</th>
<th>Proponent</th>
<th>Location</th>
<th>Description</th>
<th>Schedule or Status</th>
<th>Contributing Activity (for cumulative impacts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budd Inlet TMDL</td>
<td>Ecology</td>
<td>Budd Inlet marine waters and Deschutes River watershed including Capitol Lake</td>
<td>TMDL for dissolved oxygen in marine waters of Budd Inlet. Will assign allocations for all source contributing toward dissolved oxygen depletion in Budd Inlet, including Capitol Lake.</td>
<td>In progress – TMDL draft expected late 2021, final 2022.</td>
<td>TMDL established under this plan is anticipated to result in positive outcomes for dissolved oxygen levels in Budd Inlet.</td>
</tr>
<tr>
<td>Deschutes River TMDL</td>
<td>USEPA Ecology</td>
<td>Deschutes River watershed including Capitol Lake</td>
<td>TMDL for sediment, bacteria, dissolved oxygen, pH, and temperature in the Deschutes River.</td>
<td>TMDL nearly complete. Implementation will be ongoing.</td>
<td>TMDL established under this plan is anticipated to result in positive outcomes for noted parameters in Deschutes River.</td>
</tr>
<tr>
<td>Puget Sound Nutrient Reduction Project</td>
<td>Ecology</td>
<td>Entire Puget Sound</td>
<td>Collaborative effort with Puget Sound communities and stakeholders to address human sources of nutrients.</td>
<td>Draft expected 2022.</td>
<td>This project could reduce nutrients in Deschutes River.</td>
</tr>
<tr>
<td>Budd Inlet Sediment (Site ID 2245)</td>
<td>Port of Olympia</td>
<td>Inner Budd Inlet</td>
<td>Cleanup of contaminated sediments in Budd Inlet from multiple industrial uses. A feasibility study is underway to determine future cleanup actions.</td>
<td>Sampling is ongoing to collect data on contaminated sediments. Depending on the results of the feasibility study, cleanup construction could take place over the next decade.</td>
<td>Cleanup activities could occur at the same time as sediment removal.</td>
</tr>
<tr>
<td>Project</td>
<td>Proponent</td>
<td>Location</td>
<td>Description</td>
<td>Schedule or Status</td>
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<tr>
<td>Solid Wood Inc (Site ID 4228)</td>
<td>City of Olympia</td>
<td>Inner Budd Inlet</td>
<td>Cleanup of contamination from past wood processing activities. A remedial investigation and feasibility study are in process to determine cleanup actions for the site.</td>
<td>Sampling is ongoing to determine the scope of contamination and determine cleanup actions. Cleanup construction could take place over the next decade.</td>
<td>Cleanup activities could occur at the same time as sediment removal.</td>
</tr>
<tr>
<td>Sites listed on CSCSL</td>
<td>Ecology</td>
<td>Capitol Lake, Inner Budd Inlet</td>
<td>Many sites in the area of interest are listed on the Confirmed and Suspected Contaminated Sites List (CSCSL).</td>
<td>Sites on the CSCSL may be in various stages; awaiting cleanup, cleanup started, or no further action.</td>
<td>Cleanup activities could occur at the same time as sediment removal.</td>
</tr>
<tr>
<td>Tumwater Valley Regional Stormwater Facility</td>
<td>City of Tumwater Department of Public Works</td>
<td>Thurston County parcel #33870000300, adjacent to the Deschutes River, between I-5 and the Tumwater Valley Municipal Golf Course</td>
<td>Convert ~4 acres of an existing wetland to a stormwater facility to provide water quality treatment to runoff prior to entering the Deschutes River. The system will treat ~100 acres of runoff.</td>
<td>Expected start date is within 5 years of project application (2020).</td>
<td>Stormwater facility could improve water quality and decrease sediment entering the system. Could potentially contribute to local construction traffic during the time frame of project construction.</td>
</tr>
<tr>
<td>Project</td>
<td>Proponent</td>
<td>Location</td>
<td>Description</td>
<td>Schedule or Status</td>
<td>Contributing Activity (for cumulative impacts)</td>
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</tr>
<tr>
<td>West Bay Restoration &amp; Park Master Plan</td>
<td>City of Olympia</td>
<td>West shoreline of West Bay within Budd Inlet; immediately north of the Capitol Lake dam and the Deschutes River’s connection to Budd Inlet</td>
<td>Master plan for West Bay habitat restoration, park, and trail features. Combining ecological restoration of the site’s various ecosystems with a multiuse trail and increased passive recreation opportunities The park will expand from its current 4-acre developed area to an additional 13 acres of restored habitat and developed park on Budd Inlet.</td>
<td>Master planning underway.</td>
<td>The project could provide ecological improvements and recreation opportunities in the study area.</td>
</tr>
<tr>
<td>4th Avenue Sewer Construction</td>
<td>City of Olympia</td>
<td>4th Avenue W between the bridge and Water Street</td>
<td>Construct additional wastewater sewer capacity.</td>
<td>2023</td>
<td>Potentially contribute to local construction traffic during time frame of project construction.</td>
</tr>
<tr>
<td>4th Avenue Street Overlay</td>
<td>City of Olympia</td>
<td>4th Avenue W between the bridge and Water Street</td>
<td>Street repair and reconstruction project to extend the life of the roadway.</td>
<td>2025</td>
<td>Potentially contribute to local construction traffic during time frame of project construction.</td>
</tr>
<tr>
<td>Deschutes Parkway Lakeridge Drive Roundabout</td>
<td>City of Olympia</td>
<td>Intersection of Deschutes Parkway and Lakeridge Drive</td>
<td>Construct a roundabout and install bike lane pavement markings on Lakeridge Drive.</td>
<td>2021</td>
<td>Potentially contribute to local construction traffic during time frame of project construction.</td>
</tr>
<tr>
<td>Capitol Way - Water Quality Retrofit</td>
<td>City of Olympia</td>
<td>7th Avenue and Capitol Way</td>
<td>Construct a water quality treatment facility to treat runoff from an area roughly bounded by Capitol Way, Adams Street, 7th Avenue, and Union Avenue.</td>
<td>2026</td>
<td>Stormwater facility could improve water quality and decrease sediment entering the system. Potentially contribute to local construction traffic during the time frame of project construction.</td>
</tr>
<tr>
<td>Project</td>
<td>Proponent</td>
<td>Location</td>
<td>Description</td>
<td>Schedule or Status</td>
<td>Contributing Activity (for cumulative impacts)</td>
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</tr>
<tr>
<td>Downtown Flood Mitigation</td>
<td>City of Olympia</td>
<td>Various</td>
<td>Install tide gates on key stormwater outfalls to Budd Inlet and Capitol Lake, thereby preventing tides from flowing up the pipes and discharging to low-lying downtown streets.</td>
<td>Annual</td>
<td>This project could mitigate some of the flooding in the study area.</td>
</tr>
<tr>
<td>Near-term Capitol Lake &amp; Heritage Park Flood Barrier</td>
<td>Enterprise Services, City of Olympia</td>
<td>Throughout Heritage Park</td>
<td>Minor landscaping changes to increase the elevation of low spots in Heritage Park to lessen flood impacts. Even with these actions, low-lying areas within and adjacent to Heritage Park will remain vulnerable to flooding.</td>
<td>2024–2025</td>
<td>This project could mitigate some of the flooding in the study area.</td>
</tr>
<tr>
<td>Midterm Capitol Lake &amp; Heritage Park Flood Barrier</td>
<td>Enterprise Services, City of Olympia</td>
<td>Throughout Heritage Park</td>
<td>Address midterm flooding (up to 24 inches [61 cm] of sea level rise) along the Capitol Lake shoreline. Potential physical strategies include: relandscape Heritage Park to create a raised berm; or rebuilding and raising the current floodwall and walkway, and installing a flood gate across the railroad and Powerhouse Road SW.</td>
<td>2025–2050</td>
<td>This project could mitigate some of the flooding in the study area.</td>
</tr>
<tr>
<td>Midterm North Isthmus Flood Barrier</td>
<td>City of Olympia</td>
<td>4th Avenue W between the bridge and Water Street</td>
<td>Address midterm flooding (up to 24 inches [61 cm] of sea level rise) along the north isthmus shoreline. Construct a linked system of planter boxes along 4th Avenue W with flood gates at Simmons Street and Sylvester Street, to create temporary shoreline during large coastal storm events to prevent flooding of low-lying inland areas of downtown.</td>
<td>2030–2035</td>
<td>This project could mitigate some of the flooding in the study area. This could potentially contribute to local construction traffic during time frame of project construction.</td>
</tr>
<tr>
<td>Project</td>
<td>Proponent</td>
<td>Location</td>
<td>Description</td>
<td>Schedule or Status</td>
<td>Contributing Activity (for cumulative impacts)</td>
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</tr>
<tr>
<td>Projects to address requirements from the Deschutes River TMDL</td>
<td>City of Olympia</td>
<td>Various</td>
<td>The draft Deschutes River TMDL suggests the City of Olympia may need to investigate outfalls to the Deschutes Watershed and potentially provide water quality treatment or other mitigation. Tree planting for shade along Percival Creek and the Black Lake Ditch is also anticipated.</td>
<td>Unknown</td>
<td>Implementation of the plan is anticipated to result in water quality improvements by individual projects.</td>
</tr>
<tr>
<td>Deschutes Parkway Sidewalk Improvements</td>
<td>City of Olympia</td>
<td>Deschutes Parkway between 5th Avenue SW and Lakeridge Drive SW</td>
<td>City of Olympia's Draft Transportation Master Plan (November 2020) lists this segment as being a high priority to fill missing sidewalks.</td>
<td>No improvement yet planned</td>
<td>Improved sidewalks would enhance pedestrian access and comfort adjacent to Capitol Lake. This could potentially have a cumulative effect during construction.</td>
</tr>
<tr>
<td>Deschutes Coho Recovery Plan 2015</td>
<td>Squaxin Island Tribe</td>
<td>Upstream of Capitol Lake</td>
<td>Various small-scale restoration projects.</td>
<td>Unknown</td>
<td>Implementation of the plan is anticipated to result in habitat improvements by individual projects.</td>
</tr>
<tr>
<td>Deschutes Riparian Plan Assessment 2013</td>
<td>City of Tumwater</td>
<td>Upstream of Capitol Lake</td>
<td>Various small-scale restoration projects.</td>
<td>Unknown</td>
<td>Implementation of the updated plan is anticipated to result in habitat improvements by individual projects.</td>
</tr>
</tbody>
</table>
6.6 WHAT ARE THE CUMULATIVE EFFECTS FOR THIS PROJECT?

6.6.1 Hydrodynamics and Sediment Transport

6.6.1.1 Summary of Project Impacts

Hydrodynamics

Based on hydrodynamic modeling, the No Action and Managed Lake Alternative would have similar long-term hydrodynamic conditions, and the Estuary and Hybrid Alternatives would have similar long-term hydrodynamic conditions. All alternatives would experience high water levels and lowland flooding around the Capitol Lake Basin. For the No Action and Managed Lake Alternatives, high water levels are driven by extreme river flood events. Under the Estuary and Hybrid Alternatives, high water levels are influenced by extreme tides. Among all alternatives, the highest maximum water levels and greatest extent of flooding occur for the Managed Lake Alternative during extreme river floods. The No Action Alternative would experience similar, although slightly lower, water levels during extreme river floods.

Planned flood-proofing improvements as part of the Olympia Sea Level Rise Response Plan would reduce overland flooding driven by tidal floods and RSLR. However, flood-proofing elevations would not alleviate or fully avoid flooding caused by extreme river events for the No Action and Managed Lake Alternatives.

Sediment Transport

Based on sediment transport modeling, all alternatives would continue to accumulate sediment within the Capitol Lake Basin and in West Bay. Under the Managed Lake Alternative, sediment deposition in Capitol Lake and West Bay would be similar to the No Action Alternative, although there will be a slight (4%) increase in sedimentation in the North Basin under the Managed Lake Alternative because the deeper water levels established through dredging would allow sediment that is suspended in the water column to settle, instead of passing over the 5th Avenue Dam. For the Estuary and Hybrid Alternatives, removal of the 5th Avenue Dam would allow sediment to be transported farther downstream into Budd Inlet. This would result in more transport and less deposition in the South, Middle, and North Basins, and substantially more deposition in Budd Inlet during periods of high river flows. The
reflecting pool wall in the Hybrid Alternative forces water to accelerate around the wall as it exits the North Basin. Faster current speeds in this area result in localized scour and increased transport of sediment to Budd Inlet. Sediment deposition in Budd Inlet will increase up to 283% during periods of high river flow for the Estuary Alternative, and up to 387% for the Hybrid Alternative.

6.6.1.2 Potential Cumulative Effects

Hydrodynamics

None of the projects identified in Table 6.5.1 are anticipated to have a substantial impact on water levels within the Capitol Lake Basin. Therefore, no cumulative effects related to water levels and flooding are anticipated. The separate flood mitigation and flood barrier work planned by the City of Olympia and Enterprise Services to address flooding in downtown Olympia would provide a flood reduction benefit.

Sediment Transport

Some of the projects listed in Table 6.5.1 could result in localized changes to sediment transport. The City of Tumwater’s new stormwater facility and the City of Olympia’s water quality treatment facility could nominally decrease sediment loads to the system, as could planned restoration activities. With the possible exception of planned cleanup actions in West Bay, none of these projects would contribute to a cumulative effect. Cleanup actions could limit or increase sediment erosion within West Bay, depending on the method of cleanup chosen (e.g., dredging to remove contaminated sediment or monitored natural recovery where accumulation of cleaner sediment upstream is considered beneficial). Combined with changes under the Estuary and Hybrid Alternatives, there may be minor contribution to cumulative effects to sediment transport in West Bay. However, none of the planned future projects would have a clear effect on modeling input parameters used for the Capitol Lake – Deschutes Estuary Long-Term Management Project.

6.6.2 Navigation

6.6.2.1 Summary of Project Impacts

Under the Estuary and Hybrid Alternatives, sediment deposition would occur primarily along the east shoreline of West Bay, the
location of several marinas, the Port of Olympia, and other water-dependent businesses.

Impacts on navigation are considered significant if large commercial vessels accessing the FNC and Port of Olympia would be required to wait longer than 4 hours for channel access due to sediment deposition or long-term maintenance dredging, or if over 10% of anticipated small-craft vessels would not be able to access their marina slip for moorage as a result of sediment accumulation. The incorporation of initial dredging and an adaptable long-term maintenance dredging plan, combined with the implementation of a data-driven monitoring plan, would reduce significant impacts to less than significant levels under the Estuary and Hybrid Alternatives.

### 6.6.2.2 Potential Cumulative Effects

Cleanup actions of contaminated sediments and sites in West Bay from multiple industrial uses, identified in Table 6.5.1, may occur within the time frame for the project. The extent, duration, and specific locations of cleanup activities are not known at this time and may likely include dredging in areas of existing contamination. Potential cleanup activities could be coordinated with future maintenance dredging to avoid impacts on navigation from repeated dredge events. As a result, no cumulative effects in combination with the proposed project are anticipated.

Maintenance dredging by West Bay marinas and the USACE’s maintenance dredging within the FNC and Port of Olympia berth areas is anticipated to occur within the next 10 years. It is anticipated that this dredging would occur prior to the first maintenance dredge activity under the Estuary or Hybrid Alternatives. As a result, no cumulative effects on navigation would occur.

No projects were identified that would be expected to change the vertical or horizontal restrictions for vessel movement in West Bay that could combine with the proposed project to produce long-term cumulative effects.

### 6.6.3 Water Quality

#### 6.6.3.1 Summary of Project Impacts

Impacts on water quality for most construction activities would be less than significant, and would be minimized through implementation of protective conditions and BMPs, which would be
included in the project permits. Potentially significant adverse short-term impacts on water quality are anticipated under the Estuary and Hybrid Alternatives from the initial release of sediment and nutrients after tidal flow is restored during 5th Avenue Dam removal.

Operational impacts under the Managed Lake Alternative would range from less than significant (related to maintenance dredging) to beneficial (related to water quality improvements from aquatic plant removal in the Capitol Lake Basin). The analysis of impacts took into account the cumulative effects of project actions and the implementation of the Deschutes River TMDL and pollution control activities in the lake basin.

Operational impacts under the Estuary and Hybrid Alternatives would range from less than significant (related to maintenance dredging) to potentially significant (related to long-term water quality in the Capitol Lake Basin). As is typical of estuarine environments in Puget Sound, the water would have seasonally low dissolved oxygen and frequent algal blooms. This water would replace the water currently in the lake basin, which also experiences algal blooms but is generally well oxygenated. In West Bay, small to modest improvement in dissolved oxygen conditions are expected due to changes in circulation patterns and potential changes in nutrient loading after dam removal.

### 6.6.3.2 Potential Cumulative Effects

It is possible that the projects in Table 6.5.1 could be constructed in the same general time frame as the proposed project. However, these projects would be required to implement BMPs to protect water quality, and none are anticipated to add to the sediment and nutrient release that would occur following removal of the 5th Avenue Dam under the Estuary and Hybrid Alternatives. Therefore, no short-term, construction-related cumulative effects on water quality are anticipated.

Future requirements for stormwater management through improvements in stormwater treatment technologies and discharge limits will likely gradually improve water quality in the study area waterbodies, including the Capitol Lake Basin and Budd Inlet. These improvements would result from implementation of the Deschutes River TMDL, Budd Inlet TMDL, and the Puget Sound Nutrient Reduction projects, all of which are expected to reduce nutrient loading to study area waterbodies. Implementation of individual projects, such as the Tumwater Valley Regional Stormwater Facility,
Capitol Way Water Quality Retrofits, and restoration projects associated with the Water Resource Inventory Areas (WRIA) 13 Watershed Restoration and Enhancement, are expected to result in water quality improvements. Overall, the combined impact of these plans and projects would have a beneficial effect on water quality in the Capitol Lake Basin and in West Bay. However, with climate change, water temperature is expected to increase, contributing to lower dissolved oxygen. While the aforementioned projects would reduce nutrient sources to the lake and the inlet within the time horizon for the proposed project, with consideration of climate change, dissolved oxygen concentrations in the lake basin and West Bay would be expected to be similar to what currently exist.

6.6.4 Wetlands

6.6.4.1 Summary of Project Impacts

Under the Managed Lake Alternative, Capitol Lake would remain a freshwater system. The North Basin would remain deepwater habitat, and the Middle and South Basins would transition from deepwater habitat to vegetated wetlands. There would be a net gain in wetland functions, and there would be a minor beneficial effect.

The Estuary and Hybrid Alternatives would restore the Capitol Lake Basin to an estuarine system similar to historic conditions. Estuarine wetlands are rare in the region and provide additional functions that are not available in freshwater deepwater habitats, and there would be a substantial beneficial effect.

All of the action alternatives would include overwater structures that would result in similar areas of wetlands shade and fill. Under the Estuary and Hybrid Alternatives, the removal of the 5th Avenue Dam would remove approximately 3 acres of fill from deepwater habitats. Once the Preferred Alternative is selected, the design would be refined to minimize the wetland loss and maximize habitat benefits. With consideration of improved habitat functions and self-mitigating functions of the alternatives, the need for compensatory mitigation may be reduced to zero, especially under the Estuary and Hybrid Alternatives. With habitat features included in the action alternatives, and additional mitigation, if required by regulatory agencies, direct impacts from fill and indirect impacts from shade under all action alternatives would be less than significant.
6.6.4.2 Potential Cumulative Effects

With the implementation of measures to minimize impacts during construction and design measures to minimize wetland loss described in Section 4.6, Wetlands, adverse impacts would be less than significant. As with this project, the projects listed in Table 6.5.1 are subject to the federal, state, and local requirements related to mitigating impacts on wetlands. Even with potential for minor wetland impacts associated with the cumulative projects list, the proposed project would not result in a cumulative negative effect on wetlands.

The Estuary and Hybrid alternatives would increase the total amount of estuarine wetlands in the South Puget Sound, having a substantial beneficial effect on the availability of this rarer wetland type.

6.6.5 Fish and Wildlife

6.6.5.1 Summary of Project Impacts

Under all action alternatives, potential construction impacts on fish and wildlife would be less than significant with adherence to approved in-water work windows and standard construction BMPs. Potential construction impacts include fish entrainment and direct mortality, temporarily degraded water quality, turbidity and sedimentation, and noise and vibration. Although individual fish or wildlife could be affected, these impacts would be small and would not measurably affect local fish or wildlife populations.

Under the Managed Lake Alternative, long-term operational impacts would range from beneficial to less than significant, depending on the species. With the Estuary and Hybrid Alternatives, impacts on fish and wildlife would range from beneficial to less than significant to significant, depending on the species. The estuary conditions created under the alternative would result in substantial beneficial effects for salmon, other anadromous species, and marine fishes, including protected species within these groups. In addition, the physical footprint of the dam removal would have moderate beneficial effects on salmon and other fish species expected to use the estuary. Conversely, the brackish water in the basins would not be suitable for freshwater fish species, resulting in mortality to these species and constituting a significant impact on this species group. For wildlife species, the change to an estuarine environment under the Estuary and Hybrid Alternatives would be a significant impact on bats.
because of the size of the nearby colony and their dependence on the freshwater environment of Capitol Lake for foraging.

### 6.6.5.2 Potential Cumulative Effects

As described above, construction impacts on fish would be less than significant with implementation of minimization and mitigation measures; however, they could contribute to cumulative effects. It is possible that some of the projects in Table 6.5.1 could be constructed in the same general time frame as the proposed project; however, these projects would be required to implement similar measures for the protection of aquatic species. Any adverse impacts would be temporary and localized. Therefore, no short-term, construction-related cumulative effects on fish and wildlife are anticipated.

The estuary habitat conditions reestablished by dam removal (Estuary and Hybrid Alternatives) would result in substantial beneficial effects for salmon, other anadromous species, and marine fish. Due to historical declines, estuary habitat is a scarce and valued habitat in the region compared to freshwater ponds and lakes, which remain relatively abundant. Conversely, there would be significant impacts to freshwater fish and bats from the Estuary and Hybrid Alternatives. However, none of the reasonably foreseeable projects in Table 6.5.1 are anticipated to contribute to similar impacts on those species. None of the projects would similarly reduce freshwater habitat needed for freshwater fish and bats (for foraging). Many of the projects listed in Table 6.5.1 have the potential to beneficially affect fish and wildlife. Implementation of the Deschutes River TMDL, Capitol Lake/Budd Inlet TMDL, and the Puget Sound Nutrient Reduction projects are expected to reduce nutrient loading to study area waterbodies, which would benefit fish through improved dissolved oxygen levels. Restoration projects along the Deschutes River would improve and increase the amount of habitat available for fish and other aquatic species. Stormwater facility and retrofit projects would improve water quality in the Project Area, improving aquatic habitat. Overall, the combined impact of these planned projects would have a beneficial effect on aquatic habitat in the Capitol Lake Basin and in Budd Inlet.

Overall, none of the action alternatives, when combined with the impacts of the projects listed in Table 6.5.1, are anticipated to contribute to cumulative effects on fish and wildlife but would have long-term beneficial effects on certain aquatic species and habitats.
6.6.6 Air Quality and Odors

6.6.6.1 Summary of Project Impacts

Both the Estuary and Hybrid Alternatives would create additional tideflats in the area, with the potential to emit odors in an urban location. In consideration of the variability in frequency, intensity, duration, and differing perceptions of the odors, odor impacts from the Estuary Alternative are expected to be less than significant.

The project is not expected to create any new violations of air quality standards. The total annual emissions of each pollutant during construction and operation would be less than the general conformity de minimis thresholds; therefore, the air quality impacts associated with the action alternatives would be less than significant.

6.6.6.2 Potential Cumulative Effects

It is possible that the projects in Table 6.5.1 could be constructed in the same general time frame as the proposed project; however, analysis of cumulative construction emission concentrations of these pollutants would be speculative due to the variability in project construction schedules and mobile source trip routes. Additionally, the study area is designated as attaining all NAAQS, indicating that existing air quality conditions are not deleterious. The proposed project’s on-site and mobile emissions, when added to other projects in the vicinity, would not result in a cumulative effect.

Regional air quality is likely to improve between the present and 2030 because of more stringent regulations and trends toward cleaner vehicles. The proposed project would not result in the generation of substantial vehicle trips or other operational-related air emissions that would contribute to a cumulative air quality impact. As a result, there would be no cumulative effect.

The annual GHG emissions for all action alternatives represent less than 0.01% of estimated annual 2015 GHG emissions within Washington, and much smaller percentages of worldwide emissions. It is important to note that the scale of global climate change is so large that the impacts from one project, no matter the size, would almost certainly have no discernible effect on increasing or decreasing global climate change. However, any project contributes cumulatively to GHG emissions.
6.6.7 Land Use, Shorelines, and Recreation

6.6.7.1 Summary of Project Impacts

Most of the recreation resources in the study area would remain open and continue to operate during construction. However, Marathon Park would be closed for 4 to 8 years, depending on the alternative, and several areas around the lake would be subject to intermittent, partial closures and construction noise and visual disturbance during the periods when dredging and other construction would occur. Given the duration of construction-related recreational closures and disturbance, construction impacts on recreation are considered significant for all action alternatives.

Under the Managed Lake Alternative, extreme river floods could result in flood damage in downtown Olympia and within adjacent parks. Flooding would become more frequent and affect land and shoreline use unless mitigation measures were implemented to protect the downtown area from the flood levels.

The Estuary and Hybrid Alternatives would have minor beneficial effects by reducing the extent of river flooding. However, under extreme tidal flooding with sea level rise, the Estuary and Hybrid Alternatives could also increase the extent of flooding slightly along the perimeter of the lake basin.

6.6.7.2 Potential Cumulative Effects

Planned projects, including construction of near-term and midterm flood barrier projects at Heritage Park, would also potentially overlap with construction and/or maintenance dredging activities of the action alternatives. This could potentially contribute to the disruption to public access and recreation in the study area. If this coincided with closures at Marathon Park, there would be cumulative effects associated with short-term disruptions. Similar to the proposed project, the projects within the study area would not permanently affect recreational facilities, and some would continue to beneficially enhance recreational facilities in the area. Therefore, long-term cumulative effects on public access and recreational opportunities are generally beneficial.
6.6.8 Cultural Resources

6.6.8.1 Summary of Project Impacts

All action alternatives are expected to cause potential impacts on archaeological resources during construction from earthwork, dredging, and filling. Archaeological resources are nonrenewable, and any impact on the depositional integrity of a protected archaeological resource is considered a significant impact.

The Estuary and Hybrid Alternatives would remove the 5th Avenue Dam and 5th Avenue Bridge, eliminating the reflecting pool. If the Des Chutes Basin Project Historic District is determined eligible for listing, the Estuary Alternative would permanently diminish the integrity of the resource’s essential physical features, and would be a significant impact. However, it is also noted that the return of the estuary would reestablish pre-Des Chutes Basin Project tidelands and estuary functions associated with historic use patterns of the estuary. Similarly, if the 5th Avenue Dam, 5th Avenue Bridge, or Deschutes Parkway are determined eligible for listing, impacts would be significant under the Estuary and Hybrid Alternatives.

6.6.8.2 Potential Cumulative Effects

In the study area, past and ongoing development and natural elements have reduced the information potential and cultural value of prehistoric- and ethnographic-period cultural resources. Significant, undocumented, buried archaeological materials may be present that could be damaged or destroyed by grading or excavation associated with reasonably foreseeable actions, in addition to the proposed project. However, implementation of mitigation and minimization measures described in Section 4.8, Land Use, Shorelines, and Recreation, would ensure that project-related activities would not make a considerable contribution to cumulative effects on important undocumented cultural resources.

The projects listed in Table 6.5.1 to address flooding may change the view of the Des Chutes Basin Project Historic District. The Estuary Alternative would contribute to cumulative effects on this resource if it were determined to be eligible for listing. Similarly, project-related impacts on the Deschutes Parkway, if it is determined to be eligible for listing, would contribute to cumulative effects from the Deschutes Parkway Lakeridge Drive Roundabout.
6.6.9 Visual Resources

6.6.9.1 Summary of Project Impacts

Given the duration of construction-related staging at Marathon Park and in-water construction and staging, construction impacts on visual resources are considered significant for all action alternatives. Additionally, there would be a long-term visual impact associated with the barrier wall under the Hybrid Alternative. In the North Basin, the visual impacts of the barrier wall would be severe, introducing a large, conspicuous structure that divides the waterbody and blocks views across it from the east and west. Although mitigation for the appearance of the wall could be provided, its sheer scale would result in a significant unavoidable impact.

6.6.9.2 Potential Cumulative Effects

When analyzing cumulative visual impacts, the potential for projects in Table 6.5.1 to alter the existing visual environment within the same viewshed as the project were considered. In the short term, the action alternatives would contribute to a cumulative visual impact by adding more activities and construction equipment in the area at the same time as the reasonably foreseeable projects listed in Table 6.5.1.

No reasonably foreseeable projects in the viewshed were identified that would introduce substantial new modifications with long-term visual impacts. For this reason, the adverse visual impacts that would occur from the project under the Hybrid Alternative would not create a cumulative effect on visual resources.

6.6.10 Environmental Health

6.6.10.1 Summary of Project Impacts

Sediment dredging and placement of dredged sediments in constructed habitat areas would have no adverse impacts on sediment quality because high sediment quality is present throughout the lake within and below the planned dredge areas. Sediment quality in Budd Inlet would not be impacted by construction because permit-required BMPs would prevent discharge of sediment from the lake during dredging.

Dredging would have a minor beneficial effect to sediment quality in Capitol Lake by removing sediments with high sulfide concentrations and exposing sediments with low sulfide concentrations in the
dredge areas. Under the Estuary and Hybrid Alternatives, the natural export of sediment into West Bay would have minor to substantial beneficial effects on sediment quality in West Bay depending on the location, deposition rates, and chemical parameters. Maintenance dredging for all action alternatives would have no adverse impacts on sediment quality.

### 6.6.10.2 Potential Cumulative Effects

The proposed project would not result in impacts and thus not contribute to cumulative effects.

### 6.6.11 Transportation

#### 6.6.11.1 Summary of Project Impacts

The action alternatives would have potential short-term impacts on traffic from construction activities. Impacts would be the greatest with the Estuary and Hybrid Alternatives. Implementation of a CTMP and Traffic Control Plan is expected to reduce impacts to less than significant levels.

Construction of all action alternatives would include a period in which the 5th Avenue Bridge would be closed, though the period of closure is substantially longer for the Estuary and Hybrid Alternatives. Although mitigation measures would avoid or minimize all adverse traffic impacts during periods when the 5th Avenue Bridge would be closed, traffic increases along the 4th Avenue W detour route (or detour routes around the south end of the Middle Basin for the Managed Lake Alternative) still could result in congested operations during some periods of peak traffic demand, resulting in a significant and unavoidable impact during the times that it occurs. Truck trips associated with maintenance dredging under all action alternatives could also result in significant and unavoidable impacts if dredged spoils are removed by trucks on surface streets, which is expected to occur under the Managed Lake Alternative.

#### 6.6.11.2 Potential Cumulative Effects

The City of Olympia has plans to install a new gravity main under 4th Avenue W between the 4th Avenue Bridge and Water Street and repave the street. Construction of that gravity main is anticipated to occur between 2023 and 2025, which is unlikely to overlap with the construction time frame of the action alternatives. However, if construction were to coincide with closure of the 5th Avenue Bridge
under the Estuary and Hybrid Alternatives, or the shorter duration closure under the Managed Lake Alternative, there would be cumulative effects on transportation, exacerbating the already significant impacts of the bridge closure. Other planned projects, including the future sidewalk improvements along Deschutes Parkway, and near-term and midterm flood barrier projects, could potentially overlap with the construction time frame of the action alternatives. This could potentially contribute to local construction traffic during construction of the action alternatives, but no cumulative effects would be expected. If construction of the other future projects were to coincide with maintenance dredging, construction traffic of those projects would combine with the haul trips to remove dredged spoils from the study area to produce short-term cumulative effects on transportation. This is most likely to occur under the Managed Lake Alternative because in-water disposal (using barges, not trucks) is assumed for the Estuary and Hybrid Alternatives.

As under the proposed project, implementing reasonably foreseeable projects would also not cause a long-term increase in traffic in the study area or adjacent neighborhoods, and the increase resulting from any of the action alternatives would be small relative to overall traffic and insufficient to alter levels of service. Therefore, the combined effect of implementing reasonably foreseeable projects and any of the action alternatives would not be sufficient to cause a long-term cumulative effect on traffic.

6.6.12 Public Services and Utilities

6.6.12.1 Summary of Project Impacts

Minimal amounts of utility provision or other public services would be required for the action alternatives. Prior to project implementation, utility locations would be determined in order to avoid the existing utilities, or early coordination would be initiated with utility providers to limit potential interruption of services and minimize potential impacts during construction.

Under the Estuary and Hybrid Alternatives, for the estimated 5.5 years the 5th Avenue Bridge was closed, response times for emergency vehicles in the area would likely be increased. This would potentially be a significant impact given the extended duration, but it would be reduced to less than significant with mitigation identified in Section 4.13, Public Services and Utilities.
Under the Estuary and Hybrid Alternatives, with mitigation measures to monitor for corrosion and replace utility lines if corrosion starts to become considerable, impacts could be reduced to less than significant levels.

### 6.6.12.2 Potential Cumulative Effects

Similar to the proposed project, the reasonably foreseeable actions identified in Table 6.5.1 would have fairly minimal demands for the provision of utilities and would generally not have a permanent need for services. Some of these projects would improve or replace old or failing utility infrastructure in the area. If construction of the new gravity main under 4th Avenue W between the 4th Avenue Bridge and Water Street NW were to coincide with closure of the 5th Avenue Bridge under the Estuary and Hybrid Alternatives, there would be cumulative effects on response times for emergency vehicles, exacerbating the already significant impacts of the bridge closure.

### 6.6.13 Economics

As mentioned in Section 6.3, for economics, cumulative effects are generally associated with the implications of additional development downtown, and the long-term effects associated with ecosystem services. Economic impacts are largely cumulative, the result of broad interactions in the study area. All of the alternatives could affect downtown development and could change ecosystem services. These cumulative effects were considered as part of the economics analysis and are not further described here (see Section 4.14, Economics, and the Economics Discipline Report [Attachment 18]).

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**Reference Materials for Chapter 6.0**

- CEQ. 1997. [Considering Cumulative Effects Under the National Environmental Policy Act](#).
7.0 Planning-Level Costs, Funding Recommendations, & Other Considerations

Planning-level costs have been developed to evaluate economic sustainability and feasibility of the long-term management alternatives, which are key components of the project purpose and will be considered during the process to identify a Preferred Alternative. This chapter provides initial recommendations from the Funding and Governance Work Group on how construction and long-term management may be funded, as well as other topics that may be considered during the decision-making process that are not otherwise captured in the technical analyses, but were identified during development of this Environmental Impact Study (EIS).

7.1 WHAT IMPORTANT FACTORS ARE ASSUMED IN THE PLANNING-LEVEL COSTS?

The planning-level costs were developed by civil, environmental, and coastal engineers on the EIS Project Team and are considered a Class 4 estimate, by standards established by the Association for the Advancement of Cost Engineering. They reflect an accuracy variation of -(minus) 25% and +(plus) 35%. They assume a 3.5% annual escalation. The planning-level costs include estimates for design and permitting, construction, and long-term sediment management.

7.1.1 Design and Permitting of the Preferred Alternative (Phase 3)

Costs for design and permitting are those required to advance conceptual design of the Preferred Alternative to a final design package. This includes all elements of a complete design (e.g., dredge design, design of the temporary coffercells to construct habitat areas, habitat areas and planting plans, boardwalks), and the associated specifications that will be required to construct and deliver the project in the next
phase. Costs in this phase also include the effort to prepare comprehensive permit applications, coordinate with the governmental and agency partners with jurisdiction, and obtain the suite of environmental permits that will be required for construction and long-term management of the Preferred Alternative.

Costs for design and permitting are typically within 10% to 12% of estimated construction costs. They are included in the estimated construction costs provided in Table 7.1.1. A separate capital request would be submitted to the State of Washington for this funding. The request could be made in the 2023–2025 biennium.

Design and permitting would occur over an approximately 3- to 5-year duration and would begin as early as 2023 pending funding.

### 7.1.2 Construction of the Preferred Alternative (Phase 4)

Planning-level cost estimates for construction were developed based on costs to construct the primary elements of each alternative, including dredging, habitat areas, work at the 5th Avenue Dam (as needed for each alternative), installation of the boardwalks, and the 5th Avenue Pedestrian Bridge.

Across all action alternatives, sediment management is the project component with the greatest influence on the planning-level construction costs. Sediment dredged during construction will be entirely or mostly reused within the Project Area to create wetland and shoreline habitat. This beneficial reuse results in a significant cost savings for the project—it avoids construction costs associated with hauling the material off-site and disposing of it upland, potentially saving hundreds of millions of dollars.

A capital request for construction of the Preferred Alternative could be submitted between 2026 and 2028, if funding is immediately available for the preceding design and permitting phase and that process is completed within the estimated 3 to 5 years.

Construction is estimated to occur over a 4-to-8-year duration, depending on the alternative.
7.1.3 Long-Term Sediment Management (after construction)

Planning-level estimates for long-term sediment management (i.e., maintenance dredging) were estimated over the 30-year project time horizon, beginning after construction (2040 or later depending on the Preferred Alternative selected and when construction begins). Given the numerical modeling that was conducted for the EIS, the costs of recurring maintenance dredging required for long-term sediment management can be estimated and represent the largest long-term maintenance cost. The long-term costs provided in Table 7.1.1 do not include other potential maintenance responsibilities, such as conditions within the alternative-specific adaptive management plans, habitat enhancement plans, or other operations and maintenance associated with restored recreation. Those requirements will be better understood during design and permitting for the Preferred Alternative and can be estimated at that time.

It is assumed that the sediment removed during maintenance dredging in the Estuary and Hybrid Alternatives would be disposed at an allowable in-water location within the Puget Sound. This assumption is based on the suitable chemical quality of the Deschutes River sediment, which would be deposited in West Bay under these alternatives and removed during recurring dredge events to avoid impacts associated with sediment accumulation. Additionally, sediment dredged under the Estuary and Hybrid Alternatives would be in a saltwater environment, and there is low potential for aquatic invasive species persistence in deeper waters where dredging would occur. Low population densities of the invasive New Zealand mudsnail are assumed in Budd Inlet because of salinity levels.

Sampling for chemical quality and invasive species would occur before future dredge events to confirm suitability of the dredged material for in-water disposal. See the Navigation Discipline Report (Attachment 6) for a description of the assumed dredging frequency and locations, the Aquatic Invasive Species Discipline Report (Attachment 8) for a discussion on the impact of saltwater on existing invasive species in Capitol Lake, and the Sediment Quality Discipline Report (Attachment 15) for sediment quality data.

If the sediment is determined unsuitable for in-water disposal due to chemical quality or invasive species, these planning-level costs assume that it would be transloaded into trucks and hauled to an upland site. This upland disposal would more than double the estimated cost of recurring maintenance dredging under the Estuary and Hybrid
Alternatives. Upland disposal is the only feasible disposal option for material dredged under the Managed Lake Alternative because invasive species are expected to persist in the freshwater environment, at high densities similar to existing conditions.

The planning-level costs associated with upland disposal assume transport to the upland site by truck, rather than by rail. However, transport by rail is not precluded and was evaluated in this EIS (see Attachment 11, Air Quality and Odor Discipline Report, and Attachment 16, Transportation Discipline Report). The feasibility of rail transport from the maintenance dredging events would depend on a number of factors, including equipment availability and whether or not the upland disposal location is adequately served by rail. Additionally, transport by rail requires a significant amount of land for temporary storage where dredged material would be placed and then loaded onto rail cars as they are available. Given that maintenance dredging would not occur for several decades, the availability of nearby suitable land could not be assumed, and neither could equipment availability or rail access. Transport by rail would be reevaluated in the future prior to maintenance dredging, where upland disposal is assumed, because it could reduce the estimated costs of sediment transport for disposal.

Sediment management is not the only cost associated with long-term maintenance, but it would account for the majority spending over a 30-year period after construction. Estimating it allows decision-makers to focus on the biggest cost differentiator between the long-term management alternatives.

### 7.1.4 What are the planning-level costs for the long-term management alternatives?

The planning-level cost estimates presented in Table 7.1.1 have been developed based on the conceptual design components for the project alternatives (Chapter 2.0, Project Alternatives and Construction Approach). The accuracy of these construction and long-term maintenance dredging estimates will increase as design is advanced further.
### Table 7.1.1 Planning-Level Cost Estimates for the Project Alternatives

<table>
<thead>
<tr>
<th>Project Alternative</th>
<th>Design, Permitting (1), &amp; Construction Costs (2)</th>
<th>Maintenance Dredging Costs over 30 Years (3)</th>
<th>Construction + 30-years Maint. Dredging</th>
<th>Funding Source for Construction &amp; Maint.</th>
<th>Impact if There is a Funding Lapse after Construction</th>
<th>Potential Significant Additional Costs Not Associated with Construction or Maintenance Dredging</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Action</td>
<td>$0</td>
<td>$18M (4)</td>
<td>$18M</td>
<td>U.S. Army Corps of Engineers (USACE), Port of Olympia, and local marinas</td>
<td>Not applicable</td>
<td>Ongoing repairs and future replacement of the 5th Avenue Dam, if permits could be obtained.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Potentially significant costs to LOTT Clean Water Alliance (LOTT) because more extensive water quality treatment is likely to be required by the Washington State Department of Ecology (Ecology).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Continued overland flooding events and associated costs to the City of Olympia, Port of Olympia, and other entities. These costs would be most significant under the No Action and Managed Lake Alternatives.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Continued costs to address tribal and public concern regarding impacts and environmental impairments.</td>
</tr>
<tr>
<td>Managed Lake</td>
<td>$89–$160M</td>
<td>$248–$447M (5)</td>
<td>$337–$607M</td>
<td>Majority of construction and maintenance costs assumed to be the primary responsibility of the State of Washington</td>
<td>Reduced recreational opportunities in the North Basin; over many years, Capitol Lake would look similar to today resulting in a sunk construction cost</td>
<td>Same as the No Action Alternative, but comparatively reduced costs associated with the 5th Avenue Dam.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Potential significant costs to compensate for tribal and ecological impacts.</td>
</tr>
<tr>
<td>Estuary</td>
<td>$131–$235M</td>
<td>$48–$101M (6)</td>
<td>$179–$336M</td>
<td>Majority of construction costs assumed to be borne by the State of Washington Maintenance dredging costs assumed to be shared by Funding and Governance Work Group members (with one-quarter of the total costs funded by the USACE)</td>
<td>Impacted navigation in West Bay (up to 6 inches per year is deposited at the Olympia Yacht Club, less than 0.1 inch per year in the FNC)</td>
<td>Continued overland flooding events and associated costs to the City of Olympia, Port of Olympia, and other entities. Flooding impacts and costs under the Estuary Alternative would be less significant than those under the No Action and Managed Lake Alternatives.</td>
</tr>
<tr>
<td>Hybrid</td>
<td>$177–$319M</td>
<td>$72–$144M (7)</td>
<td>$269–$463M</td>
<td>Majority of construction costs assumed to be borne by the State of Washington Maintenance dredging costs assumed to be shared by Funding and Governance Work Group members (with one-quarter of the total costs funded by the USACE)</td>
<td>Impacted navigation in West Bay (up to 7.5 inches per year is deposited at the Olympia Yacht Club, and 0.1 inches per year in the Federal Navigation Channel [FNC])</td>
<td>Same as Estuary Alternative, but reduced costs to the City of Olympia, Port of Olympia, and other entities given the flood reduction provided by the reflecting pool barrier wall.</td>
</tr>
</tbody>
</table>

Notes for Table 7.1.1 are provided on the following page.
Notes for Table 7.1.1:

2. Funding for design for design and permitting of the Preferred Alternative would be requested from and authorized by the State of Washington in the 2023 Legislative session.

3. Potential additional costs associated with future project permit conditions have not been estimated at this time because they cannot be predicted with certainty. The planning-level cost estimates do not include potential costs associated with compensatory mitigation to offset potential temporary or permanent impacts to wetlands, fish, or other ecological functions. This could be required if the regulatory agencies do not consider the project benefits to outweigh the potential impacts (if the project is not considered “self-mitigating”).

4. Cost estimates for conditions of the alternative-specific adaptive management plans, habitat enhancement plans, and other operations and maintenance activities would be estimated during design and permitting once those requirements are better understood for the Preferred Alternative. Those long-term management costs are not included herein. The maintenance dredging cost estimates represent the largest long-term maintenance cost and help to differentiate the project alternatives.

5. This represents the estimated non-project costs associated with dredging-impacted areas of West Bay based on sedimentation rates and patterns modeled for the No Action Alternative. Numerical modeling shows that approximately one-quarter of the sediment that would be dredged would be from the FNC and turning basin, and those dredging costs (one-quarter of the total) would be the responsibility of the USACE. These costs assume that the Port of Olympia and the USACE have already dredged the existing contaminated sediment and have reestablished authorized depths. That dredging of contaminated accumulated sediment is not associated with this project, and those costs are not included in the assumed $18M that would be spent by other entities over 30 years. The planned Port of Olympia and USACE dredging of contaminated sediments is also expected to allow the future dredged material under the No Action Alternative to be disposed in-water.

6. Dredged material under the Managed Lake Alternative is from within the North Basin and is expected to be disposed of upland. In-water disposal, which is often a lower cost option, is not feasible due to invasive species presence. This total cost reflects the assumed upland disposal, with truck transport. Rail transport could reduce costs from what is shown here, and feasibility of rail transport would be evaluated prior to maintenance dredging. It is possible for a small portion of the dredged material to be beneficially reused within the Capitol Lake Basin, if needed to replenish the habitat areas in the Middle Basin. Separately, non-project dredging paid for by separate entities would still be required in West Bay, consistent with the dredging costs that are estimated for the No Action Alternative.

7. These costs reflect the additional maintenance dredging costs beyond dredging costs that would be incurred under the No Action Alternative ($18M over 30 years) to address impacted areas in West Bay. Approximately one-quarter of the sediment that would be dredged as part of the project would be from the FNC and turning basin, and that dredging is the responsibility of the USACE. Therefore, it is assumed that one-quarter of these total maintenance dredging costs would be paid by USACE. Baseline dredging in impacted areas of West Bay (estimated at $18M over 30 years) would continue to be the responsibility of the Port of Olympia, private marinas, and the USACE; additional dredging requirements shown in this estimate, resulting from the project, is assumed to be the shared responsibility of members of the Funding and Governance Work Group and USACE.

8. Costs over 30 years for the Estuary Alternative would increase to $367M to $660M if dredged material was determined not suitable for in-water disposal. However, based on findings in this Draft EIS, the sediment is expected to be suitable for in-water disposal.

9. Costs over 30 years for the Hybrid Alternative would increase to $513M to $924M if dredged material was determined not suitable for in-water disposal. However, based on findings in this Draft EIS, the sediment is expected to be suitable for in-water disposal.
7.2 WHAT ARE THE RECOMMENDATIONS FOR FUNDING CONSTRUCTION & LONG-TERM MANAGEMENT?

Under a Managed Lake Alternative, long-term funding and governance would be needed to implement activities from an adaptive management plan designed to achieve lake management objectives, such as seasonal treatment or mechanical harvesting of aquatic plants. Actions to meet lake management objectives would be the primary ongoing management commitment. Funding and governance would also ensure that long-term maintenance dredging occurred at an approximately 20-year frequency to support recreation within the North Basin. Measures outlined in a Habitat Enhancement Plan would be implemented to maintain ecological functions.

Under the Estuary and Hybrid Alternatives, the primary focus for long-term funding and governance would be sediment management in impacted areas of West Bay. Recurring maintenance dredging, at a 5- to 6-year frequency, is critical to avoiding and minimizing significant impacts to downstream resources from sediment deposition. A governing body would oversee annual monitoring and ensure that dredging was coordinated across potentially impacted areas of West Bay. Long-term funding and governance would also be needed to implement measures outlined in a Habitat Enhancement Plan. A freshwater reflecting pool, if implemented instead of a saltwater pool under the Hybrid Alternative, would also require ongoing adaptive management (a saltwater reflecting pool is not expected to require ongoing adaptive management).

Without shared long-term funding and governance, these management actions may not be implemented. In past planning processes, the lack of committed funds in the State of Washington budget was frequently cited as a potential significant obstacle to adequate long-term management of the Capitol Lake – Deschutes Estuary.

The Funding and Governance Work Group was convened to evaluate opportunities for shared funding and governance; identifying viable shared funding opportunities would provide the clearest path for implementation of a long-term management alternative. It would also ensure that after the investment of construction funds, a governing body has oversight capabilities and long-term funding sufficient to manage the resource. Achieving these goals (construction funding and long-term management) would avoid a scenario where: (1) the No Action Alternative persists and environmental conditions continue to
7.2.1  Funding and Governance Guiding Principles

The following guiding principles for funding and governance were established collaboratively by the Funding and Governance Work Group in Phase 1.

The EIS Project Team developed a potential cost allocation framework using these guiding principles and feedback from the Funding and Governance Work Group.

**Guiding Principles for Future Funding and Governance Model**

1. Dedicated and secure funding sources
2. Those who contribute to the problem should participate in funding or paying for the solution
3. Those who benefit from the solution should participate in funding or paying for the solution
4. Shared distribution of costs
5. State participation
6. Watershed-wide in scale
7. Manageable governance
8. Commitment to a long-term collaborative process
9. Adequately resourced administration
10. Support the goals and objectives of the long-term management plan and the future of the overall watershed

7.2.2  Potential Cost Allocation Framework

Through a series of discussions and review of a potential cost allocation framework, the Funding and Governance Work Group indicated that the framework should operationalize, or focus most heavily on, guiding principle #2. In this scenario, the State of Washington, who built the dam and owns much of the surrounding area, would be primarily responsible for most construction costs, with potential partnerships and/or smaller contributions from the entities represented in the Funding and Governance Work Group to demonstrate local support. This emphasis on state contributions for construction costs would support the principle of having those entities that have contributed to the worsen; and (2) the Preferred Alternative is constructed but long-term funding is not guaranteed, and environmental conditions deteriorate over time or downstream resources are significantly impacted.
existing environmental conditions participate in providing the solution. Any construction funding contributions by local entities would be subject to their respective funding authorities and capacities.

Balancing a potential contribution from a State legislative appropriation for construction costs, the Funding and Governance Work Group suggests that an equitable and efficient outcome could be that funding for long-term management is provided by those who benefit from the solution. This would operationalize guiding principal #3 with details to be determined based on the selected alternative once it is known and beneficiaries can be more clearly identified. Consensus on this outcome focused the attention of the Funding and Governance Work Group on long-term funding and governance (operations and ongoing costs after the Preferred Alternative is implemented).

### 7.2.3 Potential Long-Term Governance Models

Through a series of discussions, the Funding and Governance Work Group has initially indicated that governance for a Managed Lake would likely remain similar to existing conditions, with the State of Washington serving as the primary governing and funding body.

The Funding and Governance Work Group reviewed a range of potential governance models to identify models that may be most suitable for long-term management of the Capitol Lake – Deschutes Estuary if the Estuary or Hybrid Alternatives are selected as the Preferred Alternative. The Estuary and Hybrid Alternatives were the focus of these initial discussions because they represent the largest shift from existing conditions. A viable governance model with reliable funding will be critical to implementing either of these alternatives and the long-term management actions that would be needed to address impacts from sediment deposition in West Bay.

Of the potential governance models evaluated, the Funding and Governance Work Group identified an Interlocal Agreement under Washington’s Interlocal Cooperation Act (RCW 39.34) as well-suited for long-term governance of an Estuary or Hybrid Alternative. An Interlocal Agreement is a contract among its signatories for a specified purpose, such as implementing long-term management actions like maintenance dredging.

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**What is a cost allocation framework?**

Cost allocation framework is a method for identifying and equitably assigning costs across entities to support an economically efficient outcome. Frameworks reviewed by the Funding and Governance Work Group included cost allocation by contribution/benefit ranking; by proxy variable; or equally across all entities.

**Funding Participation by the State of Washington**

Based on guiding principles and a cost allocation framework developed by the Funding and Governance Work Group, the State of Washington would be:

- Responsible for most construction costs.
- Expected to participate in the long-term management of the alternatives.

The Funding and Governance Work Group also suggested the State of Washington may have majority responsibility for funding and governance of a Managed Lake Alternative or the No Action Alternative.
If selected, an Interlocal Agreement regarding governance of a Capitol Lake – Deschutes Estuary project would outline functional and administrative requirements of the signatories, responsibilities for operations and maintenance of a resource, and the collection and contribution of funding. An example of an entity organized through an interlocal agreement is the LOTT Clean Water Alliance, which is an agreement among Lacey, Olympia, Tumwater, and Thurston County to manage and treat wastewater. The LOTT Clean Water Alliance Interlocal Agreement also creates a nonprofit corporation to hold assets and for the structure provided by Washington’s nonprofit corporations act; the Funding and Governance Work Group is exploring this, and other, details as appropriate.

Between the Draft and Final EIS, the Funding and Governance Work Group will continue to evaluate the suitability of an Interlocal Agreement as a governance model, and is prepared to explore other models if circumstances change or other suitable models are identified. Modifications to existing legislation or new legislation may also be required.

The Funding and Governance Work Group remains committed to engaging in this process in good faith to evaluate and negotiate a funding and governance model for long-term management of the Preferred Alternative, once the Preferred Alternative has been identified, and additional details regarding cost and maintenance are available.

### 7.3 WHAT OTHER FACTORS SHOULD BE CONSIDERED?

There are a few other important considerations not captured in the technical analyses provided in this EIS, but are relevant to the project context, that are helpful for stakeholders’ understanding of the long-term management alternatives, or are important in the decision-making process. These include the following:

- The technical analyses help to support decision-making for a Preferred Alternative. The technical analyses will not unanimously point to one alternative over another; and there will always be a level of subjectivity that cannot be resolved by the technical analyses. This has resulted and continues to result in strongly held positions across the community groups. Importantly, implementation of any of the long-term management alternatives will improve water quality, sediment management, and ecological functions.

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**What is a governance model?**

Governance models represent the type of government structure and reflect the interrelated relationships, factors, and other influences upon that structure. A governing body can be developed through a range of governance models, and based on what is being governed and the purpose of governance.

**What governance models were evaluated by the Funding and Governance Work Group?**

- Status quo (state governance)
- Special Purpose District
- Public Development Authority
- Interlocal Agreement
- Nonprofit
- Joint Municipal Utility Authority

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**Draft EIS June 2021 Ch. 7 – Planning-Level Costs & Other Considerations Page 7-10**
within the Capitol Lake – Deschutes Estuary compared to the No Action Alternative. It will also reopen the waterbody to active community use. Achieving these goals are important to all governmental partners, agencies, and community members.

- Consultation with and concurrence from local area tribes is an important part of the process to obtain a Department of the Army Permit from the USACE necessary for in-water work, including construction and dredging. The Managed Lake Alternative would have a continued impact on Usual and Accustomed Fishing Grounds and Stations, and on the Deschutes Estuary, which has religious and cultural significance. The Managed Lake Alternative would perpetuate historic inequities, particularly for tribal populations that have experienced ongoing adverse effects from changes to the ecosystem since non-Indigenous settlement of the region and continued loss of connection to the natural environment. Tribal populations would disproportionately experience adverse impacts from the Managed Lake Alternative, raising environmental justice concerns. The local area tribes have suggested that the Managed Lake Alternative would have a continued significant and unavoidable impact.

- Ecology is preparing a Water Quality Improvement Plan (also known as a TMDL) for the marine waters of Budd Inlet and Capitol Lake. As part of that work, Ecology has evaluated a scenario that would maintain the 5th Avenue Dam and one that would remove the 5th Avenue Dam, similar to alternatives considered in this EIS. The work performed by Ecology is focused on the ability to meet water quality standards in Budd Inlet, whereas Enterprise Services is tasked with selecting the Preferred Alternative for long-term management of the Capitol Lake – Deschutes Estuary. After a Preferred Alternative is selected and implemented, Ecology would regulate discharges within the Project Area to achieve water quality standards based on how the Preferred Alternative impacts or benefits dissolved oxygen in Budd Inlet, and which water quality standards are applicable (freshwater or marine standards).

- The FNC is currently impacted by sediment accumulation and needs to be dredged to reestablish authorized depths and unrestricted navigation in the waterway. Dredging has not been completed by the USACE and Port of Olympia.
because of known sediment contamination within the FNC. These entities are evaluating potential approaches to conduct maintenance dredging despite the presence of contaminated sediment. This need for dredging and dredging action is separate from, and not related to, the long-term management alternatives for the Capitol Lake – Deschutes Estuary. If this dredging does not occur, and if the Estuary or Hybrid Alternative is selected as the Preferred Alternative and is implemented, then additional sediment deposition from the project is not expected to significantly impact the Port of Olympia because navigation is already impaired. Costs for the sediment dredging that is currently needed should not be added to this project.

- Project construction would require a substantial appropriation of funds from the Washington State Legislature. Funding has not yet been secured for project construction, or for design and permitting of the Preferred Alternative.
8.0 Engagement with Work Groups, Community Sounding Board, & State Government

Since the 1970s, governmental partners, agencies, and the community have been engaged in planning efforts for the Capitol Lake – Deschutes Estuary. This chapter describes specific engagement efforts with these stakeholder groups throughout this EIS process, which is being conducted to identify a Preferred Alternative for long-term management of the resource.

8.1 HOW WERE STAKEHOLDERS INVOLVED IN THIS EIS?

Enterprise Services has maintained a commitment to a process that is transparent and has robust stakeholder engagement. This commitment recognizes that governmental partners and the Squaxin Island Tribe have jurisdiction over elements of, and express interest in, the Project Area and may participate in long-term governance of the resource. State resource agencies have expertise in many of the technical areas that would be impacted by or benefit from the project, and would issue permits and approvals for implementation of the Preferred Alternative. And importantly, the Capitol Lake – Deschutes Estuary is a public resource. Representatives from the Squaxin Island Tribe, governmental and agency partners, and the community have been convened into Work Groups (Sections 8.2 and 8.3) and a Community Sounding Board (Section 8.4) for this EIS.

Enterprise Services established an engagement process to solicit input from this range of stakeholders, not only during scoping, but throughout the EIS process. This allowed Enterprise Services and the EIS Project Team to collect input as the scope of the EIS was being developed, and as technical methodologies and project alternatives were established. It reflects the understanding that the Capitol Lake – Deschutes Estuary is a shared resource, and long-term management

What specific activities were used to engage the public during this EIS process?

Engagement activities included the following:

- A project-specific website updated regularly throughout the duration of this EIS
- Regular e-newsletter updates and meeting notifications
- Participation in community events including:
  - Harbor Days (Summer 2018)
  - Olympia Arts Walk (Fall 2018)
  - Capital Lakefair (Summer 2019)
- Briefings with local stakeholder groups
- Informational campaigns and advertisements (social media, print and digital media, flyers and signage)
- Public comment opportunities at Work Group and Community Sounding Board meetings
planning should be a collaborative process that includes potential beneficiaries and key stakeholders.

Figure 8.1.1 on the following page depicts the sequence and timing of engagement with project Work Groups and the community. This is referred to as the project Process Map. It provides transparency and predictability about how and when the stakeholders are engaged, and potential discussion topics.

Enterprise Services facilitated more than 30 meetings with the Work Groups and Community Sounding Board between EIS scoping in mid-2018 and mid-2021 before the Draft EIS was issued. All of these meetings were open to the public, and every meeting ended with an opportunity for public comment. The project website was updated with notifications at least 1 month prior to each meeting, and materials and meeting notes were also posted online. This chapter provides an overview of the Work Group and Community Sounding Board meetings, focusing on the substantive discussion topics.

The following sections discuss the engagement processes in more detail.

### 8.2 WHAT ARE THE ROLES OF THE EXECUTIVE & TECHNICAL WORK GROUPS?

Enterprise Services met with Executive and Technical Work Groups throughout the EIS process. This ensured ongoing coordination with leaders of the three municipalities within which the project is located, governmental consultation with the Squaxin Island Tribe, and coordination with the two quasi-governmental entities that could be impacted by project implementation. It also engaged the agencies that have jurisdiction over environmental resources within the Project Area.

The Executive Work Group includes representation from the governmental partners. The members share policy-level feedback and ensure that the interests of their constituents are considered. They are tasked with comprehensive review of project issues, considering policy, community, and technical aspects, and remaining amenable to feedback from other interested parties.
Figure 8.1.1 Project Process Map

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**Work Group Engagement**
- Executive Work Group (EWG)
- Technical Work Group (TWG)
- Funding & Governance Work Group (FGWG)

**Decision-Making Bodies Engaged by Enterprise Services**
- Capitol Campus Design Advisory Committee (CCDAC)
- State Capitol Committee (SCC)
- Legislative
  - Anticipated Legislative briefings are shown, additional briefings may occur as requested or needed.

**Community Engagement**
- Community Sounding Board (CSB) participants selected to represent diverse community perspectives

**Legend**
- Meeting
- Milestone
The Technical Work Group includes representation from the resource agencies, the Squaxin Island Tribe, and other entities that would have regulatory authority during design and permitting of the Preferred Alternative after the EIS, or would require close coordination regarding potential significant impacts and mitigation measures. Technical Work Group members provide natural resources expertise and technical review of project topics related to long-term management. This ongoing consultation has three key benefits:

1. Ensures that the methodologies for the technical analyses were sufficient in scope for a defensible alternatives analysis, and cover potential impacts that would be reviewed by the agencies during the future permitting effort
2. Potentially increases the ability to permit the long-term management alternatives
3. Avoids making assumptions that are not consistent with agency guidance and avoids incorporating project components that would not be approved by the agencies

Importantly, the Executive and Technical Work Groups are considered advisory. They do not make decisions for Enterprise Services; rather, they support Enterprise Services in informed decision-making.

Sections 8.2.1 through 8.2.7 summarize the topics discussed in the Executive and Technical Work Group meetings. Although the meetings were held separately, the agenda items were consistent across these Work Groups. In addition to the primary agenda items, Enterprise Services briefed the Executive and Technical Work Group on discussions with and input from the Community Sounding Board. The italicized text provides information on how the topic has been addressed by the EIS Project Team, describes where the information can be found in this EIS, or provides brief supplementary information, if needed.

8.2.1 October 2018: Summary of Primary Meeting Topics

Project Overview: A brief project overview, with focus on project goals, was provided to Work Group members. The majority of Work Group members had familiarity with the project, and many had participated in past planning processes.

Work Group Role in the EIS: Enterprise Services confirmed participation from an Executive Work Group and Technical Work
Group and defined their advisory role throughout the EIS process. The EIS Project Team shared the process map that generally outlines the engagement approach through the EIS.

**EIS Scoping:** The EIS Project Team provided an update on primary themes from recent public meetings during the scoping process. Public comment opportunities and additional public engagement was discussed.

### 8.2.2 January 2019: Summary of Primary Meeting Topics

**Overview of Scoping Comments and EIS Scope:** The EIS Project Team provided an overview of comments received during scoping, and an initial framework for the EIS. Several clarifying questions were asked of the EIS Project Team, including:

- How would opposing opinions around water quality be resolved? Will water quality samples be taken in Budd Inlet and Capitol Lake as part of the EIS?
  - See the Water Quality Discipline Report (Attachment 7) for water quality data that were collected from Capitol Lake and Budd Inlet, and for an analysis on the potential benefits and effects on water quality from the long-term management alternatives.

- Will Enterprise Services sample sediment as part of the EIS?
  - See the Sediment Quality Discipline Report (Attachment 15) for results of the sediment sampling that was conducted as part of the EIS.

- Will the EIS evaluate potential impacts to recreation in West Bay, not just in Capitol Lake?
  - See Sections 4.2, Navigation, and 4.8, Land Use, Shorelines, and Recreation, for an evaluation of potential impacts to recreation in West Bay from sediment deposition.

**Agency Coordination:** The EIS Project Team described that they had recently met with each agency represented on the Technical Work Group to identify agency programs or projects with a nexus to the EIS (see Chapter 6.0, Cumulative Effects). These meetings helped to ensure that the EIS Project Team was aware of relevant information at the onset of the EIS.
Representatives from LOTT and DAHP were also welcomed as Technical Work Group members. Enterprise Services explained that an invitation had been extended to the USACE but they are not able to participate full time due to resource limitations.

### 8.2.3 April 2019: Summary of Primary Meeting Topics

**Measurable Evaluation Process:** The EIS Project Team presented the Measurable Evaluation Process that had been created to develop the long-term management alternatives for evaluation (refer to Chapter 2.0, Project Alternatives and Construction Approach, for more detail). Several questions were asked to clarify the proposed screening process, including:

- Can a component be part of multiple alternatives?
  - Yes – a component that best achieves project goals can span across the alternatives.

- Who is doing the screening?
  - The screening was done by the EIS Project Team, in coordination with Enterprise Services.

- Will sediment management extend into West Bay?
  - Yes – under the Estuary and Hybrid Alternatives, sediment management is assumed in impacted areas of West Bay.

- Can you evaluate regulatory feasibility relative to other components?
  - Based on this feedback, regulatory feasibility was evaluated relative to the other components during the screening completed as part of the Measurable Evaluation Process.

**Third-Party Review Process:** Enterprise Services explained that there had been several requests for specific technical analyses to be reviewed by third-party experts. The purpose of the third-party review would be to ensure that industry-recognized best practices were used and a reasonable level of analysis was provided to help compare the long-term management alternatives.

Enterprise Services asked the Executive Work Group members for recommendations. The majority of the third-party experts that were subsequently engaged by Enterprise Services to review the
Hydrodynamics and Sediment Transport Numerical Modeling Methodology and Analysis, Water Resources Methodology and Analysis, and Economic Methodology and Analysis were recommended by the Work Groups.

8.2.4 June 2019: Summary of Primary Meeting Topics

Measurable Evaluation Process Update: The EIS Project Team described updates to the Measurable Evaluation Process as a result of input from the Work Groups and Community Sounding Board. Specifically, the EIS Project Team determined they would conduct a relative comparison. The components that best achieved project goals relative to the other concepts would be assembled into the long-term management alternatives for evaluation in this EIS.

Third Party Review Process Update: Enterprise Services notified the Work Groups that methodology memoranda had been prepared for the Hydrodynamics and Sediment Transport Numerical Modeling, Water Resources, and Economic Analysis, and were being reviewed by the third-party experts. Enterprise Services committed to posting these documents to the project website given interest from the Work Group members and the community.

Field Work and Technical Methodologies: The EIS Project Team provided an update on the water quality monitoring within Capitol Lake and Budd Inlet.

The EIS Project Team also presented the proposed methodologies for the following disciplines: Wetlands; Fish and Wildlife; Land Use, Shorelines, and Recreation; and Hydrodynamic and Sediment Transport Modeling. The discussion focused on clarifying questions from the Work Group members.

8.2.5 November 2019: Summary of Primary Meeting Topics

Schedule Update: Enterprise Services described that the Draft EIS would be issued in mid-2021 rather than December 2020. The schedule revision was due to the Olympia Brewery oil spill, which delayed the bathymetric survey that was originally planned for April 2019. The bathymetric survey is a key input to the numerical model of hydrodynamics and sediment transport, which supports many of the later technical analyses.
• The bathymetric survey was completed in January 2020 after the seasonal plant die-off.

Technical Methodologies and EIS Assumptions: The EIS Project Team presented the proposed methodologies for the following disciplines: Aquatic Invasive Species, and Historic and Cultural Resources. One primary comment influenced the scope of analysis:

• Consider more than just plant species in the invasive species evaluation.

During the Technical Work Group meeting, the EIS Project Team asked for guidance on several technical topics, including potential use of herbicide to treat aquatic plants, beneficial reuse of excavated material, and tide gate configuration to avoid or minimize fish entrapment in the Hybrid Alternative reflecting pool. During this discussion, the Technical Work Group also confirmed that it would be reasonable to assume an extension to the existing in-water work window if sufficient measures were taken to avoid and minimize impacts to aquatic species.

• The extended in-water work window is described in Section 2.4.1 and is assumed in the construction durations.

Overview of Optimized Alternatives: The EIS Project Team presented the Managed Lake, Estuary, and Hybrid Alternatives that had been optimized through the Measurable Evaluation Process. This allowed the Work Group members to understand the alternatives that would be evaluated in the EIS and ask clarifying questions, such as:

• Will the EIS evaluate opportunities to restore boating even if the New Zealand mudsnail persists? Can the risk of spreading New Zealand mudsnails be minimized?
  
  o See Section 2.3.4 for a description of the educational signage, decontamination stations, and monitoring that is proposed in order to restore water-based recreation and prevent the spread of the New Zealand mudsnail.

• The effects of RSLR should be evaluated, particularly for the Estuary Alternative.
  
  o See Section 3.2.2 for results of the numerical modeling relative to potential future water elevations under an RSLR scenario. Potential effects from RSLR are also provided as part of the remaining technical analyses.
• What is the anticipated flushing rate for the reflecting pool under the Hybrid Alternative?
  
  o The flushing rate of a freshwater reflecting pool was analyzed in more detail as a result of stakeholder feedback. See Attachment E of the Water Quality Discipline Report (Attachment 7) for these findings.

• Are you considering water quality impacts in Budd Inlet?
  
  o See Section 4.3, Water Quality, for the evaluation of potential impacts and benefits to water quality in Budd Inlet.

8.2.6 June 2020: Summary of Primary Meeting Topics

Technical Methodologies: The EIS Project Team presented the proposed methodologies for the following disciplines: Transportation; Air Quality and Odor; Visual Resources; Sea Level Rise and Climate Change; and Public Services and Utilities. One primary comment influenced the scope of analysis and another provided an opportunity to clarify a key project assumption.

• Are you considering the use of rail in the transportation analysis?
  
  o Following input from the Work Group, as well as Community Sounding Board members, the scope of the transportation analysis was updated to include a review of potential rail use for project construction. See Section 5.12, Transportation, for more detail.

• What is the estimated project life?
  
  o The analyses cover a time period of roughly 30 years; this is considered the project time horizon. For RSLR, the numerical modeling has evaluated a 2-foot (0.61-meter) rise, regardless of when that will occur in relation to the project time horizon.

EIS Assumptions: The EIS Project Team described the recreational opportunities that would be restored under the long-term management alternatives, and are being analyzed in the EIS, to include: fishing and nonmotorized boating. Organized swimming facilities are not assumed.
• There were no comments from the Work Group members in opposition to the recreation assumptions to be included in the EIS.

The EIS Project Team also described that the Hybrid Alternative would include a saltwater reflecting pool because it had fewer technical feasibility issues relative to a freshwater reflecting pool.

• In response to Work Group and Community Sounding Board comments, the EIS includes an analysis of the freshwater reflecting pool.

8.2.7 May 2021: Summary of Primary Meeting Topics

Draft EIS Progress Update and Outreach Activities: The EIS Project Team described the contents of the upcoming EIS and associated outreach activities.

Most activities would be conducted virtually given continued uncertainty regarding the COVID-19 pandemic and in-person participation for public activities. These activities included opportunities for briefings with local councils and commissions.

Preferred Alternative Selection Process – Criteria Definitions: The EIS Project Team described the proposed process for making an informed decision about the Preferred Alternative (see Section 1.12, How Will a Preferred Alternative Be Selected and What Is the Decision-Making Process?). Members participated in a facilitated exercise to clarify and refine selection criteria definitions.

Key feedback included:

• Performance Against Project Goals is overarching and reflects the goals established collaboratively in Phase 1.

• There is overlap between Performance Against Project Goals and Other Environmental Disciplines; Enterprise Services should be sure that this overlap is helpful.

• Some elements, like ability to meet state water quality standards, should be treated as thresholds for moving forward in the evaluation of an alternative relative to decision-making.

• Regional Sustainability should be renamed and/or the definition refined.

  o This criterion was renamed Decision Durability.
• The criteria should be revisited after the Draft EIS is released and public comments are submitted.

Preferred Alternative Selection Process – Criteria Prioritization:
Each Work Group participated in an exercise to rank the criteria based on individual and collective preferences. Each member provided their feedback through facilitated exercises and selections were aggregated for reporting as described in Figure 8.2.1, with the percentage representing importance of a selected criterion to the collective group. Selections were not attributed to individuals or the entities they represent. These data will inform the process to select a Preferred Alternative but do not represent the final relative importance.

Figure 8.2.1 Results of Criteria Prioritization Exercise during Executive & Technical Work Group Meetings (May 2021)

8.3 WHAT IS THE ROLE OF THE FUNDING & GOVERNANCE WORK GROUP?

Enterprise Services convened the Funding and Governance Work Group following direction from the Washington State Legislature to
evaluate and identify an option for shared funding and governance for long-term management of the Capitol Lake – Deschutes Estuary. The Funding and Governance Work Group is made up of tribes and governmental partners with jurisdiction and/or taxing authority in the Project Area.

There are two primary goals for the Funding and Governance Work Group:

1. Develop a framework to support an equitable allocation of construction costs to responsible and/or benefiting entities.
2. Identify a governance model to ensure that long-term management activities occur after project construction. The governance model must include the mechanism or approach to fund these activities.

Achieving these goals would provide the clearest path for implementation of the Preferred Alternative. Section 7.2, What Are the Recommendations for Funding Construction and Long-Term Management?, details the progress made toward these goals.

Sections 8.3.1 through 8.3.9 provide a summary of the primary meeting topics from the series of Funding and Governance Work Group meetings. The italicized text provides information on how the topic has been addressed by the EIS Project Team, where the information can be found in this EIS, or provides brief supplementary information, if needed.

8.3.1 January 2019: Summary of Primary Meeting Topics

Project Update. The EIS Project Team provided an update regarding comments received during scoping. This supplemented the project update provided to the Funding and Governance Work Group in October 2018, which focused on a general project overview only.

Funding and Governance Work Group Open Discussion. Enterprise Services welcomed LOTT to the Funding and Governance Work Group. LOTT had not participated in Phase 1.

During a roundtable discussion, the Funding and Governance Work Group identified a set of initial tasks to support their work, including:

- Ensure that costs are spread among all those who benefit
- Carefully define benefits
• Review information about how work has been funded historically
  o Funding for operation and maintenance of Capitol Lake is provided through State Operating and Capital Budgets, which have been the funding sources since construction in 1951.

• Understand sediment management in detail, including transport, costs, and quantity
  o See Section 4.1, Hydrodynamics and Sediment Transport, for a description of projected sediment transport; see Section 4.2, Navigation, for a discussion of the volume of sediment that would be removed during maintenance dredging. Planning-level costs are provided in Section 7.1, What Important Factors Are Assumed in the Planning-Level Costs?

• Understand the difference between existing sediment and new sediment after construction dredging is complete, these will likely have different disposal costs
  o Sediment dredged during construction will primarily be beneficially reused within the Capitol Lake Basin to construct habitat, avoiding costs associated with upland disposal. Sediment from maintenance dredging events would be disposed in-water or upland, depending on the alternative.

• Understand one-time and ongoing costs. Different funding structures may be needed for each
  o See the planning-level cost estimates provided in Section 7.1, What Important Factors Are Assumed in the Planning-Level Costs?, which have been broken down to one-time and ongoing costs.

• Identify project components that are consistent across all long-term management alternatives, for example, dredging
  o Chapter 2.0, Project Alternatives and Construction Approach, has been structured to highlight components common to all alternatives.

The Funding and Governance Work Group also suggested in this discussion that the Preferred Alternative may be needed before detailed funding and governance planning.
8.3.2 June 2019: Summary of Primary Meeting Topics

**Process Proposal:** The EIS Project Team outlined four phases to developing a funding and governance model.

1. Discuss economic fundamentals and consider potential options for funding and governance.
2. Develop funding and governance options that are common across the alternatives.
3. Review and discuss draft funding and governance framework developed by the EIS Project Team.
4. Assemble and formalize the funding and governance agreement after a Preferred Alternative is identified.

**Economic Foundations:** A Senior Economist from the EIS Project Team presented on economic theory as it supports the Funding and Governance Work Group.

- How do we define value?
- How do we define efficiency?
- What conditions lead to agreement?
- How does equity affect agreement?

The Senior Economist discussed the steps required to achieve an equitable, efficient, and sustainable funding and governance outcome.

- Who are the beneficiaries and what types of value are provided by this resource?
- Are property rights clearly understood?
- What does an efficient outcome look like?
- Are any parties going to be made worse off?
- Is an outcome equitable?

8.3.3 September 2019: Summary of Primary Meeting Topics (Joint Meeting with the Executive Work Group)

**Economic Foundations:** At the request of the Funding and Governance Work Group members, the Senior Economist presented on economic theory again. This allowed the Executive Work Group members to understand these economic foundations.
Funding and Governance Options: The EIS Project Team described the differing benefits from fees, taxes, and rates, and how these could be leveraged for initial construction costs and long-term maintenance costs.

The Funding and Governance Work Group reviewed the models that had been identified in Phase 1 and discussed the potential benefits and restrictions of each. The Funding and Governance Work Group identified the Joint Municipal Utility Authority as a model that could apply to the project and requested that the EIS Project Team research this concept further.

The EIS Project Team described that the governance model would affect which funding tools are available and how those funding tools might be used.

8.3.4 November 2019: Summary of Primary Meeting Topics

Cost Component Exercise Discussion: The EIS Project Team facilitated a series of exercises aimed at better understanding who contributes to and benefits from the project, including discussion around the following questions:

1. Who do you think benefits from long-term management?
2. Where do benefits accrue for specific organizations?
3. What is your biggest priority for long-term management?
4. What do you have a responsibility or interest to contribute to?

Answers to these questions were synthesized by the EIS Project Team and considered as the economic foundations were transitioned into a funding allocation, with implications for who should be responsible for or contribute to funding.

8.3.5 June 2020: Summary of Primary Meeting Topics

Allocation Framework Discussion: At this meeting, the Funding and Governance Work Group members suggested that construction costs and long-term management costs should be allocated and considered separately.

The Funding and Governance Work Group members questioned whether it would be appropriate for any other entity to contribute to construction costs given that Washington State constructed the
5th Avenue Dam and has managed the resource since that time. Many members suggested that the 5th Avenue Dam and lack of management were the primary reasons for existing conditions within the Capitol Lake – Deschutes Estuary.

The sentiment can be summarized in a statement from one of the members: “In all the years we’ve talked about this, it has seemed that politically, it’s a good trade if the state generated the money through legislature to actually do the initial construction project, and the community takes over the long-term care and maintenance.”

8.3.6 August 2020: Summary of Primary Meeting Topics

Allocation Framework Discussion: This meeting advanced work on a cost allocation framework. At the beginning of this meeting, the Funding and Governance Work Group members agreed and confirmed that construction costs and long-term management costs must be allocated and considered separately. The Funding and Governance Work Group members reiterated that the existing conditions were a result of state actions, and that the beneficiaries could accept costs for long-term management.

The EIS Project Team presented a potential framework that would allocate construction costs based on who contributed to existing conditions, and who would benefit from project implementation. In this framework, the Funding and Governance Work Group would decide the relative weighting of contributors versus beneficiaries (e.g., 50/50, 70/30, 90/10).

Two other potential frameworks were presented: one that would allow for empirical analysis that leads to cost allocation and works with data available today, and another that would divide costs equally among entities.

Following discussion, the Funding and Governance Work Group concluded that if an allocation framework were used for construction costs, the approach of determining cost values from contributions and benefits would be most appropriate.

- Section 7.2, What Are the Recommendations for Funding Construction and Long-Term Management?, describes the outcome of this discussion in detail.
8.3.7 October 2020: Summary of Primary Meeting Topics

**Allocation Framework Discussion:** The EIS Project Team presented an updated allocation framework, based on contributions and benefits, that could be used to support the Funding and Governance Work Group in creating a defensible, transparent, and reproducible methodology to allocate construction costs. The allocation framework would have each Funding and Governance Work Group member rank their entity’s potential contribution (using a scale of 0 to 5) to sediment accumulation, degraded ecological function, water quality standard violations, and restricted active community use. Each member would then rank their entity’s relative benefit from sediment management, enhanced ecological function, improved water quality, and restored active community use. The framework would provide a cost allocation for each alternative.

In response to this, the Funding and Governance Work Group clearly stated a majority opinion that construction costs should be borne by Washington State and that further work of the members should be focused on shared funding and governance after construction. Some members suggested that a small contribution to construction costs could be reasonable to demonstrate local support and/or for recreational amenities that would be enjoyed by the public. (see Section 7.2, What Are The Recommendations For Funding Construction & Long-Term Management?)

- *Section 7.2, What Are the Recommendations for Funding Construction and Long-Term Management?, describes the outcome of this discussion in detail.*

8.3.8 January 2021: Summary of Primary Meeting Topics

**Review of Governance Models:** The EIS Project Team presented a summary of the primary long-term management activities that would occur under each alternative to inform the discussion of potentially suitable governance models.

The Funding and Governance Work Group acknowledged that there would have to be consensus around which of the long-term management activities were the responsibility of a future governing body. Some members suggested that the focus could be solely on sediment management.
An Assistant Attorney General reviewed potentially suitable governance models, pointing out that suitability may largely be determined by what the governing body is tasked with. The Funding and Governance Work Group discussed potential “must have” attributes of a governance model and debated the potential suitability of the options that had been presented. There was general interest in exploring the Joint Municipal Utility Authority and the Public Development Authority in more detail.

- Section 7.2, What Are the Recommendations for Funding Construction and Long-Term Management?, describes the outcome of this discussion in detail.

8.3.9 April 2021: Summary of Primary Meeting Topics

Review of Governance Models: An Assistant Attorney General facilitated a discussion around governance, beginning with a recommendation that an Interlocal Agreement would be most suitable for shared governance of an Estuary or Hybrid Alternative, if selected as the Preferred Alternative. Based on regulatory research, review of other governance models, and local applications of Interlocal Agreements, an Interlocal Agreement would best accommodate long-term management of the Capitol Lake – Deschutes Estuary. A sample Interlocal Agreement was reviewed with the Funding and Governance Work Group. The purpose of this exercise was to identify key assumptions that would need to be confirmed in an Interlocal Agreement, and to demonstrate the nature, content, and level of detail of an Interlocal Agreement.

The Funding and Governance Work Group agreed that an Interlocal Agreement would likely be the most suitable shared governance model for an Estuary or Hybrid Alternative, but cautioned that substantive negotiation could not begin until a Preferred Alternative is identified.

- Section 7.2, What Are the Recommendations for Funding Construction and Long-Term Management?, describes the outcome of this discussion in detail.

8.4 WHAT IS THE ROLE OF THE COMMUNITY SOUNDING BOARD?

The Capitol Lake – Deschutes Estuary is an area that holds historical and personal value for many people. The Deschutes Watershed is used for ceremonial, subsistence, and commercial harvesting of
natural resources, and is a place of strong cultural and spiritual value. Capitol Lake also supports community events such as the annual Capital Lakefair, organized athletic events, and various other gatherings. The trail system and nearby parks provide continued passive recreational opportunities that maintain the water’s edge as an important recreational center and valued amenity in the South Puget Sound area.

The community is invested in the future long-term management plan for this resource. Community members have participated in many of the past planning processes, have coordinated with governmental partners and agencies, and have met with members of the Washington State Legislature regarding long-term management planning. During scoping, the first step in this EIS, 220 community members submitted comments. A majority of the comments contained strong sentiments of support for or opposition to a specific alternative.

Community comments received during scoping, in support of a Managed Lake Alternative, mentioned interest in recreation, with value placed on the ability to walk around the lake, and on the aesthetic quality of the lake. Several comments suggested that the lake should be retained, as it is a central part of the City of Olympia and a hub of activity. Comments in opposition to a Managed Lake Alternative commonly cited water quality concerns, ecological impacts, and ongoing impacts to local area tribes.

Community comments in support of the Estuary Alternative most often cited anticipated environmental improvements, including those to water quality and habitat. There were strongly held values expressed regarding restoration of natural systems. Community members in opposition to the Estuary Alternative described potential impacts from sediment deposition in Budd Inlet.

Community comments on the Hybrid Alternative raised similar issues as described for the Managed Lake and Estuary Alternatives. Commenters either suggested that the Hybrid Alternative could be a successful compromise or that it would not satisfy either of the opposing interests. These comments mirrored the long-growing polarization of views within the community.

In response and in recognition of the continued community interest in long-term management planning, Enterprise Services convened a Community Sounding Board to participate throughout the EIS process. The Community Sounding Board is composed of a group of

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<td>• Architecture</td>
</tr>
<tr>
<td>• Birds and wildlife/habitat</td>
</tr>
<tr>
<td>• Climate change</td>
</tr>
<tr>
<td>• Historic structures</td>
</tr>
<tr>
<td>• Landscaped environments</td>
</tr>
<tr>
<td>• Local area businesses</td>
</tr>
<tr>
<td>• Maritime and Port of Olympia activities</td>
</tr>
<tr>
<td>• Natural environments</td>
</tr>
<tr>
<td>• Non-water-based recreation (hiking, biking, etc.)</td>
</tr>
<tr>
<td>• Permaculture</td>
</tr>
<tr>
<td>• Urban planning</td>
</tr>
<tr>
<td>• Water quality</td>
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<tr>
<td>• Water-based recreation</td>
</tr>
</tbody>
</table>
25 participants, representing organizational and individual interests, that were selected through an application process. Enterprise Services assembled a group that represented a wide range of community interest areas and organizations. Enterprise Services met with the Community Sounding Board six times between 2019 and 2021 to understand community concerns, values, and perspectives on specific topics of interest that contribute to a robust and well-informed EIS process.

During these meetings, the Community Sounding Board engaged in focused discussions, and individually and/or collectively provided input, feedback, and perspectives and recommendations around substantive topics relevant to the project. These discussions informed subsequent work of the EIS Project Team, were shared with the project Work Groups, and will be considered by Enterprise Services in the decision-making process.

The Community Sounding Board has not and will not be asked to vote on the long-term management alternatives. Throughout the series of meetings, there was no requirement to reach consensus on project topics. There was most often agreement on the need to implement a long-term management project. The area of disagreement continued to be on the alternative that would best achieve the commonly held project goals that were defined through the collaborative Phase 1 process (refer to Chapter 1.0, Introduction, Project Background, and History, for more detail).

Sections 8.4.1 through 8.4.5 summarize the topics discussed in the Community Sounding Board meetings and the primary observations.

8.4.1 April 2019: Summary of Primary Meeting Topics

Project Overview: Most Community Sounding Board members had a general understanding of the project proposal. There were some detailed project questions, including the extent of the Project Area and a suggestion to begin water quality monitoring.

- See Section 3.3, Water Quality, for more detail on water quality monitoring that was conducted for the project.

Community Sounding Board members also asked whether there will be a mandate for funding after the EIS, and if a source of construction funding had been identified.
- See Section 7.2, What Are the Recommendations for Funding Construction and Long-Term Management?, for more detail on funding and governance of future project phases.

Presentation of the Proposed Measurable Evaluation Process:
Enterprise Services asked the Community Sounding Board to provide input on two questions:

1. What input do you have on Step 1 of the Measurable Evaluation Process – the work to optimize the long-term management alternatives?
2. Environmental and economic sustainability will be evaluated relative to other concepts and alternative variations. Should the technical and regulatory feasibility evaluation follow that approach?

The Community Sounding Board was generally in support of the Measurable Evaluation Process and the optimization approach and appreciated the transparency of the selection process. Community Sounding Board input was mixed on how the technical and regulatory review could be approached.

8.4.2 June 2019: Summary of Primary Meeting Topics

Presentation of the Technical Methodologies: The EIS Project Team provided an overview of the three technical methodologies (Hydrodynamics and Sediment Transport Numerical Modeling, Water Resources, and Economics) that would be reviewed by third-party experts to ensure that the work was conducted using industry-recognized best practices and would include a reasonable level of analysis to allow for the comparison of alternatives.

The EIS Project Team also overviewed the approach to analyzing changes in Wetlands; Fish and Wildlife; and Land Use, Shorelines, and Recreation. The Community Sounding Board asked clarifying questions throughout the presentation.

Discussion regarding Past, Current, and Future Recreational Uses:
To support the Land Use, Shorelines, and Recreation analysis, the EIS Project Team facilitated a discussion with the Community Sounding Board. The Community Sounding Board members were broken into small groups to share their thoughts on four questions, and then reconvened to discuss as a whole.
The four questions discussed included:

1. How are you or your family using Capitol Lake and the surrounding parks (from Tumwater Falls to Priest Point Park on the shoreline of Budd Inlet) now? What kind of activities and where?
2. For those of you that used Capitol Lake in the past (before uses were restricted on the lake), how did you or your family use the lake then? What kind of activities?
3. If the currently restricted water-based uses were restored under a long-term management alternative, would this change your use of the waterbody? Would you visit more often? Less often? No change? Which activities would you or your family do more of? Less of?
4. If Capitol Lake was restored to an estuary or hybrid lake and estuary, shorelines would change, including changes to shoreline vegetation and the distance from existing trails to the water’s edge during different parts of the tidal cycle. How would these types of changes impact/benefit your use or enjoyment of the surrounding trails and parks? Would it be better, worse, or just different? Why? Under this alternative, how do you think your use of the Project Area would change and which activities do you think would stay the same?

Responses to these questions were shared with the EIS Project Team and will be considered by Enterprise Services. A primary theme of the discussion was to restore water-based recreation within the Capitol Lake – Deschutes Estuary, and this would likely increase community use. There were contrasting views on which recreational opportunities would be best within the Project Area.

- Chapter 2.0, Project Alternatives and Construction Approach, describes the water-based recreation that would be restored under all long-term management alternatives, reflecting areas of broad interest from the Community Sounding Board. See Sections 3.8 and 4.8 for a brief summary of existing and potential future recreational uses, informed by Community Sounding Board input.

8.4.3 September 2019: Summary of Primary Meeting Topics

Project Update: This meeting was held virtually, to provide a project update to the Community Sounding Board regarding field work associated with the EIS, meetings with the Work Groups, and other outreach efforts.
8.4.4 November 2019: Summary of Primary Meeting Topics

Primary Components of the Optimized Alternatives: The EIS Project Team presented the Managed Lake, Estuary, and Hybrid Alternatives that had been optimized through the Measurable Evaluation Process. This helped the Community Sounding Board understand components of the alternatives and how they would achieve project goals. Enterprise Services asked the Community Sounding Board to provide input on the following question.

• What key piece of feedback regarding the optimized alternatives would you like to communicate to the EIS Project Team?

Some of the input provided by the Community Sounding Board has been integrated into the EIS, as follows:

• Consider a freshwater reflecting pool for the Hybrid Alternative
  o See Section 2.3, What are the Primary Components Common to All Action Alternatives?, and the Water Quality Discipline Report for a discussion of the freshwater reflecting pool concept

• Develop visualizations to help convey the visual landscape of the different alternatives
  o See Section 4.10, Visual Quality, for visual simulations for the long-term management alternatives

• Make clear in the EIS that computer models support the decision-making, but that people make the decisions
  o See Section 1.2, Why is an Environmental Impact Statement Needed?, for a description of the decision-making process

• Evaluate whether Capitol Lake can be reopened to recreation even if the New Zealand mudsnail persists
  o See Section 2.3.4 and Section 4.4, Aquatic Invasive Species, for the proposal to install decontamination stations to allow water-based recreation under all action alternatives

• Evaluate the impacts of sediment on marinas and the Port of Olympia
Future Visualizations of the Optimized Alternatives: The EIS Project Team described that the EIS would include visual simulations to help convey the visual landscape of the long-term management alternatives. Through a facilitated exercise, the Community Sounding Board identified locations that would be most helpful for a visual simulation and would potentially show the areas of greatest change.

- The visual simulations included in Section 4.10, Visual Resources, were developed at the locations recommended by the Community Sounding Board.

8.4.5 June 2020: Summary of Primary Meeting Topics

Components of an Environmental Impact Statement: The EIS Project Team described the primary content in an EIS and expected for this project EIS. The Community Sounding Board asked clarifying questions, including continued interest in the following topics.

- The range of alternatives evaluated in an EIS
- Potential swimming opportunities under the long-term management alternatives
- The potential for a freshwater reflecting pool for the Hybrid Alternative

8.4.6 May 2021: Summary of Primary Meeting Topics

Draft EIS Progress Update and Outreach Activities: The EIS Project Team described the contents of the upcoming Draft EIS and associated outreach activities. Most activities would be conducted virtually given continued uncertainty regarding the COVID-19 pandemic and in-person participation for public activities. These activities included opportunities for briefings with local councils and commissions.

Draft EIS Outreach Activities: The Community Sounding Board provided feedback regarding proposed outreach activities to be conducted during the Draft EIS public comment period via survey prior to this meeting. The EIS Project Team reviewed the results of the survey and answered questions.
• There was broad support for the outreach activities as described, particularly understanding limitations caused by the COVID-19 pandemic.

Preferred Alternative Selection Process – Criteria Definitions: The EIS Project Team described the proposed process for making an informed decision about the Preferred Alternative (see Section 1.12, How Will a Preferred Alternative be Selected and What is the Decision-Making Process?). Members participated in a facilitated exercise to clarify and refine selection criteria definitions.

Key feedback included:

• **Performance Against Project Goals** is overarching and is the best indicator of overall performance of an alternative.

• There is overlap between **Performance Against Project Goals** and **Other Environmental Disciplines**.

• Tribes should be independently identified under **Regional Sustainability** to reflect their sovereignty.
  
  o Regional Sustainability was renamed Decision Durability.

• Without widespread public support, this project will not be funded by the Legislature, so **Regional Sustainability** should be heavily weighted.

• Keep the criteria simple, more complex criteria will make building consensus more difficult.

• If an alternative does well in **Performance Against Project Goals**, then **Regional Sustainability** is likely.

Preferred Alternative Selection Process – Criteria Prioritization: The Community Sound Board participated in an exercise to rank the criteria based on individual and collective preferences. Each member provided their feedback through facilitated exercises and selections were aggregated for reporting as follows (Figure 8.4.1), with the percentage representing importance of a selected criterion to the collective group. Selections were not attributed to individuals or the entities they represent. These data will inform the process to select a Preferred Alternative but do not represent the final relative importance.
8.5 HOW ARE THE LEGISLATIVE & EXECUTIVE BRANCHES OF STATE GOVERNMENT ENGAGED BY ENTERPRISE SERVICES?

Enterprise Services has also provided regular briefings to other key stakeholders, including the CCDAC, the SCC, Washington State Legislators, and the Governor’s Office. Enterprise Services will solicit input from the SCC during the decision-making process for the Preferred Alternative. Funding for design and permitting of the Preferred Alternative, and potentially for construction of the project, would be authorized by the Washington State Legislature.
9.0 Permits & Approvals for Implementation of a Preferred Alternative

After the Final EIS is published, the project would move into the design and permitting phase, pending funding. Design of the Preferred Alternative would be advanced, and Enterprise Services would work with governmental and agency partners to obtain permits and authorizations to construct and operate the long-term management approach. The suite of environmental permits and approvals that would be required are provided in this chapter.

Tables 9.1.1 through 9.1.3 presents the environmental permits and approvals that must be obtained by Enterprise Services before construction of the Preferred Alternative. Additional reviews that are applicable to the project but do not result in a permit for construction and operation are discussed in the discipline reports provided in Attachments 5 through 18.

The Managed Lake Alternative would require fewer permits, but acquiring the permits and approvals will be a complex, several-year process for any of the alternatives.
### Table 9.1.1 Federal Environmental Permits & Approvals

<table>
<thead>
<tr>
<th>Applicable Law/Regulation</th>
<th>Permit/Approval</th>
<th>Lead Agency</th>
<th>Managed Lake Alternative</th>
<th>Estuary Alternative</th>
<th>Hybrid Alternative</th>
<th>Regulatory Trigger</th>
</tr>
</thead>
</table>
| National Environmental Policy Act        | Environmental Assessment                 | USACE       | ✓                        | ✓                   | ✓                  | • Required prior to issuance of federal permits  
• Required if federal funds are used for project construction (not currently anticipated)                                                          |
| Clean Water Act Section 404 and Rivers and Harbors Act Section 10 | Department of the Army Permit           | USACE       | ✓                        | ✓                   | ✓                  | • Initial dredging within the Capitol Lake Basin and placement of dredged materials for habitat areas  
• Construction of in- and overwater structures, including boardwalks, docks, 5th Avenue Pedestrian Bridge  
• Temporary and/or permanent impacts to wetlands and fill within Capitol Lake  
• Potential long-term impacts to navigation |
| National Historic Preservation Act        | Section 106 Consultation with DAHP and affected tribes | USACE in consultation with DAHP and affected tribes | ✓                        | ✓                   | ✓                  | • Required prior to issuance of Department of the Army Permit  
• Potential adverse effects to historic properties within and adjacent to the Project Area, tribal resources, and tribal treaty rights |
<table>
<thead>
<tr>
<th>Applicable Law/Regulation</th>
<th>Permit/Approval</th>
<th>Lead Agency</th>
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<th>Hybrid Alternative</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Endangered Species Act (ESA)</td>
<td>Section 7 consultation and Biological Opinion</td>
<td>USACE in consultation with National Marine Fisheries Service and U.S. Fish and Wildlife Service</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>• Required prior to issuance of Department of the Army Permit • Potential effects to ESA-listed species, including salmonids and marine mammals from construction and operation of the project</td>
</tr>
<tr>
<td>Tribal Consultation</td>
<td>NA</td>
<td>Squaxin Island Tribe, Nisqually Indian Tribe, Confederated Tribes of the Chehalis Reservation and other local area tribes</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>• Required prior to issuance of Department of the Army Permit • Potential direct or indirect impacts to historic resources, ESA-listed species, and tribal treaty rights</td>
</tr>
<tr>
<td>Magnuson-Stevens Fishery Conservation and Management Act</td>
<td>Agency Consultation</td>
<td>National Marine Fisheries Service</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>• Required prior to issuance of federal permits • Potential impacts to essential fish habitat from construction and operation of the project</td>
</tr>
<tr>
<td>Rivers and Harbors Act Section 14</td>
<td>Section 408</td>
<td>USACE</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>• Potential impact to federal navigation channel in Budd Inlet from sediment deposition and dredging</td>
</tr>
</tbody>
</table>
### Applicable Law/Regulation

<table>
<thead>
<tr>
<th>Permit/ Approval</th>
<th>Lead Agency</th>
<th>Managed Lake Alternative</th>
<th>Estuary Alternative</th>
<th>Hybrid Alternative</th>
<th>Regulatory Trigger</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Bridge Act and Rivers and Harbors Act Section 9</td>
<td>Bridge Permit</td>
<td>U.S. Coast Guard</td>
<td>✓</td>
<td>✓</td>
<td>• Replacement of the 5th Avenue Bridge</td>
</tr>
<tr>
<td>Marine Mammal Protection Act</td>
<td>Incidental Take Authorization</td>
<td>National Marine Fisheries Service</td>
<td>✓</td>
<td>✓</td>
<td>• Potential effects to marine mammals from project construction</td>
</tr>
</tbody>
</table>

### Table 9.1.2 State Environmental Permits & Approvals, in addition to this state-led SEPA EIS

<table>
<thead>
<tr>
<th>Applicable Regulation</th>
<th>Permit/ Approval</th>
<th>Lead Agency</th>
<th>Managed Lake Alternative</th>
<th>Estuary Alternative</th>
<th>Hybrid Alternative</th>
<th>Regulatory Trigger</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean Water Act Section 401 (federal authorization administered by a state agency)</td>
<td>Water Quality Certification</td>
<td>Ecology</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>• Initial dredging within the Capitol Lake Basin and placement of dredged materials for habitat areas • Construction impacts to wetlands • Construction of in- and overwater structures, including boardwalks, docks, 5th Avenue Pedestrian Bridge</td>
</tr>
<tr>
<td>Clean Water Act Section 402</td>
<td>National Pollutant Discharge Elimination System Construction Stormwater General Permit</td>
<td>Ecology</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>• Temporary disturbance of more than 1 acre during construction, with discharge of stormwater back to Capitol Lake</td>
</tr>
<tr>
<td>Applicable Regulation</td>
<td>Permit/ Approval</td>
<td>Lead Agency</td>
<td>Managed Lake Alternative</td>
<td>Estuary Alternative</td>
<td>Hybrid Alternative</td>
<td>Regulatory Trigger</td>
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<td>-------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Clean Water Act Section 402</td>
<td>National Pollutant Discharge Elimination System</td>
<td>Ecology</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>• Ongoing management activities to manage algae and aquatic plants through application of aquatic herbicides</td>
</tr>
<tr>
<td></td>
<td>Aquatic Plant and Algae Management Permit</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Coastal Zone Management Act</td>
<td>Consistency Determination</td>
<td>Ecology</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>• Location of the project being within a coastal county (Thurston County) and the need for a Department of the Army Permit</td>
</tr>
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</tr>
<tr>
<td>Hydraulic Code</td>
<td>Hydraulic Project Approval</td>
<td>Washington Department of Fish and Wildlife</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>• Construction activities in, over, and affecting Capitol Lake</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Transport of aquatic invasive species during project construction and operation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Ongoing aquatic plant management</td>
</tr>
<tr>
<td>Aquatic Lands</td>
<td>Aquatic Use Authorization and/or Lease Agreement</td>
<td>Washington Department of Natural Resources</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>• Location of the project being on state-owned aquatic lands</td>
</tr>
</tbody>
</table>

Note:
1. The CCDAC and SCC may review project design.
### Table 9.1.3 Local Environmental Permits & Approvals

<table>
<thead>
<tr>
<th>Applicable Regulation</th>
<th>Permit/Approval</th>
<th>Lead Agency</th>
<th>Managed Lake Alternative</th>
<th>Estuary Alternative</th>
<th>Hybrid Alternative</th>
<th>Regulatory Trigger</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoreline Master Program</td>
<td>Shoreline Substantial Development Permit</td>
<td>City of Tumwater</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>• Temporary use of Tumwater Historical Park during construction</td>
</tr>
<tr>
<td></td>
<td>- Shoreline Substantial Development Permit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Construction and operation of the project within the South Basin and part of the Middle Basin, and along the shorelines</td>
</tr>
<tr>
<td></td>
<td>- Shoreline Conditional Use Permit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Conditional Use permit requires Ecology approval</td>
</tr>
<tr>
<td></td>
<td>- Shoreline Exemption</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shoreline Master Program</td>
<td>- Shoreline Substantial Development Permit</td>
<td>City of Olympia</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>• Construction and operation of the project within the Middle and North Basins, and along the shorelines</td>
</tr>
<tr>
<td></td>
<td>- Shoreline Conditional Use Permit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Shoreline Exemption</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land Use Approval</td>
<td>- Critical Areas Review</td>
<td>Cities of Olympia and Tumwater</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>• Creation of new uses within the Project Area, such as recreational amenities</td>
</tr>
<tr>
<td></td>
<td>- Site Plan Review</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Construction within critical areas and/or their buffers</td>
</tr>
<tr>
<td>Applicable Regulation</td>
<td>Permit/Approval</td>
<td>Lead Agency</td>
<td>Managed Lake Alternative</td>
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</tr>
<tr>
<td>Municipal Code</td>
<td>Floodplain Development Permit</td>
<td>Cities of Olympia and Tumwater</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>• Construction within a mapped floodplain, including habitat areas and in- and over-water structures</td>
</tr>
<tr>
<td>Municipal Code</td>
<td>Building Permit</td>
<td>Cities of Olympia and Tumwater</td>
<td>✓</td>
<td>✓ Includes construction of a new 5&lt;sup&gt;th&lt;/sup&gt; Avenue Bridge and modifications to Deschutes Parkway</td>
<td>✓ Includes construction of a new 5&lt;sup&gt;th&lt;/sup&gt; Avenue Bridge, modifications to Deschutes Parkway, and construction of the reflecting pool barrier wall</td>
<td>• Construction of new structures including boardwalks, docks, 5&lt;sup&gt;th&lt;/sup&gt; Avenue Pedestrian Bridge</td>
</tr>
<tr>
<td>Municipal Code</td>
<td>Demolition Permit</td>
<td>City of Olympia</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>• Demolition of 5&lt;sup&gt;th&lt;/sup&gt; Avenue Bridge and 5&lt;sup&gt;th&lt;/sup&gt; Avenue Dam</td>
</tr>
<tr>
<td>Municipal Code</td>
<td>Excavation Permit</td>
<td>City of Olympia</td>
<td>✓</td>
<td>✓</td>
<td>• Excavation associated with Deschutes Parkway reconfiguration and 5&lt;sup&gt;th&lt;/sup&gt; Avenue Bridge reconstruction</td>
<td></td>
</tr>
<tr>
<td>Applicable Regulation</td>
<td>Permit/Approval</td>
<td>Lead Agency</td>
<td>Managed Lake Alternative</td>
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<td>Hybrid Alternative</td>
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</tr>
<tr>
<td>Municipal Code</td>
<td>Land Clearing &amp; Grading Permit</td>
<td>City of Olympia</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>• Clearing and grading needed to support long-term staging in Marathon Park</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Clearing and grading associated with Deschutes Parkway reconfiguration and 5th Avenue Bridge reconstruction</td>
<td>Clearing and grading associated with Deschutes Parkway reconfiguration and 5th Avenue Bridge reconstruction</td>
<td></td>
</tr>
<tr>
<td>Municipal Code</td>
<td>Tree Removal Permit</td>
<td>City of Olympia</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>• Tree removal associated with Deschutes Parkway reconfiguration</td>
</tr>
</tbody>
</table>