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# List of Acronyms

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$\mu g/m^3$ ............ micrograms per cubic meter

$\mu m$ ................ micrometers

AESI ............. Associated Earth Sciences, Inc.

BACT ............ best available control technology

BMPs ............ best management practices

CAP .............. Cleanup Action Plan

dBA .............. decibels (A-weighted)

dbh ................ diameter at breast height

DDES ............ Department of Development and Environmental Services

DEIS ............. draft environmental impact statement

DS ................. Determination of Significance

Ecology.......... Washington Department of Ecology

EIS ................ environmental impact statement

ENM ............. Environmental Noise Model

EPA .............. U.S. Environmental Protection Agency

ESA .............. Endangered Species Act

FDM ............. Fugitive Dust Model

FEIS .............. final environmental impact statement

GCL .............. geosynthetic clay liner

GMA ............. Growth Management Act

HPA............... Hydraulic Project Approval

KCC............... King County Code

MCL .............. maximum contaminant level

MLLW........... mean lower low water

MTCA ........... Model Toxics Control Act

NGVD ........... National Geodetic Vertical Datum

NMFS............ National Marine Fisheries Service

NPDES .......... National Pollutant Discharge Elimination System

PHS ............... Priority Habitats and Species

PM2.5............ particulate matter less than or equal to 2.5 micrometers in diameter

PM10............. particulate matter less than or equal to 10 micrometers in diameter

ppm................ parts per million

PSCAA.......... Puget Sound Clean Air Agency

rarad............... radar advisory

RCW.............. Revised Code of Washington

SEPA ............. State Environmental Policy Act

SLM............... sound level measurement

SMA .............. Shoreline Management Act

SSDP ............. Shoreline Substantial Development Permit

TSP................ total suspended particulates

TSS................ Traffic Separation System

USFWS ......... U.S. Fish and Wildlife Service

USGS............. U.S. Geological Survey

VMRS ........... Vessel Movement Reporting System

VTS ............... Vessel Traffic Service

VTSPS........... Vessel Traffic Service Puget Sound

WAC ............. Washington Administrative Code

WDFW .......... Washington Department of Fish and Wildlife

WDNR........... Washington Department of Natural Resources

WNHP ........... Washington Natural Heritage Program

DDES

King County
Department of Development
and Environmental Services
900 Oakesdale Avenue Southwest
Renton, WA 98055-1219

June 27, 2000

Dear Interested Reader:

A copy of the Final Environmental Impact Statement (FEIS) for Glacier Northwest, Inc.'s proposal to expand its sand and gravel mine on Maury island is attached. This FEIS has been prepared pursuant to the State Environmental Policy Act (SEPA) and Rules contained therein (WAC 197-11-400) for use by the public, agencies, groups and decision-makers in review of the proposal and alternatives.

A wide variety of environmental impacts are evaluated in this FEIS. Additional analysis has been provided on most elements of the environment in response to comments received on the DEIS. In particular, the marine and terrestrial chapters have been amended and expanded. The alternatives identified in the DEIS have not changed. In addition to the proposed action and no-action alternative, two "reduced operation" alternatives are also examined. Alternative one evaluates the impacts of mining up to a maximum of 5.72 million tons of material annually. The second alternative evaluates the impacts of mining up to a maximum of 3.12 million tons of material annually.

Please address any questions on this FEIS to: Gordon Thomson, EIS Project Coordinator, King County Land Use Services Division, 900 Oakesdale Avenue SW Renton, Washington 98055-1219 (phone number 296-7286).

Your involvement in the SEPA EIS process on this proposal is greatly appreciated. Thank you for your interest and participation in this environmental review.

Greg Borba,

Greg Borba

SEPA Responsible Official

# Fact Sheet

**Title**

Final Environmental Impact Statement (FEIS) for Maury Island Glacier Northwest Gravel Mine

**Description of proposal and alternatives**

Glacier Northwest has submitted a request to King County to significantly increase mining over current levels at its Maury Island sand and gravel mine, and to barge materials off the site using the existing dock. If approved, up to 193 acres of the 235-acre site would eventually be mined. A 50-foot-wide buffer would be retained around the site perimeter, and a 200-foot-wide buffer would remain along the Puget Sound shoreline. The Applicant's proposal, two other mining alternatives, and no action are evaluated.

**Proposed Action.** The Applicant proposes to mine and export via barges up to 7.5 million tons of sand and gravel annually from a 235-acre site, located on the eastern edge of Maury Island, King County, Washington (within portions of Sections 28 and 29, Township 22N, Range 3E). Access to the site is via two private driveways off S.W. 260th Street.

Up to 193 acres would be mined over 11 to 50 years, depending on the rate of extraction. The rate would vary with market demand. Bulldozers would excavate materials by pushing materials from slope tops down to collection points, where material would be placed in a collection feeder. The feeder would load a conveyer belt, which would then deliver materials to waiting barges, tended by tugs, at the end of the loading dock.

The loading dock would be repaired using concrete or steel pilings instead of the existing creosote-treated wood pilings. At least 15 percent of the pilings would need immediate replacement and the remaining pilings would need to be replaced over the next 5 to 15 years. Most of the decking and superstructure would require replacement due to considerable decay.

Mining would occur from 6 a.m. to 10 p.m. weekdays and from 9 a.m. to 6 p.m. on Saturdays. Barge loading could occur at any time, with up to four, 10,000-ton barges (measuring 330 by 80 feet) or a greater number of smaller barges being loaded per day. Up to 20 trucks per day would deliver materials to customers on Vashon/Maury Islands.

Mined-out areas would be hydroseeded on steep slopes and planted with Douglas-fir on more level areas.

**Principal Alternatives.** The FEIS evaluates two action alternatives, the No-Action alternative, and additional mitigation alternatives. Under Alternative 1, barging would only be allowed from 6 a.m. to 10 p.m. on weekdays and from 9 a.m. to 6 p.m. on Saturdays. Under Alternative 2, barging would be allowed 7 a.m. to 7 p.m. Monday through Saturday.

Three key mitigation alternatives include (1) a madrone reclamation alternative (Chapter 5), which reduces the loss of madrone forest on the site; (2) a pileated woodpecker habitat retention alternative (also Chapter 5), which preserves a 36-acre habitat patch until a suitable replacement is provided; and (3) a new dock alternative (Chapter 6), which would reduce impacts on the marine environment by using the latest, low-impact structures and, as an additional option, by extending the dock into deeper waters.

**Location of site**

Portions of Sections 28 and 29, Township 22N, Range 3E, on the eastern edge of Maury Island next to Vashon Island and along the East Passage in King County, Washington.

**Proposal's sponsor**

Glacier Northwest
Contact: Ron Summers
5975 E. Marginal Way
P.O. Box 1730
Seattle WA 98111

**Date of implementation**

The applicant would initiate increased levels of mining as soon as possible after the Grading Permit is approved. The exact date when this would occur cannot be predicted because of uncertainties in the permitting process.

**Lead agency**

King County Department of Development and Environmental Services
900 Oakesdale Avenue SW
Renton, WA 98055-1219

**Responsible official**

Greg Borba, Supervisor, Current Planning Section
King County Department of Development and Environmental Services
Land Use Services Division
900 Oakesdale Avenue SW
Renton, WA 98055-1219

Gordon Thomson, Project Manager
King County Department of Development and Environmental Services
Land Use Services Division
900 Oakesdale Avenue SW
Renton, WA 98055-1219

**List of possible permit, approval, and license requirements**

Revised Grading Permit (King County)
Revised Surface Mining Reclamation Permit (Washington Department of Natural Resources)
Notice of Construction Permit (Puget Sound Clean Air Agency)
Periodic Review of Extractive and Processing Operations (King County)
Aquatic Lands Lease (Washington Department of Natural Resources)
Section 10 (Rivers and Harbors Act) Individual Permit (U.S. Army Corps of Engineers)
Endangered Species Act Section 7 Compliance (National Marine Fisheries Service, U.S. Fish and Wildlife Service)
Shorelines Substantial Development Permit (King County)
National Pollutant Discharge Elimination System Permit
Hydraulic Project Approval
Model Toxics Control Act Compliance
Washington Water Rights Permit
Various building permits for fences and structures

**Authors and principal contributors to FEIS**

**Name; Company; Education; Years of Experience; Role**

Steve Hall; Jones & Stokes; B.S. Wildlife Management 1987; 11; Consulting Team Project Manager; Principal Author of FEIS and Response to Comments

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Christopher Earle; Jones & Stokes; Ph.D. Forest Ecology 1993; 7; Terrestrial Plants and Animals – Madrone Forest

Stephanie Simek; Jones & Stokes; M.S. Environmental and Forest Biology; 5; Terrestrial Plants and Animals

Andy Wones; Jones & Stokes; M.S. General Science (Biological Science); 15; Marine Habitat, Eelgrass and Marine Dive Survey

Chris Cziesla; Jones & Stokes; M.S. Marine Biology 1999; 5; Marine Habitat, Transportation, Dive Survey of Applicant's Dupont Site

Grant Bailey; Jones & Stokes; B.S. Biology 1970; 27; Marine Transportation, Senior Reviews, SEPA Compliance

David Broadfoot; Jones & Stokes; M.S. Ecology 1967; 21; Light, Glare, Aesthetics – Senior Review

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Michelle Stearns; M.R. Stearns Planning and Design; M.S. Urban Planning; 25; Assistance with Light, Glare, Aesthetics; Recreation; Land and Shoreline Use

[1] Using data from an environmental noise analysis conducted by McCulley, Frick & Gilman [1998].

[2] Transportation analysis utilized data from a marine route study conducted by Art Anderson Associates [1998] and a level one traffic analysis by TDA [1998].

**Final EIS issue date**

June 27, 2000

**Nature, type, and date of final action planned or scheduled**

King County will either deny, approve, or approve with conditions the Applicant's proposal. The date of decision will depend on the many permits needed prior to King County action.

**Subsequent environmental review**

The project would be subject to periodic review (at least every 5 years) by DDES. In addition, environmental monitoring measures may be required as a condition of the grading permit, if granted.

**Location of background information**

King County Department of Development and Environmental Services
900 Oakesdale Avenue SW
Renton, WA 98055-1219

Jones & Stokes Associates, Inc.
2820 Northup Way, Suite 100
Bellevue, WA 98004-1419
425/822-1077

**Cost of copy to public**

Volume 1 – $40.00
Volume 2 – $10.00
Volume 3 – $14.00
Volume 4 – $14.00
Volume 5 – $12.00
Volume 6 – $12.00

# Summary

# Summary

## Introduction

This Final Environmental Impact Statement (FEIS) evaluates environmental impacts of Glacier Northwest's application to expand mining at their Maury Island site.

The FEIS contains no decisions or recommendations. Rather, it informs the decision-maker and the public of significant impacts and alternatives, including mitigation measures and alternatives that could achieve the project's objectives but at a lower environmental cost.

Under substantive authority of the State Environmental Policy Act (SEPA) [Washington Administrative Code (WAC) 197-11-660], adverse impacts identified in this FEIS may be used as a basis to condition the project, and significant adverse impacts that cannot be mitigated could be used as a basis to deny the project.

This FEIS revises and replaces the Draft Environmental Impact Statement (DEIS). Changes from the DEIS are in response to public comments, as required under WAC 197-11-560. This FEIS responds to opposing views on significant adverse environmental impacts and reasonable alternatives that King County determined were not adequately discussed in the DEIS.

## King County Action Being Considered

King County Department of Development and Environmental Services (DDES) must decide whether to deny, approve, or approve with conditions a grading permit. A Shoreline Substantial Development Permit (SSDP) will also be required by King County.

## Key SEPA Milestones Completed

The following list identifies the SEPA steps that have led to the issuance of this FEIS.

- Determination of Significance:  August 11, 1998
- SSDP Determination:  July 1999
- DEIS Issued:  July 1999
- Public Meeting:  September 1999
- Commenting on DEIS (extended 60-day Comment Period): July 21 through September 20, 1999.

## Major Changes Between the DEIS and FEIS

Most major changes between the Draft and Final Environmental Impact Statement (EIS) focus on terrestrial and marine environments (Chapters 5 and 6).  Both chapters have been extensively revised and expanded.

In addition, several potential mitigation measures have been added to protect sensitive species, shorelines, and madrone forest, including:

- retaining 74 percent of the madrone bluff forest area;
- retaining 33 percent of the upland (non-bluff) madrone forest in buffers and as habitat for the pileated woodpecker;
- restoring madrone prior to moving to new mining areas; specifically, maintaining at least 40 percent of the site in madrone at any one time;
- establishing minimum standards for madrone restoration in a mitigation and monitoring plan;
- altering the mining sequence so that already disturbed areas are mined first, thereby allowing areas where madrone has already been impacted to be restored first;
- replacing the existing dock with a new structure to reduce impacts on the marine environment;
- improving shoreline habitat disturbed by previous mining; and
- setting aside a 36-acre stand of mature forest as habitat for the pileated woodpecker, band-tailed pigeon, and other species that use this area; this stand would not be mined until suitable replacement habitat had been established.

These and many other measures will be considered by the decision-maker when deciding whether to approve, approve with conditions, or deny the proposed mining plan.

## Proposal Objectives

The Applicant's objectives are:

- to provide prompt and economical delivery of minerals to many customers;
- to be able to respond quickly to large projects for a variety of clients—the "third-runway" project is by far the largest project in the near future, and the Applicant clearly desires to sell product from the Maury Island site to the Port of Seattle for the proposed SeaTac airport third runway;
- to develop a long-term, productive, and profitable site to provide structural fills and other products related to sand and gravel; and
- to maximize mineral extraction, consistent with legal requirements for environmental protection.

The project is a private project, so the project objectives are those of the Applicant, and not King County. The sole objectives of King County DDES are to:

1. comply with SEPA;
2. adhere to its legal responsibilities to ensure a fair and reasoned decision regarding the Applicant's proposal; and
3. implement the DDES mission "to serve, educate and protect our community through the implementation of King County's development and environmental regulations."

To meet these objectives, DDES has prepared this EIS and will consider the environmental impacts of the project, as well as reasonable alternatives that could feasibly attain or approximate the Applicant's objectives, but at a lower environmental cost or decreased level of environmental degradation. These considerations will be factored into the decision, according to King County's substantive authority under SEPA (WAC 197-11-660).

# Summary of Proposal and Alternatives

This FEIS analyzes the Applicant's Proposed Action, two additional alternatives that include mining with reduced hours of barging, and the No-Action Alternative. In addition, the FEIS includes more than 75 mitigation measures that are a form of alternative. These measures are ways that could reasonably attain or approximate the proposals objectives, but at a lower environmental cost. Each of these alternatives is described below. Features of the alternatives are summarized in Table S-1 at the end of this chapter.

## Description of the Proposed Action

### *Scale of Operation*

Under the Proposed Action, sand and gravel extraction could approach 7.5 million tons (5.5 million cubic yards) per year, with essentially all of the increased material being sent to off-island markets via barge.

When demand for sand is low, the level of operation at the site would also be low. It is likely that the site would be idle for periods of time, depending on market demand.

It follows that the overall life span of the mine would depend on market conditions and the number of large sand and gravel contracts secured by the Applicant. At full production, the site deposits could be mined out in 11 years. Of course, the lower the level of production, the longer the operation could last. The analysis in this EIS assumes a 35-year operating window before the site is closed.

As under current practices, operations would also provide materials for the local market (Maury Island and Vashon Island). The amount of sand and gravel extracted for the local market was estimated to average approximately 15,000 tons in 1998 (range of 10,000 to 20,000 tons per year), with an annual increase assumed to be 2.5 percent for the FEIS analysis; actual increases would depend on market needs and local growth. Local supplies would be delivered by truck, at a rate not to exceed 20 trucks per day.

### *Clearing and Ground Preparation*

Clearing of the site would be phased with mining activities. Clearing would occur in scheduled phases of approximately

32 acres each. No more than two phases, or 64 acres of mining/reclamation activities, would be in process at any one time.

To address public safety concerns regarding arsenic contamination of site soils, the Applicant is proposing to fully contain contaminated materials at the site within a sealed berm. No contaminated materials would be removed from the site. At full capacity (when mining is complete), the berm would measure up to 30 feet high and 2,100 feet long. The berm would be located on the northern edge of the site, but outside of the 50-foot vegetated buffer (see next paragraph), which would be maintained.

Maintenance of the 200-foot shoreline buffer and a 50-foot buffer between the site and neighboring properties would result in approximately 14 percent of the site being retained as open space and upland habitat.

Table S-1 outlines other major features of the Proposed Action.

## Alternative 1-
## Reduced Barging Hours, Scenario 1

Alternative 1 differs from the Proposed Action in that barge loading would be restricted to 16 hours each weekday and 9 hours on Saturday (Monday – Friday 6 a.m. to 10 p.m., Saturday 9 a.m. to 6 p.m.). This alternative was developed by the EIS Team in response to public comments and is intended to allow the Applicant, the public, and decision-makers at King County to compare the environmental impacts of the Proposed Action to this hypothetical scenario of reduced hours for barge loading.

Table S-1 compares other features of this alternative with the Proposed Action.

## Alternative 2 -
## Reduced Barging Hours, Scenario 2

Under Alternative 2, barge loading would be restricted to 12 hours each weekday and on Saturday (Monday – Saturday 7 a.m. to 7 p.m.). As with Alternative 1, Alternative 2 would reduce the ability of the Applicant to provide sand and gravel products on demand, and, therefore, does not meet the project objectives as well as the Proposed Action.

Table S-1 compares other features of this alternative with the Proposed Action.

## No-Action Alternative

Under SEPA, King County must evaluate the "No-Action Alternative", which is defined by the state SEPA Handbook as "what would be most likely to happen if the proposal did not occur".

For the purpose of comparative analysis and to understand the environmental effects of the Applicant's proposal, this EIS considers the No-Action Alternative as the status quo, or essentially how the mine has operated on average over the past 20 years, with no barging and a very low level of mining for the local market only.

The features of the No-Action Alternative are summarized and compared to the Proposed Action in Table S-1.

## Mitigation Alternatives

One of the primary functions of an EIS is to inform decision-makers and the public of reasonable alternatives, including mitigation measures, that would avoid or minimize adverse impacts or enhance environmental quality (WAC 197-11-400).

This EIS includes more than 75 mitigation measures. Each measure is based on policies, plans, rules, or regulations formally designated by King County (or appropriate legislative body) and in effect when the DEIS was issued.

Each mitigation measure listed in the EIS (1) relates to a specific, adverse environmental impact identified in the EIS and (2) has been determined by King County to be reasonable and capable of being accomplished. To be reasonable, mitigation must be in proportion to the impact.

Responsibility for implementing mitigation measures may be imposed upon an Applicant only to the extent that the identified adverse impact is attributable to the proposal.

### *Madrone Reclamation Alternative (evaluated in Chapter 5)*

Mining would require the eventual clearing of one of the largest madrone stands in Washington. While not protected by any specific law, madrone forests are becoming increasingly rare, are valued by the community, and support wildlife habitat, including habitat for band-tailed pigeons, a species that receives some protection under King County policy.

Therefore, this EIS includes mitigation measures to restore madrone forest (see Chapter 5). The greatest hindrance this may pose for the operator of the site is that they could not mine out the site in 11 years (as could occur under maximum production), but instead would have to allow restoration to occur on mined areas before completing the later stages of mining.

### *Pileated Woodpecker Habitat Retention Alternative (evaluated in Chapter 5)*

King County Policy NE-604, Policy NE-603 states that:

*In the Rural Area and Natural Resource Lands, habitats for "candidate" priority species … shall not be reduced and should be preserved.*

Pileated woodpecker is the only terrestrial species designated under Policy NE-603 that is present on the site. Pileated woodpeckers most often nest in large Douglas-fir trees that are diseased or recently dead but still standing. About a dozen such trees are present in a 42-acre stand of mixed madrone/Douglas-fir forest on the northeastern portion of the site, which can therefore be considered typical habitat.

Placing some or all of a 36-acre stand of mixed Douglas-fir and madrone as a permanent set-aside would maintain the best habitat for pileated woodpeckers on the site. However, this would greatly reduce the amount of minerals available for mining.

Another option that does not so severely impact the project objectives would be to create habitat elsewhere prior to removing the 36-acre patch. Areas could be revegetated with some Douglas-fir and enhanced with created Douglas-fir snags (standing dead trees) relocated from cleared areas. These areas in turn could be set aside as habitat areas for this species.

### *New Dock Alternative (evaluated in Chapter 6)*

As an alternative to simply repairing the exiting dock, the EIS Team developed a plan to replace the existing dock with a new structure. This new structure would (1) allow the use of the latest technology to reduce shade and contamination; and (2) extend the dock to deeper water, thereby avoiding impacts to the most sensitive areas of the shoreline. Dock replacement would also avoid the need for repeated repairs that would be expected if the old structure is maintained.

This alternative has two other options that could be considered. First, the dock could be rebuilt, but not extended. Second, replacement could be limited to the dock "stem," which would eliminate the need for repeated construction close to the beach, but would not provide the other benefits that the two other options provide.

## Significant Areas of Controversy and Issues to be Resolved

As required under SEPA (WAC 197-11-408), King County conducted scoping to "narrow the scope of [the] EIS to the probable significant adverse impacts and reasonable alternatives, including mitigation measures." Toward this end, King County invited agencies, affected Tribes, and members of the public to comment on the Determination of Significance (WAC 197-11-360).

The major controversial issues identified during this process include groundwater supplies, visual and noise disturbance, arsenic contamination of topsoils, removal of madrone forest, and potential effects on marine habitat. These issues, and other questions raised during scoping, are listed at the beginning of Chapters 3 through 12 of this EIS in the sections titled "Primary Issues". These issue questions are then addressed in the impact analysis in each chapter.

## Environmental Setting

The following factors contribute to the overall environment at the site.

### The Island Environment

- The site is on an island, which means that the environment includes elements of both marine and terrestrial systems, as well as increased sensitivity to change.

- The island environment evokes social sensitivities as well, and tends to promote a strong sense of community among residents. This sense of community is an important element of the human environment and quality of life.

- Water is one of the resources on an island that is particularly sensitive. All of Vashon and Maury Islands are classified as a sole-source aquifer and groundwater recharge area.

### The Rural Environment

- The area is intrinsically rural in character, involving a mix of built and natural features and process. As can be seen in Figure 1-2, Maury Island is well forested, but also contains clusters of residential development, particularly around Quartermaster Harbor to the south of the site.

- King County has a strong commitment to keep rural areas rural, and to avoid urban sprawl and other uses that conflict with traditional rural uses and values.

- Residents place tremendous value on the rural environment of the island.

- Agriculture, forestry, and mining are part of the rural environment, as are low-density housing, open space, and wildlife habitat.

- The Sandy Shores and Gold Beach subdivisions are suburban density developments that were developed within a rural area (this is due to less stringent environmental requirements in place when the developments were reviewed by King County).

- These suburban density developments flank the shoreline on both sides of the site. These developments alter the visual character of the area, shoreline processes, and level of concern for conflicts between mining and residential uses. Figure 1-2 illustrates the location of these communities in relation to the project site.

## The Shoreline Environment

- Much of the shoreline along Maury Island is bulkheaded. Bulkheads block many of the interactive processes and exchanges that occur between marine and terrestrial environments (see Figure 11-5).

- The site is not bulkheaded, but the shoreline near the dock has been modified by past mining activities. Much of the vegetation has been previously cleared, some of the shoreline is armored by rip-rap (a wall created by large blocks of stone), and the dock itself remains as a built feature.

- Even though intensive mining has taken place at the site (with little consideration of environmental protection), the shoreline contains eelgrass; macroalgae (seaweeds); various substrates; clambeds; threatened salmon; and habitat for other sensitive species, such as rockfish, cod, and lingcod. In addition, herring, sandlance, and surf smelt spawning occurs at the site.

- The dock and sunken barges from past mining create artificial “reef” habitat for species that would otherwise be absent.

- This diversity is evidenced by the fact that recreational divers often visit the site.

## Historic Context of Mining

- The site contains an obvious open “pit” from previous mining, and the dock is a major visual feature of the shoreline.

- Mining has been a feature of the environment for many decades and predates much of the residential development.

- The mineral designation of the site has precluded other development, leaving a native madrone forest cover over much of the site.

## Forest and Wildlife

- King County recognizes that provision of wildlife habitat is an important functional value of natural resource lands, such as mineral, forestry, and agricultural lands.
- Maury Island contains the largest stands of madrone forest in King County.
- Madrone forest is not formally designated as a sensitive or unique community and no law prohibits its clearing. Nonetheless, it contributes to the county's biodiversity.
- The madrone forest provides wildlife habitat, contributes organic and inorganic materials to the marine environment, stabilizes slopes, and imparts a natural appearance that both contrasts with and softens the built features of the shoreline.
- Shipping and recreational marine traffic are commonplace off the Maury Island shoreline. A major shipping lane lies off Point Roberts, east of the project site.

## Arsenic and Other Contaminants

- The topsoils of Maury Island, including those on unmined portions of the site, are contaminated with metals, with arsenic and lead being the primary concern. Concentrations vary widely from place to place, with lower levels typically found in areas that have been disturbed (due to mixing and removal of materials).

# Phased Review

No phased review is anticipated.

# Summary of Impacts, Mitigation, and Significant Unavoidable Adverse Impacts

Impacts, mitigation measures, and significant unavoidable adverse impacts for each of the alternatives are summarized in Table S-2.

## Overview of Key Impacts

Within the context of the site being zoned mining, the many project impacts are the types that would be expected: changes in views, noise to surrounding communities, and clearing of forest and associated loss of wildlife habitat.

The main conclusion presented in Chapters 3 through 12 is that sufficient mitigation is available to effectively mitigate the major project issues of marine habitat, salmon, groundwater, arsenic, madrone forest, and wildlife.

Two facts are critical to understanding this conclusion. First, mitigation plays a major role in avoiding significant impacts. Second, under SEPA, an impact can be sufficiently mitigated, while remaining adverse. In other words, mitigation need not totally eliminate an impact, but merely needs to reduce it to an acceptable level.

The project, as proposed, would probably result in significant adverse impacts. This EIS identifies these and includes alternatives and compensatory measures that (a) are technically and economically feasible; (b) would adequately mitigate the impact to comply with established plans, policies, and laws; and (c) would still allow the Applicant to reasonably meet its project objectives.

Even with mitigation, the project would result in several undesirable impacts. The project would greatly change the overall character of the site, and the project would be visible and audible from many places. The site is zoned for mining and noise levels and other effects would be within King County Code limits. Thus, there is insufficient evidence to justify these impacts as "significant."

Removal of mineral resources from the site would result in irreversible and irretrievable commitments of natural resources. These commitments are not likely to harm long-term environmental productivity. Analysis showed no indications that mining of the site would harm the long-term environmental productivity and use of the site, including groundwater recharge and availability, wildlife and fish habitat, or opportunities for long-term subsequent use of the site.

Finally, the project would result in some adverse effects to Puget Sound chinook salmon and their habitat, as well as other features of the marine environment. The extent of these impacts would be limited to the site, and many mitigation measures are available. These measures were developed in consultation with technical experts from the Washington Department of Fish and Wildlife (WDFW), the Washington Department of Natural Resources (WDNR), and King County. We expect that mitigation will be further defined by the WDFW, WDNR, U.S. Army Corps of Engineers, and National Marine Fisheries Service, under their regulatory authority.

## Evaluation of Impacts Based on SEPA Criteria

WAC 197-11-330, which outlines the process under which threshold determinations of significant impacts are made, provides the clearest criteria for determining whether or not an impact is "significant" under SEPA:

*(a) A project may, to a significant degree: Adversely affect environmentally sensitive or special areas, such as loss or destruction of historic, scientific, and cultural resources, parks, prime farmlands, wetlands, wild and scenic rivers, or wilderness.*

The site contains three types of environmentally sensitive or special area: (1) shoreline and marine environment associated with the dock; (2) madrone forest; and (3) the sole-source aquifer. The Applicant's project objectives, with additional mitigation, could be reasonably obtained with no net loss of these special areas. "No net loss" means that adverse impacts may occur, but that they could be sufficiently mitigated.

For the marine environment, dock construction would disturb marine sediments and operations would shade and produce noise and vibration that may cause fish to avoid the area. These impacts would be limited to the site of action and could be mitigated through several conditions, including revised performance standards for the dock and replacement and/or enhancement of marine habitat near the site. The independently conducted marine assessment by the Washington Department of Ecology (Ecology) supported this conclusion.

For madrone forest, madrone could be effectively reestablished at the site, as demonstrated by the natural regeneration documented in previously mined areas. The areas are not expected to come back exactly as they are now, but, being a species associated with disturbance, madrone would probably come back to sufficient densities to replace most of the values currently being provided.

For the sole-source aquifer, groundwater intrusion could be avoided through known and standard mining practices, so that contamination and/or aquifer breach would be highly unlikely. There is no evidence to support claims that the project would significantly reduce aquifer recharge. The independently conducted Ecology study supported this conclusion.

While the project may adversely affect Puget Sound chinook salmon (a threatened species) and its habitat, this impact could be effectively mitigated through habitat enhancement and timing to avoid disturbance.

The evidence shows that the Applicant's project objectives could be reasonably obtained while meeting the requirements of the many laws applicable to the proposal. Of course, decisions of other governmental agencies with jurisdiction cannot be fully predicted.

As is typical for SEPA EISs this FEIS has been issued prior to final approval under other applicable laws. This is because SEPA (WAC 197-11-055) encourages EISs to be prepared for private proposals at the conceptual stage rather than the final detailed design stage. Most applicable state and federal laws require design-level analysis, which is not required under SEPA.

Issuance of a revised grading permit would not establish a precedent for future actions with significant effects.

The analysis indicates neither unique nor unknown risks to the environment nor risks to public health or safety. Risks and impacts related to arsenic and groundwater can be avoided by proven technologies.

## *Table S-1. Comparison of Features among Alternatives*

| Component | No-Action Alternative | Proposed Action | Alternative 1 | Alternative 2 | Proposed Action with all Additional Mitigation (including restricted hours) |
|---|---|---|---|---|---|
| ***SCALE OF OPERATION*** | | | | | |
| ***Area to be Mined*** | Ultimately, 193 acres, but much smaller area within the foreseeable future | 193 acres | Same as Proposed Action | Same as Proposed Action | 174 acres |
| ***Estimated Maximum Annual Extraction*** | 20,000 tons | 7.5 million tons* | 5.72 million tons* | 3.12 million tons* | 3.12 million tons* |
| ***Duration of Project*** | Mining to occur indefinitely | Between 11 and 50 years. Assumed to be 35 years for analysis in the EIS | Between 15 and 60 years. Assumed to be 40 years for analysis in the EIS | Between 30 and 75 years. Assumed to be 50 years for analysis in the EIS | Between 25 and 70 years |
| ***Local Market Sales*** | Local market sales would average 15,000 tons annually (range 10,000 to 20,000 tons per year) of sand and gravel, with an annual assumed increase of 2.5% | Same as No-Action | Same as No-Action | Same as No-Action | Same as No-Action |
| ***Trucking*** | Average hauling less than 5 trucks/day, over a 6-day week, assumed to increase at 2.5% annually, with a maximum of 20 trucks/ day each way (40 one-way trips) | Same as No-Action | Same as No-Action | Same as No-Action | Same as No-Action |

## *Table S-1. Continued*

| *Component* | *No-Action Alternative* | *Proposed Action* | *Alternative 1* | *Alternative 2* | *Proposed Action with all Additional Mitigation (including restricted hours)* |
|---|---|---|---|---|---|
| ***Hours of Active Mining*** | Current hours of mining:<br>M-F 7 a.m. – 7 p.m.<br>Sat 9 a.m. – 6 p.m.<br>Maintenance could occur at any time | M-F 6 a.m. – 10 p.m.<br>Sat 9 a.m. – 6 p.m.<br>Maintenance could occur at any time | M-F 6 a.m. – 10 p.m.<br>Sat 9 a.m. – 6 p.m.<br>Maintenance could occur at any time | M-F 7 a.m. – 7 p.m.<br>Sat 9 a.m. – 6 p.m.<br>Maintenance could occur at any time | M-F 7 a.m. – 7 p.m.<br>Sat 9 a.m. – 6 p.m.<br>Maintenance could occur at any time |
| ***Hours Barge Loading would be Allowed*** | None | No restrictions | 16 hours per weekday, 9 hours on Saturday:<br>M-F 6 a.m. – 10 p.m.<br>Sat 9 a.m. – 6 p.m. | 12 hours per day,<br>M-Sat 7 a.m. – 7 p.m. | 12 hours per day,<br>M-Sat 7 a.m. – 7 p.m. |
| ***Barging*** | None | Maximum of four 10,000-ton barges loaded in each 24-hour period (or a greater number of smaller barges) | Maximum of two 10,000-ton barges loaded in each weekday and one on Saturday (or a greater number of smaller barges) | Maximum of one 10,000-ton barge loaded in each working day (or a greater number of smaller barges) | Maximum of one 10,000-ton barge loaded in each working day (or a greater number of smaller barges) |
| ***Employment*** | 5 staff or fewer would operate the site | 2 to 20 staff would operate the site at any one time, with two shifts for mining and three shifts for barge loading | 2 to 18 staff would operate the site at any one time, with two shifts for mining and for barge loading | 2 to 12 staff would operate the site at any one time, with one shift for mining and for barge loading | 2 to 12 staff would operate the site at any one time, with one shift for mining and for barge loading |
| ***Clearing and Ground Preparation*** | Conducted in slow progression from the central portion of the site out | Phased clearing, with two areas up to 32 acres being cleared and prepared for mining at any one time. Up to 64 acres of land being mined or actively reclaimed at any one time | Same as Proposed Action | Same as Proposed Action | Same as Proposed Action |

## *Table S-1. Continued*

| *Component* | *No-Action Alternative* | *Proposed Action* | *Alternative 1* | *Alternative 2* | *Proposed Action with all Additional Mitigation (including restricted hours)* |
|---|---|---|---|---|---|
| ***FACILITIES AND EQUIPMENT*** | | | | | |
| ***Structures*** | None | Small office, storage and security areas, and portable restroom. Repairs to dock structure | Same as Proposed Action | Same as Proposed Action | Old dock replaced with extended, state-of-the-art facility |
| ***Access and Roads*** | Use existing | Same as No-Action, but additional access roads constructed as mining progresses | Same as Proposed Action | Same as Proposed Action | Same as Proposed Action |
| ***Heavy Equipment*** | Wheel loaders used to load trucks | Combination of bulldozers and wheel loaders used for barge-based projects | Same as Proposed Action | Same as Proposed Action | Same as Proposed Action |
| ***Processing Equipment*** | Portable screening plant as needed (expected on site for about 1 month every 5 to 10 years) | Portable crushing and screening plant as needed (expected on site for 1 to 2 months once every 3 to 4 years) | Same as Proposed Action | Same as Proposed Action | Same as Proposed Action |
| ***Conveyance Equipment*** | Material loaded onto trucks for on-island deliveries | Truck loading for on-island deliveries. Material for off-island deliveries would be transported from mined areas to barges using a conveyer belt system, ranging in length from 1,200 to 3,400 feet | Same as Proposed Action | Same as Proposed Action | Same as Proposed Action |

## *Table S-1. Continued*

| *Component* | *No-Action Alternative* | *Proposed Action* | *Alternative 1* | *Alternative 2* | *Proposed Action with all Additional Mitigation (including restricted hours)* |
|---|---|---|---|---|---|
| ***RECLAMATION*** | Low levels of mining would require little reclamation. Most reclamation done in small patches to minimal standards (as required by WDNR permit). Little or no terracing for several decades | Active mining/reclamation confined to 64 acres at one time, up to two 32-acre phases. Reclamation would follow WDNR guidelines and may include use of native plants and habitat features for wildlife. Topsoil would be manufactured onsite and augmented with offsite materials as necessary to meet WDNR reclamation standards | Same as Proposed Action | Same as Proposed Action | Major emphasis on restoring madrone forest |
| ***BUFFERS*** | | | | | |
| ***Adjacent Property Buffers*** | 50-foot vegetated buffers around perimeter of site | Same as No-Action | Same as No-Action | Same as No-Action | Same as No-Action |
| ***Shoreline Buffer*** | 200-foot shoreline buffer from ordinary high water mark of Puget Sound | Same as No-Action | Same as No-Action | Same as No-Action | Same as No-Action, also restore shoreline habitat |
| ***Stormwater Management*** | No stormwater pond constructed | A new stormwater pond would be constructed | Same as Proposed Action | Same as Proposed Action | Dispersed stormwater system, rather than centralized pond |
| * Numbers approximate. | | | | | |

## *Table S-2. Summary of Adverse Impacts*

| *Specific Adverse Environmental Impacts* | *Possible Mitigation* | *Intended Environmental Benefits* | *Unavoidable Adverse Impacts* |
|---|---|---|---|
| ***Chapter 3 – Air Quality*** | | | |
| ***Air Impact 1.*** Potential visible dust leaving the site when the operation is near the site edges. Possible insufficient inspection staff. | 1. Require air quality monitoring and reporting. | Identify and remediate problems early. | Conceivably occasional minor and temporary violations (e.g., a dust cloud leaving the site in a high wind). |
| ***Chapter 4 – Geology and Hydrogeology*** | | | |
| ***Geo/Hydro Impact 1.*** Altered recharge and drainage regime. | 1. Revise the mining plan by replacing the applicant-proposed pond with a multiple-point and upslope drainage plan. | Reduced alteration of recharge and drainage regime by more closely mimicking the existing infiltration plan onsite. | 1. Constructed drainage would cause some minor concentrations in recharge (i.e., more at collection points). |
| ***Geo/Hydro Impact 2.*** Greater peaks and lows in water table and potential intrusion into groundwater. | 2. Require direct measurement of groundwater as mining approaches final grade. Establish minimum 25-foot separation between mining and existing groundwater level. | Reduce the likelihood of aquifer intrusion. | 2. Localized peaks and troughs in the water table, but not sufficient to have any noticeable effect on wells. |
| ***Geo/Hydro Impact 3.*** Increased water use. | 3. Implement water conservation measures and consumption monitoring/reporting. Alternatives to using local water supply could be implemented. | Minimize water consumption. | 3. Dust control would require water consumption. |
| ***Geo/Hydro Impact 4.*** Spillage of fuel, oils, and liquids during equipment and vehicle refueling and maintenance. | 4. Create a designated fuel area to contain possible fuel spills. | Reduce the likelihood of pollutant spill, protecting water quality. | None. |
| ***Geo/Hydro Impact 5.*** Potentially unstable slopes could increase potential for landsliding. | 5. Perform slope stability calculations in developing final mine contouring and reclamation design. | Reduce the threat of slope failure and landsliding. | None. |

## *Table S-2. Continued*

| ***Specific Adverse Environmental Impacts*** | ***Possible Mitigation*** | ***Intended Environmental Benefits*** | ***Unavoidable Adverse Impacts*** |
|---|---|---|---|
| ***Chapter 5 – Terrestrial Plants and Animals*** | | | |
| ***Terrestrial Impact 1.*** Long-term loss of madrone forest. | 1a. Revegetate completed phases with madrone forest, rather than Douglas fir or hydroseeding. | Maintains madrone forest on the site and ensures restoration efforts. Reduces impacts on views and wildlife habitat (e.g., band-tailed pigeon). | With additional management and adjustments to the applicant's mining and reclamation, madrone forest should remain the dominant cover on the project site indefinitely, although the forest would take 50 years or more to mature and may never fully recover to preproject conditions.<br>Direct clearing of vegetation and long-term regrowth following mining cannot be avoided. Madrone forests could be replaced, although it would take several decades to approximate current conditions. |
| | 1b. Prohibit hydroseeding except where necessary to control erosion and use only native seed mixes. | Increases native vegetation cover. | |
| | 1c. Submit a Revegetation and Monitoring Plan for King County review and approval, and implement the plan. | Provides necessary details for permitting and design stage, assures effectiveness of reclamation plan and accountability for its implementation, and allows for corrective adaptation. | |
| | 1d. Monitor restoration to ensure that performance standards are being met. | Ensures compliance with performance standards. | |
| | 1e. Implement efficient monitoring and County review so as not to cause unnecessary delays that would unduly hinder project objectives (e.g., revegetation targets could be defined as part of the periodic review required for mining sites per KCC 21A.22.050). | Increases project efficiency, which ultimately increases speed with which mitigation efforts are implemented. | |

## *Table S-2. Continued*

| *Specific Adverse Environmental Impacts* | *Possible Mitigation* | *Intended Environmental Benefits* | *Unavoidable Adverse Impacts* |
|---|---|---|---|
| | 1f. Since mining would occur in phases, plan, implement, and monitor reclamation in phases (including both interim and final reclamation). | Consistent implementation of reclamation measures throughout the duration of the project. | |
| | 1g. Control Scot's broom and Himalayan blackberry to prevent them from invading cleared areas. | Prevents spread of invasive species and encourages maintenance of native vegetative cover. | |
| | 1h. Alter phased mining sequence so that highly disturbed shrubland ecosystems are mined early in the process, thus releasing these areas for revegetation to begin. Where possible, phase mining so that mining crosses each area only once. Where not possible, limit interim site stabilization measure to erosion control. | Hastens restoration efforts in highly disturbed shrubland ecosystems. Improves ecosystem recovery due to limited repetition of disturbance. Increases the amount of madrone forest on the site at any one time. | |
| | 1i. Create gentle undulations and mounds up to a few feet high to improve colonization and survivability of madrone seedlings. | Improves success of madrone restoration on the mine floor. | |
| | 1j. Establish minimum number of acres that must be maintained as madrone forest at any one time, using the specific performance standards developed in the Revegetation and Monitoring plan. | Prevents major time lag between impacts and mitigation. | |
| | 1k. Do not cut trees within buffer areas except in rare cases for hazard tree removal. Prune newly exposed Douglas-fir trees that provide important screening to reduce "sail" and associated vulnerability to blowdown. | Provides long-term protection of forested buffers, along with associated visual screening and dust control benefits. | Some increased blowdown of newly exposed Douglas-fir would be expected. |

## *Table S-2. Continued*

| *Specific Adverse Environmental Impacts* | *Possible Mitigation* | *Intended Environmental Benefits* | *Unavoidable Adverse Impacts* |
|---|---|---|---|
| | 1l. Increase buffer where practical based on existing topography and mining needs. Alternatively, increase standard buffer from 50 to 100 feet. | Reduces vulnerability of buffer forest trees to death and disease. | |
| | 1m. In buffer areas dominated by Himalayan blackberry, Scot's broom, or herbaceous weeds, remove vegetation and replant with native trees and shrubs characteristic of madrone forest. | Reduces populations of invasive species and promotes increased coverage by native species. Provides long-term protection of forested buffers, along with associated visual screening and dust control benefits. | |
| ***Terrestrial Impact 2.*** Loss of up to 139 acres of band-tailed pigeon habitat. | 2a. Retain a greater portion of the bluff, as described in Chapter 11 (Figure 11-8), to maintain an additional 9 acres of existing madrone forest. Retention of some or all of the mature madrone/Douglas-fir forest patch (Terrestrial Mitigation 3) would retain up to 36 additional acres. | Reduce habitat loss for band-tailed pigeons. | Band-tailed pigeon habitat would be reduced for several decades as mature madrone forest is removed. Restored areas have the potential to provide habitat within as little as 5 years, but would most likely require at least 20 years to provide good habitat. |
| | 2b. Restore madrone on reclaimed areas to gradually replace lost band-tailed pigeon habitat (per Terrestrial Mitigation 1). Madrone begin producing berries within 5 years. | | |

## *Table S-2. Continued*

| *Specific Adverse Environmental Impacts* | *Possible Mitigation* | *Intended Environmental Benefits* | *Unavoidable Adverse Impacts* |
|---|---|---|---|
| ***Terrestrial Impact 3.*** Loss of habitat for pileated woodpecker. | 3. Prior to clearing, conduct additional surveys to document actual pilieated woodpecker use of the 36-acre stand of mature mixed Douglas-fir forest on the northern part of the site. Set aside this area if used regularly for foraging and/or if used for nesting. Alternatively, establish habitat by planting Douglas-fir and placing snags on mined areas. Do not impact the existing 36 acres until replacement habitat is established. | Maintain habitat for pileated woodpeckers. | None. With placement of snags, pileated habitat could be preserved onsite. |
| ***Terrestrial Impact 4.*** Reduction in habitat meeting "Fish and Wildlife Habitat Conservation Area" criteria. | 4. Install a bald eagle perch pole along the shoreline. Also, protecting more of the bluff (per Chapter 11) and shoreline enhancement (per Chapter 11) would greatly offset this impact. | Increase hunting habitat for bald eagles. Appropriate perch trees are a limiting factor in bald eagle habitat. | Noise, activity, and forest clearing would cause unavoidable reductions in wildlife habitat, although mitigation measures for madrone forest and marine habitat provide good opportunities to benefit and protect the functioning of the area as fish and wildlife habitat. |
| ***Terrestrial Impact 5.*** Impacts due to herbicide use. | 5. Follow King County policies of Integrated Pest Management for public lands. | Offer additional protection to nontargeted plants and animals, as well as to ground water. | None. |
| ***Terrestrial Impact 6.*** Loss of red-tailed hawk foraging and potential nesting habitat. | 6. Place perch poles throughout site to improve hunting habitat. Place an artificial nest structure within a buffer area. | Improve habitat for red-tailed hawks. | None. |

## *Table S-2. Continued*

| ***Specific Adverse Environmental Impacts*** | ***Possible Mitigation*** | ***Intended Environmental Benefits*** | ***Unavoidable Adverse Impacts*** |
|---|---|---|---|
| ***Terrestrial Impact 7.*** Destruction of bird nests and/or eggs. | 7. Prohibit vegetation clearing between March 1 and July 15 of any given year. | Protect nesting and breeding wildlife. | Birds and other wildlife would be reduced. Individual animals would leave the site and some may perish. Effects would be limited to individuals on the site and would not significantly affect populations or protected species. |
| ***Chapter 6 – Marine Habitat and Fisheries*** | | | |
| ***Marine Impact 1.*** Repeated repairs of the dock would disturb marine sediments and inhibit recovery. The existing design creates more shade than more modern designs and materials would cause. | Option 1, element a. Replace the existing dock to meet the latest design and materials standards. | Eliminate the need for repeated disturbance in the nearshore area and allow the area to recover from physical damage. Results in most environmentally sound design and materials, thereby minimizing shading and "footprint." | Significant impacts can be avoided or compensated for. Some disturbance would be unavoidable during construction. The dock would still create shade and physical presence. |
| Displacement of fish and potential physical disturbance due to the relatively shallow loading area. | Option 1, element a (cont.) Extend dock up to 50 feet. | Protect shallow water, where biological communities are most diverse. Eliminate eelgrass shading from barges. | Significant impacts can be avoided or compensated for. An extended dock would be more visible than the existing dock. Rockfish, cod, and other sensitive species would be reduced or eliminated underneath and near the loading area, even though habitat could be compensated for through enhancement at other areas. |
| Creosote contamination from existing pilings. | Option 1, element b. Replace creosote pilings with non-contaminating material. Clean up creosote from sediments following removal of pilings. | Remove creosote contamination source from nearshore environment. | Some creosote would be released during piling removal but would quickly disperse. |

## *Table S-2. Continued*

| ***Specific Adverse Environmental Impacts*** | ***Possible Mitigation*** | ***Intended Environmental Benefits*** | ***Unavoidable Adverse Impacts*** |
|---|---|---|---|
| Shading of light-dependent nearshore biota by the dock structure. | Option 1, element c. Construct superstructure to allow as much light as possible to pass through. | Reduce shading associated with the dock. | Some shading is inevitable. Shading from a new design could be substantially less than shading from the existing dock. Shading would affect eelgrass over an area of about a few hundred square feet. This loss could be compensated for by planting eelgrass in other areas. |
| The dock would introduce physical structure that could interfere with nearshore movement, including fish passage, currents, and sediment transport. | Option 1, element d. Construct the minimum structure necessary for the intended function. Use steel or concrete to reduce the number of pilings needed by about half. | Reduce physical presence and influence of the dock. | Pilings could conceivably interfere with along-shore movements, but the overall affect would be moderate and less than existing conditions. |
| Sand and gravel would spill and potentially bury marine organisms. (see also Marine Impact 5). | Option 1, element e. Include a spill recovery system. | Reduce volume of potential gravel spillage associated with barge loading. | Some spillage may still occur and lead to changes in the species population structure around the new material. |
| Prop wash created due to maneuvering barges back and forth along the dock could affect nearshore sediments and organisms. (see also Marine Impact 4). | Option 1, element f. Include a “haul-back system”. | Reduce potential propwash associated with barge positioning. | Some propwash could still affect eelgrass. Planting eelgrass in other areas could compensate for impacted areas. |
| Potential physical disturbance to eelgrass during construction, and subsequent loss due to shading. | Option 1, element g. Prior to construction, identify, measure and mark eelgrass to avoid physical damage. | Avoid unnecessary damage to eelgrass and provide a mechanism to achieve no net loss of eelgrass habitat. | If damage to eelgrass occurs, there would be a lag between eelgrass loss and successful mitigation. |
| Lighting could affect marine creatures, some adversely some beneficially. | Option 1, element h. Install protective covering to minimize lighting of the water below the dock. | Avoid potential effects of unnatural light source on the behavior of plants and animals near the dock. | Lighting could be effectively reduced through screening. |

## *Table S-2. Continued*

| ***Specific Adverse Environmental Impacts*** | ***Possible Mitigation*** | ***Intended Environmental Benefits*** | ***Unavoidable Adverse Impacts*** |
|---|---|---|---|
| Removing piles would create temporary turbidity and sediment disturbance. | Option 1, element i. Use “vibratory extraction” method for pile removal. | Minimize turbidity and sediment disturbance during pile removal. | Some increased turbidity and sediment disturbance would occur but be limited to a relatively short time period and small area of disturbance around the base of the pilings. |
| Construction and repairs could disturb herring, surf smelt, and sand lance spawning. | Option 1, element j. Time construction and repair activities to avoid periods of herring, surf smelt, and sand lance spawning and salmon migration during any given year, as determined by King County (in consultation with WDFW and WDNR). | Avoid disturbance associated with construction during sensitive life-history phases of species of concern. | Individuals may still be present during construction activities and may temporarily avoid the site, however, direct harm from construction activities is unlikely. |
| Potential failure to follow mitigation measures on behalf of applicant and/or contractors working on behalf of the applicant. | Option 1, element k. Have independent environmental monitor(s) present during all construction activities. | Provide independent assessment and confirmation of implementation of mitigation measures. | |
| ***Marine Impact 1.*** Physical disturbance of marine sediments by dock repairs and shading and physical impacts related to dock design and location (Section 6.4.3). | Option 2. Same as Option 1, but without extending the dock. | Same as described above. | Impacts due to spilling, shading, and propwash would be greater than under option 1 because loading would occur closer to the sensitive shoreline area. |
| ***Marine Impact 1.*** Physical disturbance of marine sediments during dock repairs and shading and physical impacts related to dock design and location (Section 6.4.3). | Option 3. Replace dock stem. | Reduce shading, creosote contamination, and disturbance due to repairs within the nearshore environment. | Adverse impacts due to creosote, shading, and repairs would be greater than under options 1 and 2. |

## *Table S-2. Continued*

| *Specific Adverse Environmental Impacts* | *Possible Mitigation* | *Intended Environmental Benefits* | *Unavoidable Adverse Impacts* |
|---|---|---|---|
| ***Marine Impact 2.*** Reduction of eelgrass due to shading and/or physical impacts from barges and tugs. | 2a. Define and mark as "off-limit" to barges and tugs any sensitive areas, including all area between dolphins and shoreline, and the two shallow shelves, located 300 feet north and 200 feet south of the dock, respectively. | Limit the potential for shading and/or physical damage to current eelgrass beds as well as areas potentially suitable for eelgrass recolonization. | With avoidance, impacts would be moderate at most and potentially negligible. Habitat enhancement would also serve to offset this impact. |
| | 2b. Allow only one barge at the site at one time. Prohibit tugs and barges from tying up or otherwise being present along the dolphins. | Avoid shading and maneuvering impacts in areas away (north or south) from the immediate end of the dock. | The one barge and tug allowed would shade and/or physically impact the area immediately at the end of the dock. |
| Eelgrass may be lost, although since impacts are not direct, the specific amount of reduction cannot be predicted. | 2c. Create an eelgrass mitigation area of approximately 1,000 square feet (a greater area may be specified by WDFW). | Offset uncertainty regarding potential impacts to eelgrass from shading and physical impacts from tugs and barges, including propwash, spillage, and other mechanisms. | A lag time may exist between eelgrass disturbance and successful mitigation. |
| Potential ineffectiveness of mitigation. | 2d. Require mitigation plans to contain information required by WDFW for marine habitat mitigation. | Ensure better success of mitigation through proper design and analysis. | None. |
| ***Marine Impact 3.*** Reduction of marine life due to shading, noise, vibration, and visual disturbance from barges and tugs. | 3a. Restrict barge docking to one barge at a time (see Marine Impact 2). | Reduce the amount of shading and maneuvering due to barges at the site. | Loading and barging would create unavoidable noise and disturbance to the area immediately surrounding the dock. Marine life would leave the area and compete with others in occupied habitat. Affected species include sensitive species such as rockfish and lingcod. Creation of reef habitat would compensate for this loss, but the loss would occur nonetheless. |

## *Table S-2. Continued*

| Specific Adverse Environmental Impacts | Possible Mitigation | Intended Environmental Benefits | Unavoidable Adverse Impacts |
|---|---|---|---|
| | 3b. Replace, enhance, or provide substitute resources to compensate for habitat lost due to shading and disturbance. Habitat enhancement might include substrate enhancement, riparian/shoreline enhancement, and/or artificial reef habitat. | Replace habitat potentially degraded by shading and other disturbances from the project. Habitat enhancement should be located as close to the project area as possible. | A lag time may exist between habitat disturbance and completion of successful mitigation. |
| ***Marine Impact 4.*** Propwash scour of benthic sediments reducing or eliminating marine life and damaging eelgrass near the waterward end of dock. | 4a. Establish an approach and departure protocol with the following provisions:<br>Prohibit fully loaded 10,000-ton barges to be present at the dock during negative tides (tides lower than MLLW). | Prevent grounding of barges and damage to benthic marine life. | Barging activity would cause propwash scour of the benthic sediments near the waterward end of the dock. Although mitigation measure may serve to reduce this impact, marine life near the end of the dock would be reduced. |
| Propwash during departure. | 4a (cont.)<br>Require tugs to “back” the barge away from the dock. | Place the tug in deeper water away from the shoreline. In addition, propwash is dissipated by the barge which has a deeper draft. | |
| | 4a (cont.)<br>Use a “standing spring line” if weather does not permit “back away” (above). | Allow barges to be maneuvered away from the dock with significantly less thrust than otherwise required. | |
| Propwash from slowing down and speeding up barges. | 4a (cont.)<br>Define and require very slow approach and departure speeds. | Minimize propwash velocity and intensity while tugs and barges are near the dock. | |
| Propwash from tug propellers being directed toward shore. | 4a (cont.)<br>Prohibit tugs from directing propwash toward shore. Define exceptions and maximum throttle limits for those conditions. | Reduce propwash that may potentially disturb nearshore marine life and habitats. | |

## *Table S-2. Continued*

| *Specific Adverse Environmental Impacts* | *Possible Mitigation* | *Intended Environmental Benefits* | *Unavoidable Adverse Impacts* |
|---|---|---|---|
| Propwash from tug operators not knowing the sensitivity of the nearshore areas. | 4a (cont.)<br>Train, test, and certify tug operators in approach and departure protocols. Require annual recertification. | Eliminate impacts due to lack of knowledge or sensitivity among tug operators. | |
| Propwash from tugs maneuvering barges back and forth underneath the loading area. | 4b. Establish a "haul-back" system to eliminate the need to use tugs during loading. | Reduce the need for tugs and associated propwash during loading. | |
| ***Marine Impact 5.*** Spillage of sand and gravel in the loading area and along the conveyor system. | 5a. Install a windscreen on the overwater portions of the conveyor. | Reduce wind-blown spillage from the conveyor. | While some spillage would be inevitable, impacts would be limited to areas immediately adjacent to the existing loading area. Compensatory mitigation (see Marine Impact 3) would serve to offset this impact over time. |
| A movable boom provides more opportunities to spill, due to operator error. | 5b. Prohibit the use of a movable boom for loading. | Reduce the likelihood of spillage due to human error. | |
| Wind would blow some materials into the water. | 5c. Equip the discharge end of the conveyor with a "down spout". | Reduce the distance sand and gravel is uncontained and exposed to wind before landing in the barge. | |
| Filling barges to capacity would result in overspill of materials. | 5d. Restrict barge loading to 80% maximum capacity. | Avoid spillage due to overfilling of barges and allows more freeboard to secure load within barge. | |
| Operators may be unaware of procedures that result in spills, and spills may be detected later, but the cause would remain unknown. Workers may not feel accountable for spills, and thereby may be less diligent in preventing spills. | 5e. Establish video monitoring of loading operations to identify spillage or potential spillage. | Allow verification of compliance with and assess efficacy of protective measures. | |

## *Table S-2. Continued*

| *Specific Adverse Environmental Impacts* | *Possible Mitigation* | *Intended Environmental Benefits* | *Unavoidable Adverse Impacts* |
|---|---|---|---|
| Spills may be undetected. | 5f. Conduct quarterly dive surveys to identify spillage during first year and if spillage is found to be limited reassess annually. | Identify and quantify spillage that occurs during loading, and, most importantly, identify need to alter procedures to avoid subsequent spills. | |
| Workers may sweep spilled materials into the water, since it would be much easier. | 5g. Prohibit washing or sweeping of spilled materials from dock into water. | Reduce additional contribution to spillage from "cleaning" activities. | |
| Workers may spill sand from the spill tray. | 5h. Establish a protocol to prevent spillage during cleaning of spill tray. | Reduces additional contribution to spillage from "cleaning" activities. | |
| ***Marine Impact 6.*** Geoduck harvesting conflicts. | 6. Establish an access agreement among the Applicant, WDNR, and Puyallup Tribes. | Prevent interference with harvesting of geoducks by the tribes or state licensee. | None. Interference with geoduck harvest would be avoided. |
| ***Marine Impact 7.*** Potential adverse effects on Puget Sound chinook salmon, including startling or otherwise altered behavior of juvenile salmon. | 7a. Restore the riparian zone by replanting with native vegetation and stabilizing soils within 300 feet of the shoreline. | Compensate for potential disturbance and habitat loss. | The behavior of individual salmon may be altered due to noise. Eelgrass loss and noise could cause a minor reduction in available salmon foraging habitat at the site. The overall effect, with mitigation, would be minimal. No substantial reduction in salmon survival at the site is likely. Shoreline habitat enhancement would provide long-term benefits. |
| | 7b. Implement design considerations per King County policies and guidelines, as revised in response to the listing of Puget Sound chinook salmon. | Ensure use of best available science in design recommendations for protection of chinook salmon. | |

## *Table S-2. Continued*

| *Specific Adverse Environmental Impacts* | *Possible Mitigation* | *Intended Environmental Benefits* | *Unavoidable Adverse Impacts* |
|---|---|---|---|
| ***Marine Impact 8.*** Potential adverse impacts on forage fish (herring, surf smelt, and sand lance). | 8. Establish additional eelgrass (see Marine Impact 2 above). | Provide substrate for herring spawning and habitat for herring, surf smelt, and sand lance. | Noise may make individual herring not select the site for spawning. The site is not a major spawning area but it is used, at least in some years. Herring or other species that would have spawned at the site would likely spawn in other locations, which could reduce spawning success at those other locations due to inferior conditions and/or competition from other spawning individuals. |
| ***Chapter 7 – Noise*** | | | |
| ***Noise Impact 1.*** Increased noise perceived by neighbors as annoying or disruptive. | 1a. Employ radar-based backup warning systems on all heavy equipment. | Reduce noise, as alarm would sound only upon threat of collision (rather than sounding continuously whenever equipment is moving backward). | People could hear noise from mining equipment and other activities on the site. |
| | 1b. Engage the services of an independent consultant to monitor noise levels produced, reporting such findings to King County to ensure compliance with noise standards. | Detect and remediate violations of noise standard. | |
| | 1c. Establish an advisory committee to monitor and evaluate complaints relating to the project. | Allow onsite operations to be modified appropriately if significant or consistent complaints are observed. | |
| | 1d. Expand site buffer along eastern and western perimeter to reduce noise and increase screening provided by topography. | Reduce noise and visual impacts. | |

## *Table S-2. Continued*

| ***Specific Adverse Environmental Impacts*** | ***Possible Mitigation*** | ***Intended Environmental Benefits*** | ***Unavoidable Adverse Impacts*** |
|---|---|---|---|
| ***Chapter 8 – Transportation*** | | | |
| ***Transportation Impact 1.*** Increased risk of interference or hazard due to unannounced barge departure and arrival. | 1. Require normal reporting of arrival/departure activities under the Puget Sound Vessel Traffic Service for all tugs serving the dock. | Reduce risk of interference or hazard that could result in collisions or spills. | None expected. |
| ***Chapter 9 – Land and Shoreline Use*** | | | |
| ***LU Impact 1.*** Potential conflict with residential uses. | 1. Increase vegetated perimeter at selected locations to reduce potential conflicts with or disturbances to adjacent residences. | Reduce adverse impacts on adjacent residential land uses. | Although noise, visual, and access changes would occur, such impacts would be in compliance with existing land use law, especially in light of the current zoning of the site. |
| ***Chapter 10 – Environmental Health and Safety*** | | | |
| ***Health Impact 1.*** Risk of arsenic leaving the site as dust during soil extraction and containment procedures. | 1a. Clear and collect contaminated soils in manageable phases. | Reduce health risks associated with the release of arsenic-contaminated dust into the air. | None. |
| | 1b. Cover contaminated soils while temporarily stockpiling or transporting them to containment cells. | Same as 1a. | |
| | 1c. Place temporary covers over contaminated material within containment cells prior to final sealing of the cell. | Same as 1a. | |
| ***Health Impact 2.*** Arsenic in soils within the containment cells could be mobilized in the event the bottom liner or cover fails. | 2a. Use "linear low-density polyethylene" geo-membranes to line and cover containment cells. | Reduce health risks associated with the release of arsenic contamination into the air or water. | None. |
| | 2b. Use additional sand in the cell liner and cover. | Same as 2a. | |

## *Table S-2. Continued*

| *Specific Adverse Environmental Impacts* | *Possible Mitigation* | *Intended Environmental Benefits* | *Unavoidable Adverse Impacts* |
|---|---|---|---|
| | 2c. Construct a 3-foot or greater berm at the tow of the cell. | Same as 2a. | |
| | 2d. Design cover system to ensure that it does not fail, causing off-site erosion. | Same as 2a. | |
| | 2e. Revise site grading plan to eliminate direct-runoff pathway to Puget Sound at the cell's east end. | Same as 2a. | |
| ***Health Impact 3.*** Placement of the containment cell in the northern edge of the property may result in instability of the sea bluff due to the extra weight along the top of a sensitive slope. Normal erosion and retreat of the top of the slope could undermine the containment cell causing an uncontrolled release of soil with elevated concentrations of metals. | 3. Place containment cell to minimize adverse effects based on the final design specifications for the mine. Specify the location and final placement of the cell in the CAP. | Reduce chance of erosion or slope failure due to containment cell placement. | None. |
| ***Health Impact 4.*** Placement of an impermeable liner and cover above and below the containment cell could trap methane gas that would be generated naturally from organic matter in the soil. | 4. Create a provision for collecting and venting gases and install a methane-collection system in the containment cell. | Reduce chance of fire or explosion resulting from excessive amounts of trapped methane or other flammable gases. | None. |
| ***Chapter 11 – Light, Glare, and Aesthetics*** | | | |
| ***Visual Impact 1.*** Change in overall visual character of the site. | 1a. Restore forest wherever possible (see Chapter 5 mitigation measures). | Reduce visual impacts associated with project activities. | Increased mining would produce obvious changes in topography and overall visual character of the site. |
| | 1b. To provide a more natural appearance, contour slopes with undulating terracing, rather than traditional linear terracing. | Same as 1a. | |

## *Table S-2. Continued*

| *Specific Adverse Environmental Impacts* | *Possible Mitigation* | *Intended Environmental Benefits* | *Unavoidable Adverse Impacts* |
|---|---|---|---|
| | 1c. Increase the buffers at the western and eastern corners of the property to increase screening and reduce the visual presence of the operation to the Gold Beach and Sandy Shores Communities. | Same as 1a. | |
| ***Chapter 12 – Recreation*** | | | |
| ***Recreation Impact 1.*** Reduced opportunities for unauthorized, informal recreation at the site. Potential safety hazards to people entering the site. | 1a. Establish secure access points for public use of non-active portions of the site and beach. | | |
| | 1b. Work with the County and community to identify potential public uses. | Maintain informal recreational opportunities. | Reduced public access. |

*Chapter 1*

# Project Purpose and Background

# Chapter 1

# Project Purpose and Background

## 1.1 Introduction

### 1.1.1 Why a Decision is Needed

Glacier Northwest, a sand and gravel company with headquarters in Seattle, Washington, has submitted a grading permit application to King County. The application includes a proposal to significantly increase mining over current levels at its 235-acre Maury Island sand and gravel mine. The site is on Maury Island, adjacent to Vashon Island, in King County, Washington. King County issued a Determination of Significance (DS) for the proposal on August 11, 1998, based on its review of the project grading plan and environmental checklist dated May 1998 (this checklist is available for review at the Vashon Library). The DS documented the County's determination that significant environmental impacts could result from the proposal and an Environmental Impact Statement (EIS) is required. This EIS is being prepared to meet the requirements of the State Environmental Policy Act (SEPA), per Washington Administrative Code (WAC), Chapter 197-11 and King County Code (KCC) 20.44.

#### *1.1.1.1 Decision to Be Made*

The King County Department of Development and Environmental Services (DDES) must decide whether to deny, approve, or approve with conditions a grading permit for the mining operation, as proposed by Glacier Northwest and described in Chapter 2. In addition, a Shoreline Substantial Development Permit (SSDP) will also be required.

DDES's authority to make decisions regarding the proposed mining operation stems from King County Code, as well as its substantive authority under SEPA (WAC 197-11-660). DDES's mission is "to serve, educate and protect our community through the implementation of King County's development and environmental regulations." This Final Environmental Impact

Statement (FEIS) is one of the major tools DDES will use to achieve this mission for this project.

#### *1.1.1.2 Scope of Decision and Relation to Other Projects*

This EIS considers the specific impacts directly attributable to the Applicant's proposal to mine materials and barge them off the site. The EIS does not consider or evaluate site-specific impacts of off-loading and eventual use of materials. King County's decision to approve, deny, or approve with conditions the proposal does not pertain to off-loading, off-island trucking, or any other activity by the Applicant that occurs offsite.

King County has determined that the SeaTac expansion project and other potential markets for the material do not meet the criteria for evaluation in the same environmental document. The SeaTac proposal, or any other construction project, is not dependent on the Maury Island proposal. While these projects may eventually use product from the Maury Island site, they are not justified by the Maury Island proposal, and they are not dependent on it for their existence.

Likewise, the Maury Island proposal is not dependent on the SeaTac project, or on any other specific project, for its justification. While the Applicant has indicated a desire to secure that large potential contract, they have indicated that they wish to revise the permit on the mining site regardless of whether they would or would not receive that contract.

Consideration of other potential sites for mining is outside of the scope of the EIS. Per WAC 197-11-440, EIS Contents, "*when a proposal is for a private project on a specific site, the lead agency shall be required to evaluate only the 'no action' alternative plus other reasonable alternatives for achieving the proposal's objective on the same site*."

As stated in Section 1.2.1, King County DDES has no objectives for this project other than to (1) comply with SEPA, (2) adhere to its legal responsibilities to ensure a fair and reasoned decision regarding the Applicant's proposal, and (3) implement the DDES's mission "*to serve, educate and protect our community through the implementation of King County's development and environmental regulations*."

The DDES decision is not a broad one. For instance, DDES is not trying to determine how to acquire mineral resources. The decision is narrow. It is restricted to evaluating the Applicant's proposal and to implementing King County regulations and policies to protect the community and the environment. The scope of this EIS reflects this scope of the decision.

## 1.1.2 The SEPA Process

### *1.1.2.1 SEPA History of the Project*

On August 11, 1998, King County DDES determined that the Applicant's proposed mining plan required an EIS under SEPA before a grading permit application could be processed. King County selected Jones & Stokes as the EIS consultant in late September 1998.

King County issued a Draft Environmental Impact Statement (DEIS) on July 21, 1999. The DEIS was made available for public comment using an extended 60-day comment period, which ended September 21, 1999. During the comment period, King County received hundreds of letters and e-mails totaling more than 750 pages of comments from individuals, organizations, and agencies.

On September 14, 1999, King County held a public meeting in coordination with the Vashon Community Council at Chautauqua Elementary School on Vashon Island. During that meeting over 100 pages of testimony was received (see King County's web page at http://www.metrokc.gov for all comments received). More than 1,600 people attended, making it one of the most well attended hearings on a DEIS ever in King County.

Since the close of comments, King County and its consultant have spent considerable effort to respond to public comments. The comment/response process has been followed as required under SEPA (WAC 197-11-560).

### *1.1.2.2 Major Changes Between the Draft and Final EIS*

The public and agency comments received on the DEIS brought up many additional issues that the EIS Team used to improve the FEIS. Major changes and types of changes made to the EIS fall into four main groups.

**Modified Alternatives.** The Proposed Action remains unchanged from the DEIS. However, King County developed and added numerous mitigation measures to address public and agency concerns. Most notably, the FEIS describes and evaluates an option to replace the existing creosote-treated wooden dock with a new dock, and explains the rationale behind that option. In addition, the FEIS evaluates the option of moving the loading area into deeper water by extending the dock.

**Develop and Evaluate Alternatives not Previously Given Detailed Consideration by the Agency.** Many new mitigation measures were developed to better address adverse environmental impacts. In particular, additional measures are presented that could protect marine habitat, salmon, madrone forest, and sensitive wildlife species. Key new measures include protection of a section of madrone forest to protect band-tailed pigeon and pileated woodpecker habitat (see Chapter 5). The decision-maker may apply some or all of these as conditions, or developed additional conditions, per SEPA substantive authority.

**Supplement, Improve, or Modify the Analysis.** The analysis has been greatly improved and modified for terrestrial and marine impacts (Chapters 5 and 6). The analysis has been supplemented in many other places in the EIS. In addition, information that was not available at the time the DEIS was published has been factored into the analysis, including:

- the Jones & Stokes eelgrass survey;
- the Washington Department of Ecology (Ecology) marine study;
- newsletters from the Ecology groundwater study;
- data from ongoing well monitoring; and
- three independent engineering studies evaluating the dock and necessary repairs.

**Make Factual Corrections.** Many comments pointed out errors on tables and in text. These have been corrected, as noted in Responses to Comments (Volumes 5 and 6 of the FEIS).

**What happens next?** A decision will not immediately follow the FEIS. Per King County Code, King County cannot issue a grading permit until all other government approvals have been made (see Section 1.2.3 for a list of pending approvals). Major approvals that will be required center on the dock, and include a Washington Department of Natural Resources (WDNR) lease agreement, a Washington Department of Fish and Wildlife (WDFW) Hydraulic Project Approval (HPA), U.S Army Corps of

Engineers (Corps) permitting under Section 10 of the Rivers and Harbors Act, and a Section 404 Permit under the Clean Water Act. In addition, King County must make a determination for an SSDP under the County's Shoreline Master Program.

After these approvals, King County DDES staff will submit staff recommendations to the DDES Director. The Director then, in consultation with staff and others, makes the decision to approve, approve with conditions, or deny the proposal. At the conclusion of these processes, the permit is either denied or issued.

### 1.1.3 Who is Preparing this EIS and Making the Decision

King County DDES is the lead agency under SEPA.

Jones & Stokes, an environmental consulting firm, is responsible for conducting and documenting the environmental analysis for this EIS. They are acting as a third-party reviewer, which means that they work for and under the direction of King County, rather than for the Applicant.

## 1.2 Overview of Applicant's Proposal

The King County Comprehensive Plan designates the property as a mining site and Glacier Northwest is currently permitted to extract sand and gravel from the site. However, for the past 20 years, the site has been mined at relatively low levels to supply local markets on Vashon and Maury Islands (between 10,000 and 20,000 tons per year). Prior to that time, offsite barge deliveries to sites such as Indian Island and various piers within the Port of Seattle waterfront had resulted in annual mineral extraction levels as high as approximately 1.3 million cubic yards (1.8 million tons).

### 1.2.1 Applicant's Objectives

The Applicant's objectives are:

- to provide prompt and economical delivery of minerals to many customers;
- to be able to respond quickly to large projects for a variety of clients—the "third-runway" project is by far the largest project in the near future, and the Applicant clearly desires to sell

product from the Maury Island site to the Port of Seattle for the proposed SeaTac airport third runway;

- to develop a long-term, productive, and profitable site to provide structural fills and other products related to sand and gravel; and
- to maximize mineral extraction, consistent with legal requirements for environmental protection.

The project is a private project, so the project objectives are those of the Applicant, and not King County. King County DDES has no other objectives than to:

1. comply with SEPA;
2. adhere to its legal responsibilities to ensure a fair and reasoned decision regarding the Applicant’s proposal; and
3. implement the DDES mission “to serve, educate and protect our community through the implementation of King County's development and environmental regulations.”

To meet these objectives, DDES has prepared this EIS and will consider the environmental impacts of the project, as well as reasonable alternatives that could feasibly attain or approximate the Applicant’s objectives, but at a lower environmental cost or decreased level of environmental degradation. These considerations will be factored into the decision, according to King County’s substantive authority under SEPA (WAC 197-11-660).

### 1.2.2 Applicant’s Proposal

The Applicant proposes to convert the existing low-production site into a major, barge-based provider of minerals. To do this, they wish to be able to extract up to 7.5 million tons per year (5.5 million cubic yards), or about six times more than peak historic levels of the 1970s, the last time barging took place at the site.

Major elements of the proposal are:

- mining 193 acres over the life of the mine;
- up to 20 trucks per day for local deliveries (average would be lower);

- barging almost all mined materials to offloading facilities;
- using a belt conveyor system to move materials to barges;
- mining Monday through Friday from 6 a.m. to 10 p.m., and Saturday from 9 a.m. to 6 p.m.;
- loading barges at any time, 24 hours, 7 days per week (could be continuous for major projects);
- cleaning up arsenic and other metals within mining areas, and containing contaminated soils onsite in an enclosed berm;
- ramping up and slowing down production rates based on sales (periods of low activity expected); and
- mining between 11 and 50 years, depending on demand.

### 1.2.3 Other Permits Required for the Applicant's Proposal

The Applicant also wishes to revise and upgrade its existing Surface Mining Reclamation Permit, which was issued by the WDNR, in accordance with the 1993 amendments to the state's Surface Mining Act [Revised Code of Washington (RCW) Chapter 78.44]. The Act recognizes that, while surface mining is an essential activity, thorough reclamation of mined lands is necessary to prevent damage to the environment. Glacier Northwest has submitted a preliminary reclamation plan to WDNR, according to the requirements of the Surface Mining Act.

The U.S. Army Corps of Engineers has indicated that an individual permit would be required for repair of the dock, under Section 10 of the Rivers and Harbors Act.

U.S. Army Corps of Engineers consultation with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) would be required to comply with Section 7 of the Endangered Species Act (ESA).

King County has determined that this proposal requires an SSDP.

Per King County Code, Chapter 16.82.060, "no grading permit shall be issued until approved by federal, state, and local jurisdiction by laws or regulations." Therefore, the Applicant would be required to document compliance with all applicable permits and regulations prior to initiating mining at the site. The most likely applicable permits and regulations include:

- Shorelines Substantial Development Permit;
- Surface Mining Reclamation Permit (WDNR);
- WDNR Aquatic Lands Lease;
- Endangered Species Act Section 7 Conservation;
- National Pollutant Discharge Elimination System (NPDES) Permit for stormwater during construction;
- Hydraulic Project Approval;
- Notice of Construction Permit from the Puget Sound Clean Air Agency (PSCAA);
- Model Toxic Control Act (MTCA) compliance;
- Water Rights Permit; and
- various building permits for fences and structures.

Please note that this list is presented for public information and disclosure. Some of these permits may not be required, while others not on this list may be.

### 1.2.4 Existing Permits

Mining on the site is currently conducted under a Grading Permit from King County, Permit No. 1128-714 (April 1997), and a Surface Mining Reclamation Permit from the WDNR, Permit No. 70-010256 (1971). Current operations are also covered by a Determination of Non-Significance issued by King County in 1977. These approvals, along with an Aquatic Lands Lease from WDNR, permit mining, processing, and reclamation activity on approximately 193 acres of the 235-acre site.

Decisions and conditions regarding the grading permit will override the existing permit.

### 1.2.5 How Mitigation is Addressed in this EIS

#### *1.2.5.1 Legal Framework*

SEPA can directly affect on-the-ground actions through conditions applied as part of the decision. Any governmental action on public or private proposals that are not exempt from SEPA may be conditioned or denied to mitigate adverse environmental impacts. SEPA requires that:

1. mitigation measures be based on policies, plans, rules, or regulations formally designated by the agency related to specific, adverse environmental impacts clearly identified in an environmental document, and

2. mitigation be reasonable and capable of being accomplished.

This EIS documents this SEPA requirement by listing the specific impact, followed by the alternative/mitigation measure to reduce the impact, followed by the Regulatory/Policy basis for the condition.

Note that the EIS need not evaluate or define mitigation measures in detail, but only so far that their effectiveness and reasonableness can be determined. A "reasonable" alternative (or mitigation measure) means an action that could feasibly attain or approximate a proposal's objectives but at a lower environmental cost or decreased level of environmental degradation. (WAC 197-11-786).

In addition, mitigation measures must be in proportion to the impact caused by the project, as defined in the FEIS. Mitigation cannot be required for impacts not attributed to the project, although the Applicant can voluntarily commit to additional mitigation.

If the proposal would be likely to result in significant adverse environmental impacts identified in a final or supplemental environmental impact statement, and reasonable mitigation measures are insufficient to mitigate the identified impact, then a proposal may be denied under SEPA.

Mitigation includes measures to reduce or avoid a particular environmental impact.

#### 1.2.5.2 Types of Mitigation

Mitigation can occur in several ways, including:

- *Avoiding the impact* by not taking a certain action;
- *Minimizing the impact* by limiting the project, using technology, or taking affirmative steps to avoid or reduce impacts;
- *Rectifying the impact* by repairing, rehabilitating, or restoring the affected environment;
- *Reducing or eliminating the impact over time* by preservation and maintenance operations during the life of the action;
- *Compensating for the impact* by replacing, enhancing, or providing substitute resources or environments; and/or
- *Monitoring the impact and taking appropriate corrective measures*.

**Alternatives 1 and 2 as Mitigation.** In this EIS, four forms of mitigation are evaluated. First, the two action alternatives evaluated in the EIS examine lower levels of barging to determine how such reductions might mitigate adverse effects of the proposal. These alternatives were developed in response to public comment and internal evaluation of the proposal, as King County was determining the scope of the EIS.

**Applicant-Proposed and Legally Required Environmental Measures.** The second and third types of mitigation evaluated in this EIS are already assumed to be applied to the project and were factored in to the environmental analysis of each alternative. These two types of measures include (1) those which the Applicant has already proposed in response to known environmental issues regarding mining at the project site, and (2) those which are standard requirements of existing regulations, such as requirements stipulated by the King County Code. Collectively, these two types of mitigation measures are described in each chapter of this EIS as “Measures Already Proposed by the Applicant or Required by Regulation.”

**Potential Additional Measures and Alternatives.** The fourth and final type of mitigation includes potential measures which may be applied to the Grading Permit by King County through the County's discretionary authority under SEPA. These measures were not factored in to the impact analysis but were developed following the analysis to identify possible ways to reduce impacts or public concerns. These measures are neither required nor proposed by the Applicant, but are presented for the consideration of the public, the regulatory agencies, and King County. King County may require some or all of these measures, or may require additional measures based on their review and on public and agency comments. These potential measures are described in each chapter of this FEIS as "Additional Measures."

## 1.3 Existing Site Characteristics

The roughly 235-acre site proposed for continued mining activities is located in portions of Sections 28 and 29, Township 22N, Range 3E, on the eastern edge of Maury Island next to Vashon Island and along the East Passage in Puget Sound (Figures 1-1 through 1-5).

The following sections describe the property being proposed for mining. Additional details about site conditions are provided in the first sections of Chapters 3 through 12.

### 1.3.1 Geology/Mineral Resources

The site contains mostly sand and some gravel in a deposit referred to as Vashon Advance Outwash. These deposits make ideal structural fill for construction projects. It is estimated that the site contains a Vashon Advance Outwash deposit of approximately 85 million tons. This is equivalent to 63 million cubic yards.

### 1.3.2 Topography

The site generally slopes from northwest to southeast toward Puget Sound (Figure 1-5). The upland northern, western, and southwestern portions of the site are generally rolling with slope gradients ranging from approximately 5 to 20 percent. From these upland portions of the site, topography drops sharply to form bluffs with slope gradients ranging from approximately 60 to 100 percent. Two excavations (mining pits) from historic mining activities are present along the bluffs. These areas total 40 acres of disturbed area, of which 9 acres are currently being mined. Slopes along excavated areas range from about 60 percent to near vertical. Total elevation change across the site is about 360 feet.

### 1.3.3 Vegetation

Mature madrone forest covers most of the site. The site contains several upland plant communities, including mixed madrone/Douglas-fir forests, madrone woodlands, mixed alder and willow thickets, mixed grasses, and shrubs. The site also contains approximately 9 acres of bare ground related to the current mining operation and 33 acres of previously mined areas. Portions of the previously mined areas now have vegetation growing on them, much of which is Scot's broom and other non-native or weedy species. No wetland vegetation is located on the site. Patches of eelgrass are present landward of the barge loading dock.

### 1.3.4 Land Use Designations and Zoning

The site is designated "Mining" on the 1994 King County Comprehensive Plan Land Use Map, and is also identified as a "Designated Mineral Resources Site" on the 1994 King County Comprehensive Plan Mineral Resources Map. The site is currently zoned Mineral Resources (M) (potential RA-2.5) by the King County Zoning Code (Title 21A).

### 1.3.5 Site Access and Utilities

Access to the site is provided from two private driveways from Southwest 260th Street (Figure 1-5). Both driveways connect to the shoreline, but the driveway on the northeastern side of the site is in the best condition.

Electricity is available to power the portable equipment that has been used occasionally on the site. No other utilities, including water or sewer, serve the site.

## 1.4 Past and Current Mining Activity

Approximately 42 acres of the site has been disturbed by previous mining activities, approximately 9 acres of which has been worked in the past 5 years. The intensity of mining at the site has varied according to market conditions.

Sand and gravel have been mined from the site since the 1940s. Glacier Northwest, or its predecessors, has been mining the site since the late 1960s, with some relatively intense periods of mining in the early 1970s to provide fill for major construction projects, such as Terminal 37 and Piers 25, 86, and 115 of the Port of Seattle.

In 1971, the site (then owned by Pioneer Sand & Gravel) was the largest of four gravel pits on the southeastern coast of Maury Island. Over 4 million cubic yards of fill were extracted from the site for the construction of shipping piers and terminals along the Seattle waterfront and at Indian Island. Annual extraction levels were as high as 1.3 million cubic yards. During these past operations, bulldozers were used to push the sand and gravel downslope, into a series of tunnels and conveyor belts, and then onto barges (similar to the operations now being proposed) (Port of Seattle 1971).

Barging has not taken place at the site for over 20 years.

## 1.5 Citations

Port of Seattle. 1971. Sand and gravel play major role in construction. Port of Seattle Reporter. July.

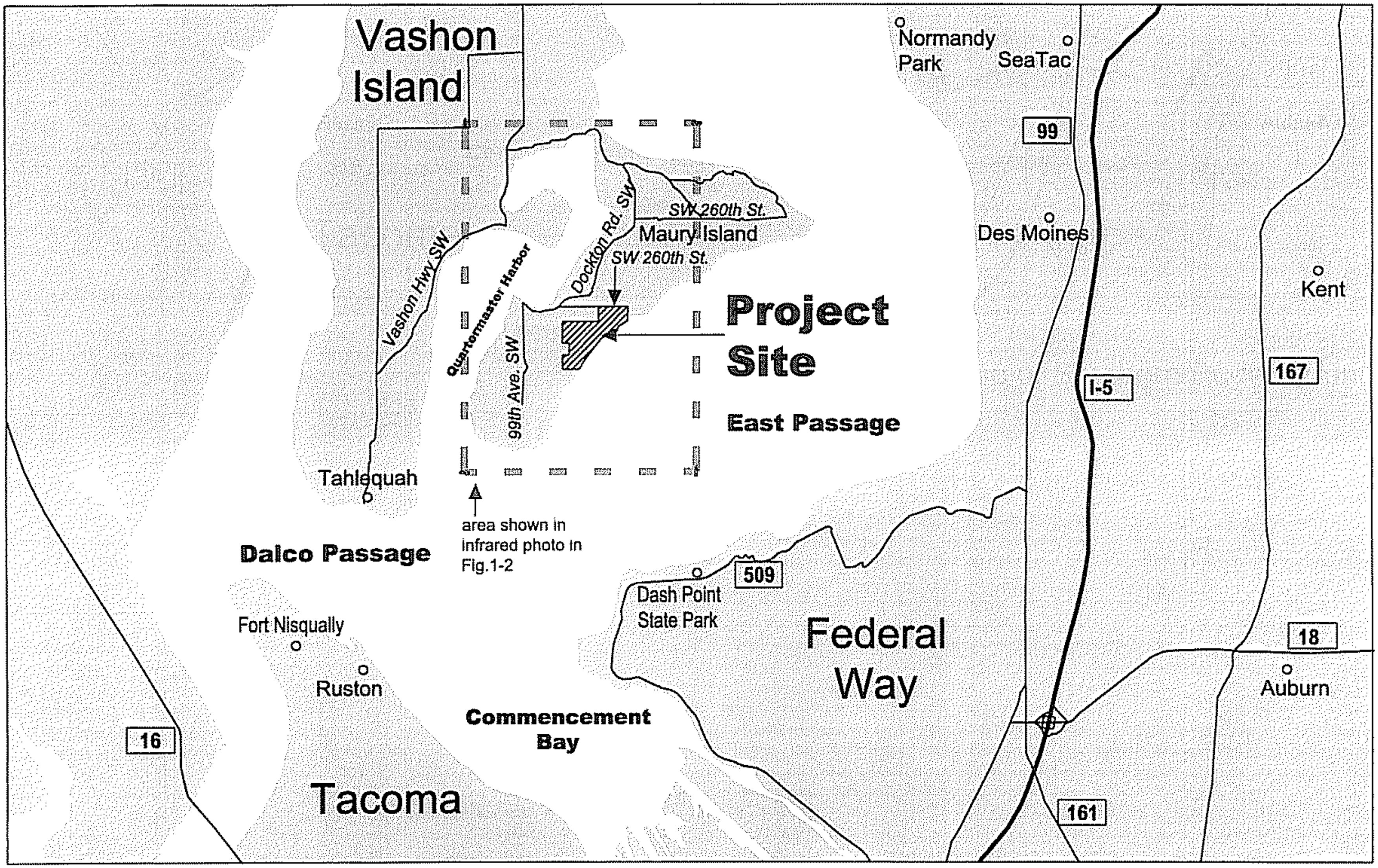


Figure 1-1. Vicinity Map of Southern Puget Sound

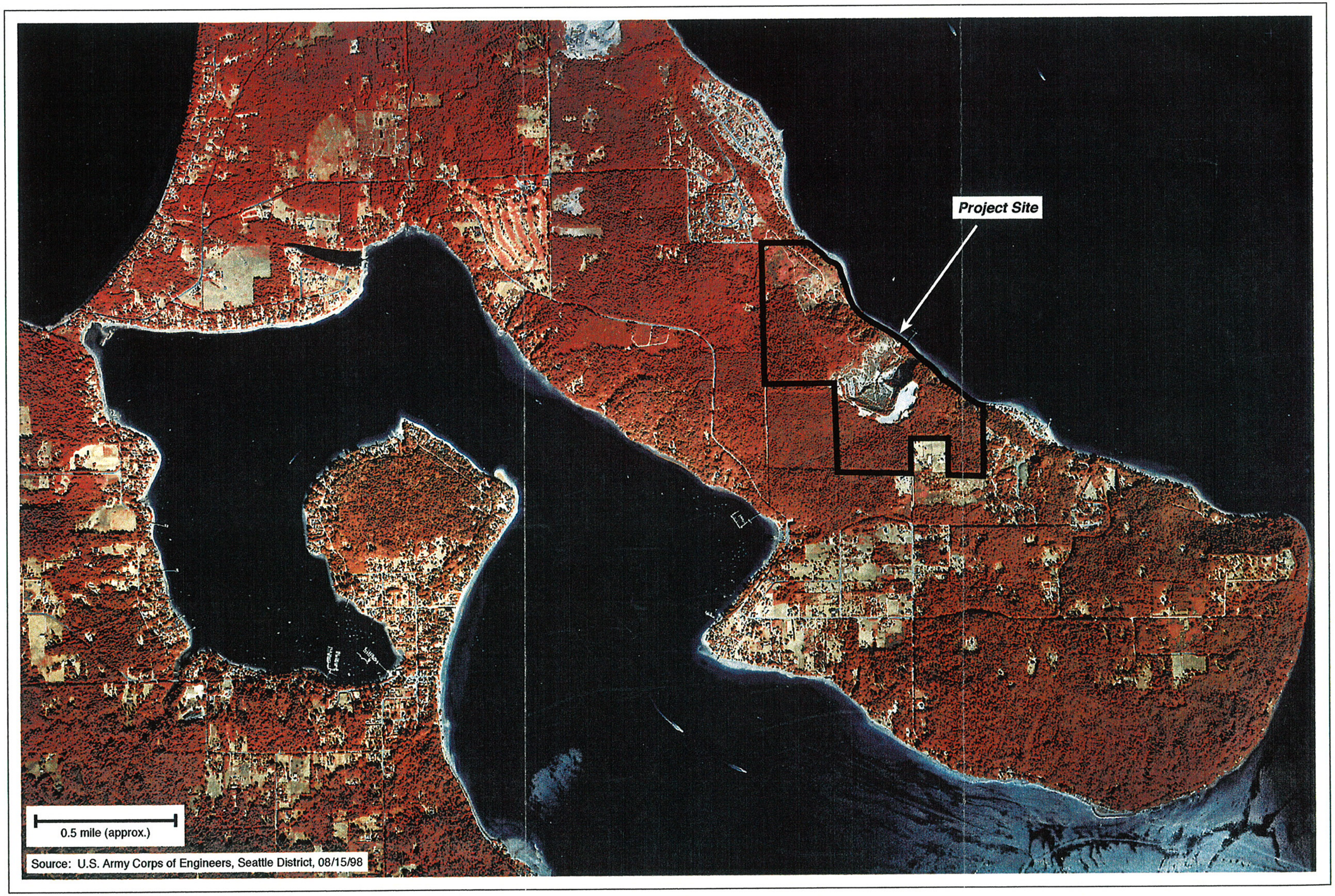


Figure 1-2. Aerial Infrared Photograph of Maury Island and Vicinity

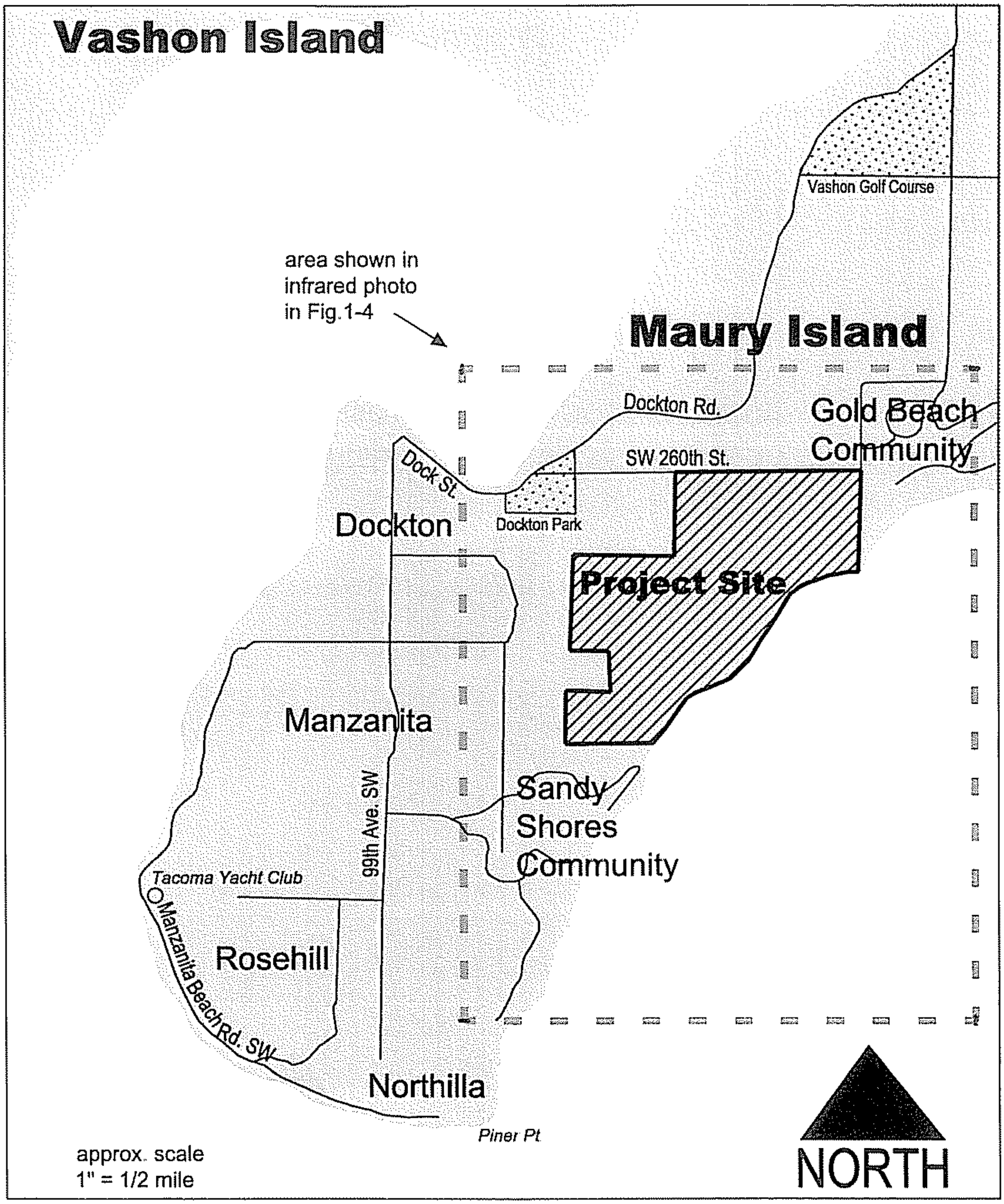


Figure 1-3. Vicinity Map of Maury Island

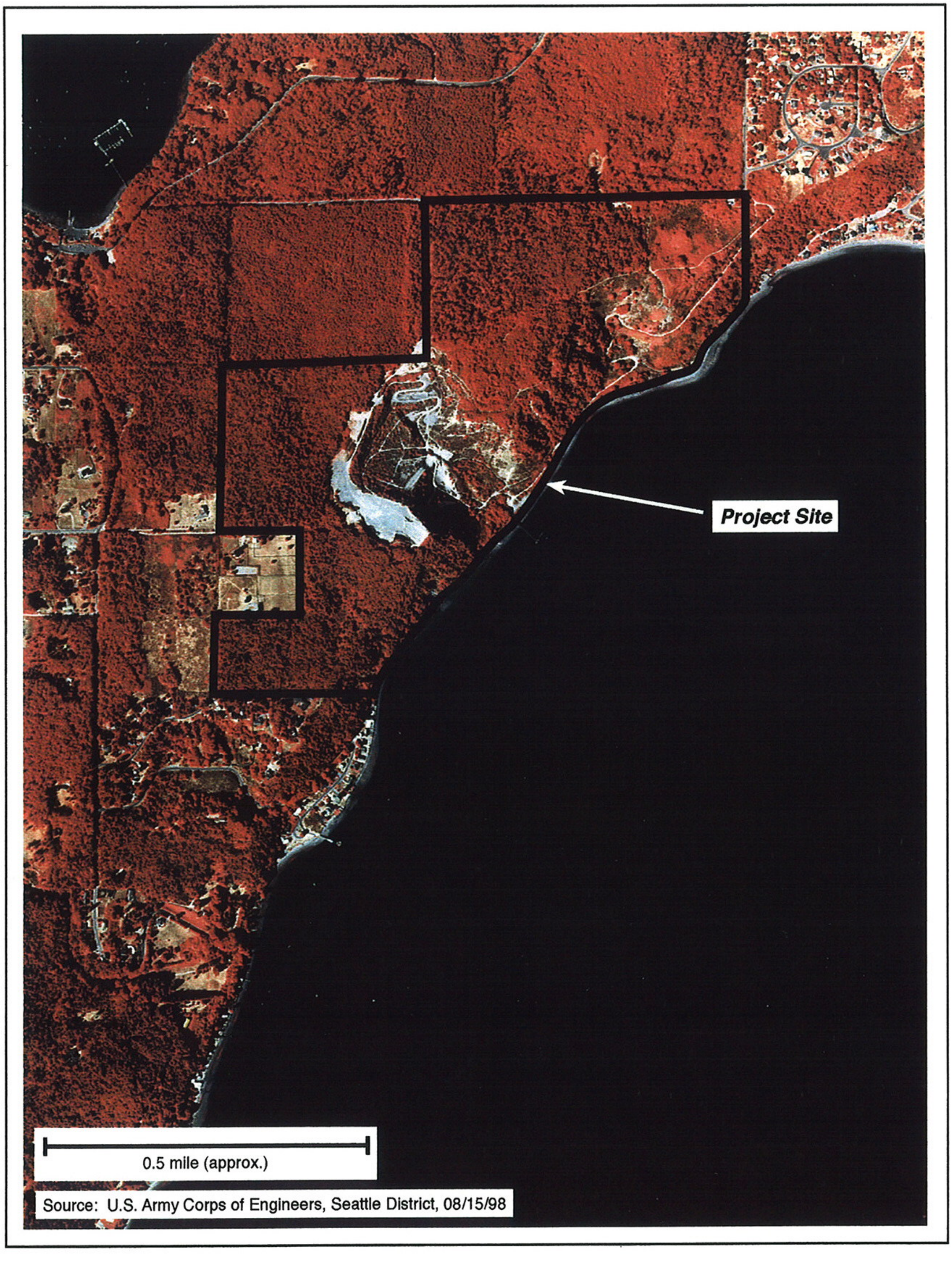


Figure 1-4. Closeup Aerial Infrared Photograph of Project Site and Vicinity

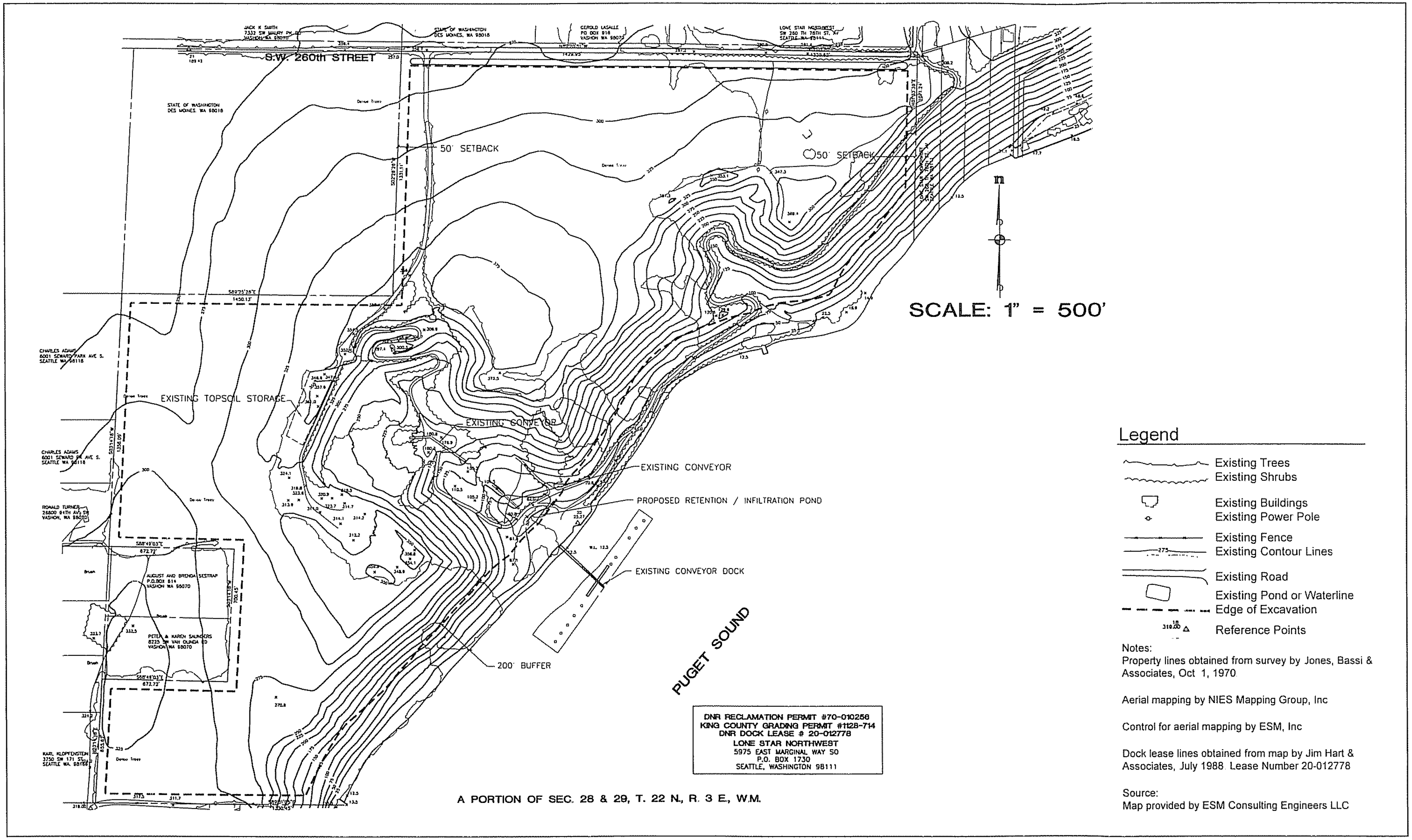


Figure 1-5. Existing Site Conditions

# *Chapter 2*

# Description of Proposed Action and Alternatives

*Chapter 2*

# Description of Proposed Action and Alternatives

## 2.1 Introduction

As described in Chapter 1, Glacier Northwest wishes to increase its maximum production rate at Maury Island from roughly 10,000 tons per year (the level of production that has occurred in recent years) to up to 7.5 million tons per year (that is, 5.5 million cubic yards).

The Applicant also wishes to revise and upgrade its existing Surface Mining Reclamation Permit, which was issued by WDNR, in accordance with the 1993 amendments to the state's Surface Mining Act (RCW Chapter 78.44).

This chapter describes the Applicant's proposal in detail, as well as two mining alternatives that would involve reduced hours of barging. The No-Action Alternative is also described. Table 2-1 at the end of this chapter compares the features of the alternatives. Conceptual diagrams of the proposed mine phasing plan, contouring plan, and reclamation plan are illustrated in Figures 2-1 through 2-3, respectively.

## 2.2 Description of the Proposed Action

### 2.2.1 Scale of Operation

The operation would last for several decades and would include periods of relatively constant mining and barging, followed by relatively inactive periods. During active periods, barge loading could occur at any time, but is most likely to occur at night (which is the Applicant's stated preference). Because of this, lighting would be required (see Chapter 11).

At maximum production rates, the mine would be exhausted in as little as 11 years. However, such a case is not likely because the market is not expected to support maximum production at the site over prolonged periods.

The proposed Port of Seattle third runway project is an example of how a single project could influence mining levels and the duration of mining at the site. That project would require a tremendous amount of fill and, should the Maury Island site be used as a source for that fill, the site could operate at the proposed production level of 7.5 million tons for 3 years or more.

Once such a project were completed, however, several years could pass before a similar level of production were needed for a large project or several large projects. While the exact market cannot be predicted, it is unlikely that the market could sustain the 7.5-million ton production level and, therefore, the site is projected to be in production over several decades.

At full production, barging could occur continuously. Under average conditions, a barge would be at the site about half of the time, even at full production This is because the 7.5 million ton annual limit would not allow 24-hour, 7-day a week barge loading to occur continuously for a year. At such a rate, the 7.5 million ton limit could be reached in about 190 days.

As under current practices, operations would also provide materials for the local market (Maury Island and Vashon Island). The amount of sand and gravel extracted for the local market was estimated to average approximately 15,000 tons in 1998 (range of 10,000 to 20,000 tons per year) with an annual increase assumed to be 2.5 percent for this EIS analysis; actual increases would depend on market needs and local growth. This would be delivered via truck, at a rate not to exceed 20 trucks per day. At some point, the increase in extraction for the local market would slow and eventually become steady, since demand for sand and gravel within the confines of Vashon/Maury Island is limited.

### 2.2.2 Clearing and Ground Preparation

Clearing of the site would be phased with mining activities (Figure 2-1). Clearing would occur in scheduled phases of approximately 32 acres each. No more than two phases, or 64 acres of mining/reclamation activities, would be in process at any one time. However, once mined, lands would take decades to approximate current conditions, so that the entire mining "footprint" would be altered both in topography and vegetation cover. Reclamation, including planting, thinning, and control of unwanted vegetation, may occur over many years. A conceptual scheme of the contouring plan is given in Figures 2-2A, B, and the Applicant's proposed reclamation plan is shown in Figure 2-3.

To address public safety concerns regarding arsenic contamination of site soils, the Applicant is proposing to fully contain contaminated materials at the site within a sealed berm. No contaminated materials would be removed from the site. At full capacity (when mining is complete), the berm would measure up to 30 feet high and 2,100 feet long. As proposed by the Applicant, the berm would be located on the northern edge of the site (Figure 2-1), but outside of the 50-foot vegetated buffer (described in the next paragraph), which would be maintained. The containment process for soils is described in more detail in Section 2.2.5.

Along the edge of the mining pit, a 50-foot-wide buffer would be retained around the perimeter of the site. About 40 feet of the buffer would be vegetated, and 10 feet would include a fence and related clearing. With the exception of the existing dock area, a 200-foot-wide naturally vegetated buffer would be retained along the Puget Sound shoreline as required by the Shoreline Management Act. No mining or other activity would be permitted within these buffer areas.

Maintenance of the 200-foot shoreline buffer and the 50-foot buffer between the site and neighboring properties would result in approximately 14 percent of the site being retained as designated open space and upland habitat.

## 2.2.3 Facilities and Equipment

The site contains a relatively uniform product, and, therefore, operations and processing would be relatively simple. Few product specifications would be produced at the site, compared to other sites that produce a wide range of products (e.g., different sizes of gravel, mixtures, etc.) requiring complicated sorting, processing, and mixing and the associated equipment.

The following sections describe facilities and equipment that would be used for the Proposed Action.

### *2.2.3.1 Structures*

A small office would be placed on the site. Other storage and security areas may be established (such as small fenced yards to protect tools or other valuable items), but no other new permanent structures would be constructed on the site. A portable, self-contained restroom facility and a portable storage container would be located on the site.

The existing dock would require maintenance and repairs, as described in Section 2.2.3.6. Otherwise, under the proposed project the dock would remain as is, with no increase in dimensions. Mitigation measures identified in Chapter 6 (Section 6.4) include replacement and/or extension of the dock into deeper water to avoid nearshore impacts.

#### *2.2.3.2 Access and Roads*

Access would remain as is, with the main entrance to the site provided from two private driveways from Southwest 260th Street. No major change in these entrances is proposed. Both roads continue to the dock. Entrances and roads would remain unpaved. Additional haul and access roads would be developed as the site is mined.

#### *2.2.3.3 Heavy Equipment*

In most cases, excavators or graders would be used to clear vegetation and soils as new areas are prepared for mining. Sand and gravel would be mined using wheel loaders and bulldozers. Wheel loaders would be used to load materials onto trucks for direct sales on the island and to feed the portable processing plant (crusher and screening facility), when present (see Section 2.2.3.4). The number of loaders and bulldozers needed would be based on market demand, loading rates, size of barges, and type of material. As an estimate for use in this analysis, between one and three loaders and one to four bulldozers would operate at any one time.

Bulldozers would be used to excavate mixed materials. They would work from the top of the slope, pushing materials down to a collection point, where the material would then be placed in a collection feeder, which delivers materials to the conveyer system.

Watering trucks and fuel/lubricant trucks would also be present onsite.

#### *2.2.3.4 Processing Equipment*

The project would include portable screens and potentially a portable crushing plant. Depending on product specifications required by customers, screens would be used to separate some of the gravels that are found in the otherwise clean sand. Gravel would be stockpiled until about 40,000 or 50,000 tons have been collected (which, based on known geologic conditions, would take about 3 to 4 years to accumulate). Once a sufficient amount is present to justify it, a portable crushing plant would be brought to the site. Such a plant takes two people to operate and can crush about 300 tons an hour, so the plant would be at the site for 1 to 2 months every 3 or 4 years.

#### *2.2.3.5 Conveyor and Dock Loading System*

For barge-based deliveries, a conveyer belt system would be used to transport materials from the working face of the mine to a barge moored to the dock. The conveyor would be moved about the site to follow mining activities, and would vary in length between 1,200 and 3,400 feet, depending on where mining is taking place. Conveyor width would be from 48 to 54 inches for conveyors from the mine to the barge loading system, and 24 inches for conveyors associated with screening or crushing plants.

Distribution of sand and gravel throughout the barge would be accomplished by moving the barge back and forth using a tug while the material is loaded from the conveyor. To eliminate the potential for spillage of sand and gravel into the water, mitigation for the conveyor system would include a splash pan.

The existing conveyor on the site would be repaired and renovated as needed, and additional conveyors would be constructed, as needed, to reach active mining areas. The portion of the existing conveyor system within the Maury Island shoreline, as defined in RCW 90.58.030(2)(d), would require the following repairs:

- Within the shoreline area, the existing conveyor structures are partially located within a tunnel. The ends of this tunnel would be reopened, and the vegetation that has grown around the conveyor structures would be cleared. In addition, approximately five power poles with power lines would be replaced in the same location (north of the dock, parallel to the shoreline, and adjacent to the existing access road) as when the conveyor system was last used.

- Approximately 175 troughing idlers and 50 return idlers would be reinstalled on the existing metal conveyor framework attached to the dock and the existing shoreland conveyor structures. One motor drive would be reinstalled approximately 50 feet from the seaward end of the dock, and an additional motor drive would be relocated on the shoreland conveyor structure approximately 75 feet landward from the ordinary high water mark.

- The rubber conveyor belts would be reinstalled by manually threading them onto and around the idlers. The belt would then be vulcanized by a land-based work crew. The belts would be approximately 54 inches wide, and would curve upward at the sides to a height of approximately 1 foot. A curved plastic or metal tray would be fitted underneath the conveyor belt to catch any material spillage.

- A spill or splash pan would be fitted at the end of the dock to catch any spillage while material is directed onto barges. The pan would be approximately 66 inches in width and 2 feet in length, and would be curved upward slightly at the sides.

- The equipment necessary to complete the conveyor work would include:

  – a backhoe to clear existing tunnels where the conveyor structure is located;

  – a work truck with a cutting torch for mechanical work to the idlers;

  – a derrick mounted on a barge to reinstall and set the motor drive; and

  – the basic equipment necessary to replace power poles and string power lines.

- All of the above work could be completed within approximately 15 working days.

#### *2.2.3.6 Dock Repairs*

The dock (Figure 2-4) has been damaged by winter storms and other weathering over the past several years. The last repairs, completed about 8 to 10 years ago, included repair and replacement of about 25 pilings in the dolphins and fender pilings. Dolphins are the clusters of freestanding pilings (not attached to the dock) used to guide barges, to prevent barges from hitting the dock, and for barges to tie up to. Fender pilings are those located on the seaward edge of the dock and are used to protect the dock from barges. Some minor repairs were also made to the walkway parallel to the conveyer system.

For the discussion of required repairs, the dock can be divided into three main segments based on structure and function. These segments are (1) the main conveyor trestle; (2) the pier; and (3) the mooring dolphins (Figure 2-4).

The main conveyor trestle is perpendicular to the shoreline and used to support the conveyor system (described in Section 2.2.3.5) from the shoreline to the barge-loading area. The trestle also provides access to the load-out area at the pier by means of a walkway.

The pier segment is perpendicular to the conveyor trestle and parallel to the shoreline and is located in deeper water. It is used to vertically support mechanical equipment for conveyor discharge onto barges and as lateral support for the "docked" barges being loaded.

Vertical support for mechanical equipment is provided by dedicated vertical bearing piling, while lateral loads from docked barges is provided almost entirely by battering pilings, which are driven at a 4:1 angle shorewards to brace against lateral loads. These pilings are further protected and supported by fender pilings, which make actual contact with the docked barges. The pier also provides access for personnel to the loading area.

The mooring dolphins consist of clusters of freestanding pilings (not attached to the dock) "banded" at the top with several wraps of wire rope to form a large, single cantilever pile. These mooring dolphins are used to tie up and secure barges during loading and to protect the pier from potential damage during barge docking.

Several structural engineering reviews of the dock facility have been completed to estimate the number of pilings requiring replacement to make the dock capable of operating as proposed by the Applicant. Symonds Consulting Engineers, Inc. assessed the dock on behalf of King County (Appendix F); Reid Middleton, Inc. assessed the dock on behalf of the Applicant (Appendix G); and Peratrovich, Nottingham & Drage, Inc. assessed the dock on behalf of the Vashon-Maury Island Community Council (Appendix H). Table 2-2 summarizes the results of the structural engineering reviews.

The assessments generally agree on the level of repair required for the conveyor trestle and pier. However, there is disagreement on the number of pilings to be replaced in the fender system and in the mooring dolphins. This disagreement in number of pilings needing replacement reflects, in part, different suggested design approaches.

The Applicant proposes to replace the minimum number of pilings necessary to safely operate the facility and to use targeted structural augmentation with steel pilings in the mooring dolphins to assure their functionality. The Symonds (King County) assessment and the Peratrovich (Vashon-Maury Island Community Council) assessment suggest a higher level or total replacement of the fendering system and mooring dolphins during the initial repair process because of their current high level of deterioration.

Evaluation of the walkways, guardrails, and other non-load-bearing timbers revealed that substantial replacement would be required to meet safety standards.

The remaining life expectancy of the structural load-bearing pilings not replaced initially is estimated to be between 3 and 10 years, with approximately 25 percent needing replacement every 3 to 5 years. This would require the replacement of about 30 pilings in the main trestle and pier structures and an additional 30 to 40 pilings in the mooring dolphins during each repair event.

Mitigation measures discussed in Chapter 6 (Section 6.4.3.2–6.4.3.4) suggest full replacement of the dock structure and dolphins to avoid repeated disturbance to the nearshore environment. New dock construction alternatives also would allow the facility to extend further from the shoreline to reduce and minimize disturbance to the shoreline associated with mining and loading operations, such as shading to eelgrass, propwash, material spillage, and noise and vibration.

Replacement of existing pilings would require a pile driver, which is a floating, barge-like vessel mounted with a frame and motorized driver. The vessel would measure about 60 feet wide by 120 feet long and would be fitted with a crane (also called a derrick). To accomplish the work, the pilot would position the derrick vessel centrally using a series of anchors (two to four, depending on conditions). The vessel would then be moved about the work site using electric winches that work up and down the anchor lines. Timber piles would be driven using an air hammer (probably Vulcan number 1) powered by a 600-cubic-foot-per-minute air compressor.

The necessary repairs are expected to take from 2 to 4 weeks to complete. If more substantial initial repairs or full replacement of the dock facility is undertaken this process would take up to several months.

#### *2.2.3.7 Signs and Lighting*

Warning and traffic signs would be posted around the perimeter of the mining area to inform people of restricted access and potential hazards.

Outdoor and security lights would be shielded with top-clad plates and focused downward to avoid glare onto surrounding areas. Strobe lights are proposed to be used on the back of heavy equipment instead of audible alarms to reduce noise during nighttime operations.

### 2.2.4 Progression of Mining

The proposed mining activities would start in the central and southern portions of the site, and the northern portion of the site would be the last area mined (see Figures 2-1 and 2-2).

Mining would proceed in a continual "leading edge," with the area in front of the leading edge being cleared, the edge itself being mined, and the area behind the leading edge being reclaimed. These three active portions of the mining operation would collectively take up between 32 and 64 acres at any one time.

### 2.2.5 Containment Procedures for Contaminated Soils

The Applicant proposes to contain contaminated soils in a lined and covered containment cell located on the north side of the property. No contaminated materials would be removed from the site.

Over the course of mining at the site, about 271,000 cubic yards of materials containing arsenic above residential cleanup levels (as defined under the MTCA Method A) would be excavated and contained. Of this total volume, approximately 50,520 cubic yards would contain arsenic concentrations that are also above industrial cleanup levels (again, using MTCA Method A). Soils containing arsenic concentrations above industrial cleanup levels would be managed in a separate phase of the cell that contains thicker or otherwise bolstered covers and linings.

The containment cell would be built along the north side of the property in phases. At full capacity (when mining is complete), the berm would measure up to 30 feet high and 2,100 feet long. The berm would have clean soil placed on top of it, and it would be vegetated. As recommended in Chapter 5, native vegetation would be preferable. Construction of the berm would proceed north to south.

While a bottom liner would not be required (per WAC 173-304-461), a liner and cover would be installed in the containment cell. The Applicant is proposing to install a geosynthetic clay liner (GCL). GCLs are made with a layer of refined clay, which serves as a barrier to water (permeabilities range from $1 \times 10^{-8}$ to $1 \times 10^{-9}$ centimeters per second). This clay is bound between layers of geotextile. A GCL is considered equivalent to 2 to 4 feet of clay (with a permeability of $1 \times 10^{-7}$ centimeters per second).

The clay in GCLs would swell as it is exposed to water and this swelling action closes possible openings in the liner.

To protect the GCL liner from damage during installation and construction, a layer of bedding sand 6 inches thick would be placed over the subgrade to protect the liner from puncture by the gravelly soil. The bedding sand would be screened to remove all material larger than 0.5-inch diameter. The GCL would be covered with a 6-inch layer of drain sand (drain sand should consist of material finer than 0.5-inch diameter with less than 3 percent of grains smaller than the U.S. No. 200 sieve [0.003 inch]).

To address public concerns about water that may accumulate in the cell, a 6-inch diameter perforated pipe would be installed along the downslope side of the cell. This drain would lead to a collection point on one end of the cell. The purposes of this drain are to prevent build-up of water over the liner and to provide a sampling location. A 2-inch diameter perforated pipe would be installed in the bedding sand (under the liner) along the north side. This would also lead to a collection point on one end of the cell and could be used to monitor water under the liner.

Contaminated materials collected during site preparation would be placed over the drain sand. The soil would be placed in horizontal layers and compacted to 90 percent density. The purpose of placement and compaction is to provide a stable slope and firm support for the final cover.

Trees and brush would be removed from contaminated areas prior to excavation of contaminated soil. The trees and brush would not be placed into the containment cell (since their decay would generate water). Contaminated soil would contain some natural organic materials such as roots and vegetation, but not sufficient amounts to generate significant water.

The cover would provide the same barrier to infiltration as the liner. The Applicant proposes a single-layer synthetic membrane or GCL for the cover. The base for the membrane would be screened soil (finer than 0.5-inch diameter). A flexible membrane would be suitable for the cover because a cover is less susceptible to physical damage than the liner. The flexible membrane would be covered with a geotextile fabric to protect it from damage. The cover would be covered with a 6-inch layer of screened drain sand or synthetic drain layer, the same as used over the liner.

The drain layer would be covered with 18 inches of soil, then the surface would be vegetated. Topsoil would not be required as long as the cover soil had sufficient nutrients to support a healthy vegetation cover. The vegetation is needed to prevent surface erosion and for aesthetics.

The containment cell would be constructed in steps to match the mine operation. The first step would start at the downslope end to collect rainwater infiltration and potential leachate. The first step is expected to take soil from Phase 1 and 2 of the mine operation (or about 46,000 cubic yards of contaminated soil). During soil placement, temporary berms would be constructed upslope to divert rainfall runoff from entering the cells. Some rainfall runoff would seep into the sand drain layer over the GCL during soil placement. This water would drain into the perforated pipe at the downslope side.

Any water collected from the berm would be tested and handled according to procedures outlined in the MTCA.

### 2.2.6 Trucking and Barging

On-island trucking and use of material would stay about the same as current conditions, with trucking activity increasing at an assumed rate of 2.5 percent per year (actual increases would be based on market needs and growth). Due to limits of on-island development, trucking would not increase indefinitely. The increase in on-island deliveries would eventually halt and become relatively stable. This EIS assumes a maximum of 20 truck trips per day. Any more trips would be considered a major project modification requiring additional SEPA review.

At maximum mining production, about 40,000 tons of material would be barged off the site each day. The most common barge size would be a 10,000-ton capacity, but smaller barges may be used in some cases. At this maximum production rate, barges could be loaded almost continuously. At lower production rates, barge loading could occur at any time of day but is most likely to occur at night, since customers tend to like the product delivered in the morning.

### 2.2.7 Hours of Operation

The Proposed Action is to have no timing restrictions on barge loading so that the Applicant can serve customers' needs for morning shipments as needed. Other activities would be restricted to general operating hours of 6 a.m. to 10 p.m. Monday through Friday, and 9 a.m. to 6 p.m. on Saturdays.

### 2.2.8 Employment

Operations would require 2 to 20 people working two shifts for excavation and three shifts for barge loading. The actual number of people employed onsite would depend on what activities are happening and the volume of material shipped per day. Each person working onsite would be involved in mining, reclamation, and barge loading; it is not possible to specify the number of people working on any particular aspect of the operation.

### 2.2.9 Reclamation

Reclamation would involve (1) slope stabilization and (2) the gradual development of vegetation over mined areas. The WDNR, rather than King County, oversees restoration efforts for mining at the Maury Island site, as it does state-wide under the authority of surface mining regulations (RCW 78.44). These regulations define reclamation as

*… rehabilitation for the appropriate future use of disturbed areas resulting from surface mining including areas under associated mineral processing equipment and areas under stockpiled materials. Although both the need for and the practicability of reclamation will control the type and degree of reclamation in any*

*specific surface mine, the basic objective shall be to reestablish on a perpetual basis the vegetative cover, soil stability, and water conditions appropriate to the approved subsequent use of the surface mine and to prevent or mitigate future environmental degradation (RCW 78.44.031[11]).*

Because the subsequent use of the site is unknown, this EIS assumes that the site would remain undeveloped, with reclaimed areas left to grow into forest and grassland communities (as established in the reclamation plan defined by the WDNR). King County may consider a rezone for the property should the owner or others present a proposal for future use other than mining. For this subsequent use, this EIS assumes the appropriate long-term vegetative cover would be native plant communities that are maturing toward the current condition of vegetation onsite. In some cases, nonnative grasses and other plants would need to be planted to prevent erosion.

Since the Proposed Action is still at the planning and environmental review stages, restoration plans are still conceptual. This is a fairly standard procedure, since this allows the WDNR and the Applicant to remain flexible in determining what specifically needs to be done to meet state requirements.

Reclamation would follow WDNR guidelines in Best Management Practices for Reclaiming Surface Mines in Washington and Oregon (Open File Report 96-2). Specific restoration plans would be developed during the latter phase of each mining stage, according to specifications stipulated by the DNR.

Consistent with the WDNR requirements, site reclamation for the Proposed Action would be accomplished in the following four steps: (1) site preparation; (2) slope stabilization and erosion control, including stormwater control and temporary erosion control measures such as hydroseeding and filter fence check dams; (3) final contouring and topsoil placement; and (4) revegetation with grasses, shrubs, and trees (see Figure 2-3). These steps are described below.

#### *2.2.9.1 Site Preparation*

In most cases, vegetation would first be cleared and then soils would be scraped using an excavator or grader. Contaminated soils would be collected and placed within the containment cell located at the northern portion of the property.

### 2.2.9.2 Slope Stabilization

Active slopes and slopes that have been disturbed but are not yet ready for final reclamation would be protected using Best Management Practices. In general, concerns over slope stability of the active mining phase are minor, since the whole purpose of the operation is to bring the material down. Slides are more of a concern for worker safety, and the operators take care to avoid major slides.

Temporary slope stabilization measures, including hydroseeding, filter fencing, and recontouring, would be employed as necessary to minimize erosion. Where appropriate, exposed slopes would be track-walked (up and down) to roughen the ground surface and reduce runoff velocities.

### 2.2.9.3 Final Contouring and Topsoil Placement

Once an area is mined and ready for permanent reclamation, slopes would be regraded to gradients less than 2 feet horizontal to 1 foot vertical, except where steeper slopes are necessary to match the existing topography. A minimum of 5-foot wide horizontal benches would be placed in the finished cut slopes for every 20 feet of vertical relief to reduce surface water runoff. The 5-foot wide benches would be back-sloped slightly into the hillside and laterally sloped to encourage gravity flow.

Because most existing topsoils would be unavailable for reclamation, either soils manufactured onsite, offsite soils, or a combination of these two would be used for reclamation. Onsite topsoils would be prepared using composted and/or mulched organic matter (from cleared vegetation) added to non-contaminated soils and/or sands. Additional soils would be brought in as necessary to assure that reclamation performance standards are met. Reclamation performance would be monitored by the WDNR, under its statutory jurisdiction over mining reclamation within the State of Washington.

Reclaimed slopes would be hydroseeded and covered with a minimum of 1.5 tons per acre of straw mulch (tacked down) or equivalent on exposed ground surfaces. The type of seeds used would be determined at the time of seeding. No noxious weeds would be included in the seed mix. Seeding would be planted prior to September in order to have the grass established by October. Hydroseeding would probably be completed by contractors, with specifications detailed in the contract.

Specifications would be developed in cooperation with the WDNR under its reclamation authority.

#### *2.2.9.4 Revegetation*

Mined areas would be revegetated with various shrubs and trees according to the specifics outlined in the WDNR phase reclamation plan. Woody debris from active mine stages would be placed in reclamation areas to provide wildlife habitat.

## 2.3 Alternative 1- Reduced Barging Hours, Scenario 1

Alternative 1 differs from the Proposed Action in that barge loading would be restricted to 16 hours each weekday and 9 hours on Saturday (Monday – Friday 6 a.m. to 10 p.m., Saturday 9 a.m. to 6 p.m.). This alternative was developed by the EIS Team in response to public comments and is intended to allow the Applicant, the public, and decision-makers at King County to compare the environmental impacts of the Proposed Action to this hypothetical scenario of reduced hours for barge loading.

The following sections describe how other features of the mining operation under Alternative 1 compare to those of the Proposed Action (see Table 2-1).

### 2.3.1 Scale of Operation

Under Alternative 1, sand and gravel extraction could be up to 5.72 million tons per year. Most of the material would be sent to off-island markets via barge. The mine would not likely operate at this level of production all the time. As for the Proposed Action, operations would slow when demand for the product is low, and operations may even stop for periods of time.

At full production, the site deposits could be mined in 15 years. At less than full production, operations could last longer. For this EIS, it is assumed that the site would operate for up to 40 years.

If mining occurred at the maximum possible rate and barge loading were to occur 16 hours each weekday and 9 hours on Saturdays, as proposed for Alternative 1, 5.72 million tons of material could be excavated annually. If mining were to proceed at a slower rate, the annual volume excavated would be less than 5.72 million tons. Actual operations would most likely vary from the maximum possible, but as for the Proposed Action, environmental impacts of this alternative are addressed at full production rates rather than at average rates.

As under current conditions (and as for the Proposed Action), the mine would also provide materials for the local market (Maury Island and Vashon Island). The amount of materials extracted for the local market would average 15,000 tons annually with an annual increase assumed to be 2.5 percent (actual increases would depend on market needs). Because demand for sand and gravel for the local market is limited, the growth in extractions for the local market would slow and eventually stabilize.

### 2.3.2 Clearing and Ground Preparation

Clearing and ground preparation activities for Alternative 1 would be the same as for the Proposed Action.

### 2.3.3 Facilities and Equipment

Alternative 1 would require the same facilities and equipment as the Proposed Action.

### 2.3.4 Progression of Mining

The progression of mining operations for Alternative 1 would be the same as for the Proposed Action, but mining would progress at a slower rate.

### 2.3.5 Containment Procedures for Contaminated Soils

Contaminated soils would be placed in a containment cell as described for the Proposed Action.

### 2.3.6 Trucking and Barging

As for the Proposed Action, trucking would remain the same as current conditions; it is assumed that trucking activity would increase at 2.5 percent per year (actual increases would depend on market demands), with a maximum of 20 truckloads daily.

At maximum mining production, about 20,000 tons of material would be barged off the site each weekday and about 10,000 tons would be barged on Saturday. The most common barge size would be 10,000 tons, but smaller barges would also be used.

### 2.3.7 Hours of Operation

Under Alternative 1, mining and barging activities would occur only from 6 a.m. to 10 p.m. Monday through Friday and from 9 a.m. to 6 p.m. on Saturdays.

### 2.3.8 Employment

Operations under Alternative 1 would require 2 to 18 people working two shifts for excavation and barge loading. The actual number of people onsite would depend on the activities occurring and the volume of material being shipped each day. As for the Proposed Action, it is not possible to specify the number of people working on any particular activity.

### 2.3.9 Reclamation

Reclamation requirements and activities for Alternative 1 would be the same as for the Proposed Action.

## 2.4 Alternative 2 - Reduced Barging Hours, Scenario 2

Under Alternative 2, barge loading would be restricted to 12 hours each weekday and on Saturday (Monday - Saturday 7 a.m. to 7 p.m.). As with Alternative 1, Alternative 2 would reduce the ability of the Applicant to provide sand and gravel products on demand, and, therefore, does not meet the project objectives as well as the Proposed Action.

The following sections describe how other features of the mining operation compare to those of the Proposed Action (see Table 2-1).

### 2.4.1 Scale of Operation

Under Alternative 2, sand and gravel extraction could be up to 3.12 million tons per year. Most of the material would be sent to off-island markets via barge. The mine would not likely operate at this level of production all the time. As for the Proposed Action, operations would slow when demand for the product is low, and operations may even stop for periods of time.

At full production, the site deposits could be mined in 30 years. At less than full production, operations could last longer. For this EIS, it is assumed that the site could be operating for up to 50 years.

If mining occurred at the maximum possible rate and barge loading were to occur 12 hours each weekday and on Saturdays, as proposed for Alternative 2, 3.12 million tons of material could be excavated annually. If mining were to proceed at a slower rate, the annual volume excavated would be less than 3.12 million tons. Actual operations would most likely vary from the maximum possible, but as for the Proposed Action, environmental impacts of this alternative are addressed at full production rates, rather than at average rates.

As under current conditions (and as for the Proposed Action), the mine would provide materials for the local market (Maury Island and Vashon Island). The amount of materials extracted for the local market would average 15,000 tons annually with an annual increase assumed to be 2.5 percent (actual increases would depend on market needs). Because demand for sand and gravel for the local market is limited, growth in extractions for the local market would slow and eventually stabilize.

### 2.4.2 Clearing and Ground Preparation

Clearing and ground preparation activities for Alternative 2 would be the same as for the Proposed Action.

### 2.4.3 Facilities and Equipment

Alternative 2 would require the same facilities and equipment as the Proposed Action.

### 2.4.4 Progression of Mining

The progression of mining operations for Alternative 2 would be the same as for the Proposed Action, but mining would progress at a slower rate.

### 2.4.5 Containment Procedures for Contaminated Soils

Contaminated soils would be placed in a containment cell as described for the Proposed Action.

### 2.4.6 Trucking and Barging

Trucking would remain the same as current conditions; it is assumed that trucking activity would increase at 2.5 percent per year (actual increases would depend on market demands), with a maximum of 20 truckloads daily.

At maximum mining production, about 10,000 tons of material would be barged off the site each weekday and on Saturday. The most common barge size would be 10,000 tons, but smaller barges may be used in some cases.

### 2.4.7 Hours of Operation

Under Alternative 2, active mining would occur only from 7 a.m. to 7 p.m. Monday through Friday and from 9 a.m. to 6 p.m. on Saturdays. Barging would occur from 7 a.m. to 7 p.m. Monday through Saturday.

### 2.4.8 Employment

Operations under Alternative 2 would require 2 to 12 people working one shift for excavation and barge loading. The actual number of people onsite would depend on the activities occurring and the volume of material being shipped each day. As for the Proposed Action, it is not possible to specify the number of people working on any particular activity.

### 2.4.9 Reclamation

Reclamation requirements and activities for Alternative 2 would be the same as for the Proposed Action.

## 2.5 No-Action Alternative

### 2.5.1 No-Action Alternatives under SEPA

Under SEPA, King County must evaluate the "No-Action Alternative", which is defined by the state SEPA Handbook as "what would be most likely to happen if the proposal did not occur".

In some cases, No-Action can mean little or no impact, such as when bare land is proposed for a major facility, and not implementing the proposal maintains the bare land condition. In other cases, however, such as for a needed new roadway, No-Action could result in increased traffic congestion, reduced safety, and serious reduction in service levels as the unmet need for a new road increases over time. In other cases, particularly those involving a change in land use or rezone, No-Action means that the proposal does not occur but the site would be fully developed anyway under existing zoning.

Because the SEPA rules do not define what the No-Action Alternative must entail, King County has some discretion in its formulation. The Applicant already has a permit to extract sand from the site up to roughly 50 feet from the property boundaries (200 feet from the shoreline). For the purpose of comparative analysis and to understand the environmental effects of the Applicant's proposal, this EIS considers the No-Action Alternative as the status quo, or essentially how the mine has operated on average over the past 20 years.

No-Action, then, assumes that relatively low mining levels would occur indefinitely. The most significant differences under No-Action are the absence of barging, no use of a conveyor system, and no large-scale extraction.

The features of the No-Action Alternative are summarized and compared to the Proposed Action in Table 2-1 and discussed below.

### 2.5.2 Facilities and Operation

Under the No-Action Alternative, the existing permit would remain as is and extraction would be maintained at an average of 15,000 tons per year (ranging from 10,000 to 20,000 tons per year). Under this development alternative, only local markets on the island would be served. At this rate of extraction, the mine would remain in operation indefinitely.

The site currently contains a dock, conveyor system, and an “open face” of the mine covering approximately 40 acres. The existing dock, which is approximately 1,300 feet in length and 50 feet wide, was constructed in 1968 by Lone Star Industries (parent company to Glacier Northwest). Although the dock has been maintained and repaired over the years, there is no record of any barge-loading activity over the past 20 years.

Operating hours would remain as currently set: from 7 a.m. to 7 p.m., Monday through Friday, and 9 a.m. to 6 p.m. on Saturdays. Employment would likely be less than five staff; two shifts are possible but unlikely.

Mining under No-Action would proceed very slowly, could continue indefinitely, and would include the following elements:

- Extraction – Gravel extraction would use equipment similar to that discussed under the Proposed Action. The major difference is that the conveyor belt to the dock would not be used. Crushing activities onsite would be sporadic as would most extraction activities.
- Sorting and Washing – The screening plant would be used to sort and crush the rock but at much lower levels. No other processing is envisioned.
- Materials Stockpiling – Stockpiling would occur at a much lower rate than the Proposed Action and at a rate similar to existing conditions.
- Water Supply and Wastewater Management – As with the Proposed Action, none would be required. Water for dust control would be trucked into the site.
- Water Collection/Treatment – Stormwater collection would remain minimal because very little of the site surface would be exposed at any one time. At the current level of extraction, it is likely that stormwater runoff would not increase from the current rate. A new stormwater pond would not be needed.

### 2.5.3 Containment Procedures for Contaminated Soils

Under No-Action, a much lower volume of soils would require management due to the low level of mining. The method for addressing contaminated soils would be agreed to between the Department of Ecology/King County and the Applicant.

### 2.5.4 Trucking and Barging

Truck activities under the No-Action Alternative are assumed to be identical to the Proposed Action because truck delivery has been the principal activity over the last 20 years. Truck activity would average less than 5 trucks per day, over a 6-day week, with up to 20 trucks per day each way (40 trips). The rate of truck activity would increase the same as discussed for the Proposed Action (assumed annual 2.5 percent increase with an eventual leveling off to relatively constant levels).

No barging would occur under the No-Action Alternative.

### 2.5.5 Reclamation

The same reclamation plan described for the Proposed Action would also apply for No-Action, as required by WDNR in the 1971 Surface Mining Reclamation Permit (No. 70-010256), as revised under the 1993 amendments to the Surface Mining Act. The rate of extraction and restoration would be entirely different than the Proposed Action. In some cases, natural revegetation is likely to occur at a faster rate than planned revegetation because of the low rate of extraction.

It is difficult to predict the exact progression of mining since under the No-Action Alternative it could take thousands of years to completely mine the site. While it is conceivable that contours may eventually reach that of the Proposed Action, this EIS assumes that a much smaller area would be affected within the predictable future. For generations to come, there would be little or no terracing. Slopes would revegetate at a rate exceeding that of new exposure. Restoration would occur to meet the requirements of the existing permit. Seeding would be done as needed but on smaller areas than for the Proposed Action.

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## Table 2-1. Comparison of Features among Alternatives

| Component | No-Action Alternative | Proposed Action | Alternative 1 | Alternative 2 | Proposed Action with all Additional Mitigation (including restricted hours) |
|---|---|---|---|---|---|
| ***SCALE OF OPERATION*** | | | | | |
| ***Area to be Mined*** | Ultimately, 193 acres, but much smaller area within the foreseeable future | 193 acres | Same as Proposed Action | Same as Proposed Action | 174 acres |
| ***Estimated Maximum Annual Extraction*** | 20,000 tons | 7.5 million tons* | 5.72 million tons* | 3.12 million tons* | 3.12 million tons* |
| ***Duration of Project*** | Mining to occur indefinitely | Between 11 and 50 years. Assumed to be 35 years for analysis in the EIS | Between 15 and 60 years. Assumed to be 40 years for analysis in the EIS | Between 30 and 75 years. Assumed to be 50 years for analysis in the EIS | Between 25 and 70 years |
| ***Local Market Sales*** | Local market sales would average 15,000 tons annually (range 10,000 to 20,000 tons per year) of sand and gravel, with an annual assumed increase of 2.5% | Same as No-Action | Same as No-Action | Same as No-Action | Same as No-Action |
| ***Trucking*** | Average hauling less than 5 trucks/day, over a 6-day week, assumed to increase at 2.5% annually, with a maximum of 20 trucks/day each way (40 one-way trips) | Same as No-Action | Same as No-Action | Same as No-Action | Same as No-Action |
| ***Hours of Active Mining*** | Current hours of mining:<br>M-F 7 a.m. – 7 p.m.<br>Sat 9 a.m. – 6 p.m.<br>Maintenance could occur at any time | M-F 6 a.m. – 10 p.m.<br>Sat 9 a.m. – 6 p.m.<br>Maintenance could occur at any time | M-F 6 a.m. – 10 p.m.<br>Sat 9 a.m. – 6 p.m.<br>Maintenance could occur at any time | M-F 7 a.m. – 7 p.m.<br>Sat 9 a.m. – 6 p.m.<br>Maintenance could occur at any time | M-F 7 a.m. – 7 p.m.<br>Sat 9 a.m. – 6 p.m.<br>Maintenance could occur at any time |

## *Table 2-1. Continued*

| *Component* | *No-Action Alternative* | *Proposed Action* | *Alternative 1* | *Alternative 2* | *Proposed Action with all Additional Mitigation (including restricted hours)* |
|---|---|---|---|---|---|
| ***Hours Barge Loading would be Allowed*** | None | No restrictions | 16 hours per weekday, 9 hours on Saturday:<br>M-F 6 a.m. – 10 p.m.<br>Sat 9 a.m. – 6 p.m. | 12 hours per day,<br>M-Sat 7 a.m. – 7 p.m. | 12 hours per day,<br>M-Sat 7 a.m. – 7 p.m. |
| ***Barging*** | None | Maximum of four 10,000-ton barges loaded in each 24-hour period (or a greater number of smaller barges) | Maximum of two 10,000-ton barges loaded in each weekday and one on Saturday (or a greater number of smaller barges) | Maximum of one 10,000-ton barge loaded in each working day (or a greater number of smaller barges) | Maximum of one 10,000-ton barge loaded in each working day (or a greater number of smaller barges) |
| ***Employment*** | 5 staff or fewer would operate the site | 2 to 20 staff would operate the site at any one time, with two shifts for mining and three shifts for barge loading | 2 to 18 staff would operate the site at any one time, with two shifts for mining and for barge loading | 2 to 12 staff would operate the site at any one time, with one shift for mining and for barge loading | 2 to 12 staff would operate the site at any one time, with one shift for mining and for barge loading |
| ***Clearing and Ground Preparation*** | Conducted in slow progression from the central portion of the site out | Phased clearing, with two areas up to 32 acres being cleared and prepared for mining at any one time. Up to 64 acres of land being mined or actively reclaimed at any one time | Same as Proposed Action | Same as Proposed Action | Same as Proposed Action |
| ***FACILITIES AND EQUIPMENT*** | | | | | |
| ***Structures*** | None | Small office, storage and security areas, and portable restroom. Repairs to dock structure | Same as Proposed Action | Same as Proposed Action | Old dock replaced with extended, state-of-the-art facility |
| ***Access and Roads*** | Use existing | Same as No-Action, but additional access roads constructed as mining progresses | Same as Proposed Action | Same as Proposed Action | Same as Proposed Action |

## *Table 2-1. Continued*

| *Component* | *No-Action Alternative* | *Proposed Action* | *Alternative 1* | *Alternative 2* | *Proposed Action with all Additional Mitigation (including restricted hours)* |
|---|---|---|---|---|---|
| ***Heavy Equipment*** | Wheel loaders used to load trucks | Combination of bulldozers and wheel loaders used for barge-based projects | Same as Proposed Action | Same as Proposed Action | Same as Proposed Action |
| ***Processing Equipment*** | Portable screening plant as needed (expected onsite for about 1 month every 5 to 10 years) | Portable crushing and screening plant as needed (expected onsite for 1 to 2 months once every 3 to 4 years) | Same as Proposed Action | Same as Proposed Action | Same as Proposed Action |
| ***Conveyance Equipment*** | Material loaded onto trucks for on-island deliveries | Truck loading for on-island deliveries. Material for off-island deliveries would be transported from mined areas to barges using a conveyer belt system, ranging in length from 1,200 to 3,400 feet | Same as Proposed Action | Same as Proposed Action | Same as Proposed Action |
| ***RECLAMATION*** | Low levels of mining would require little reclamation. Most reclamation done in small patches to minimal standards (as required by WDNR permit). Little or no terracing for several decades | Active mining/reclamation confined to 64 acres at one time, up to two 32-acre phases. Reclamation would follow WDNR guidelines and may include use of native plants and habitat features for wildlife. Topsoil would be manufactured onsite and augmented with offsite materials as necessary to meet WDNR reclamation standards | Same as Proposed Action | Same as Proposed Action | Major emphasis on restoring madrone forest |

## *Table 2-1. Continued*

| ***Component*** | ***No-Action Alternative*** | ***Proposed Action*** | ***Alternative 1*** | ***Alternative 2*** | ***Proposed Action with all Additional Mitigation (including restricted hours)*** |
|---|---|---|---|---|---|
| ***BUFFERS*** | | | | | |
| ***Adjacent Property Buffers*** | 50-foot vegetated buffers around perimeter of site | Same as No-Action | Same as No-Action | Same as No-Action | Same as No-Action |
| ***Shoreline Buffer*** | 200-foot shoreline buffer from ordinary high water mark of Puget Sound | Same as No-Action | Same as No-Action | Same as No-Action | Same as No-Action, also restore shoreline habitat |
| ***Stormwater Management*** | No stormwater pond constructed | A new stormwater pond would be constructed | Same as Proposed Action | Same as Proposed Action | Dispersed stormwater system, rather than centralized pond |
| *numbers approximate | | | | | |

## *Table 2-2. Estimated Repairs Needed for Dock*

| Structure | Pile Type[1] | Estimated Number of Piles to be Replaced: Total Number of Existing Piles | Symonds | Reid Middleton | Peratrovich |
|---|---|---|---|---|---|
| Conveyor trestle | vertical | 26 | 4 | 6 | 6 |
| Pier | bearing | 32 | 7 | 10 | 10 |
| | battering | 20 (18) | 5 | 10 | 10 |
| Fender system | fender | 24 (21) | 10 | 10 | 21 (all) |
| ***Total*** | | **102 (97)** | **26** | **36** | **47** |
| Dolphins | cluster | 190 (105) | 90 | 18[2] | 105 (all) |
| ***Grand Total*** | | **292 (202)** | **116** | **54[2]** | **152** |

[1] Total number of existing pilings differed between the Symonds (King County) assessment and the Reid Middleton (Applicant) and Peratrovich (Maury-Vashon Island Community Council) assessments. The number in parenthesis indicates the existing pilings according to the Reid Middleton assessment and the Peratrovich assessment.

[2] The number of dolphin pilings to be replaced, suggested by the Applicant, reflects adding 6 steel dolphins (3 piles per dolphin, total 18) to supplement the existing dolphins. The existing dolphin pilings could be removed or left in place because the functional capacity would be provided by the new steel dolphins.

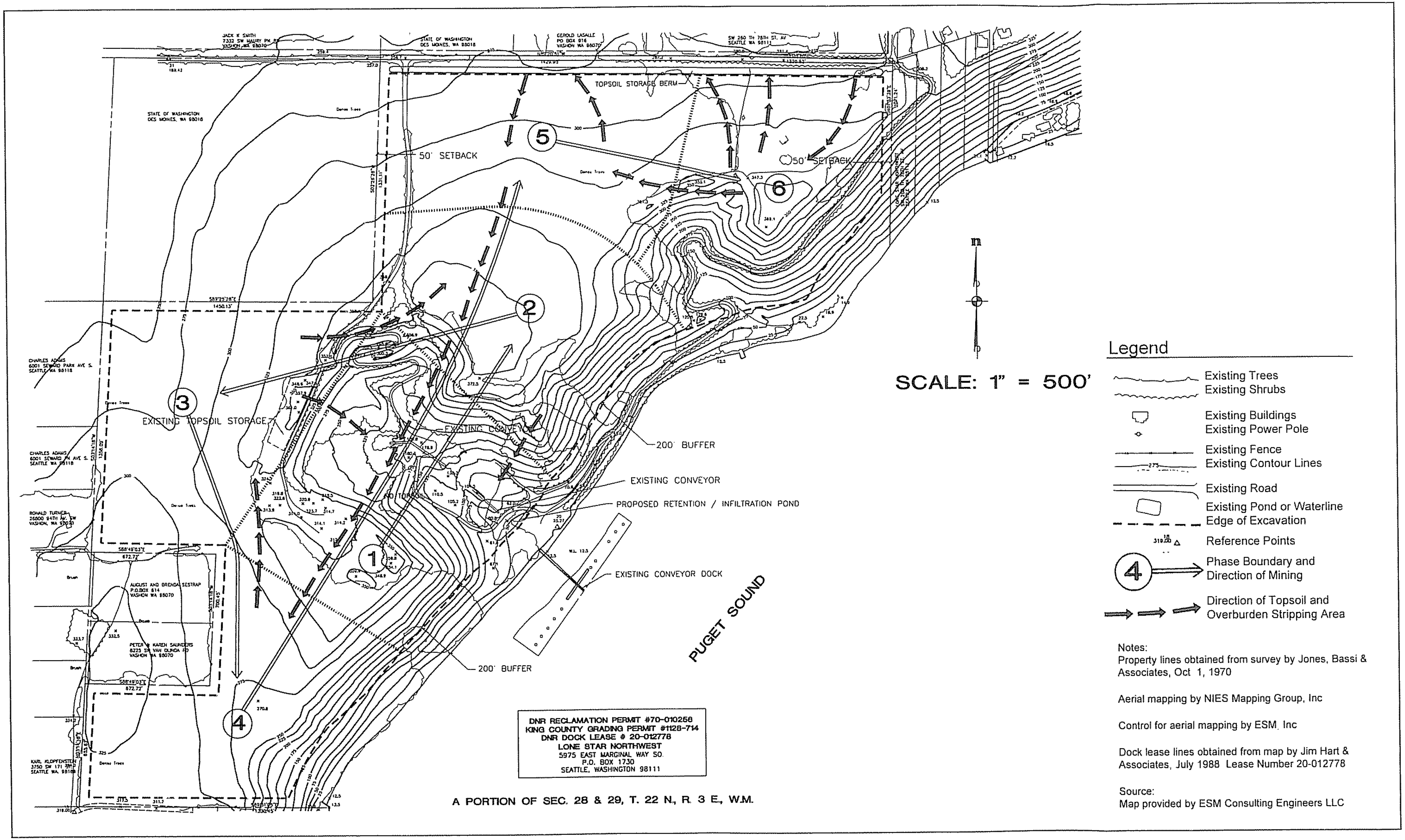
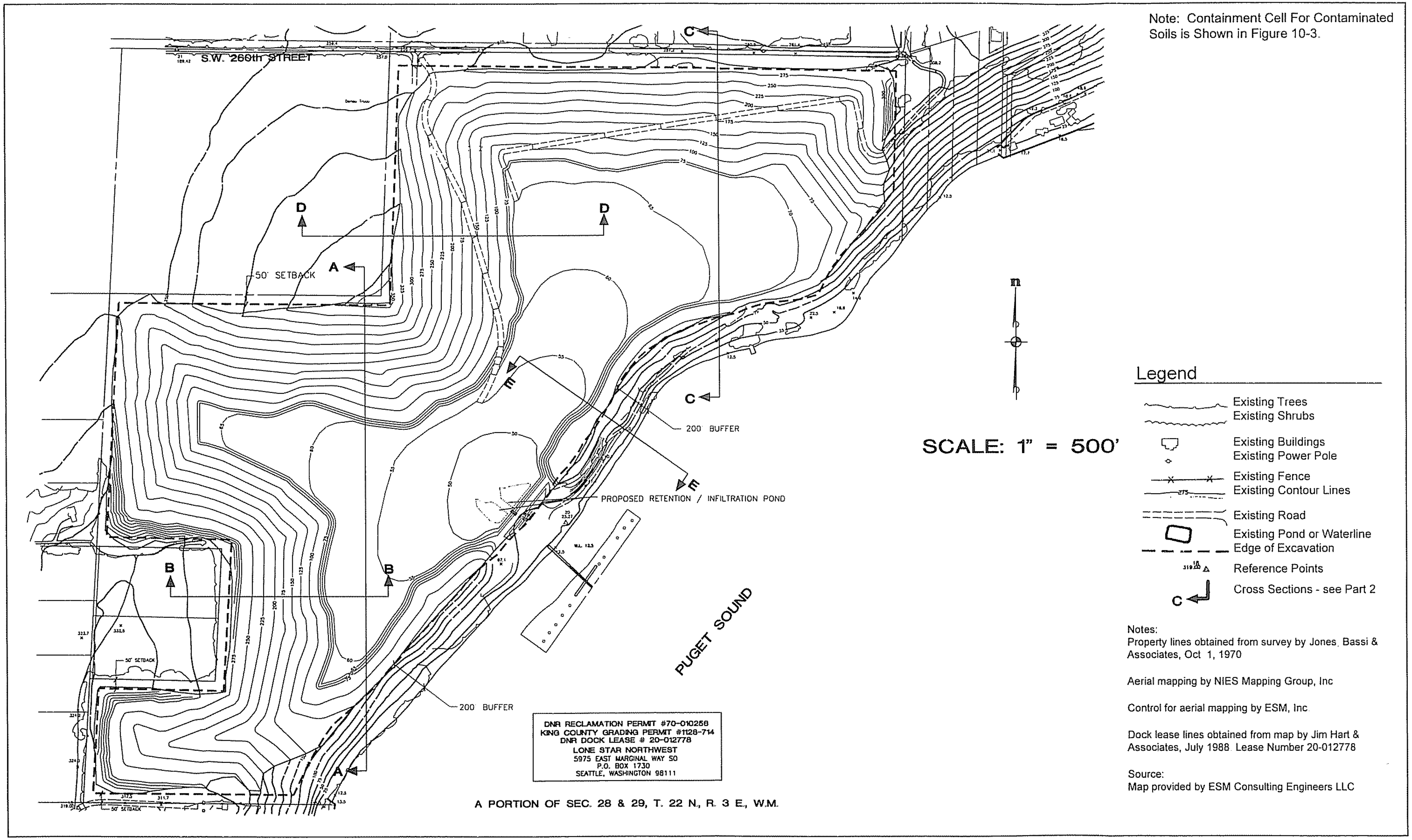



Figure 2-1. Mining Phasing Plan




Notes:
Property lines obtained from survey by Jones, Bassi & Associates, Oct 1, 1970

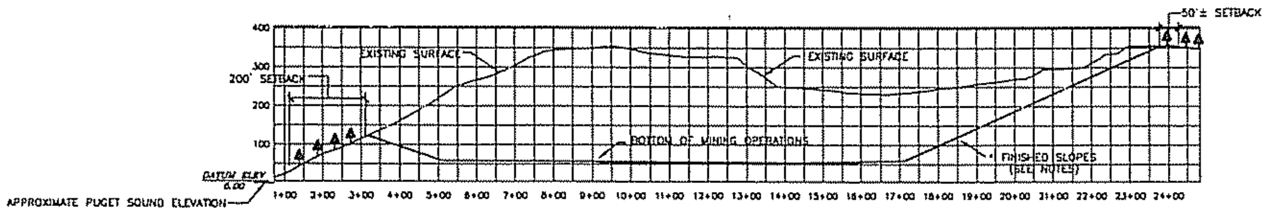
Aerial mapping by NIES Mapping Group, Inc

Control for aerial mapping by ESM, Inc.

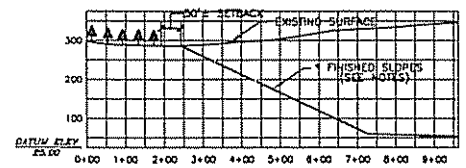
Dock lease lines obtained from map by Jim Hart & Associates, July 1988. Lease Number 20-012778

Source:
Map provided by ESM Consulting Engineers LLC

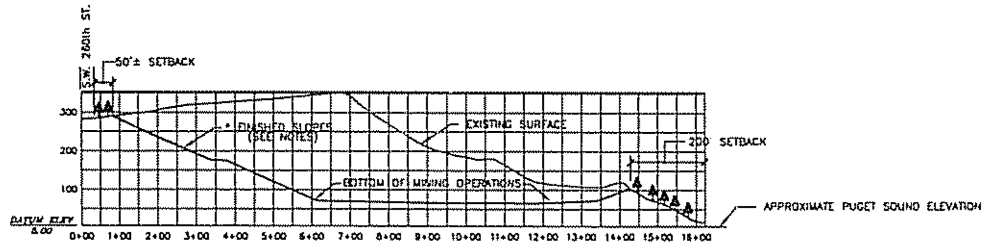
Figure 2-2A. Final Site Contours Part 1



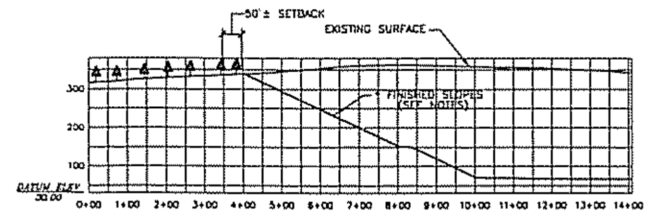

SECTION A-A



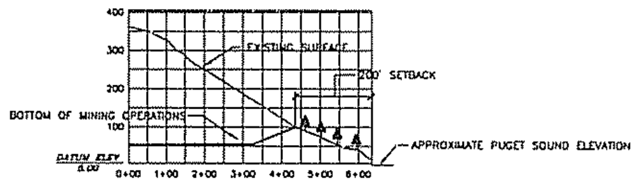

SECTION B-B




SECTION C-C




SECTION D-D

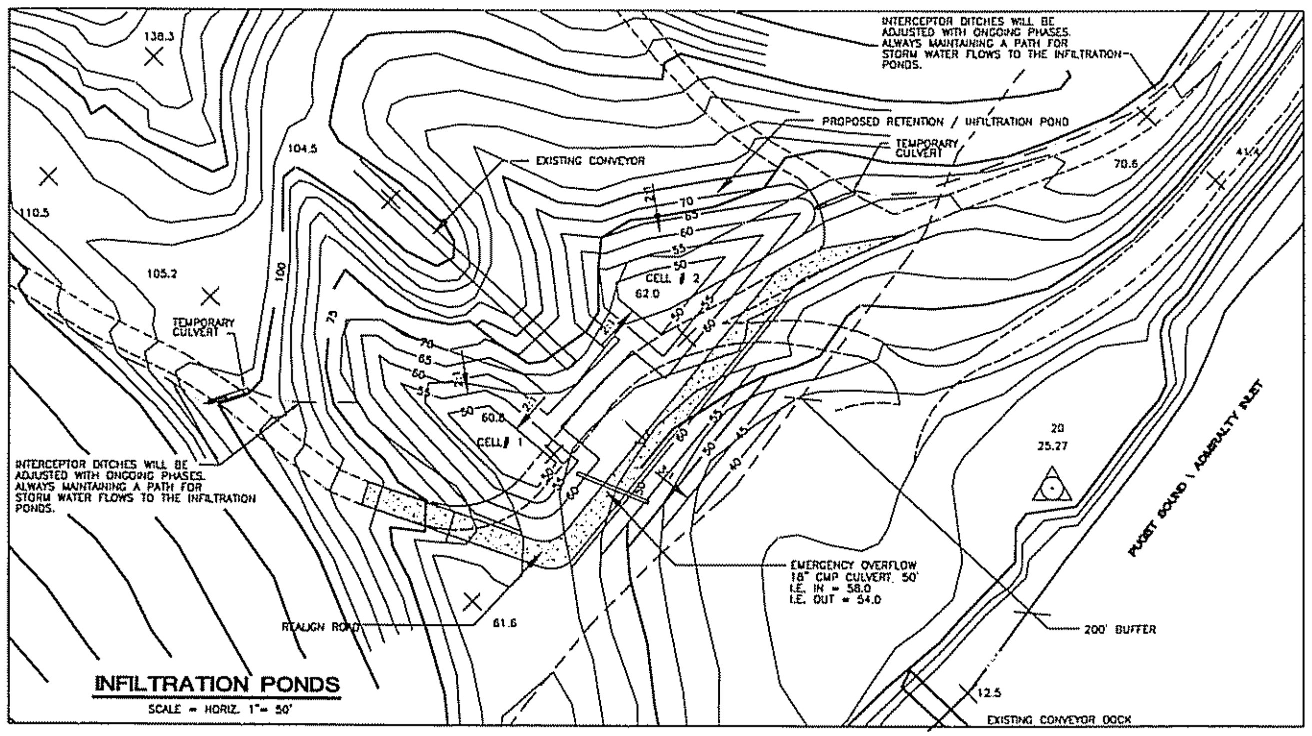



SECTION E-E

* 1. GENERALLY, SLOPES WILL VARY, USUALLY BETWEEN 2:1 AND 3:1 STEEPER SLOPES WILL BE IN LIMITED AREAS TO CREATE SINUOUS TOPOGRAPHY.

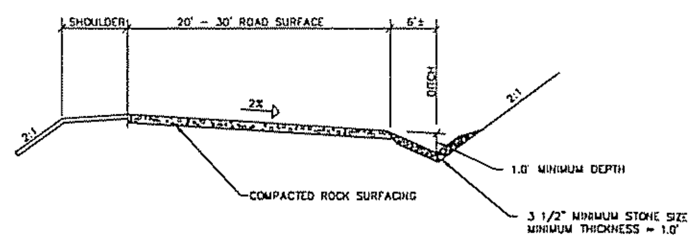
2. 15 FOOT WIDE BENCHES WILL BE ADDED AS NEEDED TO CONTROL EROSION AND SEDIMENTATION

* SCALE = HORIZ. 1"= 200'
VERT = 1"= 200




INFILTRATION PONDS

SCALE = HORIZ. 1"= 50'




GENERAL HAUL ROAD SECTION

NOT TO SCALE

Source:
Provided by ESM Consulting Engineers LLC

Figure 2-2B. Final Site Contours Part 2

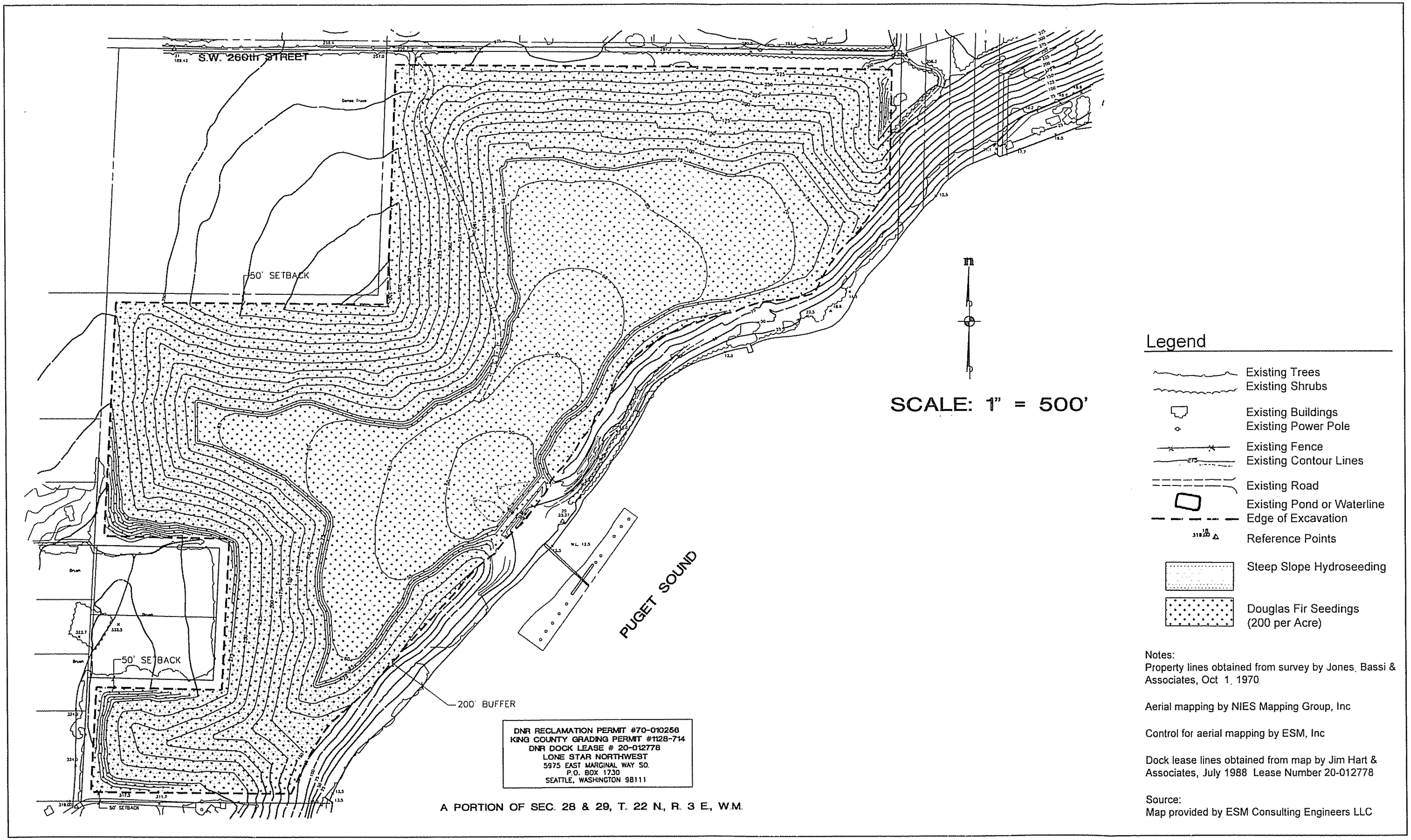



Figure 2-3. Reclamation Plan

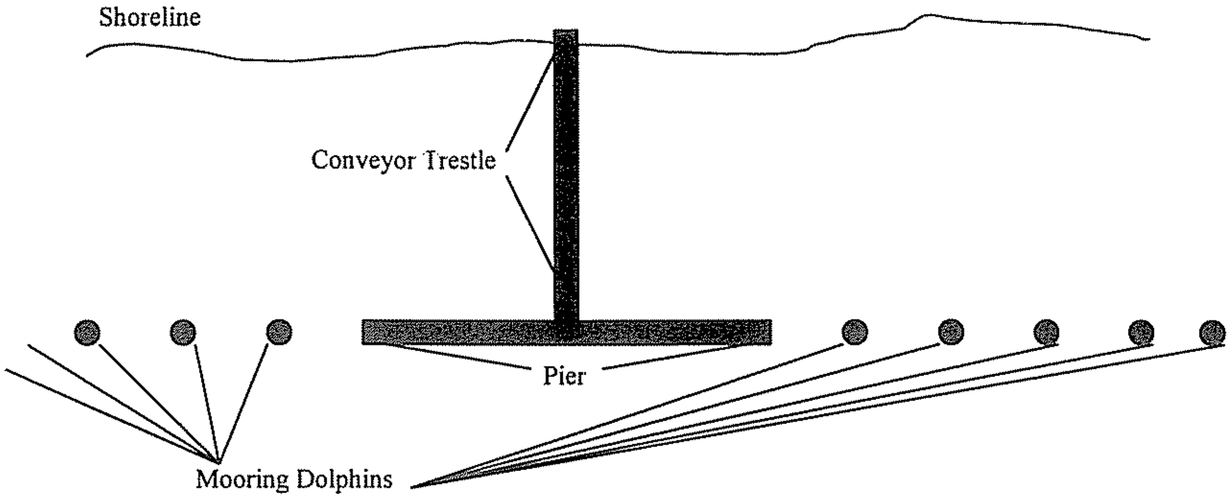



Figure 2-4. Main Components of Dock Structure

# *Chapter 3*

# Air Quality

# Chapter 3

# Air Quality

## 3.1 Primary Issues

Sand and gravel mining, by its nature, involves moving large amounts of material. Moving and disturbing such material can generate dust, especially under dry conditions. Many people are concerned about this dust drifting on and into their homes.

The primary issue analyzed in this section is:

- Would fugitive dust resulting from the project exceed regulatory standards at the property line or at nearby residential locations?

Issues associated with the release of arsenic are discussed in Chapter 10.

## 3.2 Affected Environment

### 3.2.1 Regulatory Overview

Three agencies have jurisdiction over air quality in the project area: the U.S. Environmental Protection Agency (EPA), the Washington State Department of Ecology, and the Puget Sound Clean Air Agency. Although EPA and Ecology have an oversight role, PSCAA is the primary regulatory agency and has primary permitting responsibility related to air quality issues. PSCAA has adopted ambient air quality standards as shown in Table 3-1.

Some of the "criteria" pollutants listed in Table 3-1 are subject to two types of standards. "Primary" standards are designed to protect human health with an adequate margin of safety, while "secondary" standards are established to protect the public welfare from any known or anticipated effects associated with these pollutants, such as soiling, corrosion, or damage to vegetation. It is generally accepted that if the ambient concentrations are less than the PSCAA limits listed in Table 3-1, then no significant air quality impacts have occurred.

Particulate matter (dust) less than or equal to 10 micrometers (µm) in diameter (PM10) is the focus of the analysis prepared for mining operations on the site. Other pollutants listed in Table 3-1 (sulfur dioxide, carbon monoxide, etc.) would be emitted at relatively low rates from the tailpipes of trucks and other operating equipment (e.g., bulldozers) and are expected to have minimal impacts on ambient air quality. Therefore, they are not addressed in detail in this EIS.

PM10 is important in terms of potential health impacts because particles in this size range can be inhaled deeply into the lungs. PM10 is generated by industrial activities and operations; fuel combustion sources, such as residential wood-burning stoves, motor vehicle engines, and tires, and other sources. In July 1997, the EPA revised particulate matter standards to include particulate matter less than or equal to 2.5 µm in diameter (PM2.5) because particulates at this size were the greatest concern to health (EPA 1997). However, almost all of the particulate matter generated by sand and gravel operations is larger than the fine particles considered PM2.5, and most of the particulate matter emitted is greater in diameter than the coarser particles (PM10). Therefore, only PM10 is addressed in detail.

### 3.2.2 Existing Air Quality

Ecology and PSCAA maintain a network of air quality monitoring stations throughout the Puget Sound area. In general, monitoring stations are located near where air quality problems are expected to occur, often near urban areas or close to specific large air pollution sources. A limited number of monitoring stations are located in more remote areas to provide an indication of regional or background air pollution levels.

There are no significant sources of PM10 near the project site. Because of the rural nature of the site, background or ambient PM10 concentrations are likely to be less than those reported at nearby urban monitoring stations. Since none of the existing monitoring stations is near the site, the locations of the nearest monitors were evaluated to determine which locations would best represent conditions at the project site. The nearest monitoring stations are located at:

- Kent (James Street and Central Avenue),
- Northeast Tacoma (5225 Tower Drive Northeast),

- Seattle, South Park (723 South Concord Street),
- Meadowdale (7252 Blackbird Drive Northeast), and
- Poulsbo (6th Avenue Northeast and Fjord Drive).

Of these monitoring stations, Northeast Tacoma, Meadowdale, and Poulsbo are most comparable to the rural environment of Maury Island. The most recent PM10 data for these three stations are:

- Northeast Tacoma: 46 micrograms per cubic meter ($\mu g/m^3$) (second-highest 24-hour average),
- Meadowdale: 48 $\mu g/m^3$ (second-highest 24-hour average), and
- Poulsbo: 35 $\mu g/m^3$ (second-highest 24-hour average) (PSCAA 1997).

Based on these data, the highest (and therefore worst-case) regional PM10 level (48 $\mu g/m^3$) was assumed for the background PM10 concentration at the project site. Because of the rural nature of the project site, and the lack of significant PM10 sources in the vicinity, actual background PM10 concentrations are likely much lower than those used in this analysis.

## 3.3 Impacts

### 3.3.1 Would fugitive dust resulting from the project exceed regulatory standards at the property line or at nearby residential locations?

#### *3.3.1.1 Proposed Action*

In order to describe potential dust impacts related to mining under the Proposed Action or alternatives, it is necessary first to explain features of the proposal that relate to dust impacts, and the factors that were considered in performing air quality computer modeling for the project. These are discussed in the following sections. The section titled “PM10 Modeling Results”, following the introductory discussion of methods, discusses the specific dust impacts predicted for the Proposed Action. In general the project is not anticipated to generate significant levels of the type of dust (i.e., very small particles) that creates potential health impacts. As mentioned earlier, the potential for the project to release airborne arsenic is discussed in Chapter 10.

**Features of the Proposed Action Related to Air Quality Impacts.** Under the Proposed Action, sand and gravel extraction could approach 7.5 million tons per year, with nearly all of the material being sent to off-island markets via barges. The project site would provide a relatively uniform product (sand and gravel) that would simplify how the material is extracted and processed. Essentially only a few product specifications would be produced at the site, compared to other sites that produce a wide range of products (e.g., different sizes of gravel, mixtures, etc.) that require complicated sorting, crushing, processing, and mixing equipment.

Equipment used for the project would include wheeled loaders and bulldozers. Wheeled loaders would be used to load materials onto trucks for on-island distribution. A maximum of 20 trucks per day could be required at times to meet on-island demand. Additional trucking would be considered a major project modification, and subject to SEPA review. Trucking would be a very small component of the overall project, limited to on-island markets.

Bulldozers would be used to excavate materials. Bulldozers would work from the top of the slope, pushing materials down the slope to a collection point where it would be conveyed to a feeder, which delivers materials to the conveyor system for transport to the barges.

Other than the presence of a portable crushing plant at the site for 1 to 2 months every 3 or 4 years (see Chapter 2), there would be no ancillary activities that are typically associated with mining operations (e.g., rock crushers, concrete or asphalt batching plants, wood or concrete recycling operations, etc.). There would be no lifting and dropping of mined materials (except for loading of individual trucks), nor would there be batch dropping of mined materials into the conveyor system.

**Emissions Inventory.** Operational emission rates for the air quality modeling were based on a worst-case annual extraction rate of 7.5 million tons of material with equipment operating 16 hours per day (Monday through Friday) and 9 hours per day on Saturdays. The emission rates and the ambient air quality modeling were based on the production rates shown in Table 3-2.

AP-42, EPA's Compilation of Air Pollutant Emissions, was used to provide the emission equations for each emission source associated with the project. Based on information provided in

Chapter 2 of this EIS, there would be two primary emission sources associated with the project: (1) line source emissions associated with trucks traveling on unpaved haul roads; and (2) area source emissions associated with bulldozers pushing material into the feeder/conveyor system. Worst-case annual PM10 emissions associated with the Proposed Action would be approximately 12 tons per year, as shown in Table 3-3.

**Model Selection.** There are a number of air quality models that can be used for evaluating fugitive dust impacts. The selection of a model for a particular application is determined by several factors, including the nature of the emission source, the environmental setting in which the project would occur, pollutants being evaluated, and the data available to conduct the analysis. Based on conversations with PSCAA, EPA, and Ecology, the Fugitive Dust Model (FDM) was selected for this analysis.

Three types of information are required to model air quality impacts with the FDM:

- emission source information, including emission rates and locations;
- meteorological data depicting atmospheric conditions in the vicinity of the project site; and
- receptor data, including locations at which concentrations are to be computed.

**Emission Information.** For this analysis, emission sources are grouped into two general categories:

- sand and gravel mining areas (area sources), and
- haul roads (line sources) used by trucks traveling on the site.

Figure 3-1 shows the locations of the area sources along with the project site boundaries for three scenarios modeled for this analysis. The three scenarios selected for the area sources reflect phases of the project operation when mining activities would be closest to the project boundary and would have the greatest potential for offsite impacts.

**Meteorological Information.** Meteorological data are used in the FDM to determine how the air transports and disperses emissions from the project. Under ideal conditions, onsite data are collected and used in the analysis. However, no onsite data are available for the proposed project and, because of the complicated topographical features surrounding the site, it was felt that a "generic" regional data set would not be appropriate or representative of conditions at the site.

For this project, Jones & Stokes developed a meteorological data set that consisted of all possible wind speed, direction, and stability class combinations, except that nighttime speed/stability classifications representing the most stable environmental conditions (Classes E and F) were not included because mining operations would not occur at night. Each of the remaining speed/stability combinations was modeled for each of 36 wind directions in 10-degree increments. Using this meteorological data set ensured that the worst-case combination of wind speed, direction, and stability would be reflected in the model results (i.e., the worst-case impacts associated with the project would be determined). Using this approach, a total of 1,084 hours of meteorological data were used in the modeling.

**Receptor Information.** Receptors are the locations at which PM10 concentrations are estimated. Two types of receptor locations were used for this project: project boundary locations and nearby offsite residential locations. A total of 298 receptor locations were modeled in the analysis.

**PM10 Modeling Results.** The Fugitive Dust Model was used to estimate maximum (i.e., worst-case) 24-hour PM10 concentrations at three locations representative of when mining activities would be closest to the property lines and nearest the offsite residential receptors (Figure 3-1). These three locations are discussed below as Scenarios 1, 2, and 3. As described below, under all three scenarios, the worst-case 24-hour PM10 concentrations would be less than the regulatory standard.

**Scenario 1.** Under Scenario 1, emissions were modeled based on mining activities in the northeastern corner of the project site. The nearest receptors to this portion of the project site are individual residences of the Gold Beach community, approximately 600 to 1,000 feet east of the site. Table 3-4 shows the maximum modeled 24-hour average PM10 concentrations at the property line and at nearby residential receptors.

Modeling indicated that the maximum impact under this scenario would occur near the main access road to the project site off of Southwest 260th Street. The 70 $\mu g/m^3$ project contribution plus the assumed 48 $\mu g/m^3$ background concentration would result in a total PM10 concentration of 118 $\mu g/m^3$ at this location, which would be below the 150 $\mu g/m^3$ standard. Near the Gold Beach residential receptors, modeled PM10 concentrations ranged from 112 to 116 $\mu g/m^3$ (including 48 $\mu g/m^3$ background concentration), also below the standard.

**Scenario 2.** Under Scenario 2, emissions were modeled based on mining activities in the west-central portion of the project site (Figure 3-1). The nearest residential receptors to this location are a single residence located approximately 200 feet west of the project site and residences near the southern property line.

Modeling under this scenario indicated that the maximum impact would occur at the western property line. The maximum modeled PM10 concentration at this location would be 118 $\mu g/m^3$ (including 48 $\mu g/m^3$ background concentration), the same as modeled under Scenario 1. This would also be below the 150 $\mu g/m^3$ standard. At the nearest residential locations, modeled PM10 concentrations would range from 111 to 112 $\mu g/m^3$.

**Scenario 3.** Under Scenario 3, emissions were modeled based on mining activities in the southwestern corner of the project site (Figure 3-1). As with Scenario 2, the nearest residential receptors to this location are a single residence located approximately 200 feet west of the project site and residences near the southern property line.

Modeling under this scenario indicated that the maximum impact would occur near the western property line. The maximum modeled PM10 concentration at this location would be 119 $\mu g/m^3$ (including 48 $\mu g/m^3$ background concentration), which would be below the 150 $\mu g/m^3$ standard. At the nearest residential locations, modeled PM10 concentrations would range from 108 to 115 $\mu g/m^3$.

**Annual PM10 Concentrations.** Annual average PM10 concentrations are expected to be lower than the modeled 24-hour average concentrations shown in Table 3-4 for several reasons. First, rainfall (which was not included in the emission rate estimates developed for the FDM modeling scenarios) would control some dust, reducing the overall volume of fugitive dust leaving the site. Second, average winds would provide better downwind dispersion of fugitive dust than is indicated by modeling of the worst-case 24-hour period. Because the modeled maximum 24-hour concentrations at all locations are below the regulatory standard, it is assumed that the maximum annual-average concentrations would also be less than the corresponding standard.

In addition, according to the EPA guidance document, Screening Procedures for Estimating the Air Quality Impact of Stationary Sources (EPA 1992), annual PM10 concentrations can be conservatively estimated by multiplying 1-hour modeled PM10 concentrations by 0.1. For this analysis, the highest modeled 1-hour PM10 concentration was 180 $\mu g/m^3$, which results in an annual PM10 concentration of 18 $\mu g/m^3$. This agrees very well with the annual PM10 concentration as measured at the Kitsap County (Meadowdale) monitoring station (17 $\mu g/m^3$), and is well below the regulatory standard (Table 3-1).

### *3.3.1.2 Alternatives 1 and 2*

The emission rates for Alternatives 1 and 2 were estimated by multiplying the emission rate for the Proposed Action by the ratio of the production rates for the selected alternative vs. the Proposed Action. The estimated emission rates for Alternatives 1 and 2 are shown in Table 3-3.

The fugitive dust emission rates for Alternatives 1 and 2 are less than the Proposed Action, because the daily production rate and the annual production rates would be limited by the number of loaded barges that could leave the site. Because the emission rates for each of the individual sources would be lower, it is reasonable to assume that the impacts would be lower than those modeled for the Proposed Action. Worst-case modeled PM10 concentrations for Alternatives 1 and 2, shown in Table 3-4, are all below the regulatory standards.

### *3.3.1.3 No-Action*

Under the No-Action Alternative, mining activities at the project site would continue as they have for about the last 20 years, with annual production of approximately 20,000 tons. At these low levels of extraction, very small amounts of fugitive dust are created, and therefore air quality impacts would be minimal.

## 3.4 Adverse Impacts and Mitigation

### 3.4.1 Significance Criteria

King County considers the following as indicators of significance for air quality impacts under SEPA:

- violating federal, state, or local ambient air quality standards (Table 3-1);
- causing or contributing to a new violation of the National Ambient Air Quality Standards;
- increasing the frequency or severity of an existing violation;
- delaying the timely attainment of a standard; or
- exposing people to irritating or harmful airborne materials.

### 3.4.2 Measures Already Proposed by the Applicant or Required by Regulation

a. Notice of Construction Permit. Existing regulations, under the jurisdiction of the PSCAA, adequately mitigate impacts. The PSCAA would require the Applicant to obtain a "Notice of Construction" permit, a major goal of which is to identify air pollution controls at the site. The Agency would require the Applicant to apply Best Available Control Technology (BACT) to reduce air emissions from the site.

   PSCAA considers visible dust plumes leaving the site as the threshold for violation and subsequent agency action. Thus, prior to issuing the required permit, Agency staff would determine if the control technologies would likely prevent visible dust plumes from being carried past the property line. King County has determined, as part of the SEPA analysis, that proposed control measures, together with additional monitoring, adequately mitigate this impact.

   Once the mine is in operation, Agency staff would inspect the site at regular intervals, or upon the receipt of complaints. If visible dust plumes were observed leaving the site, the Agency would issue a Notice of Violation that could result in a fine and possible shutdown of the project until resolution of the problem.

b. Dust Control Plan. Keeping fine materials moist is the most effective way to minimize dust. Such measures are routinely applied for similar projects, and they would be incorporated into the required dust control plan under the authority of Sections 9.15 and 9.20 of the PSCAA Regulation 1. These regulations require the use of BACT to achieve the goal of "no visible dust" leaving the site. The following measures would likely be incorporated into a dust control plan for the project:

- A relatively high moisture content would be maintained in mined materials to minimize emissions. A water-spray truck would be maintained onsite during operating hours to wet exposed fine, dry materials to control any increases in dust generation from operation of bulldozers or trucks on the site. Water for dust control would be purchased and trucked onto the site. Water trucks hold about 5,000 gallons, and during dry conditions, the operation would use about two truckloads per day.

- A 50-foot wide vegetated buffer would be maintained around the site's perimeter as required by King County.

- Reclaimed areas would be permanently stabilized by hydroseeding or other procedures, according to the reclamation performance standards, as soon as mining is completed. Chapter 10 provides additional dust control measures recommended to address concerns regarding arsenic, as well as a dust monitoring plan proposed by the Applicant.

c. New Source Performance Standards. In addition to PSCAA regulations, the portable crushing plant, if it were to operate at a capacity greater than 150 tons per hour, would be subject to federal New Source Performance Standards (40 CFR 60 - Subpart OOO). The standards define explicit limits for dust emitted from stacks, transfer points, crushers, and building vents, and they require source tests and record keeping.

### 3.4.3 Remaining Adverse Impacts and Additional Measures

#### *3.4.3.1 Air Impact 1 – Possible Impact Due to Inadequate Monitoring/Enforcement*

While dust control is technically simple, the real challenge in ensuring compliance is in persistent and diligent monitoring and enforcement, as well as in education of people working at the site.

King County and PSCAA are responsible for enforcement, but typically such enforcement is triggered by citizen complaints. This often is sufficient, but requires an adverse impact (assuming a valid complaint) to trigger a response.

#### *3.4.3.2 Air Mitigation 1*

Include periodic inspection and discussion with site operators as part of an environmental monitoring and reporting plan for the project.

Relevant considerations for specific timing and frequency include:

1. Inspections and discussions with staff should be more frequent at project start-up, including start-up after periods of little or no mining.

2. Inspections should be timed during prolonged dry weather, when the potential for violation is greatest.

3. Frequent violations should trigger more regular inspections.

#### *3.4.3.3 Regulatory/Policy Basis for Condition*

Per the operation standards set forth in KCC Chapter 21A.22:

*dust and smoke produced by extractive operations must not substantially increase the existing levels of suspended particulates at the perimeter of the site and must be controlled by watering of the site and equipment or other methods specified by the County.*

## 3.5 Cumulative Impacts

With appropriate mitigation, the project would not significantly affect air quality, even when considered collectively with other air pollution sources from ongoing and reasonably expected activities.

## 3.6 Significant Unavoidable Adverse Impacts

None likely with existing laws clearly addressing potential impacts, as reinforced through additional monitoring and reporting. The project would be within air quality standards. Dust control measures are economically and technically feasible, as demonstrated in many major construction projects permitted in the region. Additional buffers would address concerns of adjacent landowners. Limits would be enforced through monitoring.

## 3.7 Citations

EPA. See “U.S. Environmental Protection Agency”.

PSCAA. See “Puget Sound Clean Air Agency”.

Puget Sound Clean Air Agency. 1997. Air quality summary reports, 1997 data summary. Obtained from the Internet at www.pscleanair.org/airqual.htm.

U.S. Environmental Protection Agency. 1992. Screening procedures for estimating the air quality impact of stationary sources, revised. Office of Air Quality Planning and Standards.

U.S. Environmental Protection Agency. 1997. Compilation of air pollutant emission factors. 5th edition and supplements. Office of Air Quality Planning and Standards.

Washington State Department of Ecology. 1999. 1997 air quality data summary. Air Quality Program.

## *Table 3-1. Ambient Air Quality Standards*

| Pollutant | National Primary | National Secondary | Washington State |
|---|---|---|---|
| ***Total Suspended Particulates*** | | | |
| Annual Geometric Mean | no standard | no standard | 60 $\mu g/m^3$ |
| 24-Hour Average | no standard | no standard | 150 $\mu g/m^3$ |
| ***Lead (Pb)*** | | | |
| Quarterly Average | 1.5 $\mu g/m^3$ | 1.5 $\mu g/m^3$ | no standard |
| ***Particulates*** | | | |
| **$PM_{10}$** | | | |
| Annual Arithmetic Mean | 50 $\mu g/m^3$ | 50 $\mu g/m^3$ | 50 $\mu g/m^3$ |
| 24-Hour Average | 150 $\mu g/m^3$ | 150 $\mu g/m^3$ | 150 $\mu g/m^3$ |
| **$PM_{2.5}$** | | | |
| Annual Arithmetic Mean | 15 $\mu g/m^3$ | 15 $\mu g/m^3$ | no standard |
| 24-Hour Average | 65 $\mu g/m^3$ | 65 $\mu g/m^3$ | no standard |
| ***Sulfur Dioxide ($SO_2$)*** | | | |
| Annual Average | 0.03 ppm | no standard | 0.02 ppm |
| 24-Hour Average | 0.14 ppm | no standard | 0.10 ppm |
| 3-Hour Average | no standard | 0.50 ppm | no standard |
| 1-Hour Average | no standard | no standard | 0.40 ppm[a] |
| ***Carbon Monoxide (CO)[b]*** | | | |
| 8-Hour Average | 9 ppm | 9 ppm | 9 ppm |
| 1-Hour Average | 35 ppm | 35 ppm | 35 ppm |
| ***Ozone ($O_3$)[b]*** | | | |
| 1-Hour Average[c] | 0.12 ppm | 0.12 ppm | 0.12 ppm |
| 8-Hour Average | 0.08 ppm | 0.08 ppm | no standard |
| ***Nitrogen Dioxide ($NO_2$)*** | | | |
| Annual Average | 0.053 ppm | 0.053 ppm | 0.05 ppm |

Notes:

[a] 0.25 not to be exceeded more than two times in any 7 consecutive days.

[b] Primary standards are listed in this table as they appear in the federal regulations; ambient concentrations are rounded using the next higher decimal place to determine whether a standard has been exceeded. The data in this report are shown with these unrounded numbers.

[c] Not to be exceeded on more than 1.0 days per calendar year as determined under the conditions indicated in Chapter 173-475 WAC.

ppm = parts per million

$\mu g/m^3$ = micrograms per cubic meter

Annual standards never to be exceeded, short-term standards not to be exceeded more than once per year unless noted.

Source: Washington State Department of Ecology 1999.

### *Table 3-2. Production Rates Used for Emission Calculations*

| | *Maximum Daily Capacity (tpd)* | *Maximum Annual Capacity (tpy)* |
|---|---|---|
| ***Proposed Action*** | 40,000 | 7.5 million |
| ***Alternative 1*** | 20,000 (weekdays)<br>10,000 (Saturdays) | 5.72 million |
| ***Alternative 2*** | 10,000 | 3.12 million |

### *Table 3-3. Peak Annual PM10 Emission Rates Used to Model Potential Impacts*

| | *Proposed Action* | | *Alternative 1* | | *Alternative 2* | |
|---|---|---|---|---|---|---|
| ***Activity*** | ***Lbs/day*** | ***(tons/yr)*** | ***lbs/day*** | ***(tons/yr)*** | ***lbs/day*** | ***(tons/yr)*** |
| ***Haul Roads*** | 48.9 | 7.6 | 36.7 | 5.7 | 12.2 | 1.9 |
| ***Bulldozer Operations*** | 28.2 | 4.4 | 21.2 | 3.3 | 7.1 | 1.1 |
| ***Totals*** | 77.1 | 12.0 | 57.9 | 9.0 | 19.3 | 3.0 |

### *Table 3-4. Maximum Modeled PM10 Concentrations (24-Hour Averages)*

| | | *Maximum PM10 Concentrations** | | |
|---|---|---|---|---|
| ***Alternatives*** | ***Ambient AQ Standard ($\mu g/m^3$)*** | ***At Property Line*** | ***At Nearest Residences*** | ***Impact*** |
| ***Proposed Action*** | | | | |
| Scenario 1 | 150 | 118 | 112-116 | no |
| Scenario 2 | 150 | 118 | 111-112 | no |
| Scenario 3 | 150 | 119 | 108-115 | no |
| ***Alternative 1*** | 150 | 99 | 87-94 | no |
| ***Alternative 2*** | 150 | 83 | 77-80 | no |

* Includes 48 $\mu g/m^3$ background concentration.

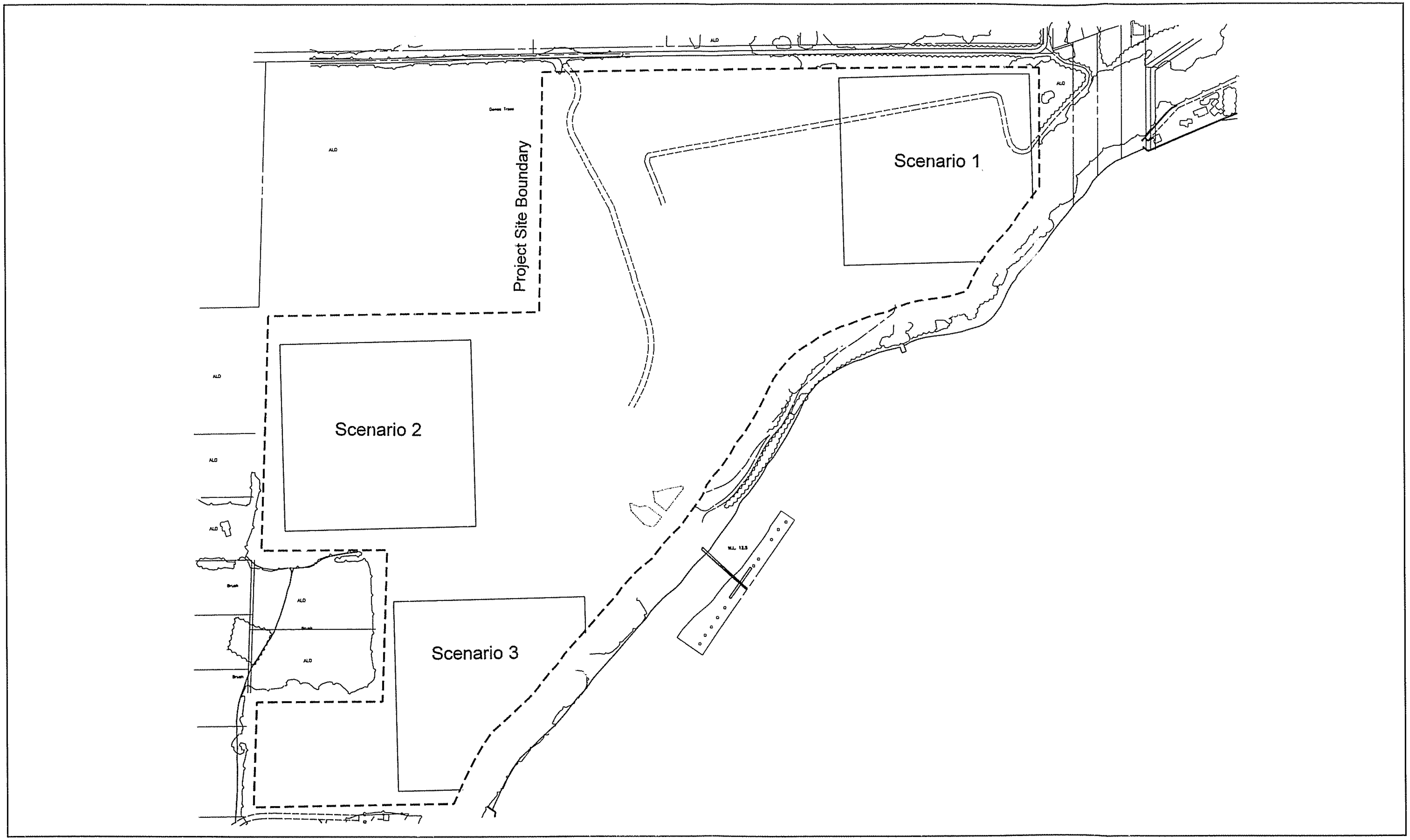



Figure 3-1. Air Quality Modeling Scenarios

*Chapter 4*

# Geology and Hydrogeology

# *Chapter 4*

# Geology and Hydrogeology

## 4.1 Primary Issues

Protection of water resources at the site is a major project issue, since Vashon/Maury Island residents rely on groundwater for their water. With the Applicant proposing to remove large amounts of earth from the site, changes in the water regime of the site would be inevitable. This chapter evaluates primary issues associated with the geology and hydrogeology of the property, as identified by the EIS Team and by concerned citizens.

The primary issues analyzed are:

- Would mining as proposed affect recharge of the aquifer system or affect the availability of water to residents on Vashon/Maury Islands?
- Would mining affect groundwater quality?
- Would the mining activity breach an aquifer or otherwise impact adjacent groundwater wells being used by local residents?
- Would the proposed mining cause saltwater intrusion into the freshwater aquifer?
- Would the proposed mining activity create slope stability problems?
- Would proposed mining affect surface water resources?

## 4.2 Affected Environment

To understand how the proposed mining operation would change water regimes, one must first understand the existing geology and water regime. The following sections describe the water regime on the site and how it relates to the water regime on other lands within the Maury Island system.

A more detailed discussion and additional background information was given in Appendix A and Appendix E of the DEIS. Additional data on water quality and recent groundwater monitoring results are included in the FEIS as an Addendum to Appendix E.

### 4.2.1 Information Sources

This report documents King County's independent analysis and conclusions based on groundwater and geologic data from the site and surrounding area.

Information used for this analysis includes previously published and unpublished data and reports, as well as data gathered from the site by King County's EIS Team. Sources of data include:

- two 2-inch-diameter water wells (OBW-1 and OBW-2) installed on the site prior to the DEIS analysis;
- a soils, geology, groundwater, and geological hazards study prepared by Associated Earth Sciences, Inc. (AESI 1998, 1999);
- studies conducted for the Applicant by ESM (1998);
- two exploration soil borings (EB-3 and EB-4), also installed prior to the DEIS study;
- five new 6-inch diameter monitoring wells (OBW-5 through OBW-9) installed under the observation and guidance of the EIS Team as part of the DEIS, three of which are equipped with continuous-recording transducers that track *static water levels* (i.e., groundwater depth at a specific time and place);
- direct observations by the EIS Team of exploration pits dug on the site by AESI;
- well logs from similar geologic mapping and well drilling operations that have occurred throughout Maury Island, obtained from the Department of Ecology (Ecology, Central Files);
- Ecology's Water Rights Application Tracking System for Maury Island (Ecology 2000c);
- well logs from the Sandy Shores and Gold Beach wells obtained from the Washington State Health Department;

- the Vashon/Maury Island Water Resources Study (Carr and Associates 1983, referred to as the “Carr report”), a general study conducted for the entire Vashon/Maury Island area;

- the Vashon/Maury Island Groundwater Management Plan (Vashon-Maury Island Groundwater Advisory Committee 1998), which provides a framework for managing groundwater on Vashon/Maury Islands and outlines the overall geology and groundwater regimes of the islands;

- the United States Geological Survey (USGS) geologic map of Vashon and Maury Islands (Booth 1991);

- results from quarterly groundwater monitoring conducted at the proposed project site since preparation of the DEIS (included in the FEIS as an addendum to Appendix E); and

- results from the Department of Ecology Maury Island Gravel Mine Hydrogeologic Impact Assessment (Pacific Groundwater Group 2000).

Ecology’s Mid-Study Fact Sheet (Ecology 2000a) and Final Fact Sheet (2000b) provide brief, less technical summaries of the Ecology results and are included in the FEIS as Appendix I.

King County’s EIS Team determined that the five new wells were needed (1) to define the groundwater depth, changes in depth over time, and groundwater flow paths; and (2) to provide stations for long-term groundwater monitoring in the event the proposed mining were to proceed. The EIS Team provided input on where wells should be located; reviewed and concurred with selected well locations; observed well drilling and logging; and used the monitoring data to conduct the independent analysis and assess how mining would affect water regimes. Locations of the onsite and offsite water wells used in the analysis are shown in Figures 3 and 9 of Appendix A of the DEIS.

These wells will continue to track groundwater levels, thereby showing how groundwater levels change over time and/or during mining, and can be used to guide future mining activities, such as the final excavation limits to be specified in the Grading Permit.

The 6-inch diameter well holes range in depth from 60 to 300 feet below the existing surface. As they were drilled, geologists took samples of the materials and mapped and described them (AESI 1999). The EIS Team used these descriptions together with logs obtained from other geologic mapping and well drilling operations in the area to describe the geology of the site and neighboring areas. Well logs from throughout Maury Island have been recorded by many different geologists for many different purposes. Therefore the terminology varies and some interpretation by the EIS Team was required. The geologic cross-sections are based on those logs with the most consistent terminology, using the best judgment of the EIS Team based on local experience in the Puget Sound basin. Appendix A of the DEIS provides details regarding the AESI and other well reports.

The terms used in this EIS follow Carr and Associates (1983), Vashon-Maury Island Groundwater Advisory Committee (1998), Booth (1991), and Ritzi (1983). The Carr report provides general information for the vicinity but lacks site-specific information and details. Likewise, the Groundwater Management Plan provides a framework for managing groundwater on Vashon/Maury Islands and outlines the overall geology and groundwater regimes of the islands. The specific classifications of aquifers and related geologic features in these two reports are useful in discussing specific groundwater sources in the vicinity of the site. Differences between these sources were recorded through the use of site-specific subsurface data. Terms and conditions reported on the USGS geologic map (Booth 1991) were also used in this analysis. However, the USGS geologic map was a regional effort and variations exist between this regional mapping effort and the site-specific information collected for this EIS. The analysis presented in this chapter therefore is based largely on the site-specific information obtained by direct sampling at the site.

## 4.2.2 Geology

### *4.2.2.1 Site Topography*

The general topography of the site is characterized by a surface sloping gently downward from the inland portion of the site, culminating in steep bluffs along the shoreward edge. These bluffs range from 200 to 300 feet above the Puget Sound shoreline. The bluff faces are covered by vegetation except in the immediate vicinity of the conveyer system and dock, and in places where the top layers of soil have slid off the slope, resulting in exposed soils (a process referred to as shallow sloughing). Such sloughing is a natural process that occurs on similar bluffs throughout the shorelines of Puget Sound. The toe of the bluff has been eroded by wave action. This erosion is a natural process.

Mining at the site has caused some obvious changes to site topography. At the eastern portion of the site, past mining removed up to 250 vertical feet of material, resulting in a large, horseshoe-shaped excavation covering about 40 acres. Other mining-related changes at the site include two unpaved roads that lead off of SW 260th Street along the northern margin of the site. One road enters the site near the northwestern corner of the property and provides access to the upland portion of the site. The second road enters the site near the northeastern corner and provides access to the low-lying part of the site, including the existing dock.

The materials that make up the geology of the site include topsoils and a discontinuous layer of till near the surface. This is underlain by coarse sands and gravels, grading to finer sands near the bottom of the deposit. These materials have been deposited over time at the site as a series of layers.

#### *4.2.2.2 Surface Materials*

Surface materials (or surface soils) are the upper and most weathered part of the soil profile. It follows that surface soils are the youngest materials on the site. These soils formed onsite by weathering and erosion of underlying materials and, therefore, reflect the composition of these deeper materials. The sandy and gravelly soils present onsite are part of the Everett series soils. Where glacial till occurs close to the surface, the soils are rocky and mixed, and are part of the Alderwood series soils.

#### *4.2.2.3 Subsurface Materials*

The site is underlain by glacial till, sand, and gravel. Till is a relatively unsorted mixture of clay, sand, gravel, and rocks (ranging in size from pebbles to boulders) left by glaciers.

The shallowest of these materials on the site is classified as Vashon lodgment till, and it occurs in thin pockets near the surface throughout the site. The Vashon till was deposited at the base of the Vashon age glacier that occupied the Puget Sound basin about 13,000 to 16,000 years ago. This soil was deposited beneath the moving ice. Till in the Puget Sound region is often thick (sometimes occurring in a layer 100 feet or deeper) and sometimes bound tightly like concrete. Because of this, till often has low permeability, meaning that water does not flow through it very easily. At this site, the top of the till layer is typically around 5 feet below existing grade. In addition, in its thinner occurrences, it lacks the concrete-like structure found elsewhere. The till has been documented to become thinner and discontinuous along the northern and western portions of the site. Therefore, the till at this site does not form a major barrier for subsurface water flow.

Underneath these thin pockets of till is a deep layer of sand and gravel referred to as Vashon Advance outwash deposits. These are the materials that would be mined. The Vashon Advance outwash sand and gravel were deposited by meltwater streams and rivers that flowed off of the glacial ice as it advanced into Puget Sound from Canada approximately 16,000 years ago. These materials grade from coarser sand and gravel near the top of the deposit to finer sands near the base.

The materials that would be mined continue from near the surface down to various depths. The differences in depth are typical in the Puget Sound region, because the materials were deposited over rolling hills and valleys rather than over a flat surface. The sands and gravels at the site appear to have been deposited in a historic basin situated between hills. The site is situated near the center of this basin, which allowed a thick sequence of sand and gravel to accumulate and form the deposits that are the basis for mining at the site.

The advance outwash soils that make up the majority of the materials on the site exhibit a range of permeabilities (a measure of how easily water flows down through a material). Overall, the materials are highly permeable (water flows easily through them), especially near the surface. This is because materials near the surface are coarse gravels and sands with abundant gaps that allow water to flow downward (i.e., they have higher permeability). Water flows less freely (i.e., slower) in the lower portions of the deposit, where finer materials are packed closer together, allowing less space for water to flow through.

While the materials that would be mined vary in permeability, none are so impervious as to form a water barrier or to slow water flow to the point that it forms an aquifer (such a barrier is called an aquitard). Small, isolated pockets of water-saturated materials are expected to occur due to differing material size and density, but none of these "pockets" would contain sufficient water to be considered an aquifer. The local pockets of perched water that may exist within the materials to be mined would be saturated for only short periods of the year and would not be a credible or dependable source of water for beneficial water uses, such as irrigation or domestic water supplies (see Section 4.2.4.3).

The oldest material encountered beneath the site is a series of fine sands with some silt beds. The stratigraphic correlation for these sands has not been determined. Carbon-14 dating of organic material from these lower sands showed that the sands are older than 45,000 years. Due to the amount of organic material present, these sands appear to be an interglacial deposit. The Olympia Beds, the common aquitard present on Maury Islands, were not specifically encountered during onsite exploration. The Olympia Beds are commonly believed to have an age on the order of 16,000 to 80,000 years before present. Mining would not extend into these older pre-Vashon sands, which lie below the materials that would be mined.

### 4.2.3 Surface Water

Besides the obvious presence of Puget Sound and the associated tidelands, no streams or other surface waters enter the site. Therefore, rainfall and groundwater are the only potential sources of surface water at the site.

Water exits the site via springs along the beach. These springs are below the area that would be mined. These springs exist where the top of the aquifer has been exposed by past wave erosion.

Because the site is underlain with highly permeable sand and gravel, rainfall that is not directly evaporated or transpired through site vegetation percolates down into the underlying groundwater system, rather than collecting in wetlands or streams. No evidence of creeks or seasonal water bodies is present on the uplands or within the pit area on the site. During heavy rains, water collects and runs off the compacted soils on existing roads, and drainage channels are present along the edges of roads. These storm flows follow the compacted drainage channels until reaching undisturbed areas or exposed sands of the existing pit area, where they then rapidly enter the ground.

### 4.2.4 Groundwater

#### *4.2.4.1 Overview of Basic Terms and Concepts Related to Groundwater*

Groundwater is any water present beneath the surface. It occurs in open spaces in soil, sand, gravel, and other sediments, and is a major element of the hydrologic cycle. The hydrologic cycle begins with precipitation (typically rain on this site), which infiltrates relatively quickly into the ground at the Glacier Northwest site.

Once water enters the ground, it will flow downward through porous and permeable materials, such as gravel and sand, until reaching an impermeable barrier (called an aquitard), such as a layer of compact till, thick clays, fine silts, or water pooled up behind such layers.

When a significant amount of water remains in place over time and completely saturates the subsurface materials, it is called an aquifer. For the purpose of this EIS, an aquifer is defined as “A formation, group of formations, or part of a formation that contains sufficient saturated permeable materials to yield economic quantities of water to wells or springs” (Driscoll 1986). An aquifer can occur at different depths or be otherwise dispersed throughout the three-dimensional area beneath the surface.

Based on the analysis conducted for this EIS, four main groundwater bodies have been identified in the vicinity of the site: (1) an interflow network, (2) perched water, (3) the principal aquifer, and (4) the deep aquifer. The following sections describe these groundwater bodies.

#### *4.2.4.2 Interflow Groundwater*

Interflow groundwater is the water below the ground surface that is not part of an aquifer. In the Puget Sound basin, interflow typically develops near the surface within low-permeability soils. Often, this lower permeability layer is a till. The interflow typically moves laterally (sideways) along the top of the till rather than vertically (downward) through the till. Interflow recharges streams and creeks in the Puget Sound basin. The interflow also serves as a reservoir for deeper recharge through the till or other material that comprises the upper aquitard.

Based on direct field observations made by the EIS Team, and on the Team’s analysis of data collected by AESI, no significant interflow network exists on the site. In other words, water is not entering the ground and then flowing laterally (sideways) off the site. Instead, the rainfall that is not directly evaporated or taken up by vegetation continues to move downward to recharge the aquifer below the site’s surface.

The only exception is that laterally flowing water was detected above the till layer that occurs near the surface at one location. As mentioned earlier, these till areas are relatively less permeable than the underlying sands and gravels, but, nonetheless, do allow water to flow through them. In addition, since the till layer occurs in patches, the laterally flowing water eventually reaches more permeable sand and gravel, at which point it starts to move downward toward the water table to recharge the principal aquifer.

The interflow that has been mapped on the site would not be a credible or dependable source of water for beneficial uses such as irrigation or drinking water. This is due to the seasonal nature of the interflow and its limited extent. At the height of the irrigation season, the interflow would be absent. The measurements that have been done onsite indicate that the interflow is present in limited areas and only during the wettest winter months.

#### *4.2.4.3 Deeper Perched Water*

At some places on the site, layers of more densely packed sands and gravels slow the downward movements of water to the point that isolated "pockets" of water form. Such pockets were found at two of the wells on the site. The depths of these pockets were 45 feet (well OBW-6) and 200 feet (well OBW-7). Because these layers of more dense materials are not connected, the pockets of water are also not connected. Thus, water eventually either drains slowly through these materials or flows off the edges of the deposit where sand and gravel occur, and then percolates downward to recharge the aquifer. This is similar to the situation previously described within the till layer, where, in places, water is slowed and may move laterally, only to eventually drain through discontinuities in the material or by reaching the permeable sands and gravels.

#### *4.2.4.4 Aquifers*

An aquifer is a relatively large and stable underground water body formed by water-saturated materials above some sort of impermeable barrier. In previous studies conducted on Vashon/Maury Island, researchers described a principal aquifer, which resides in the sands and gravels of the Vashon advance outwash, and a deep aquifer, which resides in the much lower, pre-Vashon sediments. This is the typical system that occurs throughout the Puget Sound region, since the Vashon outwash deposits typically are underlain by silts and clays that restrict water flow. This base serves to separate groundwater into distinct aquifers.

At the project site, however, it appears that this separation between the principal aquifer and the deep aquifer is not so distinct. The silts and clays are absent beneath the Glacier Northwest site and vicinity. For the purposes of EIS analysis, the aquifer at the site has been considered one continuous system. Other pre-Vashon aquitards do exist in the vicinity of the site, where the deep aquifer is clearly separated from the principal aquifer. This assumed hydraulic continuity between the principal and deep aquifer is a conservative assumption. Were such an aquitard present, then any change in recharge at the site would have little effect on the deep aquifer. Were a significant clay or silt lacustrine deposit present beneath the advance sands, this aquitard would significantly reduce the ability of groundwater from the advance sands, the principal aquifer, to flow towards the deep aquifer present in pockets within the pre-Vashon sediments. With no significant aquitard, as shown by the existing exploration data, the deep aquifer is more susceptible to impacts from decreased recharge to the principal aquifer. Hence, the assumption that there is no significant aquitard is a conservative assumption.

At the Glacier Northwest site, the materials that would be mined are located above the primary aquifer.

#### *4.2.4.5 Static Water Levels*

For mining, one of the most important considerations is at what depth is the top of the aquifer located? This elevation is often referred to as the water table, and measurement of the water table taken from wells is called the static water level.

Static water levels are not fixed, but rather change in response to weather patterns and, sometimes, human influences. Human influences can be removal of large amounts of water through wells, or changes in the recharge regime by intercepting rainwater and diverting it away from the aquifer recharge zones.

Even with these variations, the overall water level measured at any one particular point on the site is relatively stable. Water that enters these sands and gravels travels downward slowly. At the Glacier Northwest site, it is expected that rainwater takes up to 6 months to percolate down through the sands and gravels until finally reaching the water table. The existing data suggest that the time lag is 6 months for the higher portions of the site and 1 to 2 months for the existing mine area where significant materials have already been removed. Water moves downward until it reaches the water table and enters the aquifer. In addition, the site is situated in a sand-filled bowl where water that has infiltrated elsewhere offsite is directed towards the site by the sloping surface of the lower permeability pre-Vashon sediments. Therefore, despite variable precipitation such as rainstorms at the surface, the water table at the site is expected to fluctuate on the order of only a few feet over the course of a year. Ongoing monitoring would provide more information regarding this natural fluctuation and these data would be used for mine design should the project be approved.

Based on the wells established for this EIS and on previous wells, static water levels at the site measure between approximately 90 feet above sea level at the highest point to around 20 feet above sea level at the lowest. The levels generally follow the topography, with the higher levels located upslope and inland, closer to the primary recharge zones, and the lower levels located near the shoreline at the groundwater discharge area. Figures 4-1 through 4-4 map the groundwater table found at the site.

#### 4.2.4.6 Aquifer Recharge

Water that enters the site (and that does not leave via evaporation or by being taken up by plants) eventually reaches the underlying aquifer, thereby contributing to recharge of the aquifer. The recharge occurs initially within the Vashon outwash sediments. From these sediments, some of the water continues deeper into the pre-Vashon sediments (referred to as the “deep aquifer” by Carr and Associates [1983]), while the remaining water flows directly from the outwash deposits to Puget Sound.

Looking at the site within the context of Maury Island, recharge generally occurs in a radial pattern centered on the highest and central-most portions of the island, with all discharge eventually going into Puget Sound (except for that removed via wells). The interface area, where the aquifer discharges into Puget Sound, is expected to occur underground along the margins of the island. This is a typical recharge regime for an island.

This “radial discharge” pattern is illustrated on the project site by the gradient of the water table, with the static water level being near 90 feet above sea level toward the upland portion of the site, grading down to near 20 feet at the shoreline area of the site. The water table at the site grades down to meet the waters of Puget Sound. Results from the Ecology study (Pacific Groundwater Group 2000) show that the site is located within a bowl consisting of lower permeability pre-Vashon soils that rise both north and south of the site. This is consistent with the County analysis. The principal aquifer flows down the flanks of these subsurface features towards the site. This is shown on Figure 4-5, taken from the Ecology Mid-Study Fact Sheet (Ecology 2000a; Appendix I). The springs on the shoreline below the site further indicate that this site has a discharge point for groundwater.

The speed of discharge from the freshwater aquifer to Puget Sound is greatly affected by the materials through which groundwater flows and the gradient of the top of the water table. Groundwater may flow relatively rapidly in some areas, more slowly in others. The project site is a point of relatively rapid discharge, due to the relatively deep deposit of highly permeable sand and gravel and its location in a subsurface basin.

#### *4.2.4.7 Adjacent Wells and Springs*

Numerous wells are located on Maury Island. Well and spring water is the only natural source of water on the island. The four major well systems addressed in this EIS are (1) the Gold Beach wells, (2) the Sandy Shores well, (3) the Iliad well, and (4) the Dockton Water Company (three sources).

These water supply systems are discussed explicitly since they represent typical water supply systems constructed in the vicinity of the site. Other systems with similar construction may exist. While these other systems are not discussed explicitly, the conditions described here are believed to represent the conditions that would exist at other offsite water sources based on the geologic conditions documented in King County's analysis.

The Iliad well is located about 0.5 mile northwest of the Glacier Northwest site. The Iliad Well is considered to have its inlet in the deep aquifer. The static water level given on the well log of the Iliad well puts the static water levels below sea level. This is unlikely to be correct. The static water level is expected to be at an elevation close to the levels of groundwater present beneath the Glacier Northwest site. Due to the assumed hydraulic conductivity between the Principal and Deep Aquifer beneath the site, some water from beneath the Glacier Northwest site may contribute to recharge of the Iliad Well.

At Gold Beach, which maintains two wells located side by side, the static water level is approximately 29 feet above sea level, which again corresponds to groundwater levels at the Glacier Northwest site at a similar distance inland. Thus, the Gold Beach wells are cross-gradient from the Glacier Northwest site. The Gold Beach wells are considered to tap the Principal Aquifer.

The Dockton Water Company obtains water from two springs and the Sandy Shores well. At the Sandy Shores well, the static water level is reported to be near 61 feet above sea level. Given its location, it is cross-gradient, or roughly at the same level, as the water table at the Glacier Northwest site. The sandy shores well is considered to have its inlet in the deep aquifer.

The first set of springs is in the center of a swale across the street from the Dockton Park. The water level in these springs is estimated to be about 30 feet above sea level. This corresponds with the elevation of the static water level at a similar position inland at the Glacier Northwest site. Because the water table is higher at places between the Glacier Northwest site and the Dockton Park springs, a groundwater divide separates the Dockton Park springs from the Glacier Northwest site. The divide is located somewhere south of the Glacier Northwest site as shown on Figure 4-5. This further illustrates the radial flow of water out from the center of the island.

The second spring field used by the Dockton Water Company is the Hake Springs. These springs are located at an elevation of about 100 feet above sea level. This elevation is higher than the elevation of the water on the Glacier Northwest site. Hence, Hake Springs is clearly upgradient of the Glacier Northwest site, meaning that water at the Glacier Northwest site does not flow to Hake Springs.

Groundwater flowing beneath the site has been determined to discharge directly into Puget Sound. Thus the portion of the site along the beach appears to be a discharge zone for water from the principal aquifer on this part of Maury Island. Some of the water beneath the site likely contributes to deeper aquifers in the immediate vicinity of the site.

Although no wells or springs are clearly downgradient of the site, the groundwater beneath the site is recognized as an important resource and part of the aquifers that provide groundwater to the citizens of Maury Island.

## 4.3 Impacts

### 4.3.1 Would mining as proposed affect recharge of the aquifer system or affect the availability of water to residents on Vashon/Maury Islands?

#### *4.3.1.1 Proposed Action*

**Aquifer Recharge.** A primary concern regarding the Proposed Action is that mining would limit aquifer recharge and decrease the amount of drinking water available to residents on Maury Island. The proposed project would alter the timing and path of aquifer recharge at the proposed project site, but overall, with mitigation measures outlined in Section 4.4, would have no adverse impact on water resources.

**Overview**. With appropriate drainage and recharge design (as described in Section 4.4), mining would not reduce the amount of water that this site currently contributes to the aquifer and, therefore, would have no adverse effect on local water supplies.

Previous and ongoing studies indicate that adverse impacts on drinking water would not occur for four main reasons. First, as stated earlier, the site does not contribute to a lateral interflow network that directs water offsite.

Second, as shown on Figure 4-5, groundwater flow from beneath the site is not directed towards any of the existing beneficial water uses, except for the Water Rights Claim held by Glacier Northwest. This is reflected in the downward "slope" of the groundwater found at the site, with depths being near 90 feet above sea level toward the top of the site, grading down to the shoreline area of the site. This reflects the typical offshore flow of groundwater on an island system.

Third, although mining at the site would change the timing and the path that rainwater takes from the surface of the site to the underlying aquifer, effects on the groundwater table would be localized and would not affect the amount of water available to residents. The timing of recharge would change through a major decrease in the time it takes rainwater falling on the site to reach the aquifer (see below under heading "Altered recharge regime").

Fourth, the amount of rainwater that enters the ground would actually increase at locations being actively mined and reclaimed.

This is because vegetation, particularly forest, intercepts much of the rainwater. In cleared areas, up to 10 times as much rainwater may enter the ground to recharge underlying aquifers compared to a forested area. This effect would occur within the 32-acre active mining cells and recently reclaimed areas. Eventually, vegetation on reclaimed areas would again take up much of the rainwater, thereby making this increased recharge a temporary effect that would occur only during and immediately following active operation of the mine. However, the final mine reclamation plan would not include total reforestation. Hence, some increased recharge would continue to exist due to roads, other impermeable surfaces, and pasture-like areas.

In conclusion, mining would not affect the local drinking water supply because (1) appropriate drainage and recharge designs would be used (Section 4.4), (2) the site does not contribute to lateral interflow, (3) the site is not located upgradient of existing beneficial water uses, (4) the amount of water reaching the aquifer would not be reduced, and (5) during operation and early periods of reclamation, recharge would actually increase because of vegetation removal.

**Altered Recharge Regime**. Removal of surface material by mining would change the timing and the path that rainwater takes from the surface of the site to the underlying aquifer, but effects on the groundwater table would be localized and would not affect the amount of water available to residents. The timing of recharge would change through a major decrease in the time it takes rainwater falling on the site to reach the aquifer. Water now takes up to 6 months to percolate through the deepest deposits of sand and gravel at the site. As mining reduces the depth of these deposits, this lag time would be reduced.

The magnitude of this reduction in lag time would depend on the depth of material left between the surface and the groundwater. This depth would be similar to existing depths near the site perimeter, but would become shallower toward the central portions of the mine, where, at final grade, a minimum 15 feet of surface material would separate the floor of the mine and the water table. At these minimum depths, water may take as little as 20 days to move from the surface to the underlying aquifer. At other locations, such as near the site perimeter, a greater depth would be maintained and recharge rates would be more similar to the existing conditions.

This decrease in recharge time would cause variations in the quantity of water entering the aquifer at any given time. This is because the existing deep sands and gravels act to “measure” the downward flow of water into a relatively stable flow as it reaches the groundwater table. With the depth of sands and gravels reduced, this measuring effect would be reduced. During rainy periods, recharge would be relatively high, and during dry periods, recharge would be relatively slow.

The water table is expected to respond to this variation by showing localized increases and decreases in the water table immediately below the site. The magnitude of such swings is estimated to be in the range of a few feet. Currently, the groundwater table varies, on average, about 2 feet. Following mining, localized variations up to about 5 feet may occur. Groundwater mounding could occur immediately beneath recharge facilities, with local mounds having a height of 10 to 20 feet above the surrounding static water levels. Because of this, the final elevations of the mine floor must be adjusted to accommodate potential maximum groundwater levels.

These variations would be localized at the site and would not affect the amount of water available to residents. This is because the amount of water entering the groundwater table would not change. Locally, a steeper groundwater gradient would occur. The gradient would increase in the immediate vicinity of infiltration facilities that would be created as part of the mine operation. The steeper gradient would flatten out through time and over distance. Moreover, the local groundwater mounding would dissipate radially, and not unidirectionally toward the coastline

The single recharge facility proposed along the eastern edge of the site would create increased groundwater flow velocities along the edge of Puget Sound, and groundwater would therefore be lost to Puget Sound at an increased rate. This would result in a lowering of the groundwater table towards the west and could eventually cause the groundwater divide between Dockton Springs and the proposed site to shift to the east, thereby decreasing flows of water to Dockton Springs.

**Results of Ecology Study.** The Washington State Department of Ecology has published its hydrogeologic impacts assessment for the Maury Island gravel mine (Pacific Groundwater Group 2000). The study included development of a numerical simulation model for groundwater flow, and simulation of mining and reclamation impacts on that flow.

Overall results from Ecology’s hydrogeologic impact assessment are largely consistent with the results discussed above, with a temporary increase in recharge and groundwater elevations during the early stages of mine development, and a small decrease in recharge compared to current conditions over the long term due to revegetation. A similar increase in vegetative cover would be likely under the No-Action Alternative, and would result in a similar decrease in recharge and water table elevation relative to current conditions.

The results of the Ecology Study indicate that, in the worst-case scenario, there could be a decrease of flow at Dockton Springs of 2 percent and a decrease of the average annual static water level on the site on the order of 0.6 feet compared to current conditions. These impacts too are related to revegetation, and would be essentially the same under the No-Action Alternative.

**Surface Discharge**. The proposed stormwater management ponds in the floor of the mine would be designed to contain runoff from up to a 25-year storm. This would allow surface runoff from the ponds to drain directly into Puget Sound during storms with intensity greater than the 25-year event, thereby decreasing the amount of water available for recharge to the aquifer. Over time, net recharge would decrease through the spilling of peak stormwater flows. Under existing conditions, there is no significant surface discharge of rainfall runoff to the Sound.

In summary, although the site is not presently in a position to directly recharge offsite beneficial water uses, uncontrolled and unmitigated development could eventually affect offsite water sources. However, by adopting the mitigation measures outlined in Section 4.4, these impacts would be avoided, and the project would have no adverse impacts on water resources.

**Water Use.** To control dust, the operator may use up to 10,000 gallons of water per day during dry periods. No other substantial water use would be expected at the site.

The daily water use on Vashon and Maury Island is currently about 1,200,000 gallons per day (Vashon-Maury Island Groundwater Advisory Committee 1998). Therefore, at maximum use, the site would increase daily water consumption on the Island by 0.8 percent.

Water for dust control would be used only during dry weather. Hence, the average daily water use over the course of a year would be less than the daily maximum use.

The Applicant did not specify a source for dust-control water. Given the sensitivity of water resources on Maury Island, it may be difficult or impossible to obtain water from on-island suppliers. Therefore, it is most likely that water would be brought to the site from off-island sources. This water would be applied to surface materials at the site, and would either infiltrate into the soil or evaporate. The amount of water that did not evaporate would infiltrate and would therefore increase total recharge to the aquifer.

Alternatively, Glacier Northwest could exercise its existing onsite water right claim. The water right claim allows the withdrawal of 8,000 gallons of water per day. A storage tank could be built on the site to store water to allow the maximum amount of 10,000 gallons per day to be available for dry periods. There would be no impact to the overall hydraulic budget at offsite existing water sources because the water withdrawn would be taken from along the eastern margin of the site where the immediate fate of groundwater flow is discharge into Puget Sound.

Other potential sources of water for dust control are municipal water systems either on the islands or from the mainland

In any case, conservation measures to reduce water consumption, as well as measures to vary the source of water, would serve to effectively reduce any strain on water resources.

#### *4.3.1.2 Alternative 1*

The impact of Alternative 1 is the same as the Proposed Action, with no decrease in available water to Maury Island residents. The effect of increased recharge through vegetation removal would occur over a longer period because the site would remain open for a longer period, thereby leaving exposed areas of rapid infiltration available over a longer time.

Potentially less water would be used under Alternative 1 for dust control.

#### *4.3.1.3 Alternative 2*

Same as the Proposed Action and Alternative 1, with no significant effect on the amount of drinking water available on the Island. As with Alternative 1, potentially less water would be required for dust control.

#### *4.3.1.4 No-Action*

The No-Action Alternative would not affect available drinking water for the same reasons stated under the Proposed Action. Dust control water needs would be negligible.

As under the Proposed Action, most of the site would eventually be revegetated, and a slight decrease in aquifer recharge and groundwater elevations relative to current conditions would be expected.

## 4.3.2 Would mining affect groundwater quality?

### *4.3.2.1 Proposed Action*

The project would not significantly affect groundwater quality.

The primary concern related to groundwater quality is potential introduction of sediments or contaminants into the groundwater table. Concerns regarding arsenic and other contaminants related to the ASARCO smelter are addressed in Chapter 10.

The potential for impacts from fuel spills is small due to the relatively small amount of machinery that would be required to operate the mine. At full operation, up to three loaders and four bulldozers would be in operation. The Applicant has not specified fueling procedures, but typically a fuel truck supplies fuel at a designated location. As a good management practice, such designated fueling areas are lined to contain possible fuel spills. Such a measure has been included for consideration in Section 4.4.3.8.

Impacts resulting from sedimentation are not expected for several reasons. First, the sands and gravels at the site that separate the groundwater table from the surface would serve to effectively filter sediments or other contaminants. The sands that are present at the base of the proposed mining operation generally meet the specification for water treatment sands for stormwater management facilities (King County 1998). King County requires a minimum of 2 feet of such sands to filter stormwater. At the site, at least 15 feet of materials would be present to serve as a filter to groundwater. This would protect the aquifer from contaminants adsorbed onto sediment particles. No source for contaminants that would be dissolved in stormwater is expected during the mining operation.

Finally, as stated earlier, the site, with the exception of the Glacier Northwest Water Right Claim, is not located upgradient of any existing beneficial water uses, so that the trend of water movement is toward Puget Sound and away from any well sites and springs used for beneficial purposes.

#### *4.3.2.2 Alternatives 1 and 2*

As with the Proposed Action, Alternatives 1 and 2 would result in no significant adverse impacts on groundwater quality.

#### *4.3.2.3 No-Action*

Same as Proposed Action, with no significant adverse impacts on groundwater quality.

### 4.3.3 Would the mining activity breach an aquifer or otherwise impact adjacent groundwater wells being used by local residents?

#### *4.3.3.1 Proposed Action*

A major issue that must be addressed with any mining operation is the potential for breaching an aquifer. Breaching occurs when excavations cut into an aquifer, causing water to flow out.

At the Glacier Northwest site, the materials that would be mined are located above the aquifer. As described in Section 4.4, a 15-foot separation would be maintained between the bottom of the mine floor and the groundwater table. Therefore, there is no potential to breach an aquifer. As mentioned in Section 4.2.4.3, small, isolated pockets of water are expected to occur within the material that would be mined. However, these isolated pockets do not contain sufficient water to be considered an aquifer in themselves. The local pockets of water and the interflow do not represent credible sources of water for beneficial water uses.

#### *4.3.3.2 Alternatives 1 and 2*

No aquifers would be breached under Alternatives 1 and 2, for the same reasons identified under the Proposed Action.

#### *4.3.3.3 No-Action*

No aquifers would be breached under No-Action, for the same reasons identified under the Proposed Action.

### 4.3.4 <u>New Section</u>: Would the proposed mining cause saltwater intrusion to the fresh water aquifer?

This section has been added to address public concerns raised in comments to the DEIS.

#### *4.3.4.1 Proposed Action*

Saltwater intrusion occurs where groundwater levels are lowered, allowing saltwater to migrate into areas formerly occupied by fresh water. The classic hydrogeology of an island has a lens of fresh water that floats above the higher density salt water. On Maury Island, this situation has not been documented or expected to exist because sufficient water is available to recharge the existing aquifers. The flow of fresh water radially out from the center of the island appears to keep the saltwater/fresh water interface along the shoreline. Hence the simple mathematical relationship does not strictly apply to the Glacier Northwest site. However, a decrease in the amount of water present could result in a migration of the freshwater/saltwater interface towards the land and conceivably to beneath the land surface.

The existing mine, through removal of the forest cover, has increased the amount of water that recharges the principal aquifer beneath the site. Hence, it is safe to conclude that the existing mine has pushed the saltwater/fresh water interface towards the Sound.

During mining under the Proposed Action, increased recharge to the aquifer would continue to maintain the relative position of the saltwater/freshwater interface. Following mining operation, when recharge conditions are reduced to near but still above natural conditions, the salt/fresh water interface would return to its natural position.

#### *4.3.4.2 Alternative 1*

The impact of Alternative 1 is essentially the same as the Proposed Action, except spread out over a longer period of time.

#### *4.3.4.3 Alternative 2*

The impact of Alternative 2 is essentially the same as the Proposed Action, except spread out over a longer period of time.

#### *4.3.4.4 No-Action*

The impact of the No-Action Alternative would be the same as the existing conditions and no significant net change in the existing saltwater/freshwater interface would be likely.

### 4.3.5 New Section: Would the proposed mining activity create slope stability problems?

This section has been added to address public concerns raised in comments to the DEIS.

#### *4.3.5.1 Proposed Action*

The existing bluff along the eastern margin of the site has several shallow seated sloughs that have occurred. These sloughing events are a result of wave erosion at the toe of the slope. This erosion at the toe of the slope creates a steeper sea bluff and initiates soils movement through shallow sloughing. This is a natural process that will continue with or without mining unless a bulkhead or other erosion barrier is constructed along the toe of the bluff. The Proposed Action does not include any erosion protection along the beach.

The Proposed Action would result in locally unstable slopes within the mine during active mining. However, these slopes would be part of the active working face of the mine and they would be trimmed to a final slope inclination of approximately 2:1 horizontal to vertical during site reclamation. The Proposed Action would also decease the overall height of the sea bluff along the eastern margin of the site. This would decrease the amount of material that would slough during future erosion events along the sea bluff.

Removal of the upper portion of the bluffs through mining would increase overall slope stability by (1) removing portions of the bluff and (2) eliminating the seasonal seepage that could occur along the contact of the looser surficial soils and the underlying till that is present along the top of the bluff. However, local sloughing would continue to occur as a result of wave erosion along the toe of the sea bluff. This wave erosion is a natural process that has been occurring since formation of the existing Puget Sound following the retreat of the glaciers.

#### *4.3.5.2 Alternative 1*

The impact of Alternative 1 is essentially the same as the Proposed Action.

#### *4.3.5.3 Alternative 2*

The impact of Alternative 2 is essentially the same as the Proposed Action.

#### *4.3.5.4 No-Action*

The impact of the No-Action Alternative would be the same as the existing conditions and no significant net change in the existing bluff stability would be likely.

### 4.3.6 New Section: Would proposed mining cause surface water runoff to flow off the site?

This section has been added to address public concerns raised in comments to the DEIS.

#### *4.3.6.1 Proposed Action*

As discussed in Section 4.2.3, no surface water enters the site, and thus there will be no impact on streams or other surface waters originating offsite.

Rainfall and groundwater are the only potential sources of surface water at the site. Due to the porous nature of surface soils at the site, rainfall that is not intercepted by vegetation, directly evaporated, or transpired through site vegetation percolates into the groundwater system. No substantial ponding or surface accumulation collects onsite, as confirmed by Ecology (2000a). Thus there will be no impact to surface water collected onsite.

Introduction of additional compacted soil surfaces, such as roadways, during mining could produce localized surface water accumulations. Any such accumulation would flow along roadside drainages to areas of undisturbed soil, where it would rapidly infiltrate. Therefore, no offsite runoff would occur, and the availability of water for aquifer recharge would not be affected.

Groundwater at the site discharges from springs located near the tide line, and downslope from any proposed mining activity. Because no mining would occur at this location, there would be no impact on these tide-level springs. Recent testing of groundwater quality of these springs (Ecology 2000a) shows that water quality meets Washington state water-quality standards for Class AA surface waters. No evidence of leaching of arsenic, cadmium, lead, or other contaminants was detected in spring water, and Ecology (2000a,b) concluded that the proposed containment plan would further reduce the possibility for contaminant leaching (see Chapter 10).

The proposed storm water management ponds would be designed to contain runoff from up to a 25-year storm event. This would allow runoff from the ponds to drain directly into Puget Sound during storms with an intensity greater than the 25-year event, thereby decreasing the amount of water available for recharge to the aquifer (see Section 4.3.1).

#### *4.3.6.2 Alternative 1*

The impact of Alternative 1 would be the same as under the Proposed Action.

#### *4.3.6.3 Alternative 2*

The impact of Alternative 2 would be the same as the Proposed Action.

#### *4.3.6.4 No-Action Alternative*

The impact of the No-Action Alternative would be the same as existing conditions.

## 4.4 Adverse Impacts and Mitigation

### 4.4.1 Significance Criteria

King County considers the following as indicators of significance for geology and hydrogeology impacts under SEPA.

- Reducing aquifer recharge or availability of water to residential users on Vashon/Maury Island.
- Reducing groundwater quality below groundwater standards and/or drinking water standards, if such water is or could be used as drinking water.

- Reducing water available in local wells, either by aquifer breech or other factor.

- Exposing the groundwater table.

### 4.4.2 Measures Already Proposed by the Applicant or Required by Regulation

a. To prevent impacts from sedimentation, the walls of the mining pit would slope toward the mine floor and away from Puget Sound, thereby reducing runoff into the Sound.

b. A retention/infiltration pond would be constructed at the bottom of the mine site. This pond would be sized according to WDNR and King County standards for a 25-year, 24-hour storm event.

c. Additional sedimentation ponds would be constructed to reduce the chance that siltation would limit the infiltration capacity of the retention/infiltration pond.

d. To reduce sediment transport velocity and potential sedimentation impacts, rock check dams would be established at minimum intervals of 75 feet in benches or channelized runoff paths where gradients exceed 10 percent. Runoff paths would be directed into the retention/infiltration pond.

e. The site would be excavated to an elevation that would maintain a minimum 15-foot buffer between the bottom of the pit floor and the measured or predicted static groundwater level.

f. Although groundwater is not likely to seep into the mining area, action plans to respond to such seepages would be included in the mining plan. Such plans would include immediate notification of King County.

g. To prevent mining into the groundwater, the Applicant would establish monitoring wells, according to the terms outlined in a Groundwater Monitoring Plan required as part of the grading permit. Any natural fluctuation in the static level of the aquifer would be identified as mining progresses, and the depth of mining would be altered as necessary to maintain the 15-foot buffer.

h. Groundwater levels would be monitored on a quarterly basis over a 5-year period following approval of the revised Grading

Permit and Surface Mining Reclamation Permit. After 5 years, monitoring may be reduced to annual measurements if no impacts to water levels have been identified. Monitoring would cease during the reclamation phase.

## 4.4.3 Remaining Adverse Impacts and Additional Measures

### *4.4.3.1 Geo/Hydro Impact 1 – Altered Recharge and Drainage Regime*

**Specific Adverse Environmental Impact.** The Applicant proposes to direct all surface water discharge to a central pond or ponds (see Section 4.4.2, Measure b). This would shift aquifer recharge from upper areas to lower elevations, potentially affecting groundwater levels upslope of the pond(s). In addition, by channeling all drainage to a single point, the pond(s) could overflow during heavy rains, thereby decreasing the amount of water available to recharge the aquifer.

### *4.4.3.2 Geo/Hydro Mitigation 1*

Revise the mining plan by replacing the Applicant-proposed central pond with a multiple-point and upslope drainage plan to more closely mimic the existing infiltration pattern on the site. Specific elements of the revised drainage plan could include the following measures:

a. Construct standard benches proposed by the Applicant with a reverse slope back into the hill to encourage infiltration in the upper portions of the mine, rather than directing all water down to a single detention/infiltration pond.

b. Redirect infiltration to the relative elevation that generates the runoff. For example, runoff generated from the containment cells would be infiltrated at the higher native elevations of the site.

c. Install a series of temporary water collection ponds on upper slopes as part of each mining phase. Most areas under active mining would require no surface water detention or storage since water would readily enter the exposed sand and gravels, rather than washing over the surface and collecting in pools. However, where roads are present, where compaction has occurred, or near areas of stockpiled tills or other less permeable materials appropriate drainage and upslope infiltration ponds should be constructed.

d. Incorporate the numerical simulation model of the groundwater system beneath the site developed by the Department of Ecology (Pacific Groundwater Group 2000) into the final mine design. The simulations and all other available information would be used to plan the locations of infiltration facilities to mitigate the changes in the site infiltration characteristics. This model and mine plan would be revisited through periodic review to allow for changes based on the results of ongoing monitoring. Further numerical simulations could be developed to predict the amount of mounding that may occur and allow for the final mine floor to be determined based on the increased height of the static water level at the infiltration facilities.

e. During reclamation, allow water to infiltrate within the cell for each completed mining phase, rather than directing flow to the central portion of the site.

**Regulatory/Policy Basis for Condition.** The site is within a groundwater protection special district overlay. Per KCC 21A.38.150, such areas require special attention to protect groundwater quality and infiltration rates.

In addition, King County policy NE-303 states that:

*Development should occur in a manner that supports continued ecological and hydrologic functioning of water resources. Development should not have a significant adverse impact on water quality or water quantity. On Vashon Island, development should maintain base flows, natural water level fluctuations, ground water recharge in Critical Aquifer Recharge Areas and fish and wildlife habitat.*

#### *4.4.3.3 Geo/Hydro Impact 2 – Greater Peaks and Lows in Water Table and Potential Intrusion into Groundwater*

**Specific Adverse Environmental Impact.** Mining would eventually reduce the deep layer of sand and gravel deposits at the site. This would in turn reduce the time it takes water to reach the water table and would likely result in greater peaks and lows in groundwater levels throughout the year. If mining depths were based on pre-mining groundwater levels, then mining could intercept groundwater.

### 4.4.3.4 Geo/Hydro Mitigation 2

Require direct measurement of groundwater levels as mining approaches final grade. Additional exploration boring and monitoring wells could provide data to reduce the uncertainty of the zones of elevated moisture encountered in OBW-6 and OBW-7. If perched water is actually found that contributes to offsite locations, mine design plans could be modified. Additional explorations could be required throughout the life of the mine to verify static water levels within mine phases to assure that the minimum 15-foot buffer is maintained. A minimum 25-foot separation between mining and the existing groundwater level could be required until documented and approved by King County that final grades would not be within 15 feet of maximum groundwater levels. Adjustments of final elevations should be made to accommodate potential increases in groundwater levels.

The infiltration facilities should be concentrated along the toe of the western mine walls as far from saltwater as possible.

Note that the alternative drainage concept presented as Geo/Hydro Mitigation 1 would also serve to mitigate this impact.

**Regulatory/Policy Basis for Condition.** Same as Geo/Hydro Impact 1: KCC 21A.38.150 and KC policy NE-303.

### 4.4.3.5 Geo/Hydro Impact 3. Increased Water Use

**Specific Adverse Environmental Impact.** During dry periods, the Applicant proposes to use up to 10,000 gallons of water per day to control dust. Therefore, at maximum, use, the project would increase water consumption on Vashon/Maury Island by 0.8 percent above present average levels. If water from on-island sources were used, this could affect the availability of water on the island.

### 4.4.3.6 Geo/Hydro Mitigation 3

Water conservation measures and consumption monitoring and reporting would allow for long-term avoidance of impacting local water supply. Such conservation measures should be specified in a water conservation plan to be prepared and approved by King County as a condition of permit approval.

The Applicant could use the existing Water Right Claim to obtain water for dust control or bring water from an off-island site, if approved by King County. Since the proposed mining activity at the site would increase recharge through the life of the active mining, this water use would be offset by additional recharge. Moreover, any water applied that did not evaporate would contribute to aquifer recharge.

Alternatives to using the local water supply could be implemented if monitoring identifies a potential impact.

**Regulatory/Policy Basis for Condition.** Same as Geo/Hydro Impact 1: KCC 21A.38.150 and King County policy NE-303.

#### *4.4.3.7 Geo/Hydro Impact 4: Potential Fuel or Other Spill*

**Specific Adverse Environmental Impact.** Equipment and vehicles operating on the site would require periodic refueling and maintenance. There is a potential for spillage of fuels and of various lubricating and hydraulic oils and fluids used in maintenance, which could contaminate soil or groundwater.

#### *4.4.3.8 Geo/Hydro Mitigation 4*

A designated fueling area could be established to contain possible fuel spills. The area could be lined with fabric under gravel, could be constructed of concrete with appropriate spill capture reservoirs, or could involve the placement of absorbent pads. Such measures would effectively eliminate significant risks to groundwater contamination from fuels.

**Regulatory/Policy Basis for Condition.** Washington State laws as stated in 90.48 RCW, the Water Pollution Control Act and chapter 90.54 RCW the Water Resources Act of 1971, and as implemented in Chapter 173-200 WAC, Water Quality Standards for Groundwaters of the State of Washington. These laws and regulations regulate the requirement to maintain the groundwaters of the state in their existing condition.

#### *4.4.3.9 Geo/Hydro Impact 5*

**Specific Adverse Environmental Impact.** Mining would alter the existing topography at the site and remove surface material, which could lead to potential slope stability problems. In addition, construction of the containment berm on the upper slope at the north end of the property would add weight to the top of the slope.

#### 4.4.3.10 Geo/Hydro Mitigation 5

a. Perform slope stability calculations to assure that the final mine slopes would be stable. These slope stability calculations would include the effects of the containment cell proposed to be constructed along the top of the mine slopes. The calculation of slope stability for constructed slopes such as proposed for this site is a common requirement for projects of this magnitude.

b. During design, select final placement of containment cells such that the extra weight of material placed would not affect slope stability.

**Regulatory/Policy Basis for Condition.** Slope control is technically and economically feasible and is, in fact, required under the state Surface Mining Act. King County Code (KCC) Section 16.82.100 gives several operational conditions and standards of performance that address concerns regarding slope stability, and Section 16.82.40 provides specific authority to require elimination of hazards, including slope hazards.

## 4.5 Cumulative Impacts

Since the project would not affect aquifer recharge or water quality, no cumulative impacts would occur in these areas. Use of water for dust control would be an additive water use on the Island if the Applicant did not use the existing onsite water right claim.

## 4.6 Significant Unavoidable Adverse Impacts

No significant impacts that cannot be mitigated are likely.

Groundwater intrusion could be avoided through known standard mining practices so that contamination and/or aquifer breech would be highly unlikely.

No evidence exists that the project would reduce aquifer recharge. Rather, aquifer recharge would temporarily increase during active mining. The project would allow nearly the entire site to remain pervious to water infiltration. In addition, about 75 percent of the site would remain vegetated at any one time, which is nearly twice that required under KCC 21A.38.150, groundwater protection special district overlay.

Aquifer protection measures similar to those presented in this FEIS are not technically difficult and have been applied successfully at other mining projects throughout the western United States. Therefore, there is no reason to believe that such measures would not work at the Maury Island site.

Long-term monitoring and adaptation of the mining plan, as is typical and as would occur with this project, would ensure significant impacts on water resources are avoided.

## 4.7 Citations

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ESM. 1998. Reclamation Permit for Lone Star Northwest's Maury Island's sand and gravel pit. Prepared for Lone Star Northwest. November 1996. Revised January 1997. Second revision April 1998.

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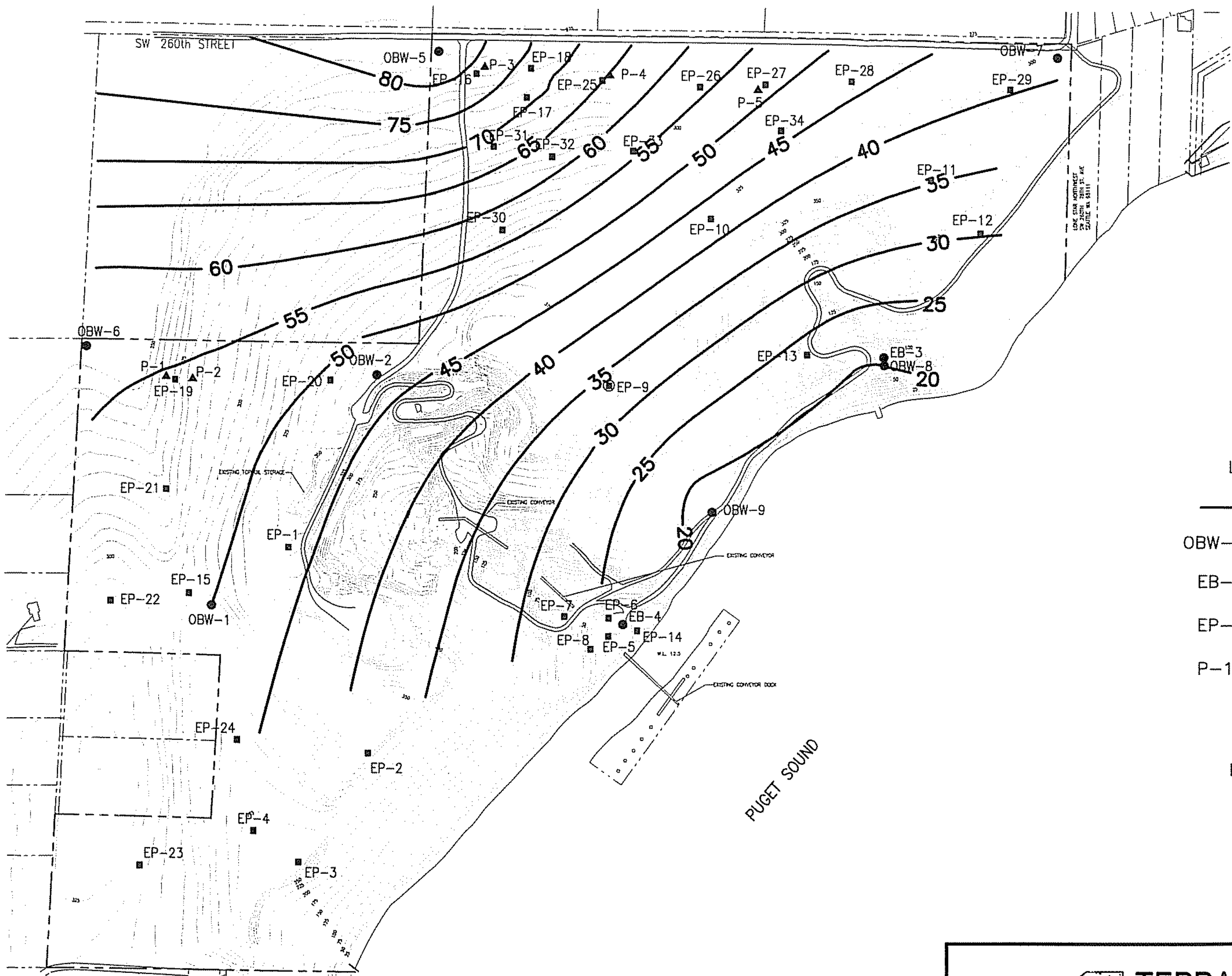
______. 2000c. Water rights application tracking system for all of Maury Island. Printed February 9, 2000

______. Central Files. Well logs for sections 20, 21, 22, 28, 29, 30, 31, and 32 Township 22N, Range 3E.

## Figure 4-1. Groundwater Contours
## Static Water Level as of February 19, 1999




N

APPROXIMATE SCALE

500 0 500 1000 feet

LEGEND

STATIC WATER LEVEL AS OF 19 FEBRUARY, 1999

OBW-1 APPROXIMATE LOCATION OF OBSERVATION WELL

EB-1 APPROXIMATE LOCATION OF EXPLORATION BORING

EP-1 APPROXIMATE LOCATION OF EXPLORATION PIT

P-1 APPROXIMATE LOCATION OF PIEZOMETER

REFERENCE:

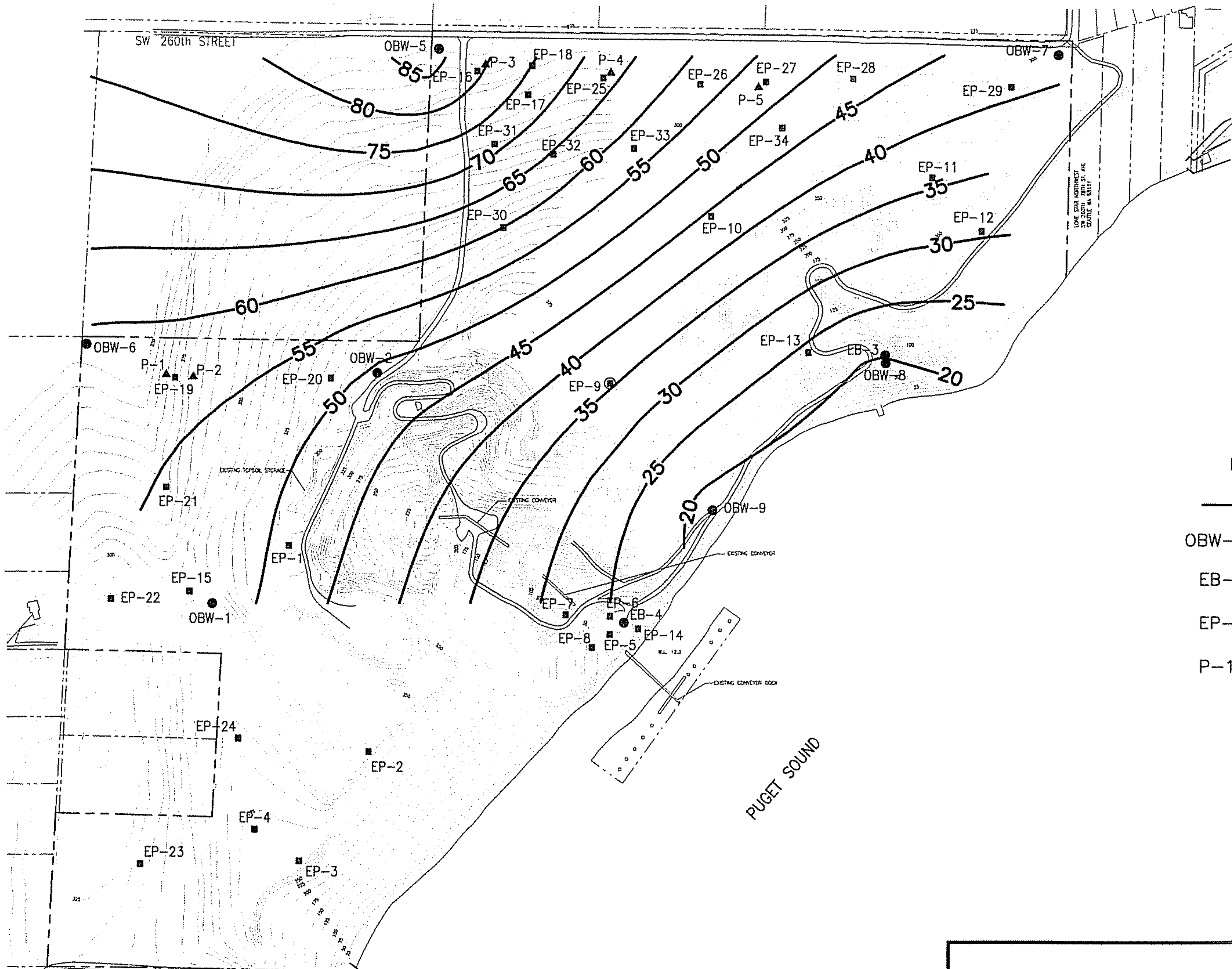
1. EXPLORATION LOCATION PLAN BY ASSOCIATED EARTH SCIENCES, INC. (AESI).
2. AERIAL MAPPING BY NIES MAPPING GROUP, INC.
3. PROPERTY LINES BY JONES, BASSI & ASSOCIATES, 10/01/70.

TERRA ASSOCIATES
Geotechnical Consultants

GROUNDWATER CONTOURS
LONE STAR GRAVEL PIT
MAURY ISLAND
KING COUNTY, WASHINGTON

| | | |
|---|---|---|
| Proj.No. 4169 | Date APR. 2000 | Figure 1 |

## Figure 4-2. Groundwater Contours Static Water Level as of June 22, 1999




N

APPROXIMATE SCALE

500 0 500 1000 feet

LEGEND

STATIC WATER LEVEL AS OF 22 JUNE, 1999.

OBW-1 APPROXIMATE LOCATION OF OBSERVATION WELL

EB-1 APPROXIMATE LOCATION OF EXPLORATION BORING

EP-1 APPROXIMATE LOCATION OF EXPLORATION PIT

P-1 APPROXIMATE LOCATION OF PIEZOMETER

REFERENCE:

1. EXPLORATION LOCATION PLAN BY ASSOCIATED EARTH SCIENCES, INC. (AESI).
2. AERIAL MAPPING BY NIES MAPPING GROUP, INC.
3. PROPERTY LINES BY JONES, BASSI & ASSOCIATES, 10/01/70.

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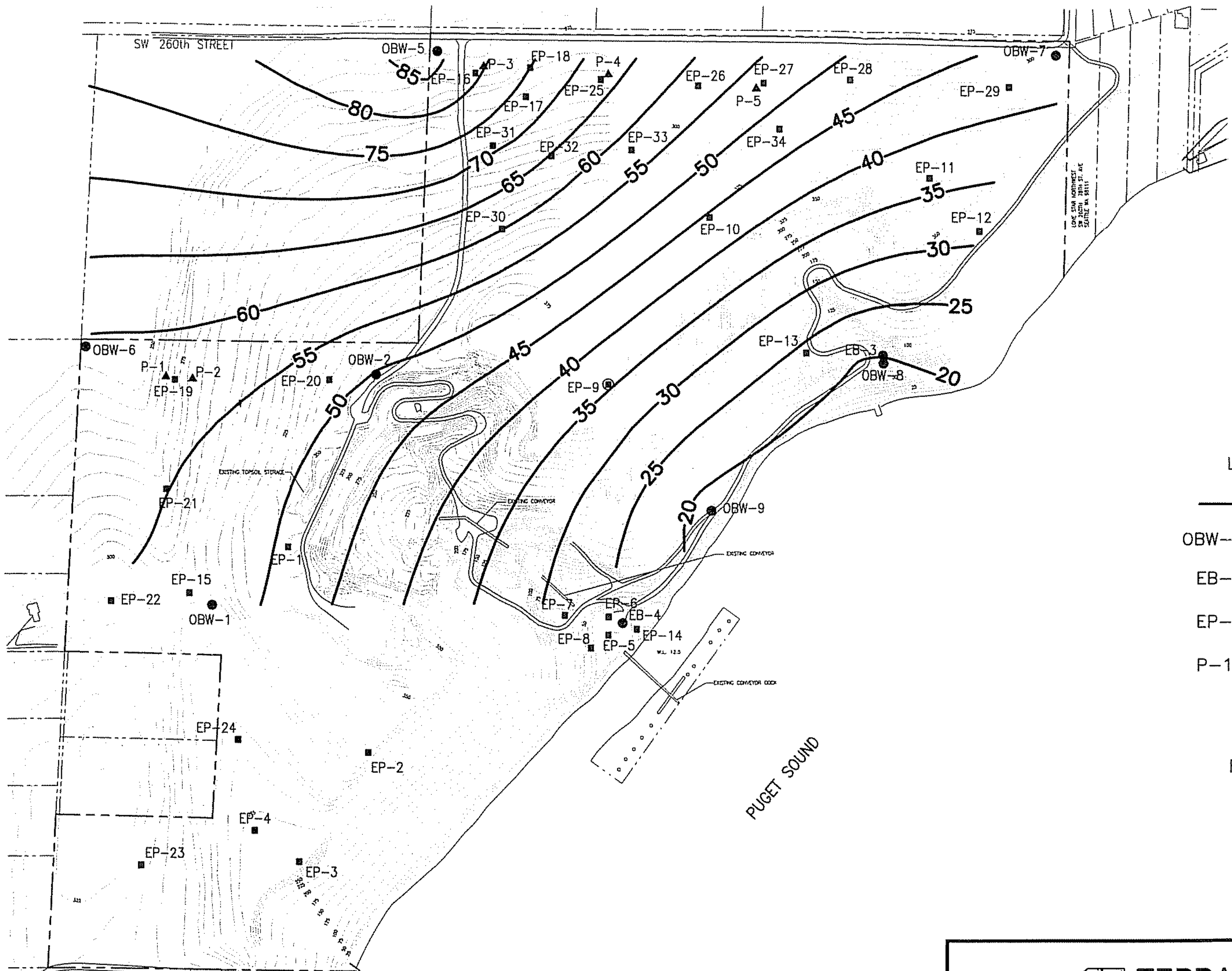
GROUNDWATER CONTOURS
LONE STAR GRAVEL PIT
MAURY ISLAND
KING COUNTY, WASHINGTON

| | | |
|---|---|---|
| Proj.No. 4169 | Date APR. 2000 | Figure 2 |

Figure 4-3. Groundwater Contours
Static Water Level as of September 20, 1999




N

APPROXIMATE SCALE

500 0 500 1000 feet

LEGEND

STATIC WATER LEVEL AS OF 20 SEPTEMBER, 1999.

OBW-1 APPROXIMATE LOCATION OF OBSERVATION WELL

EB-1 APPROXIMATE LOCATION OF EXPLORATION BORING

EP-1 APPROXIMATE LOCATION OF EXPLORATION PIT

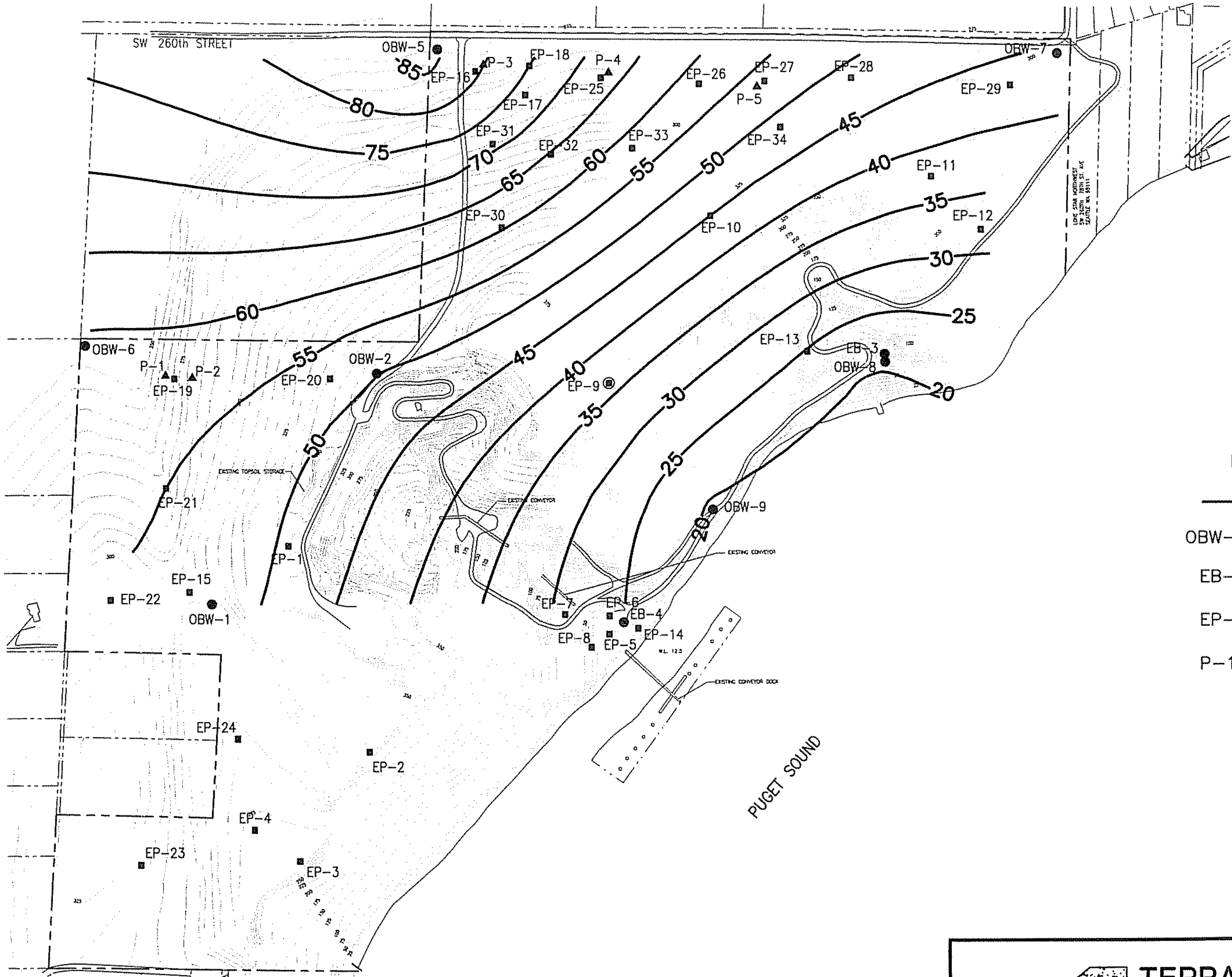
P-1 APPROXIMATE LOCATION OF PIEZOMETER

REFERENCE:

1. EXPLORATION LOCATION PLAN BY ASSOCIATED EARTH SCIENCES, INC. (AESI).
2. AERIAL MAPPING BY NIES MAPPING GROUP, INC.
3. PROPERTY LINES BY JONES, BASSI & ASSOCIATES, 10/01/70.

| TERRA ASSOCIATES Geotechnical Consultants | GROUNDWATER CONTOURS<br>LONE STAR GRAVEL PIT<br>MAURY ISLAND<br>KING COUNTY, WASHINGTON | | |
|---|---|---|---|
| | Proj.No. 4169 | Date APR. 2000 | Figure 3 |

Figure 4-4. Groundwater Contours
Static Water Level as of December 27, 1999




LEGEND

- STATIC WATER LEVEL AS OF 27 DECEMBER, 1999.
- OBW-1 ● APPROXIMATE LOCATION OF OBSERVATION WELL
- EB-1 ● APPROXIMATE LOCATION OF EXPLORATION BORING
- EP-1 ■ APPROXIMATE LOCATION OF EXPLORATION PIT
- P-1 ▲ APPROXIMATE LOCATION OF PIEZOMETER

REFERENCE:

1. EXPLORATION LOCATION PLAN BY ASSOCIATED EARTH SCIENCES, INC. (AESI).
2. AERIAL MAPPING BY NIES MAPPING GROUP, INC.
3. PROPERTY LINES BY JONES, BASSI & ASSOCIATES, 10/01/70.

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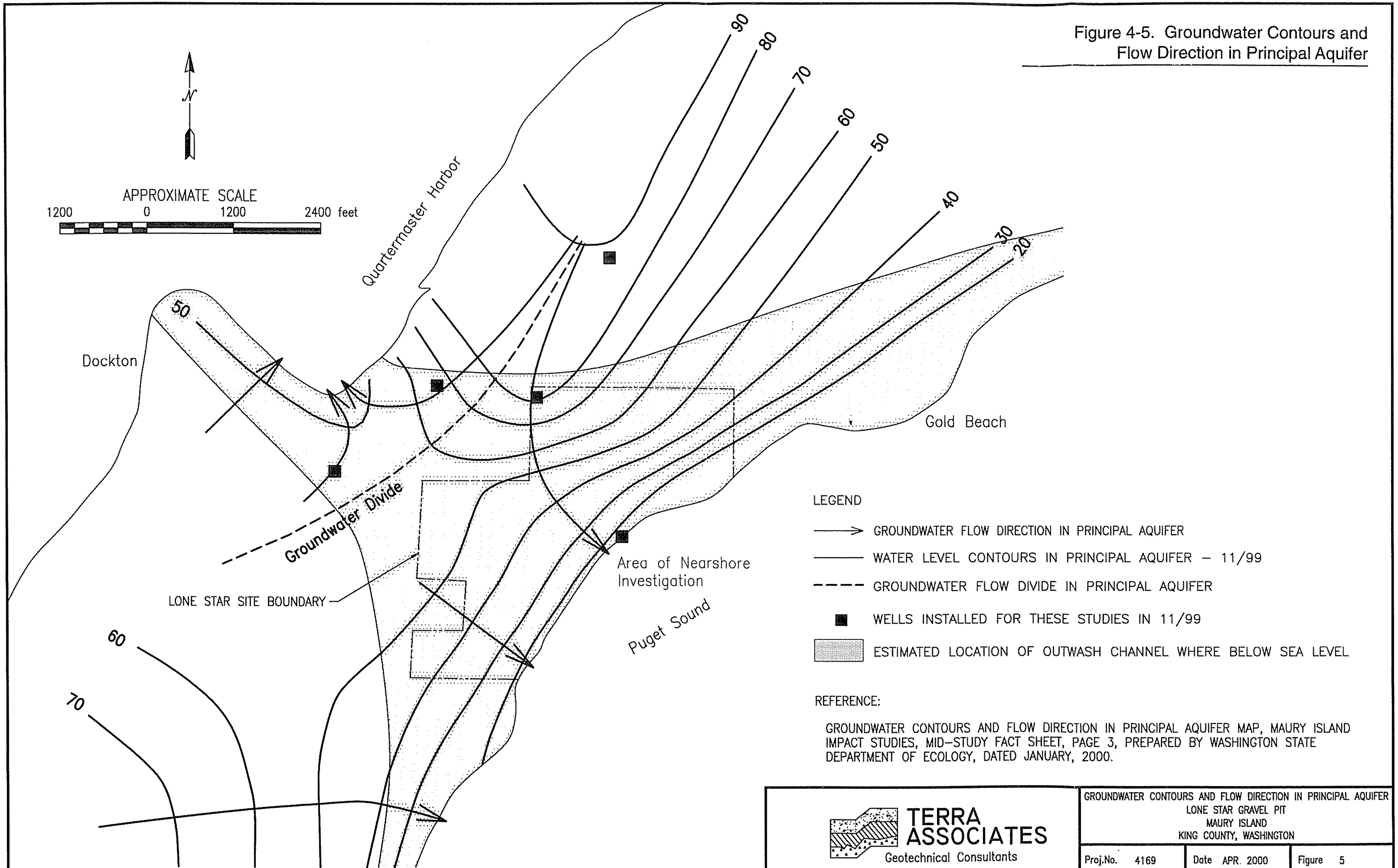
|---|---|---|
| GROUNDWATER CONTOURS<br>LONE STAR GRAVEL PIT<br>MAURY ISLAND<br>KING COUNTY, WASHINGTON | | |
| Proj.No. 4169 | Date APR. 2000 | Figure 4 |

Figure 4-5. Groundwater Contours and Flow Direction in Principal Aquifer




REFERENCE:

GROUNDWATER CONTOURS AND FLOW DIRECTION IN PRINCIPAL AQUIFER MAP, MAURY ISLAND IMPACT STUDIES, MID–STUDY FACT SHEET, PAGE 3, PREPARED BY WASHINGTON STATE DEPARTMENT OF ECOLOGY, DATED JANUARY, 2000.

TERRA ASSOCIATES
Geotechnical Consultants

GROUNDWATER CONTOURS AND FLOW DIRECTION IN PRINCIPAL AQUIFER
LONE STAR GRAVEL PIT
MAURY ISLAND
KING COUNTY, WASHINGTON

| Proj.No. 4169 | Date APR. 2000 | Figure 5 |
| --- | --- | --- |

*Chapter 5*

# Terrestrial Plants and Animals

# Chapter 5

# Terrestrial Plants and Animals

This chapter addresses impacts and mitigation for terrestrial plants and animals. Terrestrial communities are those not directly associated with the shoreline and marine environment. Marine plants and animals involve different issues and, therefore, are discussed in a separate chapter (Chapter 6).

## 5.1 Primary Issues

Wildlife and habitat protection is a common issue for any project involving removal of forest or other natural vegetation. Areas yet to be mined at the project site contain forests that have grown back after logging, and this forest and surrounding habitats support a variety of wildlife. Many residents have commented that stands of Pacific madrone on the site are important and rare plant communities that provide good wildlife habitat. Others have stated that they enjoy watching wildlife on the site and have noted the presence of interesting species, including northern alligator lizard and western fence lizard.

This chapter addresses the following primary issues:

- Would the project adversely affect a plant or animal listed or proposed for listing under the Endangered Species Act, or other species listed by the state, tribes, or King County as sensitive?
- What would the loss of existing madrone imply in terms of (1) regulations, (2) functional values of madrone forest on the site, and (3) regional distribution of madrone?
- Over the life of the mine, what is the overall effect on habitat of reactivating high-production mining on the site?

## 5.2 Affected Environment

Existing plant and animal communities at the site have been documented based on:

- a plant and wildlife assessment prepared by Raedeke Associates, Inc. (1998);
- site visits conducted by Jones & Stokes wildlife biologists;
- records from the Washington Natural Heritage Program (WNHP) regarding rare plants and the locations of high-quality native plant communities;
- records from the Washington Department of Fish and Wildlife regarding threatened, endangered, and otherwise sensitive wildlife and wildlife habitat types;
- information from the WDFW Priority Habitats and Species (PHS) database;
- examination of aerial photographs of the site and vicinity; and
- scientific literature and published reports, as cited.

### 5.2.1 Threatened, Endangered, and other Sensitive Animal Species

#### *5.2.1.1 Bald Eagle*

The bald eagle is the only threatened or endangered wildlife species that occurs regularly in the project vicinity (the bald eagle is federally and state listed as threatened in Washington). Based on direct observation and on typical bald eagle behavior, bald eagles use the shoreline and surrounding bluffs of the site. Eagles have been seen soaring over the site and perching on the dock and on hillside trees above the shoreline.

The project site is not a particularly high-use area for bald eagles. Bald eagles do not concentrate in this area to feed or seek shelter, but rather use the shoreline as part of larger foraging territories. Although no nest sites exist in the immediate vicinity, bald eagles are wide-ranging and “transient” eagles (those that have not yet established territories or that are wintering or migrating through the area) also use the area. Immature bald eagles, which are often nomadic in their early years, have been seen along the shoreline at the site.

Four bald eagle nests are located between 3 and 6 miles from the site, and individuals from these nesting territories are expected to occasionally use the site's shoreline to forage. The bluff faces are often exposed to winds that create strong updrafts, which are used by bald eagles to gain altitude and glide with little effort. Jones & Stokes biologists have observed such use by bald eagles at the site (as well as similar use by red-tailed hawks). Due to the distance from the nearest nest (more than 3 miles), this site is not considered a major element of any bald eagle nesting territory.

#### 5.2.1.2 Peregrine Falcon

Based on habitat conditions and lack of reported observations, peregrine falcons do not use the site regularly, nor do they rely on the site for survival. Peregrine falcons are known to occur in small numbers throughout the Puget Sound region, particularly during winter. They tend to concentrate where waterfowl and shorebirds concentrate. The site and adjacent shoreline, while likely to be visited from time to time by migrating or wintering peregrine falcons, is not particularly significant habitat. The site provides no peregrine falcon habitat features that are not available at many other locations along the shoreline of Maury and Vashon Islands.

#### 5.2.1.3 Other Sensitive Species and Habitats

King County Policies NE-604 through NE-607 define fish and wildlife habitat and species in order of importance and degree of protection.

- The first level of protection is habitat for "Candidate Priority Species," which *shall not be reduced and should be preserved in Rural Areas and Natural Resource Lands* (such as the site) (Policy NE-604)

- The second level of protection is "Fish and Wildlife Conservation Areas," which should be *protected wherever they occur.*

- The third level is "Candidate Priority Species of Local Importance," which should be *protected outside the Urban Growth Area.*

- The fourth level is "priority species of local importance" and their habitat, as listed by the WDFW, … which *should be protected outside the Urban Growth Area where such protection is likely to be "most successful"* (Policy NE-605).

The next four sections define these four "tiers" of wildlife species and habitats formally designated by King County. A fifth type of "sensitive" species identified in this section is "species of special concern." These, while not formally designated by King County, have been identified by other agencies and/or by public scoping comments as "species of concern" and, therefore, require consideration under SEPA.

**Habitat for "Candidate" Priority Species.** State Candidate species are those fish and wildlife species that will be reviewed by the WDFW (POL-M-6001) for possible listing as Endangered, Threatened, or Sensitive according to the process and criteria defined in WAC-232-12-297.

King County policy NE-604 states that:

*King County shall also protect the habitat for "candidate" priority species as listed by the WDFW and found in King County outside of the Urban Growth Area.*

In addition to King County Policy NE-604, policy NE-603 states that:

*In the Rural Area and Natural Resource Lands, habitats for "candidate" priority species…shall not be reduced and should be preserved.*

The King County Comprehensive Plan designates the site as M (mineral), which is a type of natural resource land.

This policy also applies to state or federally listed threatened, endangered, and sensitive species, which are discussed elsewhere (the bald eagle in Section 5.2.1.1 and marine species in Chapter 6).

**Pileated woodpecker** is the only terrestrial species designated under Policy NE-603 that is present on the site. Pileated woodpeckers most often nest in large Douglas-fir that are diseased or recently dead but still standing. About a dozen such trees are present in a 42-acre stand of mixed madrone/Douglas-fir forest on the northeastern portion of the site, which can therefore be considered suitable habitat.

This mixed stand is suitable foraging habitat and Jones & Stokes biologists have observed pileated woodpeckers in this area. No pileated woodpecker nests have ever been reported on the site. However, because individuals change nest trees each year, they may have nested on the site in the past and/or may nest on the site in the future, although few typical nest trees are present.

Pileated woodpecker home ranges typically range in size between 500 and 1,200 acres.  Therefore, the mixed stand represents about 4–10 percent of a typical range of this species.  The remaining forest on the site contains some old stumps, but is dominated by madrone and lacks the large Douglas-fir typical of pileated woodpecker habitat.  These areas could be used occasionally by pileated woodpeckers.

**Purple martin**, another "candidate" priority species, was found to be absent.  Purple martins nest in cavities (small holes in trees).  In the Puget Sound region, they are often found in old pilings along shoreline areas.  Dock pilings and the clusters of pilings located adjacent to the dock (structures known as "dolphins") were searched for evidence of purple martins, yet only European starlings were observed nesting in these structures.

**King County Designated Fish and Wildlife Conservation Areas.** This section identifies the terrestrial component of "Fish and Wildlife Habitat Conservation Areas."  Fish and other marine components are identified in Chapter 6.

Most of the shoreline of Maury Island, including marine waters and forested bluffs at the site, meet the definition of Fish and Wildlife Habitat Conservation Areas under King County Policy NE-604.  This is because the shoreline:

- contains "riparian" habitat in the bluffs;
- is used by bald eagles, which are a threatened species;
- supports eelgrass (see Chapter 6); and
- provides habitat for threatened Puget Sound chinook salmon (Chapter 6).

The King County definition of Fish and Wildlife Conservation Areas also includes "habitat of local importance" for the great blue heron, black-crowned night heron, osprey, and red tailed hawk.

Great blue herons regularly forage along the shoreline of the site and black-crowned night herons and osprey may occasionally forage or rest on the site, but the site does not contain habitat of local importance for these species.

Many people have commented that every species that could be present is significant in and of itself and that impacts need to be addressed in the EIS.  While great blue heron regularly forage along the shoreline, and osprey and black-crowned night heron may be present from time to time, the site is not considered "habitat of local importance." They do not nest on the site or otherwise depend on the site for survival, but rather use it as part of larger foraging territories.

The King County Comprehensive Plan, the WDFW Priority Species List, and the definition of "habitats of local importance" in the Growth Management Act (GMA) provide the regulatory basis to distinguish mere "presence" from "presence of breeding or other critical habitat."

As stated in the King County Comprehensive Plan:

*… it is important to note that for some species, mere presence is not considered significant. Significant habitats, for some species, are those areas that may be limited during some time of the year or stage of the species life cycle.*

The GMA defines Habitats of Local Importance as:

*… a seasonal range or habitat element with which a given species has a primary association, and which, if altered, may reduce the likelihood that the species will maintain and reproduce in the long-term … (WAC 365-190-030).*

Finally, the WDFW priority species list provides another definition that distinguishes clearly "mere presence" from "significant use areas." For this EIS, a significant use of the site was considered to be a use that meets the WDFW definition of a "Priority Area":

*PRIORITY AREA: Species are often considered a priority only within known limiting habitats (e.g., breeding areas) or within areas that support a relatively high number of individuals (e.g., regular large concentrations). These important areas are identified in the PHS List under the heading Priority Area. For example, great blue herons are often found feeding along shorelines, but they are considered a priority only in areas used for breeding. If limiting habitats are not known, or if a species is so rare that any occurrence is important in land-use decisions, then the priority area is described as any occurrence.*

These definitions need to be considered when evaluating the onsite status of the four species defined in King County Policy NE-604, as defined below.

**Red-Tailed Hawks.** Red-tailed hawks have been observed during most site visits conducted by Jones & Stokes biologists and the open areas of the mine provide good hunting habitat. No nest sites are present, but the site is a regular foraging area. The site contains potential nesting habitat, since it contains relatively isolated forest adjacent to good hunting habitat. Red-tailed hawk territories are up to several miles in diameter, depending on the suitability and dispersion of foraging habitat. Based on the amount of open habitats within about 2 miles of the site (see Figure 1-2), the site could contain about one-quarter to one-half of the foraging habitat required by one pair of red-tailed hawks. Other hunting areas include open fields that are scattered throughout the island, as well as the shoreline.

**Great Blue Heron.** Great blue herons do not nest on the site, but do forage along the shoreline, particularly during low tides. Since the nearest nesting colony is more than 2 miles away, the site is likely to be one of many foraging areas located along the Maury/Vashon Island shoreline. The only unusual habitat feature at the site is the dock, which is expected to be used by foraging and resting herons. Herons typically wade in shallow marine waters and in wetlands, but also perch on docks to rest and hunt. Based on the length of shoreline on Maury Island, the site contains less than 1 percent of the available great blue heron foraging habitat on Maury Island.

**Black-Crowned Night Heron.** This species is found mostly in eastern Washington, but a few individuals nest in western Washington. It is most closely associated with freshwater wetlands. Individuals may visit the site occasionally during winter, but they are not expected to be regular visitors or residents.

**Osprey.** Osprey may occasionally fly by the site or forage in the waters off the site, but they are not regularly present and do not nest on the site. Osprey nests are typically very obvious stick nests located adjacent to water. None are present on or near the site.

**Priority Species of Local Importance.** This category is the fourth and final "tier" of species/habitat protection under King County Policy, which specifies that these species be "protected" outside the Urban Growth Area where such protection is likely to be "most successful" (Policy NE-605).

Two species in this category are present on the site: band-tailed pigeon and Columbia black-tailed deer.

**Band-Tailed Pigeon.** This "priority species of local importance" is notable due primarily to its need for mineral springs (Rodrick and Milner 1991). Band-tailed pigeons are known to feed on madrone berries and seeds, particularly during fall and winter. Based on breeding bird counts conducted from 1959 to 1988, population levels in Washington have declined roughly 3 percent per year. Population levels have not yet declined so much to warrant consideration of upgrading its status.

**Columbia Black-Tailed Deer.** This "priority species of local importance" is also present on the site and has been observed regularly by Jones & Stokes biologists. They are relatively common throughout Maury Island, and the site provides habitat that is relatively isolated from human disturbance. Forested areas at the site provide hiding cover and cleared areas provide relatively good feeding areas. Based on historic studies of deer densities in western Washington, prime deer habitat supports from 15 to 50 deer per square mile. Based on that range, the site could support between 5 and 18 deer at any one time. Deer populations fluctuate and deer on the site are expected to travel to other properties as well, so this number is given to provide a general idea of the level of use the site may support.

**WDFW and USFWS Species of Concern.** In addition to the species formally recognized by King County under GMA, the USFWS and WDFW identify other types of species with declining population levels; that are at the edge of their range; that are important to the public; or that are somewhat rare and/or for which little information is known. These species are not formally designated by King County and receive no legal protection based on the WDFW/USFWS "species of concern" status.

Two species of concern are present on the site: the olive-sided flycatcher and the willow flycatcher.

**Olive-Sided Flycatcher.** Populations of this species are declining 2.7 percent per year in Washington state (compared with the 3.8 national average) (Sauer et al. 1999). The reasons for this decline are not well understood, but could include loss of wintering habitat in southern latitudes and loss of breeding habitat in the north. Olive-sided flycatchers use tall trees adjacent to open habitats and clearings, and may nest on the site where mining has created open clearings. In breeding bird surveys conducted throughout Vashon/Maury Island, olive-sided flycatcher was the nineteenth most commonly seen species (of a total of 63) (accounting for roughly 2 percent of all bird sightings).

**Willow Flycatchers.** This species has also been in decline due to loss of habitat (from development and cattle grazing), as well as nest parasitism by brown-headed cowbirds (Rothstein 1994). The species uses dense thickets dominated by willow, red alder, or vine maple (Sharp 1992). Declines appear to be greater in drier habitats, where breeding is limited to narrow bands of riparian habitat. In western Washington, willow flycatchers remain relatively common (Smith et al. 1997). In breeding bird surveys conducted throughout Vashon/Maury Island, the willow flycatcher ranked 20 of 63 in frequency observed (accounting for roughly 2 percent of all bird sightings). The project site contains some potential breeding habitat for this species in the alder/willow thicket northwest of the existing excavated portion of the mine, and willow flycatchers have been documented on the site along roadside "thickets".

**Cavity-Nesting Birds.** Native cavity-nesting birds are not formally designated by King County, but are declining in King County due to loss of mature forest habitat and competition for nest sites by European starlings. Typical cavity-nesting birds in King County include woodpeckers, creepers, chickadees, owls, and nuthatches.

Madrone is used by cavity-nesting birds, but the actual importance of it, particularly in pure stands such as exist at the site, has not been determined. Madrone has been found to be an important component of cavity-nesting bird habitat in Douglas-fir forest of northwestern California. While some have cited this finding as demonstrating that madrone in Washington must have higher populations of cavity-nesting birds than other forest types, some caution needs to be applied.

First, the study found that only 2 of 16 species of cavity-nesting birds actively select madrone over other tree species for nesting: the hairy woodpecker and sapsucker. Second, in the study described, madrone comprised only 7 percent of the stands by number, and 10 percent by basal area (the cumulative area covered by trunks of the trees). The stands at the Maury Island site are mostly pure madrone, and it cannot be assumed that the frequency of use would increase directly with increased madrone frequency. For instance, it is possible that scattered large madrone trees provided nesting sites, but that foraging required Douglas-fir, which is lacking in the pure madrone stands present on the site.

In the DEIS, habitat for cavity-nesting birds was considered marginal, since large snags (standing dead trees) used for nesting were rare on the site. Based on additional analysis, it is clear that madrone is used by hairy woodpeckers and sapsuckers, as well as by other species. Hairy woodpeckers and sapsuckers are primary cavity nesters, meaning they excavate their nests (rather than using existing cavities). Because of this, they probably create nesting habitat for secondary cavity nesters, such as house wrens and chickadees, which rely on existing cavities. Therefore, the madrone forests on the site are considered to be good habitat for cavity-nesting birds.

## 5.2.2 Plant Communities and Habitat

### *5.2.2.1 Overview*

About 69 percent of the site (161 acres) contains Pacific madrone and mixed madrone/Douglas-fir forest (Figure 5-1 through 5-3). Douglas-fir trees on the site range in size from about 6 to 20 inches in diameter and average about 80 feet tall, while the madrone trees range from about 6 to 22 inches in diameter and about 35 to 40 feet tall.

About 31 percent of the site (74 acres) is not forested, including areas where mining and other clearing has taken place. Non-forested areas include areas covered with mixed grasses, invasive shrubs such as Scot's broom, and open ground (Figure 5-4). Pacific madrone and red alder have recolonized some of these areas and are present in thickets within previously cleared areas.

The project site is used by a variety of mammals, including black-tailed deer, raccoon, bats, Douglas' squirrel, and possibly black bear. Deer mice, voles, moles, and shrews are likely to be relatively abundant. Jones & Stokes biologists have documented 21 species of birds at the site. Within open and disturbed habitats, white-crowned sparrow, rufous-sided towhee, and American robin were fairly common. Red-tailed hawks are also expected to forage within this habitat type (see Section 5.2.1.3). The madrone and mixed Douglas-fir/madrone forests support a variety of birds, including western wood pewee, black-throated gray warbler, orange-crowned warbler, Swainson's thrush, and yellow-rumped warbler. Pileated woodpeckers have been observed in the mixed Douglas-fir/madrone forests and other woodpeckers, such as sapsuckers and hairy woodpeckers, are expected to be present in this habitat type as well.

The site supports at least three species of reptiles. The open, dry, and gravely habitat interspersed with shrub and grass cover and dense leaf litter from madrone trees provides good habitat for reptiles, including western fence lizard, northern alligator lizard, and terrestrial garter snake. Because the site is quite dry, amphibian use of the site is expected to be limited. Nevertheless, the leaf litter provided by madrone and the dense understory of salal present in madrone woodlands provide fairly good habitat for salamanders, such as the ensatina and Northwestern salamander. Pacific chorus frogs are the only amphibians that have been documented on the site.

#### *5.2.2.2 Madrone Forest*

**Current Vegetation on the Site.** Madrone forest covers most of the site. There are four distinct madrone-dominated forest communities on the site, as shown in Figure 5-5. Madrone stands have declined greatly throughout King County and Puget Sound (Adams 1999), and Maury Island supports the highest density and largest stands of madrone in the state. The site contains the third largest stand on Maury Island.

Ecological functions of madrone include providing habitat for a variety of birds and providing bank stability on steep slopes adjacent to marine waters. The berries produced each fall are an important food source for many birds, including the band-tailed pigeon, a "species of local importance" designated in King County Policy NE-605. The Washington Natural Heritage Program considers madrone forest a priority for protection under the statewide program to acquire and set aside high-quality native plant communities.

Madrone stands and other plant communities on the site are described in the following paragraphs.

**Bluff Madrone Forest (30 acres).** Steep slopes (60 to 100 percent slope) facing Puget Sound are covered by stands of pure madrone (Figure 5-1). Historical and recent aerial photographs show that the bluff slope environment is often disturbed by small, localized, naturally occurring landslides. Madrone seedlings establish on the bare sand and gravel slopes created by these landslides. Over time this allows the bluff forest to become dominated by madrone representing many different size and age classes, from seedlings less than 1 year old to mature trees up to 60 feet tall and 24 inches in diameter. In the northern part of the site, 1944 aerial photographs show that the bluff forest was logged during the late 1930s or early 1940s, so trees in that area are relatively small, with the largest individuals about 30 feet tall and 12 inches in diameter at breast height (dbh).

**Madrone Mixed Forest (95 acres)**. A mixed forest, consisting of more than 80 percent madrone, covers much of the site, particularly in areas south of the old mining area (Figure 5-2). Historical aerial photographs (1944, 1961, 1965) show that these areas were partially logged in the late 1920s or 1930s, and later burned (1930s) during a fire that affected much of southern Maury Island. Tree-ring data collected on the site indicate that these madrone started growth in the late 1920s and 1930s. The forest is now dominated by trees 30 to 45 feet tall and 6 to 12 inches dbh, although a few trees are up to 24 inches dbh and more than 50 feet tall. The understory is greatly dominated by salal, which often forms a continuous thicket; evergreen huckleberry; and seedlings or saplings of madrone. The forest contains some relatively open areas, and locally there are young to mature individuals of Douglas-fir.

**Douglas-fir Mixed Forest (36 acres).** The largest unburned patch mentioned above is a mixed forest dominated by Douglas-fir and madrone in comparable proportions (Figure 5-3). This is a typical madrone forest type, as described by Chappell and Giglio (1994). The understory has a wide variety of shrubs and herbs, including salal, evergreen huckleberry, Himalayan blackberry, hazelnut, sword fern, bracken fern, holly, nettle, trailing blackberry, Scot's broom, fireweed, and elderberry.

**Shrubland (32 acres).** A parcel that was logged in the late 1930s or early 1940s, and portions of an old gravel mine that was active in the 1940s, are dominated by Scot's broom and various other weeds.

**Old Mine (42 acres).** Areas of the mine that have been actively worked in recent years have no vegetation or have a sparse cover of weeds, chiefly Scot's broom and Himalayan blackberry (Figure 5-4). Most of the area that was mined during the 1970s contains patches of naturally regenerated young madrone interspersed among Scot's broom and grasses. These trees are 4 to 15 feet tall with multiple stems up to about 4 inches dbh.

**Site Vegetation History.** Development of the current vegetation cover on the site was studied using aerial photographs flown in 1944, 1961, 1965, 1970, 1978, and 1998. The changes in forest structure during this period are shown in Figure 5-6. Vegetation development on the site has been influenced by a variety of disturbance factors. As noted above, the bluff madrone forest is continuously influenced by small, naturally occurring landslides. These slides probably occur in association with exceptionally severe, prolonged winter rainfall. Such slides occurred in many areas around Puget Sound, including madrone bluffs in the Magnolia neighborhood of Seattle (Adams 1999), during the winter of 1995–1996. These slides commonly remove vegetation along a relatively narrow track that extends vertically across much of the height of the bluff. By continually exposing new areas of open gravel soil, these slides allow a self-perpetuating bluff madrone forest community to develop. The bluff madrone forest on the site has also been influenced by human activity, which has included logging and gravel mining. Logging denudes the bluff, while mining cuts the bluff back to replace it with lower gradient, relatively stable slopes.

The relatively flat portions of the site, situated on top of the bluff or within the old mine workings, have been influenced by fire, logging, and mining. Large stumps remain on the site, showing that 100 years ago the site was dominated by a conifer forest containing Douglas-fir and western red cedar up to 4 feet in diameter, and a few western hemlock up to 3 feet in diameter. Madrone were probably present but only in small numbers. Old-growth forests with a similar species composition can still be found in areas on Whidbey Island, Fidalgo Island, parts of Point Defiance in Tacoma, and West Seattle.

The big conifers were logged in the early 20th century. This logging may have occurred at different times on different parts of the site. The oldest aerial photographs (1944) show recent clearcut logging in the northeastern part of the site. Most of the rest of the site had recently burned. The fire varied in severity across the site; some places were burned bare of vegetation, but other places appear to have escaped the fire. Generally, fire severity was greatest near the southern edge of the site, and less severe farther north. The 1944 photographs also show an active gravel mine in the basin near the northeastern edge of the site. This mine appears to have started as a large landslide. The mine was active in 1944, but was abandoned by the time of the next aerial photographs, in 1961.

Between 1965 and 1970 mining was initiated in the current pit, which appears as a deep notch cut into the bluff in the 1970 photographs. The 1978 photographs show the mine at its greatest extent, and the current (1998) photographs show that much of the 1978 active mine has become revegetated by patches of madrone and Scot’s broom. This revegetation was a natural process; the madrone have become established from seed shed by the surrounding forest and probably carried into the mine pit in bird droppings. Birds, particularly band-tailed pigeons, are among the primary dispersers of madrone seed (Burns and Honkala 1990).

**Site Geographic Context.** Pacific madrone grows from San Diego County, California to the east coast of central Vancouver Island, British Columbia. It occurs as far inland as the western

Sierra Nevada. In Washington, it is often found along the shoreline of Puget Sound and on southern slopes of the western Cascade Mountains (Burns and Honkala 1990).

The WNHP has identified 23 madrone stands on its database of high-quality ecosystems in Washington. These stands are mostly in the Puget Sound area, and they range in size from 12 to 207 acres. The two largest stands are on Maury Island. A stand covering 207 acres is found on public and private land in the vicinity of Maury Island Park, about 2 miles northeast of the study site. Another stand of 90 acres is found on private land in the Manzanita neighborhood on Maury Island, about 1.5 miles southwest of the study site.

The two inventoried sites on Maury Island were visited during January 2000 and found to have forest structure and species composition comparable to what is found on the study site. Like the study site, they contain madrone of many different sizes, mixed with varying numbers of Douglas-fir.

**Madrone Decline.** Several public comments on the DEIS have expressed concern that the Pacific madrone ecosystem is in decline in the Puget Sound region in general, and that this decline may threaten the forest on the study site.

Madrone stands were once common along the shores and bluffs of Puget Sound and within recently disturbed areas close to such bluffs. However, development and, recently, disease have greatly diminished this plant community so that now “madrone plant associations are rare in relatively natural conditions and uncommon in a more disturbed condition” (Chappell and Giglio 1999). Mature madrone forests at the site are in a natural condition.

By far the most common cause of madrone decline is development, since madrone grows on the same shoreline areas that attract human development. Much development on Maury and Vashon Island has occurred along shorelines that were likely once dominated by madrone stands similar to those found at the proposed mining site (see Figure 1-2).

Recently, however, remaining madrone stands have been declining due to disease. Disease usually strikes disturbed stands and individual trees in urban situations rather than pure stands such as those found at the site. The stands at the site appear healthy.

Recent studies have found that fungal diseases primarily affect isolated madrone in urban landscapes (Elliott 1999, Bressette and Hamilton 1999). The primary causes of madrone decline due to disease appear to be root damage (usually by surrounding the tree with a lawn) and stand fragmentation (usually in connection with residential development) (Bressette and Hamilton 1999, Adams et al. 1999). Since the site is currently dominated by a continuous madrone forest, there is no reason to expect the site to be at risk for madrone decline due to fungal disease. Most madrone trees on the site are currently healthy, although (as in any forest, regardless of tree species) some individuals are unhealthy or have recently died.

## 5.3 Impacts

### 5.3.1 Would the project adversely affect a plant or animal listed or proposed for listing under the Endangered Species Act, or any other species listed by the state, tribes, or King County as sensitive?

#### *5.3.1.1 Proposed Action*

**Threatened and Endangered Species.** Peregrine falcon and bald eagle, the two federally listed species present in the area, are not likely to be significantly affected by the project because no key habitat (e.g., nests) would be affected.

In Washington, bald eagles are protected under the Bald Eagle Protection Rules. These rules protect nest sites and communal roosting areas (communal roosting areas are typically protected forest stands where more than three eagles spend the night, generally during winter). The site contains neither bald eagle nest sites nor roosting sites, so the state law does not apply.

Bald eagles would probably alter their behavior to avoid mining and barge-loading areas; however, several factors moderate this impact:

- Similar shoreline foraging habitat is abundant in the area, and no nest or roost sites would be disturbed.
- Puget Sound bald eagles are fairly well adapted to human activities, so long as shoreline habitat and nest sites are not disturbed. Bald eagles on Vashon Island and throughout Puget

Sound exist within areas of relatively high development. They have adapted to boats, cars, airplanes, helicopters, homeowners, joggers, and kayakers, among many other disturbances.

- The project is not a particularly high-use area for bald eagles. In other words, it is not an area where eagles concentrate to feed or seek shelter, but rather is part of much larger bald eagle foraging areas that can cover several square miles.

- Bald eagles are expected to still use perches and the shoreline area under the Proposed Action, even during periods of active mining. During periods of relative inactivity at the mine site, as would be expected to occur under the Proposed Action, bald eagle use and habitat would be essentially the same as it is now.

Since peregrine falcon visits to the site are expected to be rare, and no nest sites or key foraging areas are present, peregrine falcons are not likely to be affected by the project.

**Fish and Wildlife Habitat Conservation Areas**. The shoreline of most of Maury Island, including the site, meets the definition of a King County Fish and Wildlife Habitat Conservation Area. Active mining would remove habitat and cause noise and activity that could disturb bald eagles, which are listed as threatened. The use is not expected to significantly affect individuals, as described in the preceding paragraph. Mining would also reduce the area of the existing bluffs by up to 50 percent. These areas are considered riparian habitat (and, therefore, meet the criteria for Fish and Wildlife Habitat Conservation Area) since trees from these bluffs contribute wood and organic material to the shoreline and associated waters.

**Great Blue Heron.** The Maury Island heron rookery, 2 miles northeast, and the Dumas Bay rookery, 4 miles southeast, are located too far from the site to be impacted by the Proposed Action. Herons from these two colonies, as well as migrant herons and others, are expected to forage on the shoreline areas of the site. However, WDFW focuses protection on breeding, rather than feeding areas, as stated in their Priority Species List: “great blue herons are often found feeding along shorelines, but they are considered a priority only in areas used for breeding.”

Herons’ use of the site would be expected to decrease due to disturbance, but herons are relatively well adapted to feeding near human activities (e.g., herons are common at the Ballard Locks within the City of Seattle), and they are expected to continue to forage at the site.

**Black-Crowned Night Heron.** This species is not expected to use the site with any frequency and, therefore, would not be adversely affected.

**Osprey.** Since no nest is located near the site, project impacts would be limited to disturbance of foraging, resting, or traveling individuals. Osprey are not particularly sensitive to disturbance (many nests occur in urban situations or along roadsides), so the overall effect of the project on this species is expected to be minimal.

**Red-Tailed Hawk.** Active mining would reduce suitability for red-tailed hawk foraging in active portions of the mine, and mining would eventually remove mature forests that provide potential nest sites. Overall, mining would maintain suitable foraging habitat, since areas reclaimed by hydroseeding would provide good hunting habitat.

**Pileated Woodpecker.** Based on pileated woodpecker home range sizes, mining at the site would eventually remove between 4 and 10 percent of the foraging territory for a breeding pair. The pileated woodpecker is a "candidate" priority species that is present on the site. Most of the typical habitat onsite is located within a 36.3-acre stand of mixed Douglas-fir/madrone forest on the northeastern portion of the site. Most of this stand (33.6 acres) would be cleared due to mining.

Per King County Policy NE-603:

*In the Rural Area and Natural Resource Lands, habitats for "candidate" priority species … shall not be reduced and should be preserved.*

Loss of this patch without compensation would be counter to this policy.

**Band-Tailed Pigeon.** Up to 139 acres of band-tailed pigeon foraging and nesting habitat would be removed over the course of mining, leaving about 22 acres of suitable habitat along the shoreline bluffs and perimeter buffer. Since band-tailed pigeon nesting areas can include defended territories up to 1 mile in radius (Brown 1985), this impact would reduce breeding habitat for a few pairs at most. The primary impact would be the loss of fall foraging habitat. Band-tailed pigeons are known to feed on madrone berries in the fall, prior to migrating south. Some band-tailed pigeons remain all winter (and some travel south to this area to winter), and wintering band-tailed pigeons are strongly associated with madrone (Chappell and Giglio 1999). During non-breeding periods, band-tailed pigeons tend to flock and range widely, so the site is probably part of larger foraging territories. Since madrone is in decline, loss of madrone on the site could contribute to declines in band-tailed pigeon populations.

**Columbia Black-Tailed Deer.** Deer would avoid active mining areas, including steep slopes containing only sand. Noise and activity would cause them to stay away from conveyors, excavating equipment, trucks, and people. Removal of mature forest would reduce hiding and fawning habitat. Fawning may still occur in the densely forested slopes that receive little human disturbance. Foraging habitat would increase during the early stages of reclamation, and deer foraging may actually interfere with revegetation. In addition, since much of the site would be off-limits to people and would not be developed, the site would still serve as a refuge for deer. Deer may bed in remaining forests on the site during the day, and then forage on the site and in surrounding areas at night. Such use is typical of deer in rural areas.

**Olive-Sided Flycatcher.** Olive-sided flycatcher nests could be destroyed during clearing, if tall trees adjacent to open habitats and mining areas are removed during the breeding season (generally April through June). Seasonal restrictions or bird surveys could avoid this impact (Section 5.4.3.14). Overall, habitat for this species may increase over the life of the mine, as reclamation areas sprout young, open plant communities adjacent to the forested site buffer, presenting good potential habitat for this species.

**Willow Flycatcher.** As with the olive-sided flycatcher, the greatest potential impact to willow flycatchers would be direct removal of nest sites, if any exist, during clearing. Again, seasonal restrictions or bird surveys could greatly reduce the potential for this impact (Section 5.4.3.14). Reclamation areas would provide willow flycatcher habitat after about 5 to 20 years. Subsequently, overstory trees would predominate on most areas, assuming reforestation efforts take place successfully. It is likely that some willow or alder thickets would persist onsite.

**Cavity-Nesting Birds.** Forest clearing would remove about 139 acres of cavity-nesting bird habitat over the life of the mine. Using the average density of nests found in Douglas-fir/madrone forest in Oregon (1.7 pairs per acre), this would represent a loss of habitat for 236 pairs of cavity-nesting birds. Hairy woodpeckers and red-breasted sapsuckers would be most affected. Removal of forest would delay the eventual development of habitat for cavity-nesting birds by about 50 years, since reclaimed areas would take at least that much time to develop conditions similar to those currently present onsite.

#### *5.3.1.2 Alternative 1*

Impacts would be the same as under the Proposed Action. Since mining would likely progress at a slower rate than under the Proposed Action, so too would the loss of forest and other habitats.

#### *5.3.1.3 Alternative 2*

Impacts would be the same as under the Proposed Action, but, as with Alternative 1, the project would last longer and nighttime activity and disturbances would be less.

#### *5.3.1.4 No-Action*

The current operation is having little or no effect on the bald eagle or peregrine falcon. Continued clearing would have similar impacts as the Proposed Action, but clearing would take place at a much smaller scale and slower pace and over a longer time.

### 5.3.2 What would the loss of existing madrone imply in terms of (1) regulations, (2) functional values of madrone forest on the site, and (3) regional distribution of madrone?

#### *5.3.2.1 Proposed Action*

**Overview.** Over the life of the mine under the Proposed Action, up to 105 acres of madrone-dominated forest would be removed, and an additional 34 acres of forest and woodland where madrone is codominant would be removed. This represents 84 percent of madrone-dominated forest on the site and 93 percent of madrone-codominated forest. The remaining forest on the site would be located within 50-foot-wide buffers along the northern and western edges of the site, and within a 200-foot-wide buffer along the shoreline (Table 5-1).

As proposed, mined areas would be revegetated by hydroseeding with mixed grasses and Douglas-fir. It is likely that madrone would naturally regenerate in parts of the previously mined areas after revegetation with Douglas-fir and grasses. This assumption is based on several factors.

1. Areas mined during the 1970s are now naturally regenerating with madrone. The regenerating trees are mostly 4 to 15 feet tall with a multi-trunked, shrub-like appearance. This is normal for open-growth madrone (Chappell and Giglio 1999). The trees are very healthy, and are expected to grow 1 to 3 feet per year. However, coverage is patchy; some areas still have no vegetative cover, and others are covered mostly by Scot's broom and other invasive weeds.

2. Madrone regenerates primarily by seeds, dispersed mainly through the droppings of birds, rodents, and deer, all of which are present on the site. Moreover, "[t]he most favorable seedbed for establishment seems to be bare mineral soil free from all, or nearly all, organic material" (Burns and Honkala 1990). At a gravel mine, bare mineral soil seedbeds are very common.

Thus, madrone would likely compete vigorously with the Douglas-fir seedlings and seeded grasses introduced at the completion of mining activities under the Proposed Action, and would likely become re-established over parts of the mined area. Nevertheless, under the project as proposed, much of the existing madrone forest would be lost.

**Regulations.** Clearing of madrone (assuming Best Management Practices) is not prohibited by law, since madrone trees are not protected under the Endangered Species Act, King County Sensitive Areas Ordinance, or other county, state, or federal laws or regulations. All clearing would be performed in accordance with WDNR Forest Practices Rules.

However, the King County Comprehensive Plan (1997) states that "The County shall strive to maintain the existing diversity of species and habitats in the County." Moreover, the plan specifically favors high diversity of native species (King County Policy NE-601). Although madrone forest is one of the most common vegetation types on Maury Island, it is relatively uncommon within the County as a whole, so conversion of the site to any other type of vegetation would likely constitute an incremental loss of biodiversity.

**Functional Values.** Clearing would temporarily remove habitat for several common species of wildlife, as well as some declining species, such as band-tailed pigeon, and would reduce other benefits of forest, including production of oxygen, visual enhancement, and human use and enjoyment of madrone forests.

**Regional Distribution**. As noted above, the largest remaining madrone stands in the region are on Maury Island, northeast and southwest of the site. The stand northeast of the site is largely within Maury Island Park. Other relatively large and healthy stands are preserved in parks just across Puget Sound at Magnolia, Discovery, and Lincoln Parks in Seattle and at Point Defiance Park in Tacoma. There are also many stands preserved on public lands to the north, such as an exceptional stand on Jones Island in the San Juan Islands.

On Maury Island, the two high-quality madrone stands recognized by WNHP have an aggregate area of 297 acres. The proposed project site has about 161 acres of forest in which madrone is a major component. The Proposed Action (without mitigation) would cause the loss of one of the largest remaining madrone stands on Maury Island (assuming maximum clearing). Parts of that total would be permanently converted to Douglas-fir forest and grassland under the proposed reclamation plan.

#### *5.3.2.2 Alternative 1*

The factors regarding madrone forest removal considered for the Proposed Action would also apply to Alternative 1. Reduction of night barging and lower maximum mine production rates would likely result in slower removal and restoration of forest, but, ultimately, the same result as the Proposed Action.

#### *5.3.2.3 Alternative 2*

Same as Alternative 1, but with an expected slower rate of forest removal and restoration.

#### *5.3.2.4 No-Action*

Should the Applicant be restricted to only current levels of mining, madrone would be cleared very slowly as mining progresses so that natural regrowth of madrone would likely keep pace with clearing. Regrowth may be patchy due to lack of active restoration efforts. Forest may be cleared in patches up to 32 acres as new mining phases are initiated.

### 5.3.3 Over the life of the mine, what is the overall effect on habitat of reactivating high-production mining on the site?

#### *5.3.3.1 Proposed Action*

By reactivating high-volume extraction and barging, wildlife habitat loss would accelerate and more area would be affected at any given time. Wildlife would be affected in three general ways: habitat loss, habitat alteration, and disturbance from noise and activity.

**Habitat Loss.** At any one time, up to 205 acres of the site would be of little value to wildlife. This area includes the active mining area and areas with less than 10 years of reclamation. Mined out areas would be subject to ongoing reclamation, and forest would take up to 70 years to reach the maturity of existing mature forest on the site. Roads and other facilities on the site would also provide little wildlife habitat. If the site were mined at maximum levels, then the entire site, save for buffers, could be converted to essentially bare gravel in 11 years.

Habitat would exist within the vegetated buffer surrounding the site, within areas yet to be mined, and within reclaimed areas. The buffers surrounding the site would support some breeding birds and other wildlife, although species that require interior forest habitats (e.g., warblers, flycatchers, and large mammals, such as bear) would leave these areas, once clearing to the buffer edge had been completed.

Areas yet to be mined would provide similar habitat to that which is present now. This habitat would be gradually removed over the life of the mine, followed by revegetation on reclaimed areas (until subsequent human use of the site, if any). As stated elsewhere, the faster mining progresses, the faster forest would be removed.

**Habitat Alteration.** Reclaimed areas would provide different habitat values, depending on the site's age and other factors, such as slope, exposure, surrounding vegetation, and reclamation treatments and techniques. Initially, reclaimed areas would provide a seedbed for a variety of plants, including native plants, invasive plants, and plants seeded or planted as part of reclamation efforts.

Areas under reclamation could be quite productive in terms of plant growth and diversity and may attract deer, small mammals, and other foraging animals. (Wildlife foraging could, in fact, hamper restoration efforts.  Monitoring and subsequent protective measures could effectively reduce this potential problem.)

With increased mine production levels, larger areas would be in early reclamation.  At maximum production, the whole site could be converted to young vegetation.

As proposed, the Applicant would hydroseed slopes and plant the floor of the mine with Douglas-fir (Figure 2-3).  This would probably not restore madrone forest on the site, although some madrone would likely grow on the grassy slopes.  Should this be the case, then species adapted to shrubby and grassy habitats would predominate on the slopes, and forest-associated species would utilize the floor of the mine where Douglas-fir forest had been established.  Overall, the site would still provide wildlife habitat, but for a different complement of species, with more common species such as American robin, northern flicker, white-crowned sparrow, and American crow, and fewer forest species, such as woodpeckers, creepers, and chickadees.

If left uncontrolled, some reclaimed areas could develop stands of Scot's broom, mixed grasses, and other weedy species that provide poor wildlife habitat.  This has occurred on some areas of the existing site.  However, little active reclamation has taken place on the site following past mining activities because it was expected that the existing cleared areas would be subsequently mined as the site excavation expands.  Slopes were seeded to maintain stability and meet standards, but were not actively restored to forest or controlled for weeds.

Specific mitigation measures, performance standards, monitoring, and contingency plans could prevent or minimize undesirable vegetation within reclaimed areas (see Section 5.4).

Assuming monitoring and restoration efforts occur, native plant communities, once established, would develop over time and become similar to existing forests in about 60 years.  Madrone, Douglas-fir, willows, and a variety of ground plants, such as bracken fern, evergreen huckleberry, elderberry, and ocean-spray, would take hold if competition from invasive plants were not too intense or if invasive plants were controlled by active removal.

Between the time that native plants become established and when they reach current site conditions, plant communities would go through a maturation process that provides differing habitat values as the community grows.  Initially, deer, small mammals, and other wildlife may be attracted by the initial flush of green vegetation.

Vegetation would become dense as shrubs and sapling trees grow, becoming suitable for some nesting birds (e.g., rufous-sided towhee, song sparrow, dark-eyed junco) and a variety of small mammals. Red-tailed hawks and bald eagles may also use these open areas to forage. As trees develop, they would begin to shade out some of the shrubs, eventually developing a forested overstory with moderate shrub growth below, similar to existing forests.

**Effects of Disturbance.** Noise and other activities would cause some wildlife to leave or avoid adjacent habitats that would otherwise be suitable. Noise associated with mining in the upland areas of the site would include heavy equipment, the conveyor system, and vehicles and trucks. Some animals are more sensitive than others, and it is difficult to predict exactly which species would avoid the area. Animals that occur in and around the existing developments on the island would likely be the same species that occur near activities at the mine.

#### *5.3.3.2 Alternative 1*

Habitat loss would be the same as under the Proposed Action, but clearing and restoration would likely progress at a slower pace. Since the project would likely last longer, impacts associated with disturbance would also last longer. Without much nighttime activity under Alternative 1, as compared to the Proposed Action, disturbance would be much less at night, and nighttime wildlife use of the site and surrounding lands may be greater than under the Proposed Action.

#### *5.3.3.3 Alternative 2*

Same as Alternative 1, only with a further reduction in mining capacity and associated decrease in the pace of mining across the site.

#### *5.3.3.4 No-Action*

Should the operation continue as it has over the past 20 years, then the rate of habitat loss would be much less than as proposed, with many portions of the site and associated habitats remaining unmined indefinitely.

## 5.4 Adverse Impacts and Mitigation

### 5.4.1 Significance Criteria

King County considers the following as indicators of significance for impacts on plants and animals under SEPA.

- Causing an unmitigated loss of nest sites or other key habitat (such as regular perch trees) for:

  1. Federal or state listed endangered or threatened species;
  2. Priority or candidate priority species of local importance;
  3. Species of local significance as defined by the King County Comprehensive Plan;
  4. Wildlife networks designated by King County; or
  5. Priority Habitats as defined by the state.

### 5.4.2 Measures Already Proposed by the Applicant or Required by Regulation

a. Revegetation. As outlined in the reclamation plan submitted by the Applicant to WDNR, mined areas would be revegetated with Douglas-fir along the relatively flat floor of the excavated mine and with seeded grasses and forbs along the steeper slopes grading down to the floor. See Chapter 2 for further details on the proposed reclamation plan.

b. Per KC 21A.38.150 (groundwater protection special district overlay), "at least 40 percent of the site must remain in natural vegetation or planted with landscaping to maintain predevelopment infiltration rates for the entire site."

c. Wetland Creation. Following completion of the project, the Applicant has suggested that a small wetland community could be planted around the retention pond at the foot of the slope. The created wetland would be designed using best design practices and planted with native plant species. To support amphibian use of the wetlands for reproduction, the created wetland would be designed to minimize substantial fluctuations in the level of the water surface during the breeding season.

If, as recommended in Chapter 4, the Applicant were to establish several water collection areas rather than a single retention pond, then similar wetland and/or moist-habitat plant communities could be established to support amphibian use.

d. Soil Augmentation. To address public safety concerns regarding arsenic, the Applicant is proposing to fully contain most topsoils at the site within a sealed berm. At full capacity (when mining is complete), the berm would measure up to 30 feet high and 2,100 feet long. No topsoils would be removed from the site.

   Because most existing topsoils would be unavailable for reclamation, either soils manufactured onsite, or offsite soils, or a combination of these two materials would be used to establish planting soils. Onsite topsoils would be prepared using composted and/or mulched organic matter (from cleared vegetation) added to non-contaminated till and/or sands. Additional soils and/or organic materials would be brought in as necessary to assure that reclamation performance standards are met. Reclamation performance would be monitored by the WDNR, under their statutory jurisdiction over mining reclamation within the State of Washington.

   Specific test plots may need to be established to determine the appropriate mix of organic material and/or augmented soils. For example, where madrone is to be established, large amounts of organic material would not be appropriate since this species prefers mineral-rich soils with relatively little organic matter.

## 5.4.3 Remaining Adverse Impacts and Additional Measures

### *5.4.3.1 Terrestrial Impact 1. Long-Term Loss of Madrone Forest*

**Specific Adverse Environmental Impact.** The project objectives cannot be achieved without removing topsoils and clearing madrone forest.

**Direct Clearing.** As proposed, over the life of the mine 138.5 acres (85 percent) of the existing mature madrone forest would be removed (Table 5-1), including:

- 16.7 acres (56 percent) of bluff madrone forest;

- 88.2 acres (93 percent) of mature madrone mixed forest; and
- 33.6 acres (93 percent) of mature Douglas-fir mixed forest.

This loss would be mostly permanent under the Applicant's proposal, because the Applicant proposes to replant mined areas with Douglas-fir and grasses. In addition, the proposed grading plan would result in a large, flat basin floor, and madrone does not recolonize well on flat surfaces. Although some madrone would likely recolonize mined-out areas, the overall effect would be to permanently convert existing mature madrone forest into Douglas-fir forest and open slopes supporting a mix of grasses, weeds, and shrubs.

**Buffer Loss.** Clearing for fencing, wind damage, and reduced vigor due to fragmentation could cause the loss of about 6.4 acres of mature mixed madrone forest and 2.7 acres of mature Douglas-fir mixed forest in buffers.

**Time Lag in Reforestation.** The Applicant proposes a phased mining sequence that impacts mature madrone forest first (Phases 2, 3, and 4), and impacts the highly disturbed shrubland last (Phase 6). This would result in a temporary net reduction in madrone forest cover.

In addition, at maximum rates of extraction, the entire mining footprint, or 85 percent of the existing madrone forest, would be cleared in about 11 years. This would create a major time lag between the time of the impact and implementation of mitigation measures. About 204 acres (87 percent) of the site would be essentially bare, and the mitigation measures would be less effective.

#### *5.4.3.2 Terrestrial Mitigation 1*

a. Revegetate completed phases with madrone forest, rather than Douglas fir or hydroseeding. Achieving this goal would require control of invasive weeds, seeding with madrone seed gathered from onsite forests, and planting shrubs (chiefly salal and evergreen huckleberry) grown from stock gathered onsite (but not from buffer areas). Innovative techniques, such as placement of perch poles (for dispersal of seeds through birds) and mounding of seed beds, could improve results.

b. Prohibit hydroseeding except where necessary to control erosion, and use only native seed mixes. In this context, "native" requires that all seed stock be derived from the Puget

Sound area. Contract growing of seed gathered within 20 miles of the site is preferred.

c. Define specific mitigation performance standards in a Revegetation and Monitoring Plan, to be prepared by a qualified specialist in habitat restoration, and reviewed and approved by King County.

   Performance standards could be refined during plan development, but should be reasonably achievable within about 10 years, assuming typical madrone growth. For example, if typical growth were about 1 foot per year, a possible performance standard could be a minimum 50 percent madrone canopy coverage, with an average tree height of 10 feet per stand.

   Stands of relatively uniform cover should be delineated so that cover averaging does not result in a patchy distribution of madrone (e.g., 50 percent cover could be achieved with 100 percent cover on 50 acres and no cover at all on another 50 acres).

d. Monitor restoration to ensure that performance standards are being met.

e. Implement efficient monitoring and County review so as not to cause unnecessary delays that would unduly hinder project objectives. For efficiency, revegetation targets could be defined as part of the periodic review that is required for mining sites per KCC 21A.22.050. Periodic review is conducted at least every 5 years at all mineral sites to determine whether "the site is operating consistent with the most current standards and to establish other conditions as necessary to mitigate identifiable environmental impacts".

f. Since mining would occur in phases (per KCC 21.22.060), plan, implement, and monitor reclamation in phases (including both interim and final reclamation).

g. Control Scot's broom and Himalayan blackberry to prevent them from invading cleared areas.

h. Alter phased mining sequence so that highly disturbed shrubland ecosystems are mined early in the process, thus releasing these areas for revegetation to begin. In addition, phase mining so that mining would cross each area only once, where possible. Where not possible, interim site stabilization measures should be limited to erosion control.

i. Do not regrade the floor of the mine into a large, flat basin, on which madrone does not recolonize well. Instead, create gentle undulations and mounds up to a few feet high to improve colonization and survivability of madrone seedlings.

j. To prevent a major time lag between impacts and mitigation, establish a minimum number of acres that must be maintained as madrone forest at any one time, using the specific performance standards developed in the Revegetation and Monitoring Plan (e.g., minimum 50 percent madrone canopy coverage, with an average height of 10 feet per stand).

   A reasonable acreage to be maintained in madrone forest may be determined by subtracting the minimum area required for large-scale mining from the entire site area.

   For example, at any one time, large-scale mining would require about 84 acres (36 percent) of the site to be cleared or sparsely vegetated, based on :

   - 32 acres for the active mining phases (based on King County Code limitations);

   - 32 acres being actively restored; and

   - 20 acres for roads, loading areas, processing equipment, conveyer system, electrical lines, office, storage, and other project features.

   This would leave up to 151 acres available for madrone forest while still allowing large-scale mining at the site. This 151 acres would be composed of (1) mature forest preserved in buffers and set-aside areas; (2) madrone in areas yet to be mined; and (3) restored madrone forest.

k. Do not cut trees within buffer areas except in rare cases for hazard tree removal. Prune newly exposed Douglas-fir trees that provide important screening to reduce “sail” and associated vulnerability to blowdown.

l. Increase buffer where practical based on existing topography and mining needs to reduce vulnerability of buffer forest trees to death and disease. Alternatively, increase standard buffer from 50 feet to 100 feet.

m. In buffer areas dominated by Himalayan blackberry, Scot’s broom, or herbaceous weeds, remove vegetation and replant with native trees and shrubs characteristic of madrone forest.

**Regulatory/Policy Basis for Condition.** King County does not have a specific policy to protect madrone forest, and, as stated in Section 5.3.2.1, madrone is not protected by county, state, or federal regulations.

Still, several policies formally designated by King County provide a basis for considering ways to minimize loss of madrone while attaining or approximating the proposal's objectives.

King County has a long-standing policy of promoting native plants. As stated in the Comprehensive Plan, protection of many types of wildlife (and associated plant communities) does not have to be at odds with development. Because much of the mining site would remain undeveloped during the life of the mine, many opportunities exist for habitat enhancement and preservation, and implementing such opportunities would be consistent with King County Policy, including NE-503, which states:

*The use of native plants should be encouraged in landscape requirements, erosion control projects, and in the restoration of stream banks, lakes, shorelines, and wetlands.*

In addition, NE-612 states:

*Incorporating native plant communities should be encouraged where possible into development proposals.*

While not formally designated by King County as a "Fish and Wildlife Habitat Conservation Areas," madrone is used by band-tailed pigeons (observed on the site by EIS Team members), which are a "priority species of local importance" (King County Policy NE-605). The Policy states that:

*King County should protect all priority species of local importance and their habitat … where they are likely to be most successful.*

Band-tailed pigeons are not particularly rare but they are declining, and their presence at the site provides additional policy basis to require that loss of madrone forest be minimized through mitigation (Sections 5.4.3.3 and 5.4.3.4).

In addition, the WNHP identifies madrone forest as an important native plant community, and Maury Island contains some of the largest stands in the County. Madrone forest provides wildlife habitat, visual and aesthetic values, as well as contributing woody debris to shoreline areas.

Terrestrial Mitigation 1(f), which is to require revegetation planting and monitoring on a phase-by-phase basis, is based on policy RL-413, which states, in part:

*Where mining is completed in phases, reclamation also should be completed in phases as the resource is depleted.*

This measure is also intended to respond to public concerns regarding the feasibility of restoring madrone forest on the site.

#### *5.4.3.3 Terrestrial Impact 2 – Loss of Band-Tailed Pigeon Habitat*

**Specific Adverse Environmental Impact.** Up to 139 acres of Band-tailed pigeon foraging and nesting habitat would be removed over the course of mining, leaving about 13 acres of suitable habitat along the shoreline bluffs and 9 acres in perimeter buffer. Since band-tailed pigeon nesting areas can include defended territories up to a 1-mile radius (Brown 1985) this impact would reduce breeding habitat for a few pairs at most. The primary impact would be the loss of autumn foraging habitat.

#### *5.4.3.4 Terrestrial Mitigation 2*

a. Increase the amount of madrone retained or restored on the site to reduce band-tailed habitat loss. Retention of additional portions of the bluff, as described in Chapter 11 (Figure 11-8), would maintain an additional 9 acres of existing madrone. Retention of some or all of the mature madrone/Douglas-fir forest patch (Terrestrial Mitigation 3) would retain up to 36 additional acres. With both measures, up to 58 acres of habitat could be retained.

   Increasing buffers and set-asides greatly reduces the amount of material available to be mined. Slope and grading requirements reduce mineral availability in a greater proportion than the area set aside. For example, a 20 percent reduction in area could reduce up to 50 percent of available minerals. Because of this, reducing the allowable mining area compromises the project objectives, and, at some point, becomes an unreasonable alternative per WAC 197-11-786.

b. Restore madrone on reclaimed areas to gradually replace lost band-tailed pigeon habitat (per Terrestrial Mitigation 1). Madrone begin producing berries within 5 years of age.

**Regulatory/Policy Basis for Condition.** Same as listed under Terrestrial Impact 1.

#### *5.4.3.5 Terrestrial Impact 3 – Loss of Habitat for Pileated Woodpecker*

**Specific Adverse Environmental Impact.** Based on pileated woodpecker home range sizes, mining at the site would remove between 4 and 10 percent of the foraging territory for one breeding pair. The pileated woodpecker is a "candidate" priority species that is present on the site. Most typical habitat onsite is located within a 36-acre stand of mixed Douglas-fir/madrone, located on the northeastern portion of the site. Most of this stand (34 acres) would be cleared due to mining.

Per King County Policy NE-603:

*In the Rural Area and Natural Resource Lands, habitats for "candidate" priority species … shall not be reduced and should be preserved.*

Therefore, loss of this patch would be counter to this policy.

#### *5.4.3.6 Terrestrial Mitigation 3*

Set aside some or all of the 36-acre stand of mixed Douglas-fir and madrone to maintain the best habitat for pileated woodpeckers on the site. This measure would greatly reduce the amount of minerals at the site available for mining. Another option that does not so severely impact the project objectives would be to create habitat elsewhere prior to removing the 36-acre patch. Areas that have been mined could be revegetated with some Douglas-fir and enhanced with created Douglas-fir snags (standing dead trees) relocated from cleared areas. These areas in turn could be set aside permanently as habitat areas for this species.

**Regulatory/Policy Basis for Condition.** King County Policy NE-603.

#### *5.4.3.7 Terrestrial Impact 4 – Reduction in Habitat Meeting "Fish and Wildlife Habitat Conservation Area" Criteria*

**Specific Adverse Environmental Impact.** The shoreline of most of Maury Island, including the site, meets the definition of a King County Fish and Wildlife Conservation Area. Active mining would cause noise and activity that would disturb bald eagles, which are listed as threatened. The use is not expected to significantly affect individuals, as described in Section 5.3.1.1. Mining would also reduce up to 50 percent of the existing bluffs. These areas are considered riparian habitat (and, therefore, meet the criteria for Fish and Wildlife Habitat Conservation Area) since trees from these bluffs contribute wood and organic material to the shoreline and associated waters.

#### *5.4.3.8 Terrestrial Mitigation 4*

To compensate for potential disturbance to bald eagles, establish a perch pole for bald eagles along the shoreline and plant Douglas-fir. The pole should be designed and sited as approved by King County. Protection of an additional portion of the bluffs (as described in Chapter 11) would offset much of the impact from loss of riparian habitat. See also potential mitigation in Chapter 6, which includes habitat enhancement within the 200-foot shoreline buffer.

**Regulatory/Policy Basis for Condition.** King County Policy NE-604.

#### *5.4.3.9 Terrestrial Impact 5. Impacts due to Herbicide Use*

Herbicides can adversely affect the environment by affecting nontargeted plants and animals, such as salmon. In addition, herbicides can enter ground and surface waters.

#### *5.4.3.10 Terrestrial Mitigation 5. Prohibit Herbicide Use*

Follow King County policies of Integrated Pest Management for public lands. As of this writing, these policies are still in draft form, but integrated pest management is a proven and accepted approach to controlling weeds.

**Regulatory/Policy Basis for Condition.** This measure is based on KC policy NE-502, which states:

*King County should actively encourage the use of environmentally safe methods of vegetation control. Herbicide use should be minimized.*

In addition, since the site is within a groundwater protection special overlay district (KCC 21A.38.150), unrestricted and/or indiscriminate use of herbicides would be imprudent.

#### *5.4.3.11 Terrestrial Impact 6 – Loss of Red-Tailed Hawk Foraging and Potential Nesting Habitat*

**Specific Adverse Environmental Impact.** Active portions of the mine would be reduced in suitability for red-tailed hawk foraging, and mining would eventually remove mature forest that provides potential future nest sites. Overall, mining would create more suitable foraging habitat, since, once vegetated (even minimally), reclaimed areas would provide good hunting habitat.

#### *5.4.3.12 Terrestrial Mitigation 6*

Place artificial perch poles throughout the site to improve foraging habitat values on the site, since red-tailed hawk foraging is often limited by available perches. Placement of artificial nest structures within the buffer would help to offset potential losses of future nesting areas. Similar techniques have been used recently in Surrey, British Columbia, to mitigate direct removal of a red-tailed hawk nest site.

**Regulatory/Policy Basis for Condition.** King County Policy NE-604.

#### *5.4.3.13 Terrestrial Impact 7 - Destruction of Bird Nests and/or Eggs*

**Specific Adverse Environmental Impact.** The Applicant's proposal does not include measures to avoid disturbing nesting birds. Because of this, the project could result in the direct destruction of bird nests and/or young, including those protected under the Migratory Bird Treaty Act.

#### *5.4.3.14 Terrestrial Mitigation 7*

Prohibit vegetation clearing between March 1 and July 15 of any given year (or as otherwise determined through onsite consultation and concurrence with WDFW and/or King County DDES).

**Regulatory/Policy Basis for Condition.** RCW Title 77.15.130 (Protected fish or wildlife—Unlawful taking), establishes that a person is guilty of unlawful taking of protected fish or wildlife if the person:

*… hunts, fishes, possesses, or maliciously kills protected fish or wildlife, or the person possesses or maliciously destroys the eggs or nests of protected fish or wildlife, and the taking has not been authorized by rule of the commission.*

WAC Section 232.12.011(3), defines, protected wildlife as:

*… all birds not classified as game birds, predatory birds (magpie, crow, starling, House sparrow) or endangered species, or designated as threatened species or sensitive species; …*

Based on these laws, most birds that nest on the site are classified as protected wildlife and, therefore, their nests containing eggs and/or young are protected by law.

Active nests containing young or eggs of many birds are also protected under the Federal Migratory Bird Treaty Act, which prohibits taking, killing or possessing migratory birds, including nest sties. As with “protected wildlife” under Washington Law, “migratory birds” under federal law include most species that breed at the site.

## 5.5 Cumulative Impacts

Gradual removal of most forest stands on the site would continue the trend of deforestation on Maury Island and elsewhere in King County. Because the site is on a relatively small island, the loss of forest represents a greater proportion of available habitat than would occur on mainland sites. Unlike some other types of development, however, this proposal involves revegetation as each segment of mining is completed.

Prior to reclamation, the greatest impact due to the loss of woodland would be to animals that require a lot of space and cover, such as bear and deer. Other species, such as pileated woodpecker, screech owl, weasels, skunks, and coyotes, would also lose the protective cover of the forest.

In addition, development within King County and elsewhere has resulted in conflicts between people and animals, with deer browsing in gardens and bears entering neighborhoods. Development of the site probably would not cause any major conflicts on its own, but it would add to the causes of such conflicts.

Forests are expected to continue to decline on the island as development continues as zoned. Since much of the mine would be reforested subsequent to mining, the loss of forest habitat would not be permanent, although it could be long term (up to 50 to 100 years, depending on mining and reforestation rates).

## 5.6 Significant Unavoidable Adverse Impacts

Mining of the site would reduce madrone forest on the site (Terrestrial Impact 1). If the site were to be mined within 11 years (which is possible under maximum production), then 139 acres of madrone forest would be converted to relatively barren ground. Restoration per Terrestrial Mitigation 1 would offset some of the impact, but madrone would take time to mature and would not likely attain current mature forest conditions for at least 50 years. Madrone may develop in a patchy distribution in some areas.

Loss of madrone would reduce habitat for a “candidate” priority species, the band-tailed pigeon (Terrestrial Impact 2).

Active and recent mining areas would occupy up to 205 acres if mined within 11 years, not including the area for the dock, and would provide little or no wildlife habitat. A longer mining schedule would decrease the area affected, since mined out areas would have a chance to recover before the entire site is cleared. Certain individual animals would no longer use the site and would either perish onsite or move to other areas. Animals that move to other areas (1) are likely to have lower survival and reproductive success, and (2) may affect survival and reproductive success of animals already occupying offsite habitat.

Impacts would be at the scale of individuals and would not threaten populations, although should the site be mined quickly, one of the largest remaining madrone forests (and associated wildlife habitat) on Maury Island would be lost.

Habitat values would remain relatively unchanged within buffers. For about the first 10 to 20 years, reclaimed areas would provide habitat for species associated with shrubby habitats, including lizards, snakes, deer mice, Columbian-black tailed deer, sparrows, towhees, and swallows. Restored forests would not provide habitat for warblers, woodpeckers, and other species associated with more mature forests for at least 25 years.

The site would continue to support wildlife communities that are not present within developed residential areas and, therefore, would continue to support native wildlife and biodiversity on the Island.

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WDFW. See "Washington Department of Fish and Wildlife".

## *Table 5-1. Proposed Action – Effect on Site Vegetation*

| *Vegetation Type* | *Madrone Status* | *Area in 50-foot Wide Perimeter Buffer (acres)* | *Area in 200-foot Wide Shoreline Buffer (acres)* | *Area to be Mined (acres)* | *Total Area (acres)* |
|---|---|---|---|---|---|
| Bluff madrone forest | Dominant tree | 0.0 | 13.3 | 16.7 | 30.0 |
| Madrone mixed forest | Dominant tree | 6.4 | 0.0 | 88.2 | 94.6 |
| Douglas-fir mixed forest | Codominant tree | 2.7 | 0.0 | 33.6 | 36.3 |
| Old mine | Codominant shrub | 0.1 | 2.9 | 38.9 | 42.0 |
| Shrubland | Minor | 1.0 | 3.9 | 27.2 | 32.1 |
| | | 10.3 | 20.1 | 204.6 | 235.0 |

Figure 5-1. Bluff Madrone Forest (left) Adjoining Old Mine Habitat (right)

98-306-001
06/15/00

Figure 5-2. Madrone Mixed Forest

98-306-001
06/15/00

Figure 5-3. Douglas-fir Mixed Forest

98-306-001
06/15/00

*Larger Patches of Green "Shrubs" are Young Pacific Madrone and Alder*

Figure 5-4. Old Mine Habitat

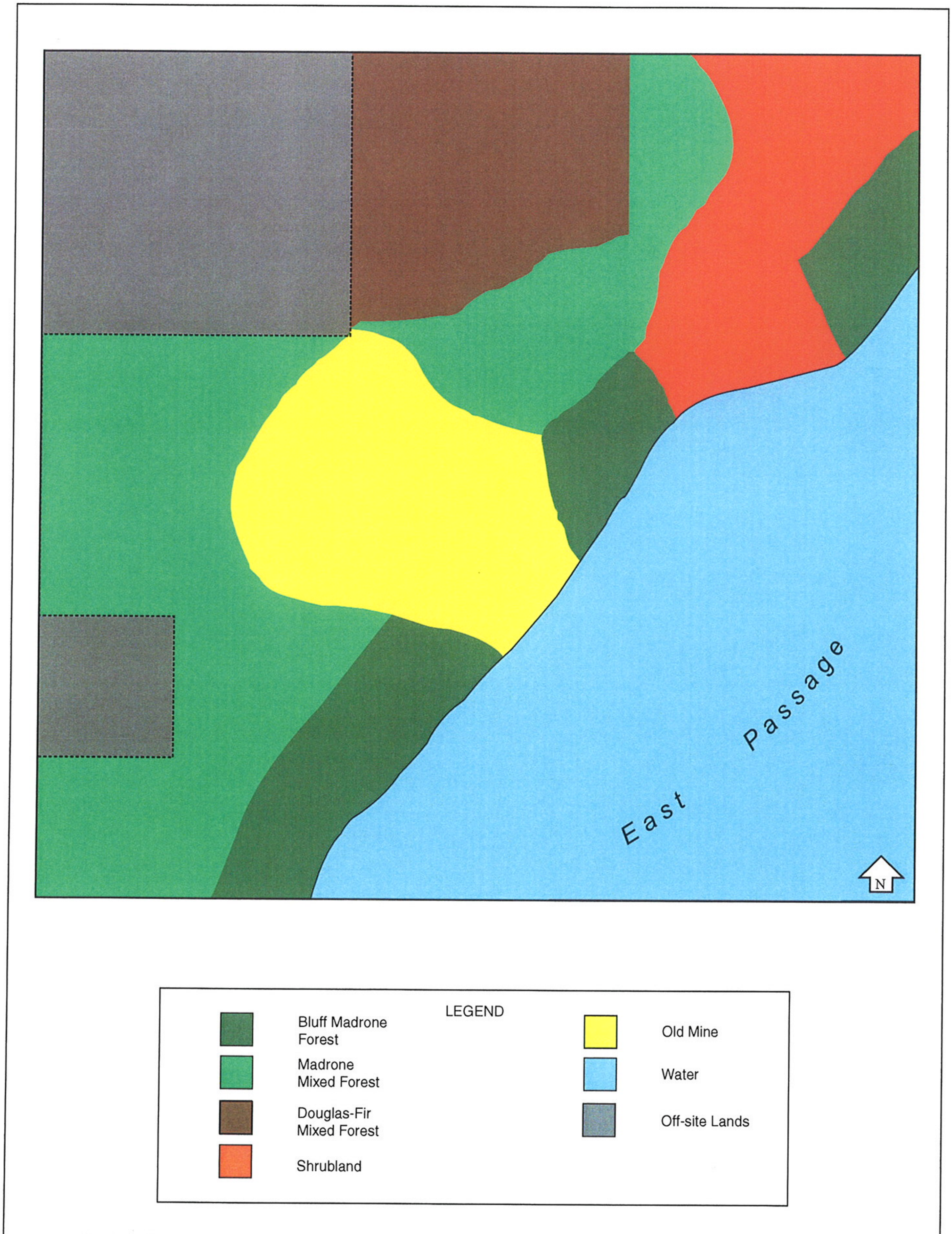


Figure 5-5. Current Vegetation Types on the Project Site

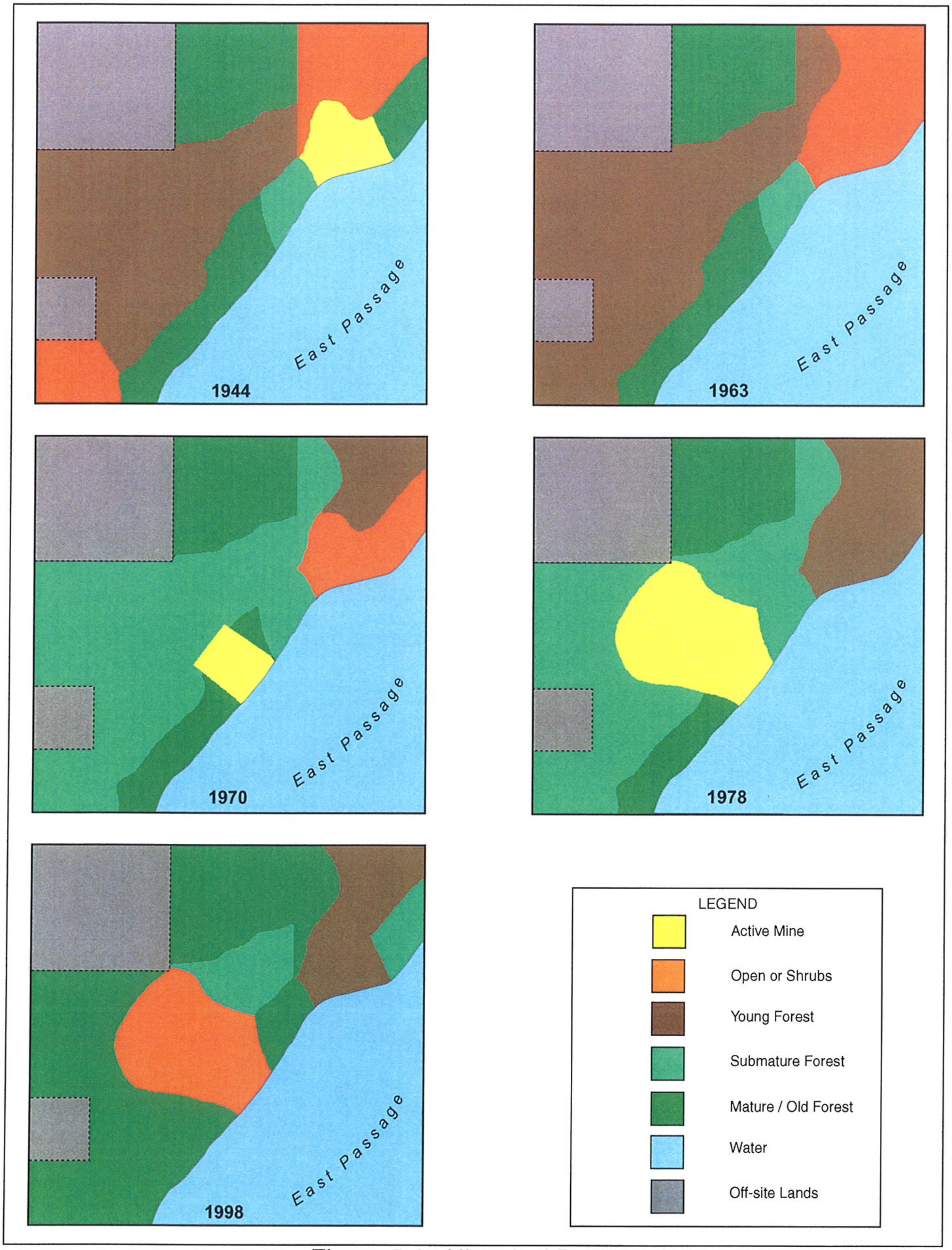


Figure 5-6. Historical Pattern of Vegetation Development at the Mine Site, 1944 to 1998

*Chapter 6*

# Marine Habitat and Fisheries

# *Chapter 6*

# Marine Habitat and Fisheries

This chapter addresses impacts and mitigation for marine plants and animals. Marine communities are those directly associated with the shoreline and marine environment. Terrestrial plants and animals involve different issues and are discussed in a separate chapter (Chapter 5). The recent listing of Puget Sound chinook salmon under the endangered species act and population declines of other marine species have greatly increased agency concerns regarding shorelines.

## 6.1 Primary Issues

About one-third of Puget Sound shorelines and half of King County shorelines have been developed. The shoreline at the site has also been developed, but since the dock has not been used for more than 20 years, the area is now quiet and is used by a variety of fish and other marine organisms. Sunken barges and the dock itself now provide habitat for a variety of marine life.

Resumption of barging would reintroduce activity along the shoreline at the project site. These activities would include renovation and maintenance of the existing dock; maneuvering and docking barges and tugs; and loading mined products onto barges from the conveyor. Figures 6-1a through 6-1c show the location of the existing dock and the position of barges along the dock under the Proposed Action in relation to the existing nearshore marine environment.

The primary issues analyzed in this chapter include:

- Would shading from barges at the dock adversely affect eelgrass or other marine biological communities?
- Would accidental spillage of sand and gravel during barge loading adversely affect marine life under or near the dock and barges?
- What would be the potential for petroleum spills from increased marine equipment activity?

- Would stormwater, propeller wash, or barge grounding affect marine organisms?
- Would removing a portion of the bluff during mining change the deposition/erosion dynamics of the beach?
- What effect would the project have on geoduck clam harvest by the Puyallup Tribe?
- Would the noise and vibration from pile driving or barge loading affect salmon and other marine animals, including whales?
- How would dock repairs and/or maintenance impact marine habitats?
- How would artificial light from the project affect marine life?

## 6.2 Affected Environment

The physical and biological characteristics of the marine environment adjacent to the project site are fairly typical of Puget Sound beaches. Information sources used in this analysis include:

- A marine biology report prepared as part of the Environmental Checklist (Associated Earth Sciences, Inc. 1998);
- an eelgrass survey and general marine reconnaissance survey conducted by Jones & Stokes in July and August 1999 (Jones & Stokes 1999; included as Appendix J);
- a marine assessment conducted under the direction of the Department of Ecology (EVS 2000);
- the Puget Sound Environmental Atlas (Evans-Hamilton, Inc. and D.R. Systems 1987, PSEP 1992);
- publications from the USFWS, National Marine Fisheries Service, WDFW, Washington Department of Health, and other agencies on the status of fish and fisheries;
- personal communication and workshops with staff from the WDNR, WDFW, and King County DNR; and
- scientific literature and other published reports, as cited.

For a comprehensive review of shoreline life in Puget Sound, see Kozloff (1983).

## 6.2.1 Physical Components

Marine habitat at the site can be divided into three physical zones: intertidal, nearshore subtidal, and offshore (Figure 6-1a).

### *6.2.1.1 Intertidal Zone*

The *intertidal zone* is the area exposed during low tide and submerged at high tide (commonly referred to as the beach). At the site, this zone is sandy, with occasional bands of cobble (stones 2.5 to 10 inches in diameter) running parallel to the beach.

### *6.2.1.2 Nearshore Subtidal Zone*

The *nearshore subtidal zone* is the area between mean lower low water elevation (MLLW) and about -30 feet MLLW. Since water depth fluctuates constantly in this zone, depth is measured based on the average lowest low tide of the day. This point is measured as “0 MLLW.” One foot deeper would be –1 MLLW. One foot shallower would be + 1 MLLW.

The nearshore subtidal zone near the dock consists of sand and silt (Figures 6-2a and 6-2b). Starting from the shoreline, the bottom slopes gradually to about the end of the dock, at which point the bottom drops off steeply. A mound of sand and gravel spilled during previous loading operations is present below the old loading point of the dock (the top of the mound measures about -20 feet MLLW) (see Figures 6-1a and 6-1b).

A principal concern for this analysis is the nearshore subtidal zone of approximately -22 feet MLLW or less (Figures 6-2a and 6-2b). This is the depth zone found to support eelgrass in Puget Sound (Phillips 1984). Eelgrass is considered very important because of its use by spawning herring, Dungeness crab, juvenile salmon, and other marine animals. Eelgrass is protected under WAC 220-110, Hydraulic Code Rules.

As Figures 6-2a and 6-2b show, water depths seaward of the dock are mostly deeper than -22 feet MLLW. This is important because this is where most activities associated with barging materials would occur, and because eelgrass and associated communities typically do not occur at depths of 22 feet or greater.

Shoreline armoring (bulkheads and riprap) protect community developments to the north and south of the project area (Figure 11-5). These structures probably affect alongshore sediment transport to and from the site.

Several extensions of the inshore bench occur as submerged ridges oriented perpendicular to the shoreline at regular intervals (Figure 6-3). The dock and associated historical product spill are located on top of one of these ridges. Additional ridges are located north and south of the dock approximately 300 feet apart.

The substrate on these ridges consists of sand coarser than that found inshore, but does not contain cobble, which is found under the end of the conveyor. Eelgrass grows on the ridge north of the dock.

#### 6.2.1.3 Offshore Zone

The third physical zone is the *offshore zone* (generally areas below –30 MLLW). At the site, the substrate within the offshore zone consists of a mix of coarse and silty sands.

Human-made features in the offshore zone include the dock and associated pilings; offshore dolphins; a sunken pleasure boat; and two sunken wooden barges (Figure 6-2b).

Table 6-1 summarizes the physical components of the marine habitat associated with the project site, as well as associated algae, plants, and animals typical of the area.

### 6.2.2 Biological Components

The marine environment near and around the dock includes areas of bare sand, eelgrass beds, and “reef” habitat associated with the pier and sunken barges. An eelgrass survey and marine reconnaissance survey conducted on July 24th, 1999 and August 1, 1999, identified one aquatic plant (eelgrass), six varieties (taxa) of algae, 22 invertebrate species, and 20 fish species (Jones & Stokes 1999).

Key species of concern, as identified through scoping and public/agency comments on the DEIS, are described below.

#### 6.2.2.1 Eelgrass

**Eelgrass at the Site.** Several eelgrass patches grow between the dock and the shore (Figures 6-2a and 6-2b) within the nearshore intertidal zone. Based on habitat and light availability, eelgrass could occur anywhere at this site down to a depth of about -22 feet MLLW. However, direct surveys found most eelgrass at the site between -5 feet and -15 feet MLLW (Appendix J). The deepest eelgrass occurred at -15.9 feet MLLW.

Eelgrass at the site is not particularly unique or healthy, when compared to other eelgrass beds in the region. For example, eelgrass at the site grows in isolated patches, ranging in size from 10 by 10 feet to 40 by 60 feet during the 1999 growing season. In contrast, eelgrass grows in larger beds in Quartermaster Harbor and other identified eelgrass areas in Puget Sound. Eelgrass patches north and south of the site cover larger areas and are more continuous in nature. Eelgrass patches at the site may be fragments of larger eelgrass beds disturbed by past mining activity. Within the patches on the site, eelgrass density ranges from single plants to 22.9 turions (stems) per 0.25 square meter. In high-quality beds in Puget Sound, eelgrass grows at densities up to 215 turions per 0.25 square meter (Phillips 1984). Average eelgrass beds are in the range of 40 to 50 turions per 0.25 square meter.

In Quartermaster Harbor, and along the shores southwest of Sandy Shores, eelgrass forms a more continuous band, and eelgrass occurs at densities of approximately 40 turions per 0.25 meter and greater.

**Eelgrass Function within the Marine Ecosystem.** Eelgrass serves a variety of ecological functions. It provides food for grazers and nutrients to sediments; provides shelter for juvenile fish (including salmon and herring); and stabilizes sediments (Phillips 1984). As such, eelgrass and its associated flora and fauna are an important element of the Puget Sound food web.

For a more complete description of the ecological role of eelgrass, see Phillips (1984).

**Local and Regional Context of Eelgrass at the Site.** Eelgrass covers about 63 percent of the Maury Island shoreline (10.6 linear miles) and 56 percent of the combined Vashon/Maury Island shoreline (Puget Sound Estuary Program 1992).

The proposed project site encompasses approximately 800 linear feet of nearshore. If the entire linear extent of the site were to be considered eelgrass, this would represents 1.4 percent of the eelgrass habitat for Maury Island and about 0.5 percent of the eelgrass habitat of Vashon/Maury Island combined (Table 6-2).

The area of suitable shallow eelgrass habitat (< -22 feet MLLW) at the site is narrower than at other locations on the islands because of the narrow width of the shallow-water shelf. The shoreline at other locations (e.g., Quartermaster Harbor) does not drop off as rapidly, and these areas therefore provide larger areas of suitable eelgrass habitat.

**Other Sea Plants.** Bull kelp (*Nereocystis leutkeana*) is not present at the project site, based on diving surveys and the Puget Sound Environmental Atlas (Puget Sound Estuary Program 1992). The nearest patch indicated by the atlas is more than 1 mile away.

Other larger macroalgae (seaweed), including *Lamineria* spp. and *Ulva* spp., are common below the dock and surrounding areas. Both of these species are common in Puget Sound.

#### *6.2.2.2 Geoducks*

Geoduck clam (*Panope generosa*) beds are found along the entire southeastern shoreline of Maury Island, including the project site (Goodwin and Herren 1992, Sizemore et al. 1998).

Geoduck harvest is an economically important fishery in Puget Sound for both the State and Tribal Nations.

The site represents about 1 percent of the 149-acre Maury Island geoduck tract. A tract is an area that, in the opinion of state and Tribal biologists, contains sufficient densities to allow harvest. The Maury Island site has a moderate density of about 1 geoduck every 5 square feet (0.22 clams per square foot) (Sizemore et al. 1998). Near the site, geoducks generally occur from the subtidal nearshore zone to about 200 yards out.

The Puyallup Tribe and the WDNR both plan to harvest geoducks from this bed during the next few years. They will use water jets to blast away mud and sand around each clam hole and then pick up the clam by hand. This leaves small craters, about 2 feet wide and up to several feet deep, scattered about the sea floor.

Puyallup clam divers work four days per week between 8 a.m. and 4 p.m. (Winfree pers. comm.).

#### *6.2.2.3 Herring*

The NMFS is currently reviewing Pacific herring (*Clupea harengus pallasi)* for protection under ESA. Herring spawning occurs in shallow subtidal zones on vegetation and other shallow water substrate. Eelgrass is a preferred substrate for spawning, along with marine algae and sometimes other materials such as pilings and docks (Hart 1973). Most egg deposition occurs in substrates from 0 to –10 feet MLLW. After 10 to 14 days of incubation the larvae drift with currents, and undergo further development. At sexual maturity (2 to 4 years), herring migrate back to their natal spawning grounds.

About 52 percent of the Maury Island shoreline has been identified as herring spawning grounds by the Puget Sound Estuary Program (1992). The core herring spawning area on Maury Island is located in Quartermaster Harbor and extends to the Sandy Shores community, which is about 0.5 mile southwest of the site. The Quartermaster Harbor stock is considered to be “healthy” (Bargmann et al. 1998).

Herring probably spawn at the site, given that the proposed project site is located in proximity to known spawning areas, that herring spawning is typically associated with eelgrass, and that eelgrass is present at the site. Due to the patchy distribution of eelgrass, the site is not expected to be a major spawning ground. Herring are more likely to spawn at the site during high population cycles, as some individuals are forced away from more preferable spawning habitat. During low population cycles, the site may be used less or perhaps not at all.

Surveys for herring spawning at the site have not been undertaken. Direct surveys would be required to document the actual level of use, but for SEPA decisions regarding the proposal, it is adequate to conclude that some spawning occurs, but that this area is not a core area for spawning.

Herring, surf smelt (Section 6.2.2.4), and sand lance (Section 6.2.2.5) are important prey for birds, for marine mammals, and for other fish, such as salmon. Thus, herring, surf smelt, and sand lance are key components of the marine ecosystem in Puget Sound. In addition, both commercial and recreational fisheries use various forage fish species.

#### *6.2.2.4 Surf Smelt*

Although no surf smelt (*Hypomesus pretiosus*) spawning surveys have been completed at the site, spawning beaches have been noted southwest of the existing Glacier Northwest dock on the southeast shoreline of Maury Island between the point at Sandy Shores and Piner Point (Pentilla 1995a). Spawning beaches have also been identified northeast of the project site at Point Robinson. Surf smelt spawning occurs at high tide on mixed sand–gravel substrates in upper intertidal areas. Eggs adhere tightly to beach surface substrate and subsequent wave action disperses the eggs into the top several inches of beach material, where they incubate for 2 to 5 weeks (Bargmann et al. 1998). Due to the near proximity of surf smelt spawning beaches, it is likely surf smelt also spawn in the intertidal zone of the project site where appropriate substrate is available. The surf smelt stock in this area spawns from October through February of each year.

#### 6.2.2.5 Sand Lance

Sand lance (*Ammonites hexapterus*) spawning areas have been identified in the same areas on Maury Island as mentioned above for surf smelt (Pentilla 1995b); thus it is also possible that sand lance spawning areas could be present in the intertidal zone at the project site where appropriate substrate is available. Sand lance are obligate upper intertidal spawners, depositing eggs in sand-gravel substrate between the mean high tide line and about +5 feet tidal elevation. Broods of eggs incubate in the beach for about 1 month after which larvae enter the nearshore plankton. Sand lance spawn from November through February and may spawn several times at any given site. Sites appear to be used year after year (Bargmann et al. 1998).

#### 6.2.2.6 Salmon

Chinook, coho, pink, and chum salmon; steelhead; and sea-run cutthroat trout all use the intertidal environment of southern Puget Sound during the juvenile life stage. Juvenile salmon forage for tiny crustaceans and other animals among the substrate, algae, and eelgrass of the intertidal zone. Since no salmon-bearing rivers or streams are close to the site, juvenile salmon at the site are marine adapted and not in the more sensitive transition stage between fresh and salt waters. Larger salmon may also be found in deeper offshore habitat. Juvenile salmon use the intertidal zone around the existing dock, and larger salmon use the offshore habitat. Juvenile salmon are present primarily during late spring and early summer. Older salmon may be present offshore all year.

#### 6.2.2.7 Dock and Sunken Barge Communities (Reef Habitat)

The dock, sunken pleasure boat, and two sunken wooden barges create high-relief habitat that supports typical piling and reef communities. The dock creates increased habitat for shellfish (barnacles, mussels, limpets, chitons etc.) and shellfish predators, including Dungeness crab and seastars. The shell fragments in this area (Figure 6-2b) provide substrate for the recruitment and settlement of larval Dungeness crab (Dumbauld et al. 1993). Dungeness crabs and seastars have been shown to negatively affect eelgrass through bioturbation associated with foraging and burrowing (Simenstad et al. 1997). The sunken boats as well as the dock provide habitat to lingcod, rockfish, greenling, and other reef fish. Many of the “reef” fish are predators of juvenile salmon and are also state-listed candidate species (described below). Table 6-3 provides a complete listing of organisms observed at the site during eelgrass surveys.

#### 6.2.2.8 Rockfish

Several species of rockfish are currently under review by NMFS for protection under ESA. Brown rockfish (*Sebastes auriclatus*) and copper rockfish (*Sebastes caurinus)* have been identified in the site area, primarily associated with the man-made structures (dock and sunken barges). Generally, rockfishes inhabit rocky and artificial reef structures and other habitats with vertical relief. Eggs hatch internally in the female and are released as larvae during the spring. Larvae remain in the plankton for several months and then settle on marine vegetation and nearshore reef habitats. Rockfishes tend to be mid-level consumers and feed primarily on shrimp, crabs, and small fishes (including juvenile salmon). Copper and brown rockfishes are sedentary species and have small home ranges (~30 square meters on high-relief reefs). Rockfishes are long-lived species, with some reaching 75 years of age (Matthews et al. 1986).

#### 6.2.2.9 Cod

**Pacific Cod.** Puget Sound Pacific cod (*Gadus macrocephalus)* has been petitioned for listing under the Endangered Species Act (ESA) and its status is currently under review with the National Marine Fisheries Service (NMFS) for further action. Pacific cod occurs throughout most of Puget Sound, typically in areas with deep (>80 feet) and cold water (> 10°C). Individuals spend much of their time near the bottom feeding on clams, worms, crabs, shrimp, and juvenile fish.

Puget Sound contains three stocks of Pacific cod, based upon fishery pattern, location of spawning grounds, parasitic markers, and tagging studies. The Maury Island site falls within the range of the southern stock. Populations of the southern stock have declined over the past several decades.

Spawning by Pacific cod has been documented by Washington Department of Fish and Wildlife biologists in waters 60 feet deep off Rosehilla, located approximately 1.2 miles southwest of the project area.

Pacific cod probably occurs in the deeper waters surrounding Vashon and Maury Island, including East Passage. However, Pacific cod is not expected to occur regularly at the proposed site because of its preference for waters deeper than 80 feet.

**Walleye Pollock.** Walleye pollock (*Theragra chalcogramma*), another member of the cod family, has been petitioned for listing under the ESA. Walleye Pollock are carnivorous, midwater, schooling codfish typically considered a northern, colder water species. Populations in Puget Sound are thought to be at the extreme southern end of their Pacific Coast distribution.

The southern Puget Sound stock of walleye pollock is considered distinct from the northern Puget Sound stock due to differences in growth rates and spatial separation during spawning. The southern stock has been declining since the 1980s and is at a critically low level and possibly extinct.

Little information is available on the life history of walleye Pollock in Puget Sound. Walleye pollock are known to spawn in Dalco Passage which is approximately 3 miles southwest of the project area. Adults are associated with both nearshore and deepwater habitats. As such, walleye pollock may occur near the project area but their frequency of occurrence is unknown.

**Pacific Hake.** Pacific hake (*Merluccius productus*) is a member of the hake family (*Merlucciidae*) and resembles cod externally. Pacific hake has been petitioned for listing under the ESA because of declining populations and smaller adult sizes. This species was heavily exploited by commercial fisheries during the mid 1980s and continues to experience considerable predation pressure from marine mammals. Marine mammal predation is thought to be a major factor limiting Pacific hake recovery.

Puget Sound Pacific hake are known to spawn primarily in Port Susan, approximately 50 miles north of the project area. Juvenile and adult hake are found in both nearshore and offshore habitats. Although pacific hake have not been documented at the Maury Island site, due to their wide distribution in Puget Sound it is likely that they periodically visit the project area.

**Lingcod.** Lingcod (*Ophidon elongates)* is part of the Hexagrammidae family and is not part of the codfish family (Gadidae). Lingcod is not currently listed under ESA but settlement and nursery areas are considered saltwater habitat of special concern by the Washington Department of Fish and Wildlife and WAC Hydraulic Code Rules (WAC 220-110-250). Lingcod occupies habitats with vertical relief commonly referred to as "reef" habitat. Individuals are territorial and lay eggs in nests, which they actively guard.

Lingcod occurs at the Maury Island site in "reef" habitat associated with the dock and the sunken barges. Lingcod eggs were observed near one of the sunken barges during dive surveys conducted at the site.

#### *6.2.2.10 Bull Trout*

Bull trout (*Salvelinus confluentus*) was listed as threatened under the Endangered Species Act on November 1, 1999 (Federal Register 64[210]:58910-58933). Several different life-history forms have been observed in this species, including stream-resident, fluvial, adfluvial, and anadromous. Of these life-history patterns only anadromous individuals venture into marine waters as adults. The other life-history forms (stream-resident, fluvial, and adfluvial), as well as juvenile and spawning anadromous bull trout, occur only in fresh water.

Adult anadromous bull trout may occasionally visit the Maury Island site area while foraging in the marine environment. They are opportunistic feeders and prey on many organisms, including small fish such as sculpins and juvenile salmon.

Mature anadromous bull trout return to freshwater between late May and September and spawn between August and November. Sub-adult anadromous forms migrate from the marine environment in the fall and early winter, to overwinter in freshwater.

Populations of native char (which include bull trout and Dolly Varden) have been identified in several rivers in the Puget Sound Basin, including the Nisqually, Puyallup, and Green Rivers. Due to the difficulty in distinguishing between Dolly Varden (not a threatened species) and bull trout, it is uncertain whether anadromous bull trout are present in these drainages.

### 6.2.3 Other Considerations of the Marine Environment

#### *6.2.3.1 Recreational Fisheries*

With the exception of geoduck beds, as described earlier, no recreational shellfish beaches or commercial shellfish beds are designated or monitored on the southeast shoreline of Maury Island by the Washington State Department of Health (Washington Department of Health 1996). However, local residents and visitors have indicated periodic use of the site, including the dock, for recreational gathering of clams and crabs. Other less economically important species of fish and invertebrate are likely found along the shoreline of the project site.

Some recreational catch of chinook salmon is known to occur offshore from the project site.

## 6.3 Impacts

### 6.3.1 How would shading from barges at the dock adversely affect eelgrass or other marine biological communities?

Light is a major factor determining the characteristics of marine communities. Shorelines are zones of shallow water where considerable light reaches the subsurface, thus supporting plant and animal production. This is why shorelines are particularly productive ecosystems.

Shading could be caused by shadows cast by barges, tugs, and the dock, as well as by sediments and air bubbles created by tug prop wash (prop wash is the turbulence created by the thrust of propellers). This section addresses the impacts of shading due to barges and tugs. Section 6.3.4 addresses shading from prop wash and Section 6.3.8 addresses shading from the dock.

**Light and Eelgrass.** Eelgrass, like any photosynthesizing plant, requires light. Both natural and human factors can affect water clarity and thereby decrease the depth to which light penetrates adequately for eelgrass growth. Some of these factors are plankton abundance, pollution, turbidity from runoff, and shading from overwater structures.

Shading from Washington State Ferry terminal structures, turbulence from ferry vessel traffic, and bioturbation (foraging and burrowing by seastars and crabs) have been identified as factors limiting eelgrass distribution near ferry terminals (Thom et al. 1995).

**Light and Other Marine Biological Communities.** Like eelgrass, many other plants and animals require light. Most notably, macroalgae (commonly called seaweeds) are limited by light, although they tend to be able to grow in deeper water than eelgrass. Other organisms may depend indirectly on light, since they use habitats created by macroalgae and other light-dependent organisms.

#### *6.3.1.1 Proposed Action*

**Eelgrass.** Three patches of eelgrass could be partially shaded and, therefore, reduced in area.

- Patch 1: a 20- by 20-foot patch located about 30 feet from the end of the dock (along transect line N1 in Figure 6-2a);
- Patch 2: a 40- by 60-foot eelgrass patch, extending out between the dolphins located about 300 feet north of the dock (along transect line N7 in Figure 6-2a); and
- Patch 3: a 50- by 60-foot eelgrass patch, landward of the dolphins, located about 200 feet south of the dock (along transect line S6 in Figure 6-2a).

Patch 1 would be indirectly shaded when the sun is low in the sky. This 20-foot by 20-foot patch is located a few feet north of the dock and about 30 feet shoreward of where barges would be loaded.

Shading would be greatest during winter, when the sun is low in the sky and not contributing a large amount of light and when eelgrass is in a period of slow growth (Figure 6-4).

Patch 2 could be shaded directly, since the patch extends seaward of the dolphins. Since this patch is 300 feet from the loading area, most shading would occur only during arrival or departure of barges. Shading could also occur during loading, but only in an extreme situation. This situation would arise should a barge be positioned as far north as it could while still under the loading area, and if a tug was at the northern end of this barge. In such situations, the patch would be directly shaded.

This shading could reduce the extent of this patch but is not expected to eliminate this patch, since shading would be intermittent, occurring only during arrival and departure and/or when a barge is shifted as far north as possible while being loaded.

Patch 3 would be shaded during barge loading, when barges were moved to the south to fill the northernmost part of the barge.

The other patches of eelgrass at the site would not be shaded because they are sufficiently far from the barge loading area where shading would occur.

**Other Marine Biological Communities.** Much of the area underneath the loading area would be directly shaded by barges and tugs.

Shading would be concentrated around the end of the conveyor, since this area would be shaded almost constantly during peak operation. Because barges would be moved back and forth during loading, the duration of shading would decrease as the distance from this point increases.

The impact would occur in an area of human-made reef habitat. This habitat type is not particularly common along the south shore of Maury Island.

The extent of macroalgae (*Laminaria* spp. and *Ulva* spp.) located directly beneath where the barges would be loaded would be reduced due to shading. These species are relatively common and impacts would be limited in extent to the area immediately surrounding the dock.

Moreover, shading (and noise) is not expected to totally eliminate use of the area by marine organisms. Ferry docks and other active and/or shaded areas are known to support relatively rich communities of reef-oriented species.

#### *6.3.1.2 Alternative 1*

Shading effects from Alternative 1 would be essentially the same as under the Proposed Action. Barges could be tied up at the dock during daylight hours, since night loading would not occur. However, as discussed under the Proposed Action, this would not significantly shade eelgrass beds.

#### 6.3.1.3 Alternative 2

Shading effects from Alternative 2 would be essentially the same as under the Proposed Action. Barges would be loaded only during daylight hours, but fewer average hours per day would be required at this level of output than under the Proposed Action. As discussed under the Proposed Action, eelgrass beds would not be significantly shaded.

#### 6.3.1.4 No-Action

Under the No-Action Alternative, as defined in Chapter 2, there would be no barge activity or modifications to the dock and no change in shading of the marine environment.

### 6.3.2 How would accidental spillage of sand and gravel during barge loading adversely affect marine life under or near the dock and barges?

#### 6.3.2.1 Proposed Action

Some spilling of mined material is inevitable with a project of this scale.

Due to the high volumes of materials proposed to be loaded under maximum production levels, state agencies and the public expressed concern about the frequency and quantity of accidental spillage. The concern is that spilled sand and gravel would bury marine organisms. Further literature review, discussions with loading facility operators, and a dive survey at a currently active barge-loading facility in Dupont were conducted to supplement the analysis presented in the DEIS.

Two categories of accidental spillage have been evaluated: (1) spillage due to a barge sinking or other accident, leading to a major input of sand and gravel into the water; and (2) accidental spillage of smaller amounts from the conveyor and around the barges during normal loading operations.

**Barge Accident Spillage.** A major spill, such as may occur with a barge sinking at the dock, would bury geoducks, clams, kelp and other sedentary marine life that exist under the loading area. Salvage or other removal of spilled material may further disrupt the sediments. The rate of recovery of the benthic meiofauna (small invertebrates living in sediments) following disturbance is on the order of days to months (Sherman and Coull 1980). Full recovery could take several years.

The probability of a large spill due to a loaded barge overturning or sinking is low. No loaded barges have been lost pierside at any of the Applicant's mining operations in Puget Sound. Two barges have sunk in transit (one in Lake Union and one in Elliot Bay).

**Conveyor Spillage.** Spilling during routine operations is by far the greatest concern, since, without extensive protective measures, spilling could occur regularly over long periods of time, thereby directly burying marine organisms.

Estimates of spillage for a conveyor system are 1 pound per foot of conveyor per year (City of Dupont 1993). This estimate was based on an unprotected (without spill tray or wind guard) conveyor, with annual production of 3 to 4 million tons. The Maury Island site, at maximum annual production of 7.5 million tons, would approximately double this figure, leading to potential spillage of 2 pounds per foot of conveyor per year. There are approximately 300 feet of conveyor located over the nearshore, so up to 600 pounds of material could be spilled per year if no protective systems were utilized.

Some spillage of sand and gravel is inevitable. Spilling is expected to occur immediately below the point were the conveyor meets the barge, resulting in some reduction in shellfish, algae, and other marine organisms directly below the loading point (as has been documented to occur at the Dupont site and in previous operations at Maury Island).

Spilling could also occur along the conveyor itself. While the proposed spill tray could be designed to capture much of this spillage, some additional spilling would be expected during manual cleaning of the tray.

**Spillage Around Barges during Loading.** A dive survey conducted at the active Dupont barge-loading facility revealed that significant amounts of spillage occurred around the sides of the barges being loaded (Appendix K). The volume of spillage was sufficient to create mounds 3 to 10 feet high and 5 to 15 feet long. Gravel accumulation was limited to the range of motion of the loading arm (movable boom) used at this facility. It is likely that the gravel spills were caused by using the movable boom to load the barge to maximum capacity.

The gravel deposited at the Dupont facility did not have significant algal accumulations or show signs of recruitment of other marine organisms. The benthic community around the gravel mounds and further along the dock did not appear to be significantly altered from pre-facility construction conditions, based on a comparison with videos of underwater surveys completed pre-construction (video tapes provided by Glacier Northwest). There was no evidence of significant transport of material away from the immediate loading zone by currents. Additionally, there did not appear to be significant accumulation of fine sediments around the loading facility.

Because the Maury Island loading dock is not proposed to be equipped with a movable boom, spillage would be limited in lateral extent to the areas directly off the end of the conveyor (on either side of the barge). If amounts of spillage were similar to those found at the Dupont facility, burial of attached or sessile (non-moving) benthic organisms would occur.

Recovery may be delayed and take up to several years, depending on the quantity and the frequency of spillage. Long-term effects, after spillage ceased, would be minimal as the material being loaded is similar to the substrate currently at the end of the pier. There would be rapid re-colonization of the benthic substrate and community re-establishment would take place over the course of several years. Studies on the effects of adding gravel to intertidal sandflats in Puget Sound indicated increased net productivity in comparison to control plots (Thom et al. 1994). Certain meiofauna that are important in the diet of juvenile salmon were also higher in plots with added gravel (Simentstad et al. 1991). Additionally, clam production on graveled areas has been shown to increase on the order of 2 to 10 times versus ungraveled substrate (Thompson and Cooke 1991, as cited in Thom et al. 1994).

Effects on the larger surrounding area, including eelgrass beds, would not be significant. Larger grain sizes would settle rapidly and would therefore be deposited only in the immediate vicinity of the end of the dock. Smaller grain sizes, which may be transported by currents, would be dispersed over a large area. Deposition rates due to dispersal of fine-grained sediments are expected to be less than during commonly occurring natural events (e.g., storm wave action). (The effects of suspended sediments on marine organisms are discussed further in Section 6.3.4.)

Over time, the accumulated pile of sand and gravel could interfere with loading. Currently the shallowest point at the end of the dock, where barges would be located, is 20 feet deep at MLLW

(Figure 6-1b). A fully loaded 10,000-ton barge has a draft of 16 to 17 feet. Significant spillage at the end of the conveyor at the Maury Island site could decrease water depth and cause a loaded barge to rest against the bottom during negative tides, causing additional disturbance to the sediments.

#### *6.3.2.2 Alternative 1*

The potential for spills due to a barge accident would be somewhat less than under the Proposed Action, since less material would be loaded with the conveyor system.

Impacts from conveyor spillage would be about the same, even though the accumulation may be less due to lower peak volumes.

#### *6.3.2.3 Alternative 2*

Same as Alternative 1.

#### *6.3.2.4 No-Action*

Under the No-Action Alternative, no sand and gravel would be loaded using the conveyor system and there would be no risk of accidental sand and gravel spillage.

### 6.3.3 What would be the potential for petroleum spills from increased marine equipment activity?

#### *6.3.3.1 Proposed Action*

The possibility of accidental spills of petroleum products due to the proposal is minor because:

- No vessel refueling would take place at the project site, reducing the risk of petroleum spills.
- All vessels would operate in compliance with Coast Guard regulations to limit the potential for petroleum spills.
- Barges would be hauling sand and gravel, not petroleum products.
- All vessels would operate with spill containment equipment aboard.

The tug boats most likely to be used at the site carry between 25,000 and 80,000 gallons of diesel fuel, 300 to 1,000 gallons of lube oil, and 55 to 200 gallons of hydraulic oil. Normal operations of the vessels do not result in significant spillage of petroleum products.

As with any boat, tugs would release oil and diesel into the water from their exhausts. The small amounts would disperse quickly. Currents would move and dilute such inputs and any one area is unlikely to be impacted repeatedly. The invertebrate communities that develop on the pilings may accumulate some hydrocarbons in their tissue from repeated exposure. Mortality to the piling communities is unlikely and long-term accumulation would not be significant because of the intermittent nature of the inputs and the rapid rate of depuration (cleaning-out) of most compounds from animal tissues (Anderson 1977, Rossi 1977). Studies have shown very low accumulation of polycyclic aromatic hydrocarbons (PAHs, a group of chemicals associated with petroleum products) in fish or other higher trophic levels when feeding on contaminated animals (McElroy et al. 1989).

A major accident or equipment failure could result in significant spillage of diesel fuel and smaller amounts of hydraulic oil. The amount would depend on the size of tug used, which may include tugs with fuel capacity up to 80,000 gallons. There are numerous studies investigating the effects of petroleum products on marine organisms. Most work has been done after large spills involving hundreds of thousands of gallons. Refined fuels, including diesel, tend to oxidize and volatilize more rapidly than crude oil or bunker fuel oil and do not remain in the system as long. However, more highly refined fuels also tend to be more toxic to organisms (Zieman 1982).

In past spills of diesel fuel, such as the Guemes Island spill in northwest Washington, sensitive shoreline intertidal invertebrates (shore crabs, amphipods, clams, limpets, and snails) were affected and mortality was high. Recolonization and recovery of these areas occurred within 6 months (Woodin et al. 1972).

Studies made on eelgrass following oil spills have shown temporary damage to blades if the oil contacts the blade in air. If the leaf remains covered with water, there is no apparent damage. Rhizomes and roots do not appear to be damaged in any case. It is possible that a spill in spring could interrupt the production and/or viability of pollen from immature flowers (Phillips 1984).

For shorebirds, oiling, loss of food, or consumption of tainted food are the greatest potential impacts. For fishes, the greatest impacts occur on bottom dwellers. Flatfish may develop tumors on their ventral surfaces when they come in contact with polluted sediments. Crabs, mollusks, and annelids (worms) appear to be highly resistant to oil contamination. Smaller crustaceans are more severely affected (Phillips 1984). Sand lance and surf smelt spawning habitat can be damaged or destroyed by oiling (Bargmann 1998).

The chances of a major accident at the site are small, even at maximum production levels.

#### *6.3.3.2 Alternative 1*

The potential risk of accidental petroleum spills under Alternative 1 would be similar but less than that under the Proposed Action because fewer loading hours would likely occur each day.

#### *6.3.3.3 Alternative 2*

The potential risk of accidental petroleum spills under Alternative 2 would be similar but less than that under the Proposed Action or Alternative 1 because fewer loading hours would likely occur each day.

#### *6.3.3.4 No-Action*

Under the No-Action Alternative, as defined in Chapter 2, there would be no barge loading and therefore no risk of petroleum spills from marine traffic due to the project.

### 6.3.4 Would stormwater, propeller wash, or barge grounding affect marine organisms?

#### *6.3.4.1 Proposed Action*

**Stormwater.** Muddy water generated on the mining site would not enter marine waters and reduce marine water quality. Surface water from the mining operation would not flow directly from the site to marine waters, but would rather infiltrate through the ground, thereby filtering out sediments. No washing of excavated material would occur onsite. Therefore, the potential for impacts to groundwater quality from mining operations is evaluated in

Chapter 4, Geology/Hydrogeology, and Chapter 10, Environmental Health and Safety.

**Prop Wash.** When under power, the propellers of tug boats create powerful currents known as prop wash. In shallow water, prop wash can scour the bottom, raise sediments, and harm marine life, such as eelgrass. Prop wash could potentially affect marine organisms through three primary mechanisms, (1) scouring, (2) suspended sediment, and (3) shading caused by air bubbles and increased turbidity.

**Scouring.** Scouring is caused by the effect of currents generated by the propeller on bottom sediments. When currents reach sufficient velocity, sediments are resuspended, harming or eliminating the attached plants and animals. The potential effects of scouring on specific marine resources are described in the following paragraphs.

**Eelgrass.** Three patches of eelgrass could be damaged by scouring from prop wash if tug operations are unrestricted:

- Patch 1: a 20- by 20-foot patch located about 30 feet from the end of the dock (along transect line N1 in Figure 6-2a);
- Patch 2: a 40- by 60-foot eelgrass patch, extending out between the dolphins located about 300 feet north of the dock (along transect line N7 in Figure 6-2a); and
- Patch 3: a 50- by 60-foot eelgrass patch, landward of the dolphins, located about 200 feet south of the dock (along transect line S6 in Figure 6-2a).

A review of the scientific literature indicates that eelgrass is relatively tolerant of elevated currents (Fonseca and Kenworthy 1987). Phillips (1984) described eelgrass patches, in suitable substrate, surviving in Puget Sound where tidal velocities are as great as 200 cm/sec. (4.5 miles per hour [mph]). Optimal growth was noted under conditions with currents 30 to 40 cm/sec (0.7 to 0.9 mph). Studies conducted to asses the impact of propeller wash from Washington State Ferries indicated that currents with a velocity above 75 cm/sec (1.7 mph) damaged eelgrass by eroding away the overlying sediment and that currents above 110 cm/sec (2.5 mph) caused extensive damage to eelgrass rhizomes (Hart Crowser 1997).

Based on previous studies, direct prop wash from tugs could affect eelgrass up to at least 100 feet away and probably considerably further.  Hart Crowser (1997) found that a 30 m (~100 feet) setback was adequate to protect eelgrass from passenger ferries. However, the vessel evaluated had about half the horsepower of tugs (1,445 hp versus up to 3,000 for tugs) and twin 46-inch diameter screws rather than a single prop about twice that size. The modeling of prop wash is extremely complex and involves so many variables that could change at the project site (e.g., vessel characteristics, current, barge size, tides, wind) that specific modeling and prediction are not feasible.  Therefore, an exact limit of impact cannot be predicted.  Still, it is reasonable to expect considerable damage to eelgrass beds if prop wash is oriented directly at the beds.

**Sunken Barges.** The sunken wooden barges and associated habitat are vulnerable to being damaged by prop wash scouring.  The elevated currents could dislodge, damage, and/or rearrange the "reef" structure provided by the barges.  The majority of organisms associated with the barges depend on this structure to provide the habitat they require.

Most of the reef habitat provided by the sunken barges is in water deep enough to avoid the effects of prop wash.  However, the shallow end of the northernmost barge could be damaged by the proposed operations as tug boats position barges at the dock during arrival, loading, and departure.

**Fish Eggs.** Herring, surf smelt, sand lance, rockfish, and lingcod all potentially deposit their eggs at the Maury Island site. Many species of fish, including herring and lingcod, attach their eggs to various substrates such as eelgrass.  Prop wash scouring, primarily due to the rearrangement of the substrate, could damage eggs of these species.  If the substrate were rearranged, the eggs could become buried and thereby destroyed or suffocated.

Sand lance and surf smelt spawn in upper intertidal areas of sandy beaches.  The upper intertidal area is not expected to be influenced by prop wash because it is more than 250 feet away from where tug boats would be operating.  Moreover, the upper intertidal area is consistently exposed to wave action, which rearranges the sediments, and the eggs of both sand lance and surf smelt are thus adapted to these conditions and would most likely be unaffected.

Rockfish eggs hatch internally in the female.  Young are released as larvae to drift with the currents for several months.  Currents may be elevated due to prop wash but this is not expected to harm the larvae.

Herring spawn in shallow subtidal zones on vegetation and other shallow water substrate.  Eelgrass is a preferred substrate for spawning, along with marine algae and sometimes other materials, such as pilings and docks (Hart 1973).  Most egg deposition occurs at tidal elevations of 0 to –10 feet.  If prop wash is sufficient to damage eelgrass, some damage to herring eggs attached to the eelgrass may occur.

**Suspended Sediment.** Prop wash can resuspend sediments when elevated currents interact with the bottom.  Suspended sediment can harm marine organisms that depend on clear water for their survival.  When suspended sediments settle out of the water column they can accumulate and bury attached organisms not adapted to such processes.  Currents can transport the suspended sediments away from their origin and deposit them at more distant locations.  As a point of reference, typical concentrations of suspended sediment in the immediate vicinity of dredging activity is around 2 to 400 mg/l (Kiorboe et al. 1981).  Significantly less suspended matter would be expected from propeller wash associated with tug activities.

**Eelgrass.** Eelgrass is adapted to some sedimentation.  A primary ecological function of eelgrass beds is to capture and stabilize sediments (Phillips 1984).  The growth rate of eelgrass shoots is sufficient to avoid burial due to increased sedimentation.  Eelgrass distribution would be limited more by light reduction from suspended sediments than by burial from suspended sediments.  The effects on eelgrass of light reduction due to increased turbidity and air bubbles are discussed below.

**Salmon and Other Fish.** Salmon encounter high levels of suspended sediments under natural conditions.  Servizi and Marten (1992) reported that suspended sediment concentrations in the Fraser River are typically 300 to 600 mg/l and occasionally exceed 1,000 mg/l.  During tests with under-yearling coho salmon, no mortality was observed when fish were exposed to concentrations as high as 6,900 mg/l, but the fish exhibited avoidance at 300 mg/l (Servizi and Martens 1992).  Cyrus and Blaber (1987a, b) suggest that several species of marine and anadromous fish appear to prefer turbid over clear water during early life stages.  On the other hand, in laboratory experiments using aquaria, juvenile chum salmon showed avoidance to suspended sediments at all levels tested and the fish would either return to clear water or go to the surface.  However, individual fish in this experiment did occasionally stay in the turbid water for extended periods of time (Martin et al. 1976).

Several researchers have suggested the “turbidity as cover” hypothesis, according to which turbidity may reduce predation pressure on young salmonids, thereby providing a form of protective cover and enabling them to evade detection or capture by predators (Blaber and Blaber 1980, Grandall and Swenson 1982, Simenstad et al. 1982). Gregory (1992) concluded that although high concentrations of suspended solids cause physiological and behavioral stress, lower concentrations may reduce predation on juveniles.

Suspended sediments are not expected to affect salmon under the proposed operations. Studies conducted to assess the impact of propeller wash from Washington State ferries indicate that the bubble plume and suspended sediments persist for only several minutes after the arrival or departure of vessels (Simenstad et al. 1997). If propeller wash were sufficient to suspend sediments near juvenile salmon, concentrations would not be high enough or of a long enough duration to harm the fish. Additionally, predators would be affected by the same conditions and would not gain any advantage.

**Fish Eggs and Larvae.** Studies on the effects of suspended sediments on eggs and larvae from various species of fish indicate a fairly high tolerance to suspended sediment exposure (Swenson and Matson 1972, Morgan et al. 1983). Experiments on feeding abilities of newly hatched herring larvae showed that feeding increased significantly at suspended sediment concentrations of 500 to 1,000 mg/l. At concentrations greater than 1,000 mg/l feeding decreased. It was concluded that feeding abilities are adapted to residence in turbid (0 to 100 mg/l) estuarine environments occupied during the larval growth stage (Boehlert and Morgan 1985).

Studies found no correlation between suspended sediment concentrations and herring embryonic development or egg mortality for tested concentrations up to 300 mg/l. Visual inspection showed that practically no particles adhered to eggs even though they were smothered with settled material (Kiorboe et al. 1981). At concentrations of 10,000 mg/l hatching was delayed for herring, surf smelt, and lingcod eggs. Surf smelt were more sensitive to suspended sediments than lingcod and herring (Morgan and Levings 1989).

Since most species of estuarine fish are adapted to naturally occurring high levels of turbidity, the potential increase in turbidity and deposition of fine sediments associated with prop wash is not expected to reach critical levels at the Glacier Northwest site.

**Shading from Bubbles and Increased Turbidity.** Prop wash can affect light levels by increasing the number of air bubbles and the concentration of suspended sediments. Both air bubbles and suspended sediment cause the absorption, refraction, and reflection of light, thereby reducing the amount of light available for marine organisms.

**Eelgrass.** As discussed in Section 6.3.1 shading can adversely affect eelgrass. When light levels are reduced to below 3 moles of photosynthetically active radiation (PAR) per square meter per day ($M/m^2$/day) for a period of 1 to 2 weeks eelgrass plants may die (Simenstad et al. 1997).

During tug and barge arrival and departure, light reduction over eelgrass beds from bubbles and suspended sediments would occur only briefly and intermittently and would therefore not be significant. There would be a maximum of four arrivals and four departures during daylight hours. This level of activity would not reduce irradiance below the necessary 3 $M/m^2$/day PAR. However, during loading the positioning of the barges could direct bubbles and suspended sediments over eelgrass patch 2 (along transect line N7 in Figure 6-2a) if the tug were attached to the northern end of the barge. Since barge repositioning would need to occur relatively frequently during loading, this patch could be reduced due to shading from bubbles and suspended sediment.

**Sunken Barges.** The sunken barges would receive less light under the proposed operations as tug boats position barges at the dock during arrival, loading, and departure. Since positioning during loading would be an ongoing process, the sunken barges could be shaded virtually continuously while a barge is at the facility. The light reduction due to this activity could significantly alter the plant communities associated with the sunken barges.

**Summary.** As proposed, there would be no restrictions on tug boat operations at the Maury Island site. If unrestricted vessel operations were allowed, marine organisms, including three eelgrass patches and a portion of one of the sunken barges, could be adversely affected by elevated currents and associated scouring due to propeller wash. Furthermore, shading from bubbles and suspended sediments could adversely affect one eelgrass patch and the plant communities associated with the sunken barges if tug boats were used to position barges during loading.

#### *6.3.4.2 Alternative 1*

The potential for sediment disturbance effects from Alternative 1 would be somewhat less than under the Proposed Action, since this alternative would involve fewer barge loads per day during peak periods.

#### *6.3.4.3 Alternative 2*

The potential for sediment disturbance effects from Alternative 2 would be somewhat less than under the Proposed Action or Alternative 1, since this alternative would require fewer barge loads daily than either of the other action alternatives.

#### *6.3.4.4 No-Action*

Under the No-Action Alternative, there would be no potential for marine sediment disturbance due to the project since no barge loading or shipping would take place.

### 6.3.5 Would removing a portion of the bluff during mining change the deposition/ erosion dynamics of the beach?

#### *6.3.5.1 Proposed Action*

About half of the bluff along the southeastern side of the site would be removed. Maintenance of beaches requires deposition and erosion of rock, sand, and sediment. Therefore, changes in material available for deposition through bluff erosion could result in changes in the characteristics of the beach below. Typically, the sand component is reduced, as often occurs due to bulkheading.

Shoreline stabilization structures (bulkheads and riprap) are present along waterfront communities north and south of the project site (Figure 11-5). These structures probably reduce natural sediment movement (alongshore littoral drift) to the project site and reduce habitat quality in the area.

The Applicant would leave a 200-foot vegetated buffer from the beach inland under the Proposed Action. This buffer would continue to provide protection against erosion and would be expected to maintain approximately the existing conditions of sediment input from the bluff to the beach. The upper areas that would be removed are well vegetated and are not expected to be contributing greatly to shoreline sediments. Thus, the erosion and deposition dynamics of the beach are not expected to change with implementation of this project.

#### 6.3.5.2 Alternative 1

The effects of removing a portion of the bluff would be the same under Alternative 1 as under the Proposed Action, except that the change in topography would presumably take place over a longer time since mining would occur at a slower rate.

#### 6.3.5.3 Alternative 2

The effects of removing a portion of the bluff would be the same under Alternative 2 as under the Proposed Action. The change in topography would take place over a longer period than under either the Proposed Action or Alternative 1.

#### 6.3.5.4 No-Action

Under the No-Action Alternative, mining would continue at the site, but at very low levels. Changes in the topography would occur slowly over many years. No changes in beach erosion/deposition dynamics would be expected.

### 6.3.6 What effect would the project have on geoduck clam harvest by the Puyallup Tribe?

#### 6.3.6.1 Proposed Action

During barge loading operations, it would be unsafe for geoduck divers to work in the vicinity of the end of, or approaches to, the dock. Geoduck harvesting limits have been established as 2.7 percent of the biomass estimated for the region. Typically this limit is attained by the concentrated harvesting of geoducks in as small an area of a tract as possible. This is done to localize harvesting impacts and to potentially aid recruitment to the harvested site by leaving surrounding geoduck beds intact. If an agreement with WDNR and the Tribes can be reached the area could be harvested prior to any construction or barging activity at the site. If no agreement can be reached compensation for lost harvest would be necessary.

#### 6.3.6.2 Alternative 1

The effect of Alternative 1 on geoduck harvest would be the same as under the Proposed Action, except that it might be more difficult to schedule access for geoduck divers, since barge loading could occur only during more limited hours.

#### *6.3.6.3 Alternative 2*

The effect of Alternative 2 on geoduck harvest would be the same as under Alternative 1.

#### *6.3.6.4 No-Action*

Under the No-Action Alternative, as defined in Chapter 2, no barge loading would occur. Therefore, there would be no reduction in access to the site by geoduck divers.

### 6.3.7 Would the noise and vibration from pile driving or barge loading affect salmon and other marine animals, including whales?

#### *6.3.7.1 Proposed Action*

Pile driving and barge loading would create noise and vibrations underwater. For this project, King County technical staff, citizens, and the WDFW have voiced concern that the noise would harm juvenile salmon, herring, and other fishes, as well as marine mammals.

Large salmon (those that have been in saltwater for more than a few months) would likely use the area around loading barges less. As salmon mature, they tend to occur in very deep waters and, thus, larger salmon and mature salmon returning to spawn are not likely to be affected by the project.

For salmon, the primary concern is related to juvenile migration, feeding, and rearing, as identified in WAC 220-110-271. Based on the known biology of salmon, the key concern for juvenile salmon is activity near the mouths of rivers. During migration to saltwater from freshwater (which occurs in the spring), juvenile salmon often linger close to the mouths of rivers where freshwater is still present. As they arrive in these areas, they may stay near the surface and in shallow areas along the shore, where a “lens” of freshwater is present. They stay within this freshwater lens as they slowly adjust to saltwater conditions.

Because juvenile salmon tend to congregate at the mouths of rivers, and because their movements are restricted due to their limited adaptability to saltwater, construction work near the mouths of major rivers poses the greatest potential risk to juvenile salmon.

At the Maury Island site, this use of a freshwater lens is not an issue. Since no river is nearby, the waters near the dock do not contain significant freshwater layers nor do they receive juvenile salmon fresh from the river, but rather fully adapted marine-stage juvenile salmon. Therefore, the most serious concern for migrating juvenile salmon (impacts during the relatively vulnerable time when fish are transitioning from freshwater to saltwater metabolism) is not an issue at the Maury Island site.

Once migrating juvenile salmon adjust to the marine environment near the mouths of rivers, they begin to disperse and head toward sea, where they spend the next several years before returning to spawn. When they first leave the estuarine areas, these fish stay very near the shoreline. Biologists speculate that they do this to avoid predators and feed in the productive shoreline habitats. As the fish become larger (typically by midsummer), they venture into deeper water.

Therefore, essentially all shallow shoreline areas are potential juvenile salmon rearing and migration habitat during spring and early summer. It follows that salt-water adapted juvenile salmon occur near and around the existing dock and, in particular, close to low-tide level where some eelgrass beds are present. The shoreline area is part of the overall shoreline habitat used by juvenile salmon throughout Puget Sound.

Since salt-water adapted juvenile salmon are expected to occur near the project site, repair, maintenance, and operation of the dock and associated tugs and barges under the Proposed Action and Alternatives 1 and 2 could cause juvenile salmon to disperse, school, startle, or otherwise react to noise. This reaction could conceivably increase their risk of falling prey to larger fish or birds. Dock repair and construction are known to have some effects on juvenile salmon, and, intuitively, it makes sense that construction activity (especially pile driving) would cause some fish to leave the area.

However, in a study conducted for the U.S. Navy Home Port at the mouth of the Snohomish River (a known juvenile salmon migration route), the actual effects of pile driving on juvenile salmon were observed to be relatively minor (Anderson 1990). While juvenile salmon occurred in lower numbers near active pile driving operations, the study found that the decrease was "subtle" and that juvenile salmon were often observed "milling around the pile driving rigs during active pile driving." As is the case with most animals, salmon are expected to tolerate certain constant noise and disturbance. Noise and vibration from shoreline activities, such as those that would occur at the project site, are not significant factors contributing to the decline of salmon populations (in contrast to dams, harvest, and destruction of spawning habitat).

A number of studies assess hearing in adult and juvenile salmonids. Many of these studies have focused on attempts to divert fish from dam turbines using sound and have met with no, or at best limited, success (Mueller et al. 1998). Salmonids are considered hearing generalists and their sound sensory system responds to the particle motion component of sound. Juveniles showed avoidance response to 10-Hz signals but not to 150 Hz, although avoidance at the 10-Hz signal occurred only if the fish was within about 3 feet (1 m) of the sound source (Knudsen et al. 1992). Low-frequency sounds propagate very poorly in shallow water because the wavelength is larger than the depth. The lowest frequency that will propagate is 300 Hz in water about 3 feet (1 m) deep and 30 Hz in water about 35 feet (10 m) deep (Rogers and Cox 1988).

Based on these considerations, the overall magnitude of the effects on salmon from barge loading and dock repairs at the Maury Island site would be relatively minor. The risks would be reduced by restricting construction activities as required by WAC 220-110-271 (no construction between March 15 and June 14 of any given year).

**Herring.** There is some evidence in the literature that herring respond to sounds produced by approaching large vessels (about 50 to 65 feet). Fishermen refer to the need for herring to "harden", which they define as the process by which the fish become more accustomed to the presence of moving vessels. Fishermen typically delay fishing for several days so that hardening can take place. This process is more common along the open coast than the inner coast, suggesting that the exposure of herring to the noise of continuous vessel traffic while the fish migrate through inner waters of the Puget Sound Region may assist in the "hardening" process (Schwarz and Greer 1984).

The primary shipping lanes serving Tacoma and south Puget Sound run adjacent to the Maury Island shoreline (Figure 8-2). According to U.S. Coast Guard statistics, 4,883 vessels that participated in the Vessel Traffic Service (see Chapter 8 for further discussion) transited through the East Passage adjacent to the Maury Island shoreline between April 1999 and April 2000 (Appendix L). This translates to approximately 13.4 vessels/day, although higher and lower volume days occur. The southbound shipping lanes pass within 1,500 yards of the entrance to Quartermaster Harbor, which contains the active spawning grounds of the Quartermaster Harbor herring stock. The Quartermaster Harbor stock is considered “healthy” by WDFW and the shipping traffic does not appear to have influenced spawning behavior. It is unlikely that noise generated at the Glacier Northwest site (approximately 2 miles from the entrance to Quartermaster Harbor) from approaching and departing vessels, gravel loading, or pile driving would have any effect on the Quartermaster Harbor stock. As with salmon, attempts to divert herring using sound have been largely unsuccessful (Nestler et al. 1992).

The precise effect of the increased noise from the Proposed Action is difficult to determine. Very little habitat is even present at the site, but the WDFW considers any possible herring habitat as important. Since the effects cannot be predicted precisely, King County is assuming that herring spawning at the site would be “reduced.” The importance of this reduction is questionable, since herring are believed to spawn at the site mainly during high population cycles, when higher quality habitat south of the site is fully utilized.

**Marine Mammals.** For marine mammals, such as whales, seals, and sea lions, construction and activity at the project site would cause negligible effects. The basis for this conclusion is related to the context of the Puget Sound environment. Shipping traffic and port activities are a commonplace reality for the marine mammals that inhabit the area. For example, seals and sea lions are common at the Ballard Locks and Shilshole Bay, where ship traffic, noise, and human disturbance levels are very high. In addition, the project site is not located at any major feeding ground, congregation point, breeding area, or migration route for marine mammals.

The most likely effect of the project on marine mammals would be avoidance of the area by harbor seals during times when barges are being loaded. Harbor seals tend to avoid areas of high human disturbance. Nevertheless, harbor seals have been observed in relatively high human use areas, including Elliott Bay.

Killer or orca whales are the most commonly occurring resident whale species. Resident pods travel throughout Puget Sound for much of the year. The typical range of the southern resident orca community encompasses the entire inland waterways of Puget Sound, the San Juan Islands, and the Georgia Strait in Canadian waters. They are known to travel at least 300 miles up and down the coasts of Washington to the south, and along Vancouver Island to the north. It is not known how far offshore into the Pacific Ocean they may travel. They usually swim from 75 to 100 miles every 24 hours. They are not expected to be affected by the project since they have been shown to be adapted to the presence of humans and related noises and activities. Killer whale populations are declining, but activities in central Puget Sound have not been considered as a contributing factor to this decline.

Recent hypothesis over the causative factors for orca deaths are related to bioaccumulation of PCBs and other toxins thought to suppress immune system functioning.

As mentioned above, the shipping lanes serving Tacoma and south Puget Sound run adjacent to Maury Island. Approximately 13.4 vessels transit through East Passage per day and therefore marine mammals, which commonly occur in this area, appear to be tolerant of human activity.

Other species of whale, including gray and minke, occur sporadically in Puget Sound and may travel in the vicinity of Maury Island. The Proposed Action is not expected to significantly alter such use because of the infrequency of that use, the whales' demonstrated tolerance to disturbance, and, as mentioned previously, the overall environmental context of Puget Sound. In spring 1999, a gray whale spent two days along the Seattle waterfront, where intense industrial and shipping activities occur. While such use may be the result of "desperate" individuals in search for food, the whale appeared to be unaffected by the activities.

#### *6.3.7.2 Alternatives 1 and 2*

For the reasons outlined above, Alternatives 1 and 2 would have no significant effect on salmon, marine mammals, or their habitat.

#### *6.3.7.3 No-Action*

Since no activities would occur along the shoreline, the No-Action Alternative would have no effect on salmon, marine mammals, or their habitat.

## 6.3.8 How would dock repairs and/or maintenance impact marine habitats?

### *6.3.8.1 Proposed Action*

The state of the existing dock and the impact to the marine environment has been a complicated issue and the focus of much public comment and subsequent analysis and discussion from the EIS Team. The dock involves several interrelated issues, including impacts associated with design, construction, maintenance, and operation. To address these concerns, King County has modified and supplemented the analysis in this section.

As proposed, the existing structure would be used to the fullest extent possible. In the DEIS, the analysis assumed about 30 percent of the pilings and 25 percent of the decking and superstructure would require replacement based on a dock assessment done by General Contractors Inc. Additional studies conducted by Symonds Consulting Engineers Inc. on behalf of King County are included as Appendix F and indicate that at least 15 percent of the pilings would need immediate replacement and the remaining pilings would need to be replaced over the next 5 to 15 years. Most of the decking and superstructure would require replacement due to considerable decay.

**Design.** Under the Proposed Action, the existing design would remain essentially unchanged. The dock design can be divided into two components: pilings and decking/superstructure.

The design specifications for pilings can affect the amount of shading, the level of creosote contamination, the type and amount of "reef" habitat provided, and the surface area of marine sediments occupied by pilings.

Under the Proposed Action, reef habitat and shading provided by pilings would remain about the same, although some reef habitat would be temporarily impacted, as pilings with established communities are replaced with "clean" pilings.

Existing pilings are treated with creosote and are therefore a continuous source of creosote contamination. Under the Proposed Action, long-term creosote contamination would be reduced, as existing laws prohibit the use of creosote-treated pilings. Creosote contamination would increase temporarily during removal of pilings, as creosote that may have accumulated at the base of the pilings would be exposed and agitated during removal.

The design specifications for decking affect shading as well as spill potential. As proposed, the existing solid decking would be replaced. Shading would increase about 10 percent due to replacement of missing decking. Placement of the Applicant-proposed spill tray would also increase the amount of shading, although the height of the conveyor and spill trays would diffuse the shading caused by these structures.

The type of decking structure also affects incidental spilling. Using solid (wood) decking, as proposed, would form a barrier for spills occurring over decked areas.

**Construction/Repair.** During dock construction and repair, marine habitat would be impacted by (1) pile removal and replacement and (2) the operation of the derrick (the barge-like vessel containing the pile-driving equipment). Both of these can impact marine habitat by direct disturbance and by stirring up sediments (turbidity).

**Direct Disturbance.** Pile removal and replacement would disturb the areas within approximately 5 feet of pilings. Existing, well-sorted sediment layers that currently support stable biological communities would be disrupted. The mud from a few feet below the current surface contains naturally occurring sulfides and other materials that are toxic to organisms that live near the surface.

This disturbance would affect mostly common species, such as worms, small clams, and other invertebrates. The key concern with this project is the eelgrass bed located near the end of the dock. In studies of Washington State Ferry Terminals, Simenstad et al. (1997) suggested that disturbed areas become unsuitable for eelgrass for 10 years or more. Therefore, replacement of pilings could reduce much of the 20- by 20-foot section of eelgrass growing near the end of the dock.

Operation of the derrick would disturb sediments due to anchoring and, potentially, during resting on the bottom during low tides. Anchoring would mix sediments and reduce biological communities in a manner similar to pile removal and replacement.

In shallower areas, the derrick may rest on the bottom during low tides. This would temporarily reduce populations of marine invertebrates and plants in these areas. If the derrick were to rest on eelgrass beds, then shading and physical damage could occur. Depending on the extent of the damage, impacts may be long-term, since eelgrass is known to be sensitive to physical disturbance.

**Turbidity.** Repairs and maintenance would stir up sediments, causing clouds of fine material to drift and settle near areas of activity. This increase in turbidity (the amount of solids suspended in the water column) could reduce light and/or bury organisms when the sediments settle.

However, turbidity is not expected to eliminate marine habitats or significantly affect their functioning because:

- The impact would be short-term (limited to a 2-month period). Studies have should that light reduction typically takes 1 to 2 weeks to cause eelgrass loss (Simenstad et. al. 1997). Active pile driving and removal would proceed around the site incrementally and would not exceed 1 to 2 days at any given location.

- A relatively low volume of sediments would be generated. The area immediately adjacent to the dock and down current would become cloudy, but measurable deposits of sediments would be limited to within approximately 10 feet of operations.

- Tidal and other currents would quickly disperse sediments. Based on a study conducted at a similar site (1.9 miles northeast), currents at the site move from south to north and average around 30 feet per minute (0.34 mph) (FishPro 1989). Turbidity would decrease with distance.

- Turbidity is a natural occurrence along the shorelines of Puget Sound (e.g., rivers and other runoff commonly create turbidity, especially during rainy periods).

Increased turbidity would not adversely affect salmon and other fish, as discussed in Section 6.3.4.

**Maintenance.** In response to public comments, King County has modified and supplemented the analysis of impacts due to dock maintenance. The analysis presented in the DEIS did not detail the effects of long-term maintenance that would be required should about 70 percent of the existing structure be kept (this was the assumption used in the DEIS).

The Applicant wishes to make only the repairs necessary to make the dock functional. Using this approach, much of the dock would be 20 years old or older and would therefore require replacement relatively soon. Pilings that may be adequate now could require replacement in only a few years.

Therefore, as proposed, impacts of maintenance may continue for several years, as existing pilings become old and require replacement.

The type of impacts that would occur are the same as described under dock construction and repairs, including direct disturbance and increased turbidity.  As discussed under construction/repairs, direct disturbance would have the greatest effect on the marine environment.  Turbidity would cause only temporary and minimal effects.

**Operation.** The Applicant proposes to operate the facility in essentially the same manner as occurred during previous operations in the 1970s.

A tug would be used to move barges underneath the conveyer to evenly distribute sand and gravel.  As described in Section 6.3.4, this would create turbulence (prop wash) on the seaward side of the dock, potentially affecting marine habitat, including the "reef" habitat provided by the sunken barges in the area.

Spill trays used to capture material from the conveyor would be cleaned manually.  As stated in Section 6.3.2, manual cleaning would cause some incidental spillage.

As such, operation of the facility would result in the loss of a portion of "reef" habitat provided by one of the sunken barges. Additionally, spillage during spill tray cleaning would temporarily affect small localized areas under the spill tray but would not be expected to have wider reaching or long-term impacts.

#### *6.3.8.2 Alternatives 1 and 2*

The potential for temporarily increased turbidity would be the same as under the Proposed Action, since the same dock repairs would be required.

#### *6.3.8.3 No-Action*

Under the No-Action Alternative, no dock repairs would be required and there would be no temporary increase in turbidity.

## 6.3.9 New Section: How would artificial light from the project affect marine life?

### *6.3.9.1 Proposed Action*

Agency and public comments indicated concern about the effects of light, from loading and barging activities, on marine life near the dock. A review of the available scientific literature was conducted to determine the magnitude of such effects. Based on this review it is unlikely that light would have significant effects on marine life in the project area.

Light from the project may attract or repel marine organisms. Light attracts many species of fish (including juvenile salmon) and crustaceans (Popper and Carlson 1998). Attempts to repel fish around the turbines in hydroelectric projects using mercury lights or strobe lights have met with limited success (Nemeth and Anderson 1992). Attempts to use light to attract fish away from hydroelectric projects have been equally unsuccessful.

Factors known to affect fish response to light include age, physiological condition, motivation, and light intensity (Anderson 1988). Puckett and Anderson (1988) showed that juvenile chinook salmon were attracted to light.

Overall, the effects of light on marine organisms vary dramatically depending on the time of day, the intensity of the stimulus, and the species (Popper and Carlson 1998). Attraction to light could have negative and/or positive effects on the species influenced. Species could expect to find increased prey abundance or potentially increased predator abundance.

Tug boat lights may also attract certain species. Lights on tug boats are typically directed forward or towards the rear of the vessel and not directly into the water. The majority of this light is reflected off the surface of the water. Significant attraction of juvenile salmon is not expected because the salmon migrate close to the shoreline**,** whereas tugs and associated lighting would be located waterward of the end of the dock and the dolphins about 250 feet from the shoreline.

## 6.4 Adverse Impacts and Mitigation

### 6.4.1 Significance Criteria

King County considers the following as indicators of significance for impacts on marine habitats and fisheries under SEPA.

- Causing an unmitigated adverse impact on
  1. Federal- or state-listed endangered or threatened species; or
  2. Habitat for federal- or state-listed endangered or threatened species, including any designated critical habitat.

Additionally consideration is given to habitat for candidate species listed by the WDFW as well as species of local importance and Fish and Wildlife Habitat Conservation Areas designated in the King County Comprehensive Plan.

Significant habitats, for some species, are those areas with habitat characteristics that may be limited during some time of year or stage of the species life cycle. Therefore mere presence is not always considered significant and King County has chosen to focus habitat protection on lands where the species are likely to be most successful.

Table 6-4 lists Federal and State threatened and endangered species, species of local importance, and fish and wildlife habitat conservation areas that occur within or near the project area.

### 6.4.2 Measures Already Proposed by the Applicant or Required by Regulation

a. Dock repairs would follow the requirements for new dock construction, as outlined in Table 6-5, and other WDFW requirements to protect eelgrass and other elements of the marine environment (per WAC 220-110 Hydraulic Code Rules).

b. To protect against sand and gravel spilling from the conveyor belt into the intertidal and subtidal marine environment, a spill tray would be fitted below the conveyor belt from the beach out to the discharge end. The tray would be checked and maintained on a regular schedule.

c. The conveyor belt would be equipped with an automatic power interrupt switch, which would engage if no barge were in place to accept the material.

d. All tugs and other potential sources of petroleum product spills would be equipped with emergency spill response and clean-up equipment.

e. A spill response and containment plan for site mining activity would be prepared.

f. Prior to construction, the WDFW would require a marine monitoring and mitigation plan. Per WDFW requirements, the plan would (a) establish a baseline of eelgrass coverage and density; (b) document that the project results in no loss of eelgrass; (c) document that the project results in no significant deposition of sediment in the conveyor/dock vicinity; and (d) provide contingency plans if it appears that the project does result in sediment deposition or a measurable loss of eelgrass coverage or density.

   Construction and repair activities, including pile driving, would be timed to avoid salmon migration and/or herring, surf smelt, and sand lance spawning. Current construction avoidance windows in saltwater areas are generally from June 15 to September 30 of any given year (per WAC 220-110-271). Specific construction avoidance windows may be refined based on consultations with King County and other regulatory agencies (e.g., WDFW, WDNR, and the U.S. Army Corps of Engineers).

### 6.4.3 Remaining Adverse Impacts and Additional Measures

#### *6.4.3.1 Marine Impact 1 – Disturbance Caused by Dock Repairs and Design-Related Impacts (Shade/Materials)*

**Specific Adverse Environmental Impact.** Marine communities would be physically disturbed during removal and replacement of pilings and anchoring (and potential grounding during low tides) of the derrick when working on the dock stem (the portion of the dock that runs from the shore to the mooring structure).

Based on additional structural analysis, much of the dock superstructure (decking, stringers, and all other features besides pilings) would need to be replaced. Several parts are missing, and much of what remains is untreated wood that has rotted. The welded steel structure of the conveyor is also in disrepair and would require extensive welding and retrofitting. In addition, at least 15 percent of the pilings would need to be replaced immediately and remaining pilings would need to be replaced within 5 to 15 years.

A trade off exists between initial, one-time impacts of repairs and long-term impacts of maintenance. In other words, the more extensive initial repairs and associated disturbances are, the lower the long-term maintenance requirements and thus the associated impacts would be. If only minimum repairs are performed, as proposed, then impacts from maintenance could continue for several years.

Another consideration is that dock design specifications have changed considerably since the dock was constructed. Creosote pilings are no longer acceptable, and most docks are now constructed using concrete and/or steel pilings. This presents a problem with repairs at the dock, because concrete and steel pilings do not fit in well with wood pilings. Fastening steel and concrete to existing wood structures would be difficult and expensive. While wood pilings using non-creosote preservatives are available, such pilings are not as durable as concrete or steel and would require replacement much more frequently.

In addition, grating and other design features are used to reduce shade, and using steel or concrete pilings can reduce the total number of pilings in half.

The mitigation strategies outlined below define specific performance standards for the dock, using the latest design recommendations and requirements to protect the marine environment, as well as measures to mitigate the impact of ongoing repairs.

Dock design, construction, repair, and maintenance will be subject to many permits and legal requirements other than SEPA. Because of this, some mitigation measures may not be acceptable or may require variances under other permits. Therefore, the EIS Team developed three options to mitigate adverse impacts associated with dock design, repair, and construction.

#### 6.4.3.2 Marine Mitigation 1 – Option A: Dock Replacement and Extension

The following specifications would minimize long-term impacts on the marine environment at the site, including shading, creosote contamination, and ongoing disturbance due to maintenance needs. These specifications were developed based on estimated repair needs and on the latest design specifications being considered under King County code, WDFW recommendations, and the Shoreline Management Act.

King County anticipates that these measures would be further defined through required WDFW, WDNR, NMFS, and U.S. Army Corps of Engineers approvals.

a. Replace the existing dock to meet the latest design and materials standards. This would reduce impacts associated with repeated maintenance. Require all pilings and structures to be sufficiently sound to have an expected life of at least 15 years. This measure would also reduce ongoing leaching of creosote into the waters at the site. In addition, extend the dock up to 50 feet so that tugs and barges would be in deeper water. This would eliminate most concerns regarding shading and propwash in the nearshore area. In addition, this would reduce disturbances on the bottom underneath the barges, since the barges and tugs would not be so close to the bottom.

b. To avoid impacts associated with creosote-treated timbers, use pilings recommended by the WDFW and/or WDNR. Current recommendations are for steel or concrete pilings. Prohibit use of toxic materials to construct, repair, maintain, paint, or preserve the structure (per KCC 25-16-120).

c. To reduce shading, design the superstructure (all elements besides pilings) to allow as much light as possible to pass through. Place special emphasis to allow light to pass through on and around where eelgrass is currently growing. Require replacement materials on any surface shading the water to use prisms or be otherwise designed to allow at least 50 percent of incident light to penetrate to the water surface (per KCC 25-16-120). Minimize (a) shading of waters between 3 and 13 feet deep and (b) placement of pilings in waters between 3 and 13 feet deep (per KCC 25-16-120).

d. Construct minimum structure necessary for the intended function (per KCC 25-16-120).

e. Include a spill recovery system, as identified under Marine Impact 5.

f. Include a haul-back system, as identified under Marine Impact 4.

g. Prior to construction, measure the existing eelgrass patch located adjacent to the dock (30 feet from the end) and place markers to avoid physical damage.

h. Install protective covering to minimize dock lighting of the water below the dock.

i. Require "vibratory extraction" to minimize turbidity and sediment disturbance during pile removal.

j. Time construction and repair activities, including pile driving, to avoid periods of herring, surf smelt, and sand lance spawning and salmon migration during any given year, as determined by King County (in consultation with the WDFW and WDNR).

k. Require an independent environmental monitor (or monitors) to be present during all construction activities to ensure mitigation procedures are followed.

The initial disturbance of making these repairs would be greater than if only minimal repairs were made. However, King County has determined that the additional disturbance caused by replacing the dock would nevertheless result in a lower environmental impact because:

1. Impacts related to maintenance over the life of the project would be much lower,

2. The latest design standards would provide long-term mitigation for impacts related to shading, creosote, and maintenance, and

3. Better spill prevention and containment can be installed as part of the new design.

Compensatory habitat enhancement, as defined under Marine Impact 3, would serve to offset this impact over time.

#### *6.4.3.3 Marine Mitigation 1 – Option B: Dock Replacement*

As an alternative to extending the dock, the dock could still be replaced, but without an extension.

This would still provide the environmental benefit of (a) reducing the number of times construction would have to occur in the nearshore area; (b) eliminating creosote pilings; and (c) reducing the footprint and shading through new designs and materials.

#### *6.4.3.4 Marine Mitigation 1 – Option C: Dock Repair*

The dock could be repaired and still be improved to reduce environmental impacts. This would still leave treated pilings at the site and would reduce the flexibility to design features to protect the environment.

As an option to complete replacement, replacing only the stem of the dock would achieve many of the benefits of complete dock replacement, since the primary area of concern is the area closest to shore. Most of the design features listed in Option A could still be applied to the dock stem portion.

**Regulatory/Policy Basis for Condition.** King County protects shorelines under the authority and requirements of several formally designated policies, plans, rules and regulations.

Under the King County Shoreline Management Master Program (KCC Title 25), the shoreline on the project site is designated as a "Conservancy Environment." Under this designation, King County can place conditions on otherwise legal actions to protect, conserve, and manage existing natural resources within such shorelines.

The shoreline at the site also meets King County's definition of a Fish and Wildlife Conservation Area. The following features present at the site are identified and protected under King County policy NE-604 as Fish and Wildlife Habitat Conservation Areas:

- habitat for federal or state listed Endangered or Threatened Species (specifically Puget Sound chinook salmon at this site);
- habitat for Salmon of Local Importance (other species of salmon);
- kelp and eelgrass beds; and

- herring and smelt spawning areas (potentially present, although not identified in Puget Sound area inventories).

Under King County Policy NE 602:

*fish and wildlife should be maintained through conservation and enhancement of terrestrial, air, and aquatic habitats*

In addition, the recent listing of Puget Sound chinook salmon as threatened provides King County with the authority and responsibility to consider additional conditions on proposals necessary to protect salmon habitat. The use of SEPA substantive authority is consistent with existing County policies and can be accomplished within the general framework of permit review.

Finally, King County Policy NE-603 states that:

*Habitats for species which have been identified as endangered, threatened, or sensitive by the state or federal government shall not be reduced and should be preserved. In the Rural Area and Natural Resource Lands, habitats for "candidate" priority species identified by the County, as well as species identified as endangered, threatened, or sensitive by the state or federal government shall not be reduced and should be preserved.*

#### *6.4.3.5 Marine Impact 2 – Reduced Eelgrass Productivity Due to Shading and/or Physical Impacts from Barges and Tugs*

**Specific Adverse Environmental Impact.** Eelgrass could be reduced in the following areas due to shading by or physical contact with tugs and barges:

- all areas between the shoreline and existing dolphins,
- the shallow shelf located approximately 300 feet north of the dock (transect N7 in Figure 6-2a), and
- the shallow shelf located approximately 200 feet south of the dock (transect S6 in Figure 6-2a).

In addition, the eelgrass bed located near the end of the dock could be physically damaged and/or reduced due to pile removal and/or replacement.

See Marine Impact 4 for the potential for this and other eelgrass patches to be disturbed by propwash.

### *6.4.3.6 Marine Mitigation 2*

The following measures would mitigate impacts associated with the shading of eelgrass:

a. Define and clearly mark as sensitive areas "off-limit" to barges and tugs, including:

   - all areas between the shoreline and existing dolphins,
   - the shallow shelf located approximately 300 feet north of the dock (transect N7 in Figure 6-2a), and
   - the shallow shelf located approximately 200 feet south of the dock (transect S6 in Figure 6-2a).

b. Prohibit tugs and barges from tying up or otherwise being present along the dolphins. Allow only one barge at the site at one time.

c. To offset uncertainty regarding potential impacts to eelgrass due to this impact, as well as from propwash, spilling, and other mechanisms, create an eelgrass mitigation area covering an area of approximately 1,000 square feet. (A greater area may be specified by the WDFW.) Similar eelgrass mitigation has been successfully used for other projects to mitigate direct removal of eelgrass, so King County considers this measure to be technically and economically feasible, as well as effective in mitigating impacts on eelgrass. Design and performance standards would be developed under review and approval of King County. The U.S. Army Corps of Engineers, WDNR, and WDFW have jurisdiction to require additional mitigation under their regulatory authority separate from SEPA.

d. Require mitigation plans to contain elements required by WDFW for marine habitat mitigation, including:

   1. baseline data;
   2. estimate of impacts;
   3. mitigation measures;
   4. goals and objectives;
   5. detailed implementation plan;
   6. adequate replacement ratio;

7. performance standards to measure whether goals are being reached;

8. maps and drawings of proposal;

9. as-built drawings;

10. operation and maintenance plans (including who will perform);

11. monitoring and evaluation plans (including schedules);

12. contingency plans, including corrective actions that would be taken if mitigation developments do not meet goals and objectives; and

13. any agreements on performance bonds or other guarantees that the Applicant would fulfill the mitigation, operation and maintenance, monitoring, and contingency plans.

Protection of eelgrass through avoidance and establishment of a planted eelgrass patch would effectively minimize and/or compensate shading from barges and/or tugs resulting in no net loss of eelgrass presence and/or function, although a temporary net loss would occur due to the time it takes for mitigation sites to develop.

**Regulatory/Policy Basis for Condition.** Same as described under Marine Impact 1.

#### *6.4.3.7 Marine Impact 3. Reduced Marine Life (Other than Eelgrass) Due to Shading, Noise, Vibration, and Visual Disturbance from Barges and Tugs*

**Specific Adverse Environmental Impact.** Marine invertebrates and macroalgae would be reduced and, in some cases, eliminated along approximately 500 feet of the nearshore subtidal zone that would be shaded from barges (and otherwise impacted by noise and physical disturbance). Additional reductions could occur along dolphins and other nearshore areas at the site.

Loading and barging would create unavoidable noise and disturbance to the area immediately surrounding the dock. This area currently supports marine life associated with underwater structures. This marine life includes sensitive species, such as cod and rockfish, that are WDFW “candidate” species and are also under review by NMFS for listing under the Endangered Species Act.

#### 6.4.3.8 Marine Mitigation 3

a. Restrict barge docking to one barge at any one time (as defined under Marine Impact 2) to reduce the effect of shading during barge loading.

b. Compensate for habitat lost due to shading and disturbance by replacing, enhancing, or providing substitute resources or environments, per WAC 197-11-768.

   Habitat compensation could be in the form of substrate enhancements (e.g., placement of cobbles), creation of artificial reef habitat, riparian/shoreline enhancement, and/or other enhancements that would benefit the marine environment. Specific measures are not proposed at this time, but would be defined in conjunction with other permitting for the project under the Shoreline Management Act, and through applicable regulatory agencies, including the U.S. Army Corps of Engineers, WDFW, and WDNR. With major habitat restoration efforts being undertaken throughout the region, effective mitigation could be developed that is reasonable and technically feasible of accomplishing mitigation objectives. Habitat enhancement should be located as close to the impacted area as possible, and be restricted to the southeastern shoreline of Maury Island.

**Regulatory/Policy Basis for Condition.** Same as described under Marine Impact 1.

#### 6.4.3.9 Marine Impact 4 - Propwash

**Specific Adverse Environmental Impact.** Without restrictions, tugs could direct propwash toward shore and scour the bottom, potentially eliminating eelgrass and other marine organisms.

In addition, during low tides, a fully loaded 10,000-ton barge could physically damage the bottom around the end of the dock.

#### 6.4.3.10 Marine Mitigation 4

a. Establish Approach and Departure Protocol: The following restrictions are based on the EIS Team's interviews of tug operators and review of similar restrictions placed at other facilities. Clear approach and departure rules have been used successfully at other docking facilities to avoid impacts to the marine environment.  Presented below are preliminary restrictions to mitigate impacts from tug operations.  These restrictions would be further refined during final project design conducted as part of final permit specifications.

1. Prohibit fully loaded 10,000-ton barges to be at the dock during negative tides (tides lower than MLLW) to ensure adequate separation from the barge and the bottom.

2. Require tugs to "back" the barge away from the dock to minimize propwash.  By backing away from the dock, the tug is located in deeper water on the waterward side of the barge and prop wash bottom interaction is reduced.  In addition, the majority of the prop wash would be dissipated by the barge, which has a deeper draft.  Specific exemptions may be defined for conditions that may render this technique impractical or unsafe (e.g., certain winds, tides, or currents).

3. Under conditions that may render "backing" impractical or unsafe, the use of a "standing spring line" and proper fendering of the dolphins could be required to facilitate departure utilizing low-thrust maneuvering.  A standing spring line is a rope that uses tension to swing the barge away from the dock and reduce the need for propeller thrust.

4. Define and require a very slow approach and departure speed to reduce propwash velocity and intensity (and shading due to air bubbles).

5. Prohibit tugs from directing propwash toward the shore except where absolutely necessary.  Define when it may be necessary to direct propwash toward the shore and establish maximum throttle limits for such situations.

6. Require tug operators to be trained, tested, and certified in the approach and departure protocol.  Require annual recertification.

b. Establish a "haul back system" to be used to position the barge during loading.  The Applicant proposes to use tugs to move barges back and forth under the conveyor to distribute the load. This would increase the use of tugs and associated potential for propwash impacts.  By establishing a haul back system—a system of cables and pulleys to position the barge along the dock—propwash associated with the loading procedure could be eliminated.

Establishment of a planted eelgrass patch (defined under Marine Impact 2) and compensatory habitat enhancement (defined under Marine Impact 3) would further serve to offset the likelihood of a significant loss of habitat due to propwash.

**Regulatory/Policy Basis for Condition.** Same as described under Marine Impact 1.

#### *6.4.3.11 Marine Impact 5 – Spilling*

**Specific Adverse Environmental Impact.** Sand and gravel would accumulate below the loading area and/or along the conveyor, eliminating most plants and animals living on and within the sea floor in these areas.

#### *6.4.3.12 Marine Mitigation 5*

The following measures would reduce spillage from the conveyor belt:

a. Install a windscreen on the portion of the conveyor that passes over water to eliminate wind-blown spillage. Require King County approval and engineer-prepared plans to assure that the screen would prevent wind from blowing materials off the conveyor.

b. Prohibit the use of a movable boom at the Maury Island site. Such a boom increases the likelihood of spillage due to human error.

c. Require the discharge end of the conveyor to be equipped with a "downspout." A downspout would reduce spillage by reducing the distance over which the sand and gravel is exposed to wind before landing on the barge.

d. Restrict barge loading to 80 percent maximum capacity to allow more space between the load and the sides of the barge and to prevent overloading. Specific measures would need to be established to define and monitor limits.

e. Establish video monitoring of loading operations to identify spillage or potential spillage and revise management procedures accordingly.

f. Conduct quarterly dive surveys to identify spills for the first year, and annual dives thereafter if spilling is found to be limited to the spill impact area immediately below the dock.

g. Prohibit any washing or sweeping of spilled materials from the dock into the water.

h. Establish a clear protocol to prevent spillage during cleaning of spill trays. An automatic recovery system could be designed to return collected materials to the shore via a reverse conveyor system. Hand clearing may be less effective.

While some spillage would be inevitable, the impacts would be limited to small areas immediately adjacent to the existing loading area, which is small and which consists of previously spilled materials. Compensatory habitat enhancement, as defined under Marine Impact 3, would serve to offset this impact over time.

**Regulatory/Policy Basis for Condition.** Same as described under Marine Impact 1.

#### *6.4.3.13 Marine Impact 6 – Geoduck Harvest*

Operation of the facility could interfere with Tribal and/or State geoduck harvesting.

#### *6.4.3.14 Marine Mitigation 6*

Require an access agreement among the Applicant, the WDNR, and the Puyallup Tribes to prevent interference with geoduck harvest.

**Regulatory/Policy Basis for Condition.** Same as described under Marine Impact 1. Commercial shellfish areas are specifically protected under NE-604, Fish and Wildlife Conservation Areas.

#### *6.4.3.15 Marine Impact 7 – Potential Adverse Effects on Puget Sound Chinook Salmon*

**Specific Adverse Environmental Impact.** Individual Puget Sound chinook salmon could be impacted by habitat changes, including changes in eelgrass (see Marine Impact 1), changes in predation factors, and changes in behavior.

Young salmon use eelgrass for foraging and for hiding cover. Without additional mitigation, the Proposed Action could reduce eelgrass from propwash, shading, and dock construction and repair.

Changes in predation could occur should dock structures and the associated underwater habitat change due to repairs. Dock structures are known to support predators of salmon.

Minor changes in behavior of migrating juvenile salmon could occur due to vibration, noise, and visual disturbances related to mining at the site. Such changes could conceivably reduce the survivability of individuals, but would not affect Puget Sound salmon at the population or species level. Impacts would be limited to the site boundaries.

#### *6.4.3.16 Marine Mitigation 7*

a. To ensure no net loss of habitat, restore the riparian zone by replanting forest with native vegetation and stabilizing soils within 300 feet of the shoreline. Follow WDNR recommendations for shoreline management.

b. Implement design considerations per King County policies and guidelines, as revised in response to the listing of Puget Sound chinook salmon (using the latest working draft and/or staff recommendations, should the revised guidelines not be completed before the project starts).

Individual chinook salmon may be adversely affected by behavior modification. Timing restrictions would eliminate concerns about dock repairs/construction impacts on juvenile migration. Riparian habitat enhancements, together with eelgrass mitigation (Marine Mitigation 2), would result in no net loss of salmon habitat.

**Regulatory/Policy Basis for Condition.** Same as described under Marine Impact 1, in particular, King County's authority and responsibility to condition projects to protect listed species.

#### *6.4.3.17 Marine Impact 8 – Potential for Adverse Effects on Forage Fish (Herring, Surf Smelt, and Sand Lance)*

**Specific Adverse Environmental Impact.** As with Puget Sound chinook salmon, the project would alter current habitat of herring, including changes in eelgrass, changes in substrate (the mud, sand, and other materials on the bottom), and noise/vibration/ visual disturbances.

As described in Section 6.3, significant impacts on surf smelt and sand lance are not expected, since these species spawn high up on the shoreline.

The scientific evidence is not sufficient to accurately predict if herring spawning would be affected by the project. Since the project site is outside of the core herring spawning area, potential disturbance to spawning would be most likely to occur during high population levels, when “spill over” from the main spawning grounds occur.

The impact would be limited to the site, and would not be expected to eliminate spawning, since herring, as with most other fish that spawn communally, are highly motivated to spawn, and less likely to be frightened by noise. The biggest concern would be loss of habitat, since with lower habitat values, herring would either not spawn in this area, or would continue to spawn with lower survival of eggs.

This critical role of habitat prompts the consideration of mitigation measures to minimize losses of eelgrass, as described above under Marine Impact 2.

#### *6.4.3.18 Marine Mitigation 8*

Establish additional eelgrass, as described under Marine Impact 2.

**Regulatory/Policy Basis for Condition.** Same as described under Marine Impact 1.

## 6.5 Cumulative Impacts

SEPA requires that EISs evaluate and disclose cumulative impacts, and provides the following guidance on how to factor cumulative impacts into decisions regarding impacts and mitigation (WAC 197-11-060):

*The range of impacts to be analyzed in an EIS (direct, indirect, and cumulative impacts, WAC 197-11-792) may be wider than the impacts for which mitigation measures are required of applicants (WAC 197-11-660). This will depend upon the specific impacts, the extent to which the adverse impacts are attributable to the applicant's proposal, and the capability of applicants or agencies to control the impacts in each situation.*

Impacts to salmon and the marine environment are a good example of how many apparently small actions can combine to cause major environmental effects.  People have developed about one-third of the shorelines of Puget Sound.  Much of this development is in the highly populated King County, where about half the shoreline is developed.

This past development has, in part, contributed to the decline in marine organisms, including salmon, rockfish, eelgrass, and herring.  Other causes, including logging, dams, urban and suburban development, fishing, pollution, and even changes in ocean currents and upwelling, have aggravated these declines.  No one factor "caused" the declines.  But together they have worked to threaten salmon and other species with extinction.

The proposed mine at Maury Island would not, in itself, tip the scales one way or another regarding the continued existence of salmon or other marine species.  However, any impacts on the marine environment must be looked at in light of the extensive impacts that have already occurred.  This cumulative aspect of the anticipated impacts contributed to the extensive analysis and mitigation presented in this chapter.  While the project would affect elements at the scale of the site and individuals, rather than at regional or population levels, these impacts are increased in significance due to the numerous, wide-ranging actions that have occurred in the past.

## 6.6 Significant Unavoidable Adverse Impacts

The project objectives cannot be achieved without some adverse effects on the marine environment.  While these impacts could be greatly offset through avoidance and compensation (as described in Section 6.4), noise, spillage, shading, and physical impacts would be expected during the active mining operation.  Most of these impacts would occur for as long at the project operates. Subsequent to cessation of mining, the shoreline is expected to recover.  The current condition of the site shows that this area can recover from relatively extensive damages.  Past mining occurred with little or no consideration of the environment, and now the site is considered a good example of a healthy, functioning shoreline.

SEPA, WAC 197-11-330 (threshold determination), provides some guidance regarding significance, directing agencies to consider whether:

*A project may, to a significant degree: … Adversely affect environmentally sensitive or special areas, such as loss or destruction of historic, scientific, and cultural resources, parks, prime farmlands, wetlands, wild and scenic rivers, or wilderness;*

The shoreline at the site is an environmentally sensitive and special area, and, as discussed in Section 6.4, some disturbance to the shoreline and associated biotic communities would be unavoidable. Dock construction would disturb marine sediments and operations would shade the marine environment and produce noise and vibration that may cause fish to avoid the area.

The severity of these impacts cannot be fully predicted, simply because so many variables are involved and because we do not have absolute knowledge about marine ecosystems. Where uncertainty exists, additional mitigation measures have been developed for consideration as precautionary measures. Such a precautionary stance may be appropriate due to the sensitivity of the marine environment; the high degree of public and agency concerns; and the many applicable laws, plans, and policies, including the Endangered Species Act, the Shoreline Management Act, and King County code and policy.

Puget Sound chinook salmon may be startled by noise, vibration, and visual/physical presence created by barge loading operations. Still, salmon are expected to continue to move past the site. The project would not create a barrier to migration. Impacts of operation may alter the behavior of individual salmon.

Any alteration in behavior could conceivably reduce the ability of individuals to feed, breed, or seek shelter, but the actual impact is expected to be "sub-lethal" and may even be negligible. The scientific literature provided little evidence pointing to probable significant adverse impacts. The marine environment is a noisy place and the constant, relatively low level of noise and vibration that would be generated by the project is not the type of stimulus typically found to startle animals of any type. Intense, spontaneous, and irregular noises are the type of noises that are startling.

Impacts on eelgrass could be essentially avoided by extending the dock into deeper water. If the dock were not extended, then two patches of eelgrass could be reduced. The impact can still be mitigated by requiring replacement planting, as is commonly done for areas where eelgrass is removed. Some net loss would probably occur due to the lag time between impact and mitigation. In addition, mitigation is not always effective. The absolute area that could be impacted is in the range of a few hundred square feet. The exact area cannot be predicted precisely, but the patches would probably remain, replacement patches could be established, and other patches may develop naturally over time.

Herring spawning may be reduced within the eelgrass patches present at the site, and noise from the project could conceivably cause herring to avoid the site. The impact may affect individuals, but would not measurably affect herring at the population level, including the Quartermaster Harbor stock (which is considered healthy). The site is not a major spawning area, and in some years, herring probably do not spawn at the site at all. Creation of additional eelgrass habitat, per Marine Impact 2, would compensate for potential impacts to herring over time.

King County will not issue a grading permit until the Applicant obtains all other required county, state, and federal approvals. Most of these approvals focus on the marine environment, and require much more detailed mitigation plans than is required under SEPA. SEPA requires only that the feasibility and effectiveness of mitigation measures be determined (although detailed plans are required prior to project initiation). However, wetland permitting through the U.S. Army Corps of Engineers will require more detailed plans. Likewise, the WDFW will require detailed plans for the dock and associated mitigation measures.

King County will coordinate with these agencies, including the WDFW, WDNR, U.S. Army Corps of Engineers, and National Marine Fisheries Service, to further define mitigation measures. A coordinated effort among the agencies involved would be the preferred way to develop the more specific plans required by these agencies under their regulatory authority.

In summary, several unavoidable adverse impacts on the marine environment are expected. Dock construction would disturb marine sediments and operations would shade and produce noise and vibration that may cause fish to avoid the area. These impacts would be limited to the site of action and could be reduced or compensated for through the many mitigation measures presented in Section 6.4, including revised performance standards for the dock and replacement and/or enhancement of marine habitat near the site.

# 6.7 Citations

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## *Table 6-1. Summary of Marine Habitat Zones Adjacent to the Project Site*

| *Habitat Zone* | *Slope and Depth* | *Substrate* | *Typical Plant and Animal Life* |
|---|---|---|---|
| ***Shoreline*** | Elevation greater than about +13.4 feet MLLW | Coarse sand with occasional areas of cobble | Sparse |
| ***Intertidal Zone*** | Gentle slope -2.9 to +13.4 feet MLLW | Coarse sand with occasional areas of cobble | Various algae, eelgrass at lower end. Presumably used by juvenile salmon, spawning herring, surf smelt, and sand lance. Limited bivalves and crabs. |
| ***Nearshore Subtidal Zone*** | Gentle to steep slope, -2.9 to -22 feet MLLW | Sand and silt | Patches and beds of eelgrass, various algae including Sargassum, flat fish (e.g., sole, flounder), juvenile salmon (including chinook), and herring (spawning). Some bivalves and crabs. |
| ***Offshore Zone*** | Tidal elevations below -30 feet MLLW | Sand and silt | Bivalve mollusks including geoduck clams, horse clams, cockles dominate. Various starfish species, especially the sunflower-star (*Pycnopodia helianthoides*). Occasional crabs. |
| ***Dock*** | Gentle to steep slope, greater than +4 to -22 feet MLLW | On and adjacent to pilings | A typical piling community. Species observed on the pilings included sea anemones, giant barnacles, green sea urchins, kelp crabs, decorator crabs, nudibranchs, limpets, chitons, mussels, jingle shells, and various red and brown algae. Pile perch, striped seaperch, and rockfish also expected here. |
| ***Sunken Boats*** | Below -30 feet MLLW | Pleasure boat and two wooden barges. | Large numbers of pile perch, striped seaperch, lingcod, and rockfish. At least three masses of lingcod eggs were observed on one of the sunken barges. |

### *Table 6-2. Extent of Eelgrass Habitat at Proposed Project Site*

| | Proposed Site | | | Linear Extent | |
|---|---|---|---|---|---|
| ***Habitat*** | ***Linear extent*** [a] | ***Percentage of Maury*** | ***Percentage of Maury/Vashon*** | ***Maury Island*** | ***Maury/Vashon Island*** |
| Total | 800 feet | 0.89% | 0.28% | 16.9 miles | 52.4 miles |
| Potential eelgrass [b] | 800 feet [b] | 1.4% [b] | 0.52% [b] | 10.6 miles | 29.3 miles |
| Current eelgrass | 150 feet [c] | 0.26% | 0.09% | 10.6 miles [d] | 29.3 miles [d] |
| Herring spawning [b] | 800 feet [b] | 1.7% [b] | 0.78% [b] | 8.8 miles | 19.5 miles |

[a] Linear measurements are not meant to be indicative of the actual area of eelgrass habitat but simply to give a general sense of the scale of the Glacier Northwest site.
[b] The use of 800 feet represents the entire site; eelgrass and herring spawning do not currently occur on the entire site.
[c] "Current" eelgrass values for the proposed project site are based on an eelgrass survey conducted in summer 1999 (Jones & Stokes 1999).
[d] The "current" eelgrass values for Maury/Vashon Island are based on the Puget Sound Environmental Atlas (PSEP 1992). More recent eelgrass surveys have not been completed for Maury and Vashon Islands.

## *Table 6-3. Marine Algae, Plant, and Animal Species Observed Adjacent to the Maury Island Gravel Mine Site*

| *Major Taxa* | *Common Name* | *Scientific Name* | *Abundance* | *Notes* |
|---|---|---|---|---|
| ***Algae*** | Diatoms | *Bacillariophyceae* | Common | Common on sand at about –5 feet MLLW |
| | Kelp | *Laminaria saccharina* | Common | Common at –10 feet to -30 feet MLLW |
| | Red algae | *Rhodophyta* | Occasional | |
| | Thin red algae | *Gracilaria* sp. | Occasional | |
| | Sea lettuce | *Ulva lactuca* | Common | Drift *Ulva* between +5 feet and 0 feet MLLW, attached *Ulva* below 0 feet MLLW |
| | | *Enteromorpha* sp. | Common | Drift *Enteromorpha* between +5 feet and 0 feet MLLW, attached between 0 feet and –5 feet MLLW |
| ***Plants*** | Eelgrass | *Zostera marina* | Common | In patches and small beds generally between –5 feet and –16 feet MLLW |
| ***Hydrozoa (jellyfish)*** | Lion’s mane jellyfish | *Cyanea* sp. | 1 | On transect S-3 |
| ***Anthozoa (anemones)*** | Plume anemone | *Metridium* sp. | Common | Common on pilings; orange and white varieties |
| ***Mollusks*** | Geoduck clam | *Panopea generosa* | Occasional | Common under the pier; occasionally found elsewhere; found below -15 feet MLLW |
| | Piddock clam | *Pholadidae* | Occasional | Common under the pier; occasionally found elsewhere; found below -15 feet MLLW |
| | Heart cockle | *Clinocardium nutalii* | Occasional | |
| | Bay mussel | *Mytilus edulis* | Common | On pilings |
| | Octopus | *Octopus* sp. | 1 | On transect N-8 |
| ***Worms*** | Plume worms | *Sabellidae* | Occasional | On pilings |
| | Tube worms | *Polychaeta*. | Common | In sand at about –2 feet MLLW |
| ***Shrimp*** | Broken-back shrimp | *Crangonidae* | 1 | On control transect C-1 |
| ***Crabs*** | Dungeness crab | *Cancer magister* | Occasional | |
| | Graceful crab | *Cancer gracilis* | Occasional | In eelgrass beds |
| | Red rock crab | *Cancer productus* | Few | |
| | Northern kelp crab | *Pugettia producta* | Occasional | |
| | Helmet crab | *Telmessus cheiragonus* | Occasional | In control area eelgrass bed, transect C-1 |
| | Hermit crab | *Pagurus* sp. | Occasional | |
| ***Barnacles*** | Acorn barnacle | *Balanus* sp. | Common | On cobbles, boulders, and pilings +10 feet to +5 feet MLLW |

## Table 6-3. Continued

| Major Taxa | Common Name | Scientific Name | Abundance | Notes |
|---|---|---|---|---|
| ***Sea Stars*** | Sunflower star | *Pycnopodia helianthoides* | Common | At depths below –20 feet MLLW |
| | Sunstar | *Solaster dawsoni* | Common | |
| | Short-spined sea star | *Pisaster brevispinus* | Occasional | At depths below –20 feet MLLW |
| | Rose star | *Crossaster pappofus* | 1 | On transect N-6 |
| | Leather star | *Dermasterias imbricata* | Occasional | At depths below –20 feet MLLW |
| ***Fish*** | Shiner perch | *Cymatogaster aggregata* | Common | Especially common in eelgrass |
| | Pile perch | *Rhacocheilus vacca* | Common | Near pilings |
| | Brown rockfish | *Sebastes auriculatus* | Common | Near pilings |
| | Copper rockfish | *Sebastes caurinus* | Occasional | Near pilings |
| | English sole | *Parophrys vetulus* | Common | |
| | C-O sole | *Pleuronichthys stellatus* | Occasional | |
| | Starry flounder | *Platichthys stellatus* | Occasional | |
| | Sand dab | *Citharichthys* sp. | Occasional | |
| | Crescent gunnel | *Pholis laeta* | Common | In eelgrass |
| | Sand lance | *Ammodytes hexapterus* | Abundant | Large schools |
| | Tubesnout | *Aulorhynchus flavidus* | Common | |
| | Cabezon | *Scorpaenichthys marmoratus* | 1 | |
| | Buffalo sculpin | *Enophrys bison* | Occasional | |
| | Sculpin (other unidentified) | Various species | Common | |
| | Ratfish | *Hydrolagus colliei* | 1 | On transect N-6 |
| | Chinook salmon | *Oncorhynchus tshawytscha* | Occasional | Age 0+, two on transect S-3, one on C-1, one on C-2 |
| | Snake prickleback | *Lumpenus sagitta* | 1 | On transect S-5 |
| | Painted greenling | *Oxylebius pictus* | 1 | |
| | White-spot greenling | *Hexagrammos stelleri* | 2 | On transects S-7 and S-9 |
| | Spiny dogfish | *Squalus acanthias* | 1 | On transect C-2 |

## *Table 6-4. Sensitive Marine Species in the Vicinity of the Project Area*

| Species | Federal Status | State Status | King County Local Importance: 2000 (proposed) | King County Local Importance: 1997 (revisions to 1994 plan) | Location on Site |
|---|---|---|---|---|---|
| ***Chinook Salmon Puget Sound ESU*** | Threatened | Candidate | Yes | | Juvenile salmon may use nearshore areas during outmigration. Adult salmon are likely to occur in the deeper areas. |
| ***Bull Trout*** | Threatened | | | Yes | No known use of site; however, bull trout may occasionally visit the site for foraging. |
| ***Pacific Herring*** | Under review[1] | Quartermaster Harbor stock not listed[2] | Yes | | Adults and juvenile herring occur at the site. Eelgrass may be used for spawning by overflow from Quartermaster Harbor stock. Main spawning grounds are located in Quartermaster Harbor. |
| ***Rockfish***[3] | Under review | Candidate | Yes | | Several rockfish species occur in "high relief" habitat provided by the structure of the dock and sunken barges. |
| ***Pacific Cod, Walleye, Pollock, and Pacific Hake*** | Under review | | Yes | | No known use of site; however, Pacific cod may occasionally visit. |
| ***Lingcod*** | | | Yes | | Lingcod occur in "high relief" habitat provided by dock and sunken barges. Lingcod eggs were observed at the site during dive surveys. |
| ***Longfin and Surf Smelt*** | | | Yes | | Smelt occur in shallow areas of the site. Spawning possible along upper intertidal sandy beach (+5 ft MLLW). |
| ***Pacific Sandlance*** | | | Yes | | Sandlance occur in shallow areas of the site. Spawning possible along upper intertidal sandy beach (+5 ft MLLW). |
| ***English and Rock Sole*** | | | Yes | | Sole occur at the site associated with sand/gravel substrate throughout project area. |
| ***Commercial and recreational shellfish areas*** | | | Yes | | No commercial or recreational shellfish beds have been identified that are monitored by the Washington Department of Health. However, collection of shellfish by island residents and visitors occurs. |
| ***Kelp and Eelgrass beds*** | | | Yes | | No bull kelp (*Nereocystis*) occurs at the site, however *Laminaria spp.* is common near the end of the dock. Several patches of eelgrass occur in the project area and larger beds occur to the north and south of the site (See Figures 6-2a and 6-2b.) |
| ***Herring, Sandlance, and Smelt spawning areas*** | | | Yes | | Herring spawning may occur in eelgrass at the site during years of peak abundance of the Quartermaster Harbor stock. Surf smelt and sand lance may spawn in the upper intertidal areas (+5 feet MLLW) along the sandy beach. |

Note: Salmonids of local importance that may occur at the project site include chum, coho, and pink salmon; searun cutthroat; and steelhead trout.

[1] Species under review by the National Marine Fisheries Service are not afforded protection under the Endangered Species Act or any state or local regulations.

[2] Pacific herring stocks at Discovery Bay and Cherry Point are State Candidate species but the Quartermaster Harbor stock is considered healthy.

[3] Brown, copper, and quillback rockfish are currently under review by NMFS for listing under the ESA. Brown, copper, greenstriped, widow, yellowtail, quillback, black, china, tiger, bocaccio, canary, redstripe, and yelloweye rockfish are State candidate species. Black, copper, quillback, and yelloweye rockfish are King County species of Local Importance.

## *Table 6-5. Compliance Analysis of Washington Administrative Code Guidelines Related to Dock Construction*

| ***WAC Requirement per Chapter 220-110 WAC HYDRAULIC CODE RULES*** | ***Compliance as Proposed?*** | ***Additional Mitigation*** |
|---|---|---|
| Work waterward of the ordinary high water line shall be prohibited or conditioned for the following times: March 15 – June 14. | No. | Require dock repair work to be completed outside of these dates. |
| (3) Piers, docks, floats, rafts, ramps, boathouses, houseboats, and associated moorings shall be designed and located to avoid shading of eelgrass (*Zostera* spp). | Yes. The major portion of the dock (where barges would be loaded) is located in areas too deep for eelgrass. | |
| (4) Kelp (Order *Laminariales*) and intertidal wetland vascular plants (except noxious weeds) adversely impacted due to construction of piers, docks, floats, rafts, ramps, boathouses, and houseboats shall be replaced using proven methodology. | No. | Mitigation may be required for potential spillage impacts to kelp located under the barge loading area. |
| (5) Mitigation measures for piers, docks, floats, rafts, ramps, and associated moorings shall include, but are not limited to, restrictions on structure width and/or incorporation of materials that allow adequate light penetration (i.e., grating) for structures located landward of -10.0 feet MLLW. | Potentially. Compliance would require additional consultation with the WDFW. | The WDFW may require grating to be used where possible to allow additional light penetration along the shoreline. |
| (6) Piers, docks, floats, rafts, ramps, boathouses, houseboats, and associated moorings shall be designed and located to avoid adverse impacts to Pacific herring spawning beds and rockfish and lingcod settlement and nursery areas. | No. Rockfish and lingcod are present where barges would be loaded. Herring spawning could be affected at the site. | Mitigation may be required to replace or compensate for potential impacts to rockfish, lingcod, and herring habitat. |
| (7) Piers, docks, floats, rafts, ramps, boathouses, houseboats, and associated moorings shall be designed and located to avoid adverse impacts to juvenile salmonid migration routes and rearing habitats. | Yes. The elevated pier structure with widely spaced pilings allows fish passage. | |

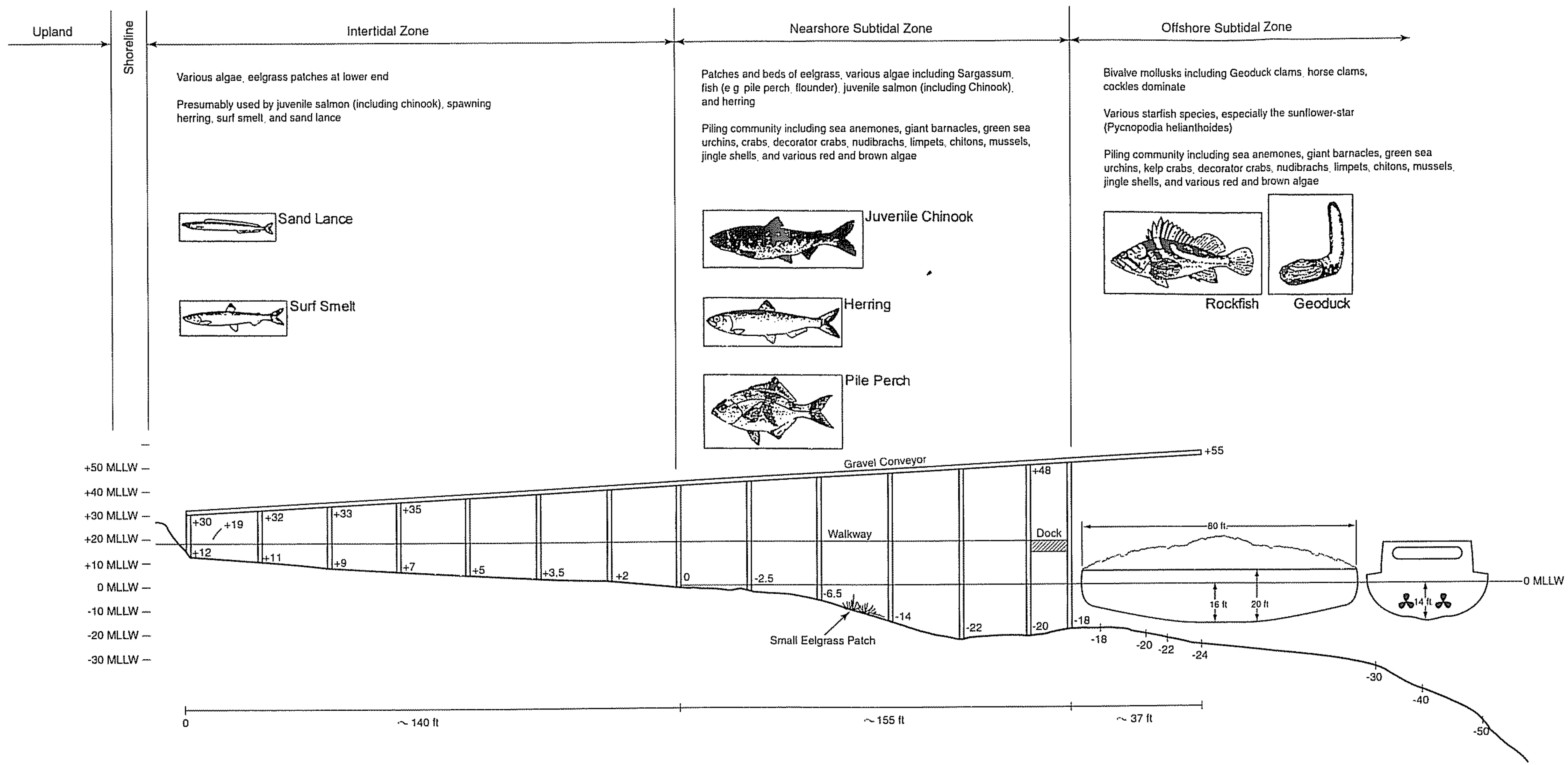



Figure 6-1a. Cross-Section at Low Tide of Nearshore Area Potentially Affected by Proposal

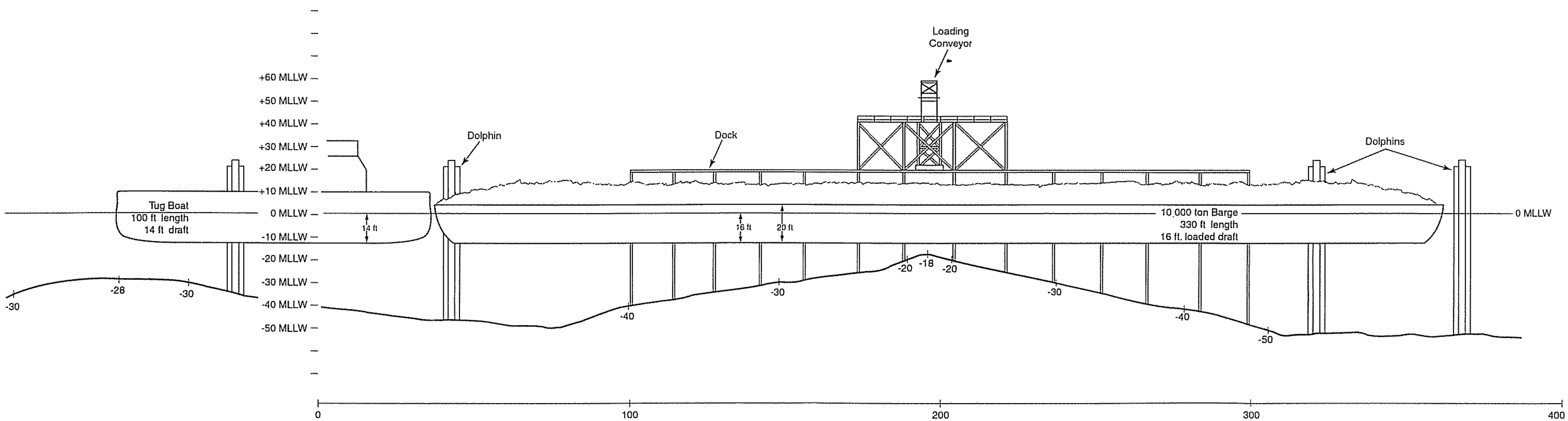
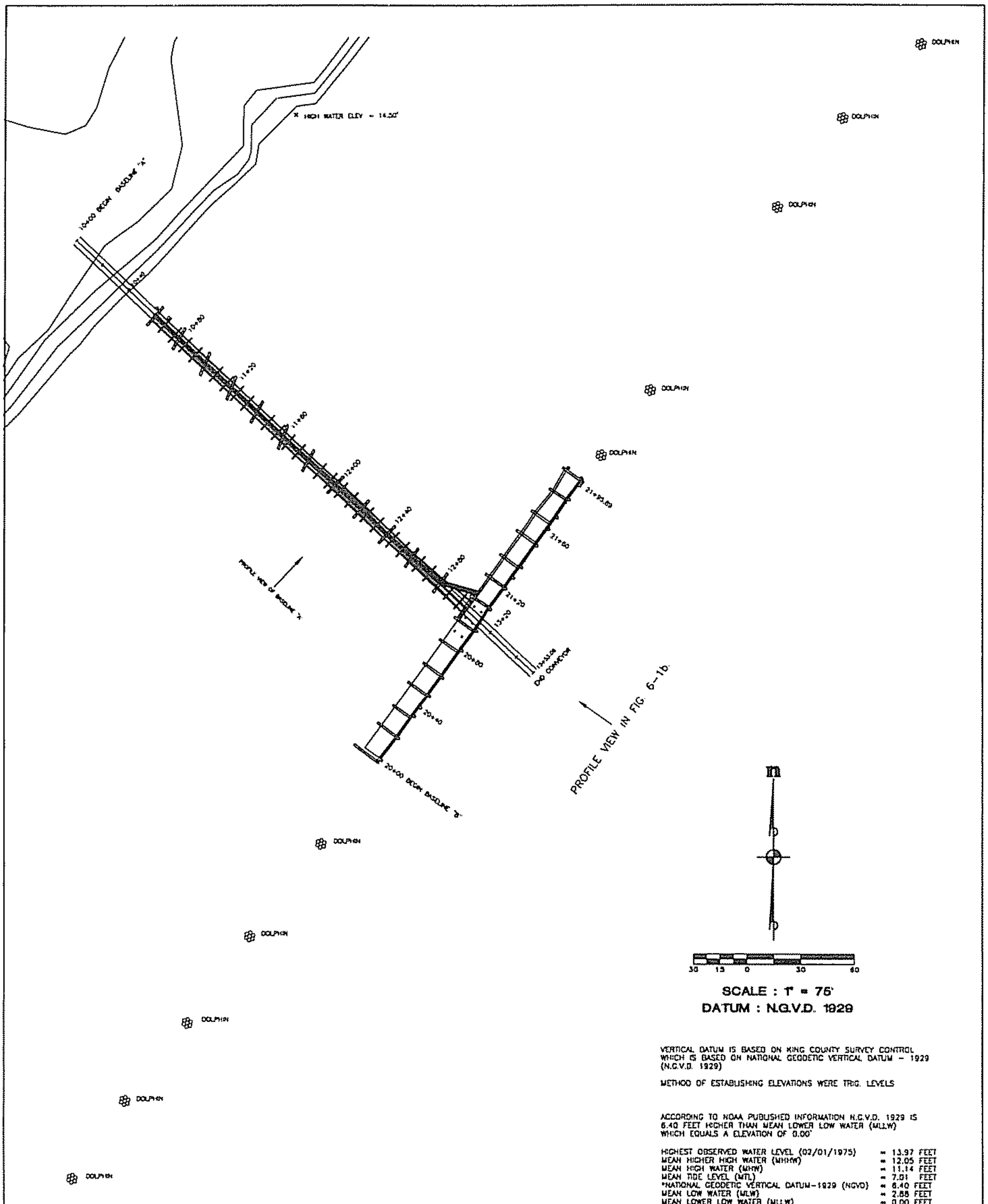


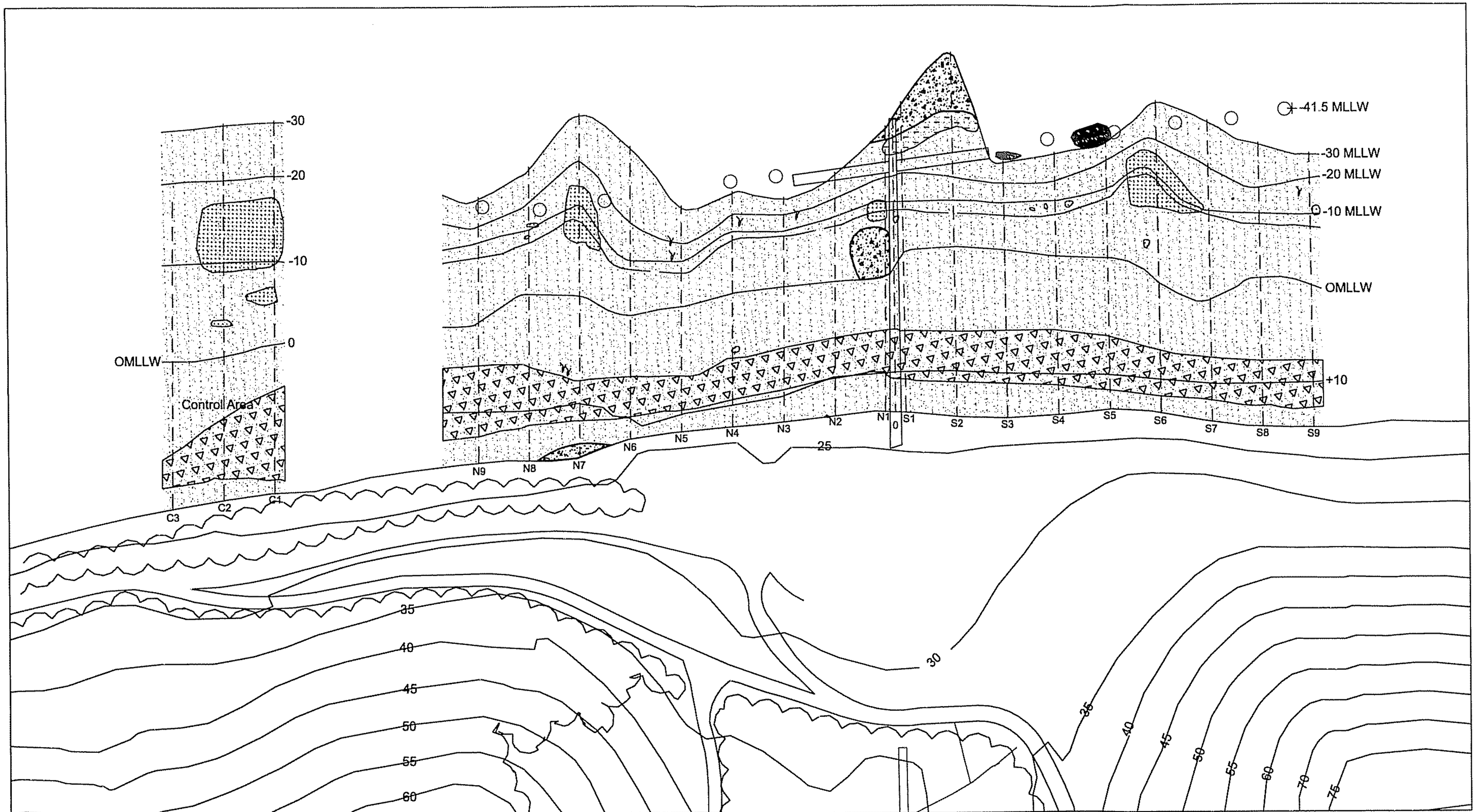

Figure 6-1b. Front View at Low Tide of the Barge and Loading Facility




Source: Glacier Northwest, 1999
Aerial Survey: Nies Mapping Group

08306.98

Figure 6-1 c. As-Built Drawing of Dock and Dolphins from Above




LEGEND

- Sand
- Sand & Gravel
- Gravel/Cobble
- Wood Bits
- Shell Fragments
- Eelgrass Bed
- Transects
- Depth Contour
- Elevation Contour
- Slope Change
- Single Eelgrass Turion

1"=100'

0 100

Jones & Stokes

Figure 6-2a.

Approximate Location of Survey Transects, Bathymetry, and Eelgrass Beds

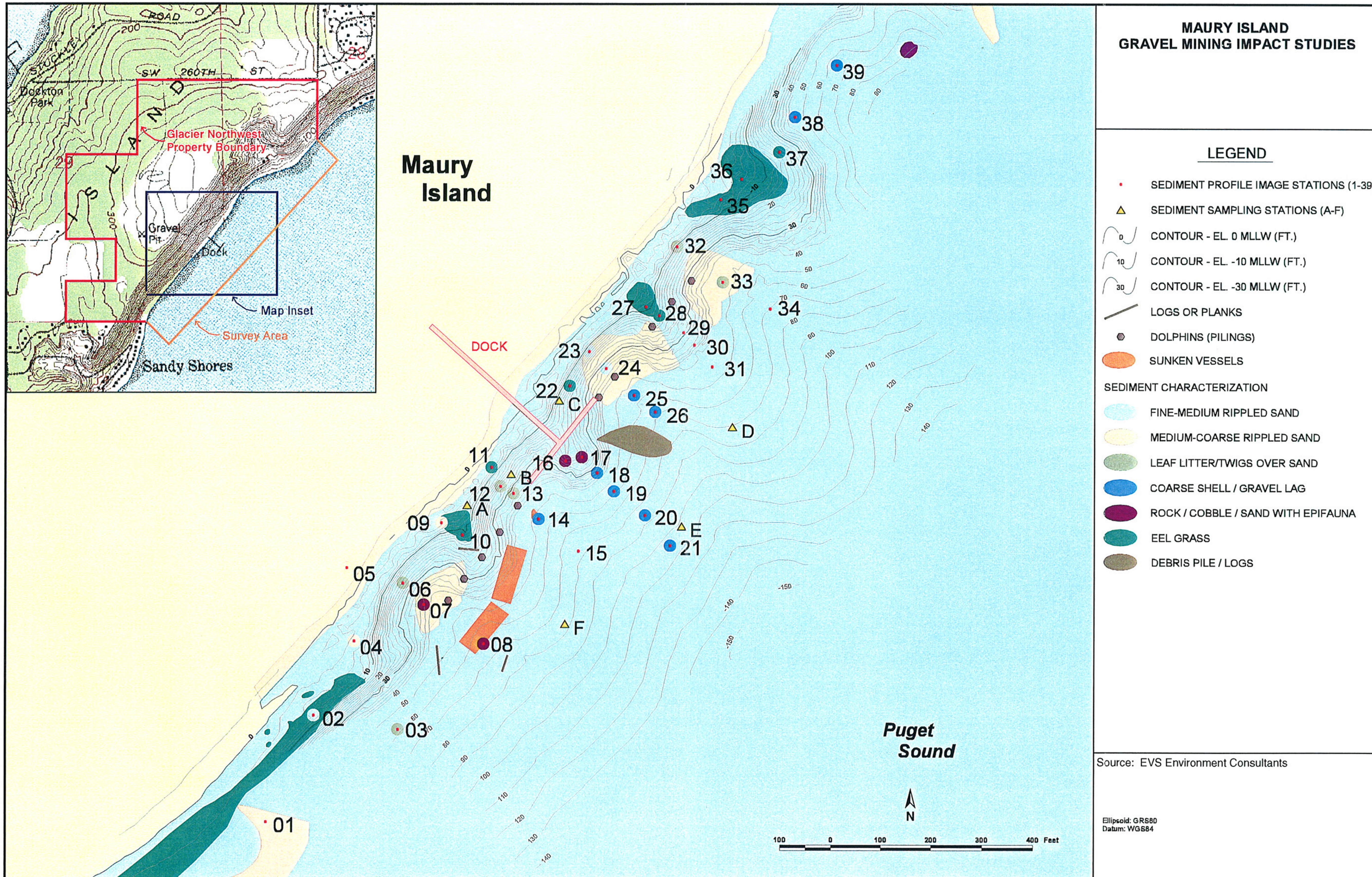
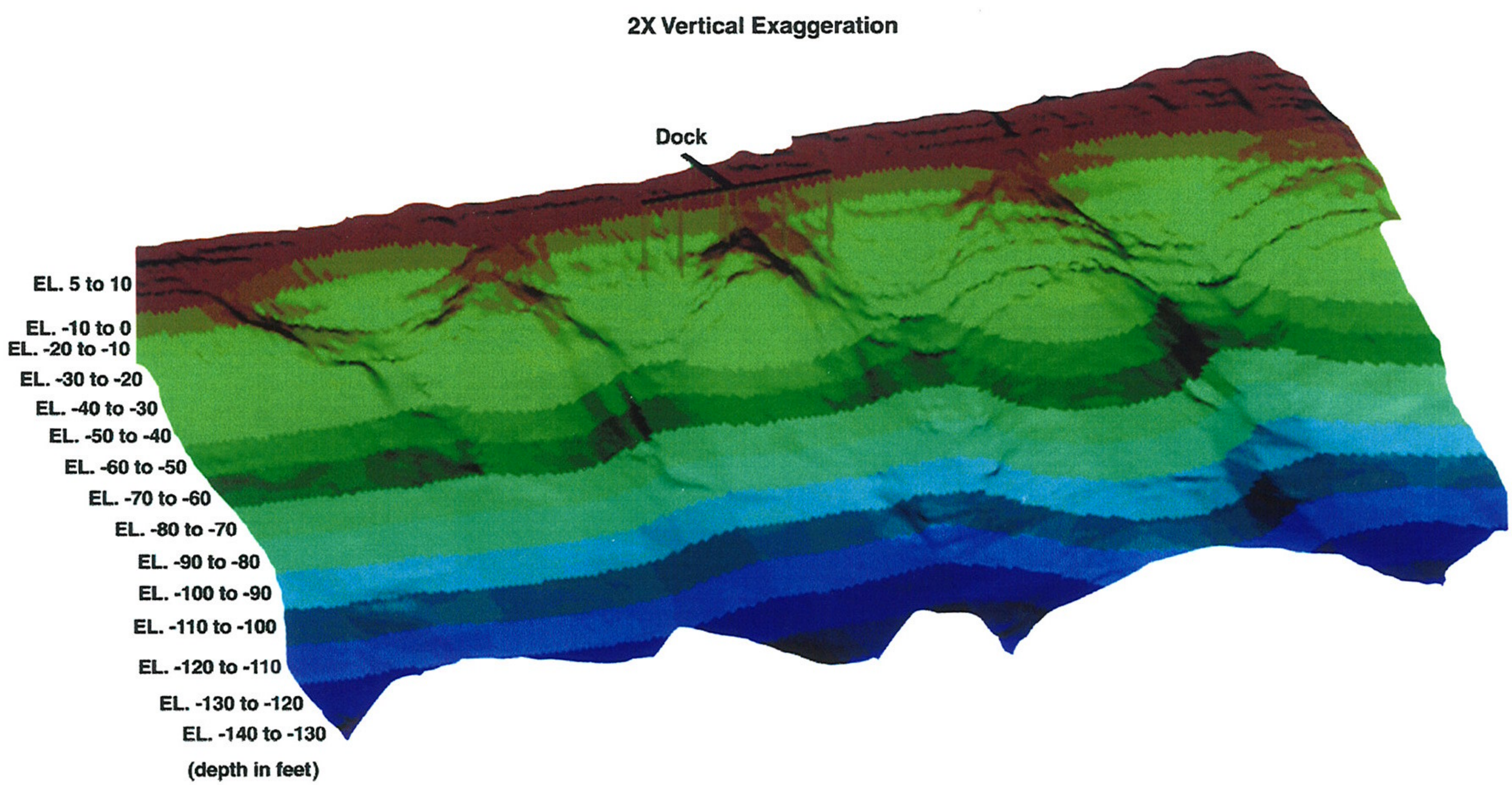


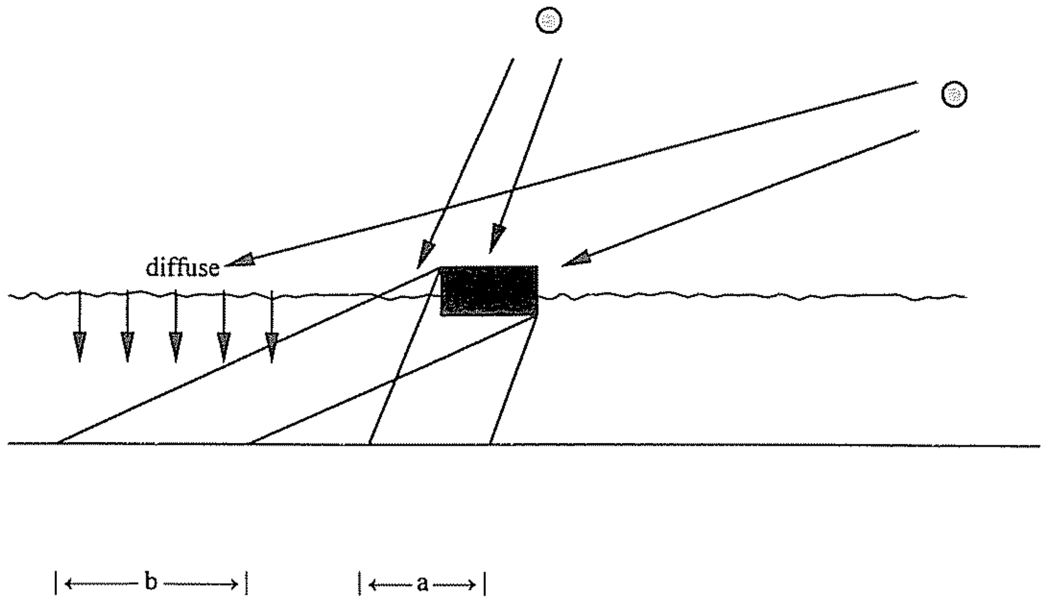

Figure 6-2b. Results of Nearshore Environment Characterization Study




Source: EVS Environment Consultants 2000.

98-306-001
06/15/00

Figure 6-3. Three-Dimensional View of Nearshore Bathymetry Adjacent to Project Site




The effect of shading is reduced when the sun is low in the sky since diffuse light contributes a greater proportion of overall light as the solar angle decreases.

## Figure 6-4. Effect of Solar Angle on Shading

# Chapter 7

# Noise

# *Chapter 7*

# Noise

## 7.1 Primary Issues

Sand and gravel mining involves the operation of heavy equipment for extended periods each day. The operation of this equipment can generate noise, which could potentially impact nearby residents.

The primary issue analyzed in this section is:

- Would noise levels resulting from the project exceed regulatory standards at nearby residences?

## 7.2 Affected Environment

This section describes the existing noise environment in the project area. Information in this section is based primarily on a technical report prepared by McCulley, Frick, and Gilman (1998) for the Maury Island Mining Operation Expanded Environmental Checklist (Appendix M).

### 7.2.1 Background Information on Noise

#### *7.2.1.1 What is Noise and How is it Measured?*

Sound travels through the air as waves of minute fluctuations of air pressure caused by some type of vibration. In general, sound waves travel away from the noise source as an expanding spherical surface. As a result, the energy contained in a sound wave is spread over an increasing area as it travels away from the source. This results in a decrease in loudness at greater distances from the noise source.

Sound level meters measure the actual pressure fluctuations caused by sound waves, with separate measurements made for different sound frequency ranges. The decibel (dBA) scale used to describe sound is a logarithmic scale which accounts for the large range of audible sound intensities. The nature of the dBA scale is such that individual sound levels for different noise sources cannot be added directly to give the sound level for the combined noise source. For example, two noise sources producing equal sound levels at a given location will produce a combined sound level 3 dBA greater than either sound alone. When two sound sources differ by 10 dBA, the combined sound level will be 0.4 dBA greater than the louder source alone.

People generally perceive a 10-dBA increase in sound levels as a doubling of loudness (noise). For example, a 70-dBA sound level will be perceived by an average person as twice as loud as a 60-dBA sound level. People generally cannot detect differences of 1 to 2 dBA between noise sources; however, under ideal listening conditions, differences of 2 or 3 dBA can be detected by some people. A 3- to 5-dBA change in the sound level would probably be perceived by most people under normal conditions.

#### *7.2.1.2 How Do Environmental Conditions Affect Noise?*

When distance is the only factor considered, sound levels from isolated point sources of noise typically decrease by about 6 dBA for every doubling of distance from the sound source. Conversely, moving half the distance closer to a point sound source increases the sound level by 6 dBA. The degree of impact also depends on who is listening and on existing sound levels in the area. If background sound levels are high, introducing a new sound source would tend to have less impact than if background sound levels are low.

Sound levels at different distances can also be affected by factors other than the distance from the noise source. Topographic features and structural barriers that absorb, reflect, or scatter sound waves can increase or decrease sound levels. Atmospheric conditions (wind speed and direction, humidity levels, and temperature) can also affect the degree to which sound is attenuated over distance.

#### *7.2.1.3 How Do People Perceive Noise Levels?*

The human ear does not respond equally to all sound frequencies. Therefore, when considering the effects of sound on people, it is necessary to consider the frequency response of the human ear. Instruments are designed to respond to or ignore certain sound frequencies. The frequency weighting network most often used to evaluate environmental noise is the A-weighting network, which reduces the measured sound pressure level for low-frequency sounds while slightly increasing the measured pressure level for some high-frequency sounds (1 kHz to 3 kHz). Measurements from instruments using this system are reported in “A-weighted decibels” or dBA. All sound levels in this section are provided in A-weighted decibels. Table 7-1 shows sound levels produced by common sources.

For a given sound source, factors affecting the impact at a receiver include the distance from the source, the frequency of the sound, the absorbency of the intervening terrain, the presence or absence of obstructions, and the duration of the event. The degree of impact also depends on who is listening, existing sound levels, and when the event takes place.

#### *7.2.1.4 How is the Significance of Noise Impacts Assessed?*

Although standards of significance for noise relate to the exposure of people to severe sound levels and substantial increases in sound level sources, people often express concerns about the possible audibility resulting from a project and related issues of sleep disturbance and quality of life.

Audibility is a complex phenomenon because it depends on the characteristics of the intrusive sound with respect to the characteristics of background sound levels. It would not be uncommon for a highly tonal sound, such as music or an alarm, to be distinctly audible even when the absolute level of the sound is well below (i.e., 5 to 10 dBA less than) the background sound level.

The relationship between audibility and annoyance is also complex and extremely subjective. The fact that a sound is audible does not necessarily mean that it will be annoying or cause a problem. Because of the difficulty in assessing the audibility of sound and related annoyance, audibility alone is not used in this EIS to evaluate the significance of impacts. Rather, the noise limits set under King County Code are the appropriate criteria to gauge the significance of impacts. The question of whether sound levels resulting from the mine would exceed these regulatory standards is addressed in Section 7.3.1.

## 7.2.2 Regulatory Overview

### *7.2.2.1 King County Noise Limits*

The King County Code establishes limits on the levels and durations of noise crossing property boundaries. Allowable maximum sound levels depend on the zoning of the noise source and the zoning of the receiving property (Table 7-2).

King County Code allows these noise limits to be exceeded for certain periods of time as shown below:

- 5 dBA exceedance for no more than 15 minutes in any hour; or
- 10 dBA exceedance for no more than 5 minutes of any hour; or
- 15 dBA exceedance for no more than 1.5 minutes of any hour.

King County's noise code also identifies noise sources and activities that are exempt from the noise limits described above:

- sounds created by stream traffic on public roads;
- sounds created by warning devices (such as back-up alarms); and
- sounds from blasting and from construction equipment are exempt from the standards during the day (7 a.m. to 10 p.m. weekdays and 9 a.m. to 10 p.m. on weekends).

### *7.2.2.2 Existing Land Uses and Zoning*

The project site is designated as a Mineral Resource Area in King County's Comprehensive Plan and is zoned for mining (see Chapter 9, Land and Shoreline Use). Mining has taken place on the site at variable rates since the 1940s, with relatively low rates of extraction over the past 20 years. According to the King County Noise Code, the project site would be considered an industrial noise source.

The project site is bordered by Puget Sound to the south, forest in the northwest corner, individual residences to the west, and the communities of Gold Beach and Sandy Shores to the northeast and southwest, respectively. For these land uses, the applicable noise limits (Table 7-2) would be for an industrial source affecting rural residential receivers.

### 7.2.3 Existing Sound Levels

Sound levels were measured at two locations in the Sandy Shores and Gold Beach communities to characterize existing sound levels in the vicinity of the project site. Sound levels were measured from 5 p.m. on February 16, 1998 to 11:00 a.m. on February 17, 1998. Average sound levels at both locations during the day ranged from 43 to 53 dBA. During the evening hours, sound levels ranged from 37 to 46 dBA. Sound level measurement locations (SLM) are shown in Figure 7-1 and summarized in Table 7-3.

## 7.3 Impacts

### 7.3.1 Would noise levels resulting from the project exceed regulatory standards at nearby residences?

#### *7.3.1.1 Overview*

In general, sound levels resulting from mining would not exceed applicable sound level standards. During later mining phases, noise from nighttime barge-loading operations could exceed the regulatory standards at some residential locations under certain wind or other atmospheric conditions, as discussed later in this section.

#### *7.3.1.2 Methods Used to Evaluate Impacts*

The project would generate noise from construction activities and mining operations. Operational impacts were evaluated using the Environmental Noise Model (ENM), a computer simulation model (RTA 1989). The model estimates sound levels after considering the noise reductions or enhancements caused by distance, barrier effects provided by intervening topography, ground surfaces (including water), wind, atmospheric stability, and absorption.

The ENM evaluates noise levels at receptor locations based on the sound power levels of the noise sources operating on the project site. Sound power levels for operating equipment expected to be used at the project site were based on measurements of similar equipment operating at other active sites. Noise levels were evaluated for 17 receptor locations (Figure 7-1).

The ENM estimates sound levels for the most appropriate set of meteorological conditions. For this analysis, meteorological conditions consisting of a neutral atmosphere were evaluated with and without a 2 meter/second (4.5 mph) wind blowing from the sound source toward the receivers. A 2 meter/second wind was used because it could noticeably increase the sound levels of distant sources, but would not significantly affect the background sound level. This meteorological condition results in worst-case sound conditions. Higher wind speeds could also increase the sound levels at distant sources, but would also increase the background sound levels.

### *7.3.1.3 Proposed Action*

**Construction Noise.** Construction would occur only during the daytime hours and, like all construction activities, would be exempt from King County noise standards during the daytime (per KCC 12.94.020).

Sound levels on the project site would increase beginning with the reconstruction of the conveyor system and repairs to the loading dock. Construction noise would depend on the type of equipment being used and the amount of time it is in use. Table 7-4 identifies sound levels associated with typical construction equipment. Pile driving would be one of the loudest construction activities, and would produce daytime noise for about 2 weeks. Initial construction activities would occur approximately 1,000 to 1,500 feet from the nearest residential locations.

The sound levels shown in Table 7-4 consider attenuation only due to distance. Other factors, such as site topography, would likely make construction sound levels at 1,000 feet less than those shown. At a distance of 1,000 feet from the project site, noise levels from construction activities would not result in significant impacts.

**Operational Noise.** Sound levels resulting from the project would not exceed applicable sound level standards except that, during later phases of the mining operation, noise from nighttime barge-loading operations could exceed the regulatory standards by approximately 1 dBA under certain wind or other atmospheric conditions, as discussed later in this section.

Onsite sound sources associated with operation of the mine would include:

- bulldozers and/or loaders used to mine material;
- a loader to load material into a hopper feeding the conveyor system;

- a conveyor carrying material from the mining area to the processing and barge loading areas;
- loading of barges, including noise from the conveyors and the tugs; and
- trucks delivering materials to and from the site.

To characterize the potential impacts, sound levels of similar equipment operating at an active mining operation were recorded and used in the noise model (Table 7-5).

Under the Proposed Action, barge loading could occur 24 hours a day. Other activities would vary on a project-by-project basis, but would not occur outside of 6 a.m. to 10 p.m. Monday through Friday and 9 a.m. to 6 p.m. on Saturdays. The Applicant has proposed a number of measures to reduce sound levels during mining (Section 7.4.2), and these measures are incorporated into the analysis.

Results of the ENM analysis under calm conditions (0 meter/second wind) and with a 2 meter/second wind speed are shown in Tables 7-6 and 7-7, respectively for the 17 modeled residential receptor locations. Modeling was completed for each of the six proposed mining phases (Figure 2-1):

- Phase 1 – excavation of the existing active area;
- Phase 2 – excavation to the northeast;
- Phases 3 and 4 – excavation to the property boundaries on the west side of the site; and
- Phases 5 and 6 – excavation to the property boundaries on the east and northeast sides of the site.

The maximum daytime activity in any single hour (shown as "Day" in Tables 7-6 and 7-7) would include mining, processing, and barging operations. These activities would include bulldozers (or loaders) moving excavated materials, loaders working near the processing plant feeding the conveyors or filling trucks, and a barge being loaded. Because these activities would generally occur during daytime hours, they would have to meet King County's allowable daytime sound level of 57 dBA for an industrial noise source affecting rural residential receivers. If these activities occurred prior to 7 a.m. on weekdays, the nighttime sound level of 47 dBA would have to be met.

Nighttime activities for this analysis were assumed to consist of the loading of barges using the conveyor system and one loader located near the processing plant feeding the conveyor to the barge. These activities would be required to meet King County's allowable nighttime limit of 47 dBA.

Under calm conditions, during the day, measured sound levels at residential receptors ranged from 42 to 51 dBA (Table 7-6). Modeled sound levels under the Proposed Action during daytime hours ranged from 41 to 49 dBA, with the highest sound levels occurring during Phase 1 and Phase 3 of the mining operation near the west property boundary. As shown in Table 7-6, sound levels under calm conditions with maximum production would meet King County's allowable daytime sound level of 57 dBA. Under nighttime conditions with barge loading activities taking place, sound levels would also be within King County's allowable nighttime limit of 47 dBA.

Sound levels with a wind speed of 2 meter/second under maximum production are shown in Table 7-7. With a 2 meter/second wind blowing from the primary noise sources toward each receptor, the noise model estimates that project-related sound levels would comply with King County's daytime and nighttime standards at all locations except at individual residences represented by receptor location GB7 in the Gold Beach community. Receptor GB7 is located in a residential area on a hill overlooking the Gold Beach community (see Figure 7-1). By Phases 5 and 6 of the mining operation, most of the intervening topography on the project site would have been excavated. Sound level estimates at GB7 indicate that sounds from nighttime barge-loading operations could exceed the 47 dBA limit at night with a wind blowing from the southwest to the northeast.

Since estimated sound levels would be within King County standards for nearby residents (except as defined above), sound levels would be within limits for people who live across Puget Sound, including people in Redondo, Sash Point, and other waterfront communities.

#### *7.3.1.4 Alternatives 1 and 2*

Under Alternatives 1 and 2, the same general operations would take place at the site, but at lower levels of activity (i.e., the number of barges loaded per day and the hours of equipment operation would be limited, as described in Chapter 2). Sound levels under either alternative would be similar to those described for the Proposed Action but would occur for shorter periods of time. In addition, nighttime sound levels would be lower because fewer barges would be loaded. Other impacts would be similar to those described for the Proposed Action and would not exceed applicable regulatory standards.

#### *7.3.1.5 No-Action*

Under the No-Action Alternative, periodic mining activities would continue as they have in the past, with approximately 20,000 tons of material being mined per year for on-island markets. Impacts associated with the No-Action Alternative would be minimal.

## 7.4 Adverse Impacts and Mitigation

### 7.4.1 Significance Criteria

King County considers the following as an indicator of significance for noise impacts under SEPA.

- Violating King County Noise Ordinance. Per that ordinance:

  *It is the policy of King County to minimize the exposure of citizens to the physiological and psychological dangers of excessive noise and to protect, promote and preserve the public health, safety and welfare. It is the express intent of the county council to control the level of noise in a manner which promotes commerce; the use, value and enjoyment of property; sleep and repose; and the quality of the environment.*
  (Ord. 3139 § 101, 1977).

The specific standards within that ordinance were developed specifically to comply with that policy and are therefore commonly used by King County DDES as the threshold of significance under SEPA. This is not to say that mitigation may not be considered for noise affects that do not violate noise standards, but rather that such affects, while adverse, would not be considered significant.

### 7.4.2 Measures Already Proposed by the Applicant or Required by Regulation

The following measures have been proposed by the Applicant to minimize impacts associated with the project:

a. Construction of a 12-foot berm along the western perimeter and in the northeastern corner of the site to ensure that there would always be a barrier between operating equipment and nearby residences.

b. Regular maintenance of the conveyor system and the barge-loading conveyor to ensure that squeaking of the equipment is minimized.

c. Use of strobe lights instead of audible alarms for back-up warning devices used onsite during nighttime operations.

Incorporation of these mitigation measures into the construction and operation of the project would ensure compliance with the King County Noise Code and would result in sound levels lower than those allowed by the code.

## 7.4.3 Remaining Adverse Impacts and Additional Measures

### *7.4.3.1 Noise Impact 1 – Increased Noise Perceived by Neighbors as Annoying or Disruptive*

**Specific Adverse Environmental Impact.** This impact is not in violation of King County Code, but, nevertheless, is appropriate for consideration under SEPA due to the level of concern regarding noise. Per WAC 197-11-660, an impact need only be adverse, and not necessarily significant, for mitigation to be applied as a condition.

### *7.4.3.2 Noise Mitigation 1*

The following measures have been identified to further reduce concerns regarding noise and associated concerns related to land use and compatibility of the site with nearby residences.

a. Employ radar-based backup warning systems on all heavy equipment. Such systems detect objects or people in the equipment's path when the equipment is moving in reverse. The system produces an audible warning only when an object or person is detected to be within an unsafe proximity to the equipment. By using this type of warning system, the annoyance noise associated with backup alarms could be eliminated. Approval by the Washington State Department of Labor and Industry for this type of alarm system would be required.

b. Engage the services of an independent consultant to monitor sound levels produced by noise-generating activities and report such findings to King County to ensure compliance with noise standards. Monitoring would be conducted at or near the residential locations exposed to the highest project-related sound levels during the monitoring period. Monitoring would commence when any noise-generating activity begins on the project site. Once every 3 months, the Applicant would submit a short letter report summarizing the results of the monitoring program. If the County determines that project-related activities are resulting in violations of noise criteria, the County would notify the Applicant who would then be required to implement additional measures to bring project-related sound levels into compliance with the criteria identified earlier.

c. Establish an advisory committee to monitor and evaluate complaints relating to the project. The advisory committee could be composed of representatives of the mining operator, area residents, and King County staff. As needed, the committee would recommend actions to be taken by the mining operator to reduce or eliminate noise complaints.

d. Expand the site buffer along the eastern and western perimeter to reduce noise and increase screening provided by topography (see Figure 11-8 in Chapter 11).

**Regulatory/Policy Basis for Condition.** Under KCC 12.86.010 (Declaration of Policy), King County seeks to minimize exposure to excessive noise and to control noise levels in a manner which promotes commerce, the use and enjoyment of property, and the quality of the environment.

## 7.5 Cumulative Impacts

None expected.

## 7.6 Significant Unavoidable Adverse Impacts

None expected. Neighbors would likely hear the project, and some would perceive this as annoying. Nevertheless, the project is not expected to result in noise levels that would significantly affect the use, value, and enjoyment of property; sleep and repose; or the quality of the environment.

## 7.7 Citations

McCulley, Frick & Gilman, Inc. 1998. Environmental noise analysis for expanded environmental checklist, Lone Star Northwest Maury Island mining expansion. April 21. Included as Appendix E to: Huckell/Weinman Associates, Inc. 1998. Expanded environmental checklist for Northwest Aggregates Maury Island mining operation. May.

RTA Software Pty Ltd. 1989. User's guide for the environmental noise model (ENM). Distributed by Scantek, Inc. Rockville, MD.

U.S. Environmental Protection Agency. 1971. Noise from construction equipment and operations, building equipment, and home appliances. (Report No. NTID300.1.)

## *Table 7-1. Weighted Sound Levels and Human Response*

| *Sound Source* | *dBA** | *Response Criteria* |
|---|---|---|
| Carrier deck jet operation | 140 | Limit amplified speech |
| Limit of amplified speech | 130 | Painfully loud |
| Jet takeoff (200 feet)<br>Auto horn (3 feet) | 120 | Threshold of feeling and pain |
| Riveting machine<br>Jet takeoff (2,000 feet) | 110 | |
| Shout (0.5 foot)<br>New York subway station | 100 | Very annoying |
| Heavy truck (50 feet)<br>Pneumatic drill (50 feet) | 90 | Hearing damage (8 hour exposure) |
| Passenger train (100 feet)<br>Helicopter (in-flight, 500 feet)<br>Freight train (50 feet) | 80 | Annoying |
| Freeway traffic (50 feet) | 70 | Intrusive |
| Air conditioning unit (20 feet)<br>Light auto traffic (50 feet) | 60 | |
| Normal speech (15 feet) | 50 | Quiet |
| Living room<br>Bedroom<br>Library | 40 | |
| Soft whisper (15 feet) | 30 | Very quiet |
| Broadcasting studio | 20 | |
| | 10 | Just audible |
| | 0 | Threshold of hearing |

* Typical A-weighted sound levels taken with a sound-level meter and expressed as decibels on the scale. The "A" scale approximates the frequency response of the human ear.

Source: U.S. Council on Environmental Quality 1970.

## Table 7-2. King County Environmental Noise Limits (dBA)

| District of Noise Source | District of Receiving Property | | | |
|---|---|---|---|---|
| | Rural Day/Night | Residential Day/Night | Commercial | Industrial |
| **Rural** | 49/39 | 52/42 | 55 | 57 |
| **Residential** | 52/42 | 55/45 | 57 | 60 |
| **Commercial** | 55/45 | 57/47 | 60 | 65 |
| **Industrial** | 57/47 | 60/50 | 65 | 70 |

Source: King County Code, Chapter 12.88.

## Table 7-3. Existing Sound Levels (dBA)

| Hours | $L_{eq}$[1] | $L_{02}$[2] | $L_{08}$[3] | $L_{25}$[4] | $L_{90}$[5] |
|---|---|---|---|---|---|
| **Gold Beach[6]** | | | | | |
| 7 a.m. – 10 p.m. | 43-51 | 51-57 | 47-53 | 43-51 | 35-47 |
| 10 p.m. – 7 a.m. | 38-45 | 46-53 | 40-49 | 36-46 | 32-42 |
| **Sandy Shores[7]** | | | | | |
| 7 a.m. – 10 p.m. | 43-53 | 51-61 | 47-54 | 42-51 | 34-46 |
| 10 p.m. – 7 a.m. | 37-46 | 43-52 | 39-49 | 34-47 | 32-41 |

1 The equivalent sound level (the level of a steady sound that contains the same acoustical energy as the fluctuating noise over a given time period, such as 1 hour)

2 Sound level that is exceeded 2.5% of the time or 1.5 minutes per hour

3 Sound level that is exceeded 8.3% of the time or 5 minutes per hour

4 Sound level that is exceeded 25% of the time or 15 minutes per hour

5 Sound level that is exceeded 90% of the time or 54 minutes per hour

6 The sound level meter was placed on the back deck of 25914 Gold Beach Drive and overlooked Puget Sound. This location has a clear view to the barge loading dock. Noise sources audible while present at this location were water lapping on the shore, airplanes, and nearby residential activities.

7 The sound level meter was placed in the backyard of 8909 SW 274th Street. This location was on a hill overlooking Puget Sound and the existing dock. Noise sources audible while present at this location were wind in the trees, distant airplanes, the air conditioning system of the residence, and activity of the resident outside.

Source: McCulley, Frick & Gilman 1998; Appendix M.

### *Table 7-4. Typical Construction Equipment Sound Levels*

| ***Types of Equipment*** | ***Range of Noise Levels (dBA)*** | |
|---|---|---|
| | ***At 50 Feet*** | ***At 1,000 Feet*** |
| ***Clearing*** | | |
| Bulldozer | 77-96 | 51-70 |
| Dump Truck | 82-94 | 56-68 |
| ***Grading*** | | |
| Scraper | 80-93 | 54-67 |
| Bulldozer | 77-96 | 51-70 |
| ***Paving*** | | |
| Paver | 86-88 | 60-62 |
| Dump Truck | 82-94 | 56-68 |
| ***Stationary Equipment*** | | |
| Generators | 71-82 | 45-56 |
| Compressors | 74-87 | 48-61 |

The range of sound levels presented stem from the variety of types of equipment that may be used for particular tasks as well as the different sound levels that may be produced by different operational modes of the same equipment. For example, some equipment would make more noise when handling heavy loads than when simply idling.

Source: U.S. Environmental Protection Agency 1971.

## *Table 7-5. Summary of Source Sound Levels*

| ***Source*** | ***L25 (in dBA at 100 feet)*** |
|---|---|
| ***Processing Plant***[1] | 83 |
| ***Barge Loading***[2] | 64 |
| ***Bulldozer***[3] | 83 |
| ***Front-End Loader***[4] | 83 |

1 Measured the crusher plant operating at the Glacier Northwest Mats Mats pit.

2 Measured the sound levels of a barge being loaded at the Glacier Northwest Dupont facility. The material being loaded, rock mixed with sand, is anticipated to be similar to the material extracted from the Maury Island pit. The sound level of the loading represented above does not include the warning alarm sounded at the onset of loading or the squeaks of the conveyor. Both of these sounds are louder than the barge loading but can be effectively mitigated through the use of strobe lights for the alarm and adequate maintenance for the squeaky equipment. See Section 7.4.2.

3 Measured a CAT D10 bulldozer operating at the Glacier Northwest Dupont site over several cycles of the dozer moving material.

4 Measured a CAT 992 front-end loader at the Glacier Northwest Dupont site over several cycles of the loader excavating material and dumping it into a hopper.

Source: McCulley, Frick & Gilman 1998.

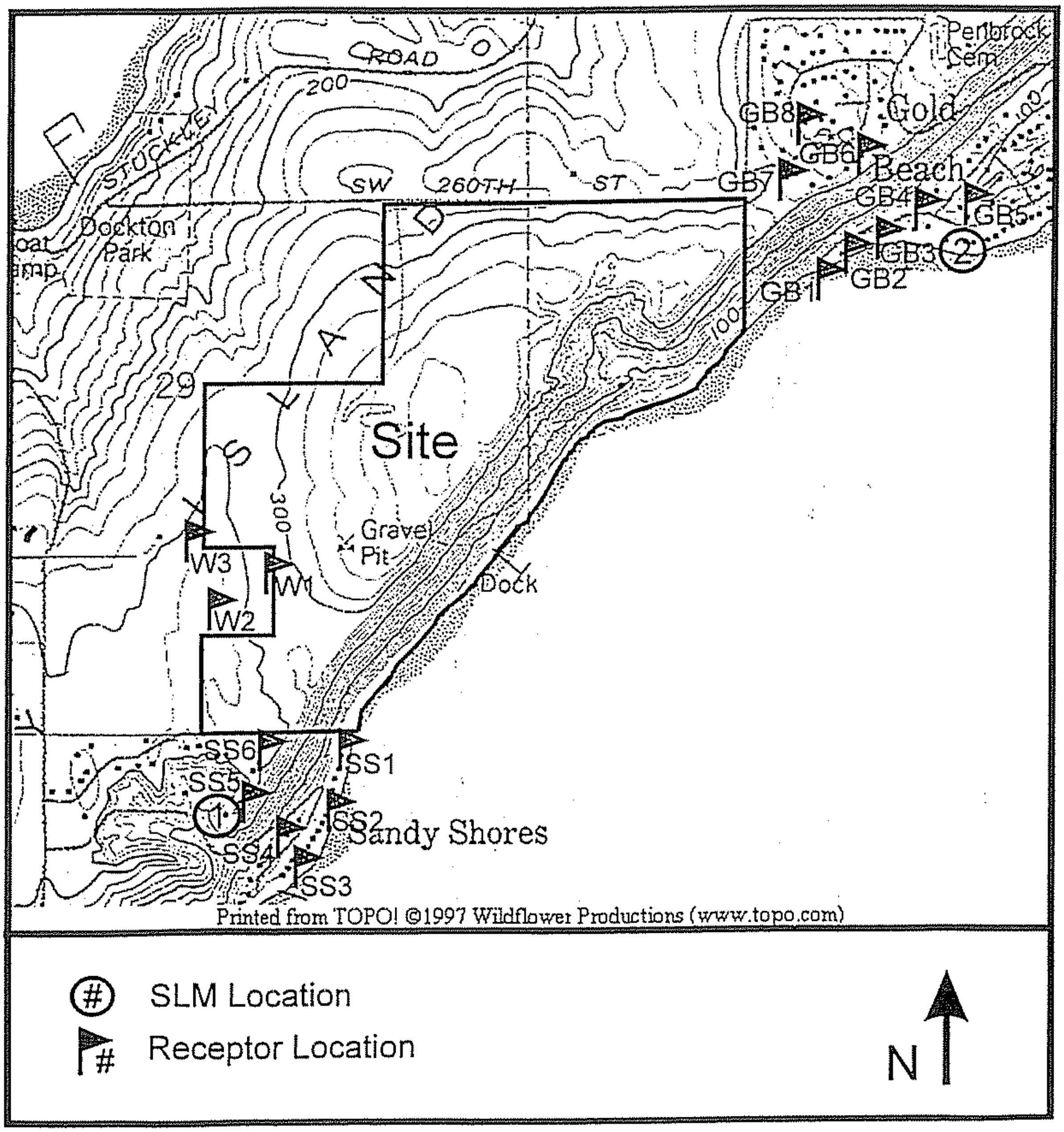
## *Table 7-6. Operational Sound Levels—Calm Conditions*

| Receptor | | Measured Existing Sound Levels (L25s) | Calculated Sound Levels (dBA) | | | | | | King County Allowable Level |
|---|---|---|---|---|---|---|---|---|---|
| | | | Phase 1 | Phase 2 | Phase 3 | Phase 4 | Phase 5 | Phase 6 | |
| ***Gold Beach*** | | | | | | | | | |
| GB1 | Day | 43-51 | 36 | 33 | 33 | 35 | 33 | 46 | 57 |
| | Night | 36-46 | 32 | 32 | 32 | 32 | 32 | 32 | 47 |
| GB2 | Day | 43-51 | 37 | 32 | 32 | 36 | 33 | 46 | 57 |
| | Night | 36-46 | 32 | 32 | 32 | 32 | 32 | 32 | 47 |
| GB3 | Day | 43-51 | 38 | 32 | 32 | 36 | 33 | 45 | 57 |
| | Night | 36-46 | 31 | 31 | 31 | 31 | 31 | 31 | 47 |
| GB4 | Day | 43-51 | 35 | 27 | 27 | 34 | 29 | 43 | 57 |
| | Night | 36-46 | 24 | 24 | 24 | 24 | 26 | 26 | 47 |
| GB5 | Day | 43-51 | 37 | 30 | 30 | 37 | 33 | 44 | 57 |
| | Night | 36-46 | 29 | 29 | 29 | 29 | 30 | 30 | 47 |
| GB6 | Day | 42-51 | 33 | 38 | 30 | 31 | 39 | 41 | 57 |
| | Night | 34-47 | 26 | 27 | 27 | 27 | 31 | 31 | 47 |
| GB7 | Day | 42-51 | 32 | 41 | 31 | 32 | 44 | 45 | 57 |
| | Night | 34-47 | 19 | 24 | 24 | 24 | 33 | 33 | 47 |
| GB8 | Day | 42-51 | 32 | 38 | 31 | 31 | 40 | 41 | 57 |
| | Night | 34-47 | 17 | 21 | 21 | 21 | 30 | 30 | 47 |
| ***Residences on Hill West of Site*** | | | | | | | | | |
| W1 | Day | 42-51 | 47 | 43 | 45 | 50 | 41 | 41 | 57 |
| | Night | 34-47 | 32 | 36 | 36 | 36 | 36 | 36 | 47 |
| W2 | Day | 42-51 | 49 | 45 | 47 | 45 | 38 | 41 | 57 |
| | Night | 34-47 | 32 | 31 | 31 | 31 | 31 | 31 | 47 |
| W3 | Day | 42-51 | 44 | 39 | 48 | 40 | 37 | 37 | 57 |
| | Night | 34-47 | 28 | 32 | 32 | 32 | 32 | 32 | 47 |
| ***Sandy Shores*** | | | | | | | | | |
| SS1 | Day | 43-51 | 42 | 40 | 39 | 42 | 39 | 42 | 57 |
| | Night | 36-46 | 37 | 38 | 38 | 38 | 38 | 38 | 47 |
| SS2 | Day | 43-51 | 42 | 42 | 37 | 42 | 38 | 41 | 57 |
| | Night | 36-46 | 35 | 36 | 36 | 36 | 36 | 36 | 47 |
| SS3 | Day | 43-51 | 42 | 41 | 36 | 37 | 38 | 40 | 57 |
| | Night | 36-46 | 34 | 35 | 35 | 35 | 35 | 35 | 47 |
| SS4 | Day | 43-51 | 39 | 39 | 35 | 36 | 36 | 40 | 57 |
| | Night | 36-46 | 33 | 34 | 34 | 34 | 34 | 34 | 47 |
| SS5 | Day | 42-51 | 45 | 40 | 38 | 44 | 41 | 41 | 57 |
| | Night | 34-47 | 31 | 33 | 33 | 33 | 35 | 35 | 47 |
| SS6 | Day | 42-51 | 46 | 43 | 43 | 52 | 42 | 42 | 57 |
| | Night | 34-47 | 36 | 37 | 37 | 37 | 37 | 37 | 47 |
| Source: McCulley, Frick & Gilman 1998; Appendix M. | | | | | | | | | |

## *Table 7-7. Operational Sound Levels—with 2 m/s Wind*

| Receptor | | Measured Existing Sound Levels (L25s) | Calculated Sound Levels (dBA) Phase 1 | Phase 2 | Phase 3 | Phase 4 | Phase 5 | Phase 6 | King County Allowable Level |
|---|---|---|---|---|---|---|---|---|---|
| ***Gold Beach*** | | | | | | | | | |
| GB1 | Day | 43-51 | 46 | 39 | 39 | 47 | 42 | 50 | 57 |
| | Night | 36-46 | 38 | 38 | 38 | 38 | 39 | 39 | 47 |
| GB2 | Day | 43-51 | 46 | 39 | 39 | 47 | 44 | 50 | 57 |
| | Night | 36-46 | 37 | 38 | 38 | 38 | 39 | 39 | 47 |
| GB3 | Day | 43-51 | 46 | 39 | 39 | 47 | 47 | 52 | 57 |
| | Night | 36-46 | 37 | 38 | 38 | 38 | 41 | 41 | 47 |
| GB4 | Day | 43-51 | 44 | 42 | 43 | 46 | 49 | 52 | 57 |
| | Night | 36-46 | 34 | 36 | 36 | 36 | 40 | 40 | 47 |
| GB5 | Day | 43-51 | 45 | 50 | 50 | 51 | 50 | 53 | 57 |
| | Night | 36-46 | 36 | 42 | 42 | 42 | 45 | 45 | 47 |
| GB6 | Day | 42-51 | 47 | 49 | 47 | 47 | 54 | 53 | 57 |
| | Night | 34-47 | 38 | 40 | 40 | 40 | 47 | 47 | 47 |
| GB7 | Day | 42-51 | 46 | 50 | 47 | 47 | 56 | 55 | 57 |
| | Night | 34-47 | 34 | 37 | 37 | 37 | ***48**** | ***48**** | 47 |
| GB8 | Day | 42-51 | 46 | 49 | 46 | 47 | 54 | 54 | 57 |
| | Night | 34-47 | 33 | 36 | 36 | 36 | 46 | 46 | 47 |
| ***Residences on Hill West of Site*** | | | | | | | | | |
| W1 | Day | 42-51 | 56 | 48 | 49 | 50 | 46 | 46 | 57 |
| | Night | 34-47 | 37 | 40 | 40 | 40 | 40 | 40 | 47 |
| W2 | Day | 42-51 | 56 | 54 | 53 | 48 | 48 | 49 | 57 |
| | Night | 34-47 | 41 | 39 | 39 | 39 | 38 | 38 | 47 |
| W3 | Day | 42-51 | 54 | 47 | 52 | 45 | 43 | 44 | 57 |
| | Night | 34-47 | 33 | 38 | 38 | 38 | 37 | 37 | 47 |
| ***Sandy Shores*** | | | | | | | | | |
| SS1 | Day | 43-51 | 48 | 51 | 44 | 46 | 48 | 50 | 57 |
| | Night | 36-46 | 43 | 43 | 43 | 43 | 43 | 43 | 47 |
| SS2 | Day | 43-51 | 49 | 51 | 46 | 49 | 48 | 49 | 57 |
| | Night | 36-46 | 41 | 42 | 42 | 42 | 42 | 42 | 47 |
| SS3 | Day | 43-51 | 50 | 50 | 45 | 44 | 47 | 48 | 57 |
| | Night | 36-46 | 40 | 41 | 41 | 41 | 41 | 41 | 47 |
| SS4 | Day | 43-51 | 48 | 50 | 42 | 43 | 47 | 48 | 57 |
| | Night | 36-46 | 40 | 40 | 40 | 40 | 40 | 40 | 47 |
| SS5 | Day | 42-51 | 53 | 52 | 50 | 51 | 50 | 50 | 57 |
| | Night | 34-47 | 44 | 44 | 44 | 44 | 44 | 44 | 47 |
| SS6 | Day | 42-51 | 54 | 52 | 51 | 55 | 51 | 51 | 57 |
| | Night | 34-47 | 44 | 45 | 45 | 45 | 45 | 45 | 47 |

* The modeled sound level exceeds King County's allowable limit.
Source: McCulley, Frick & Gilman 1998; Appendix M.




Source: McCulley, Frick & Gilman 1998.

Figure 7-1. Sound Level Measurement and Receptor Locations

# *Chapter 8*

# Transportation

# *Chapter 8*

# Transportation

## 8.1 Primary Issues

This chapter addresses impacts from both truck traffic and barging related to the project. Primary issues addressed include:

- Would truck traffic resulting from the project increase congestion or degrade traffic operations on local streets?
- To what extent would tug and barge traffic affect or be affected by other boat traffic on Puget Sound, including increased risk of collisions or spills?
- Would tug/barge tows cause wake effects?
- How would the addition of barge traffic affect the Washington State Ferry System?

## 8.2 Affected Environment

### 8.2.1 Truck Traffic

This section describes the existing traffic conditions in the vicinity of the project. This information is based on the Level One Traffic Analysis prepared by TDA (1998) and included in the Maury Island Mining Operation Expanded Environmental Checklist (Huckell/Weinman Associates 1998).

#### *8.2.1.1 Roadway Network*

Roadways in the vicinity of the project site are shown in Figure 8-1 and described in Table 8-1.

#### *8.2.1.2 Existing Traffic Volumes*

In previous years the mine has operated with a maximum of 20,000 tons mined per year for local markets. Truck trips generated under that level of activity number approximately 500 to 1,000 per year.

Figure 8-1 shows projected background turning movement volumes in the year 2002. No transportation improvements are planned in the study area.

#### 8.2.1.3 Sight Distance

On Southwest 260th Street, the stopping sight distance is approximately 180 feet and on 79th Avenue Southwest, the stopping sight distance is approximately 190 feet. This stopping distance meets King County Road Standards.

### 8.2.2 Marine Traffic

This assessment is based, in part, on an independent marine route study prepared by Art Anderson Associates (1998), which provides route maps and additional details.

#### 8.2.2.1 Definition of Study Area

The study area for marine transport issues encompasses Puget Sound and associated waterways in the vicinity of the Maury Island gravel mine, from south of Tacoma near DuPont, north to Elliott Bay and the mouth of the Duwamish River. This corridor would encompass the areas most likely to order aggregate from the project site, including areas of south Puget Sound, the Tacoma area, and the Seattle area. Areas further north, such as Edmonds, Everett, Bellingham, and Port Angeles, would likely be less frequent customers for aggregate from the Maury Island mine over time than the markets mentioned above. This is due to a lower population center, greater distance from Maury Island, and availability of closer gravel sources.

Key commercial shipping passages within the study area include the Tacoma Narrows, Dalco Passage at the south end of Vashon Island, and the East Passage to Elliott Bay (Figure 8-2). Some tug/barge traffic would travel outside of this area, but it is expected that most traffic, over the life of the project, would travel between the Seattle area and Tacoma via the East Passage.

#### 8.2.2.2 Puget Sound Vessel Traffic Service

The U.S. Coast Guard monitors the Vessel Traffic Service (VTS), a radar tracking system for all large vessels and tow vessels in Puget Sound and through the Strait of Juan de Fuca. The Coast

Guard can monitor vessel type, speed, and destination via the VTS. The monitoring is done on radar screen and via radio as captains check in when leaving port, or for other reasons, to notify the Coast Guard and/or to inquire about navigational conditions.

The VTS is made up of three components: (1) Vessel Movement Reporting System (VMRS); (2) Traffic Separation System (TSS); and (3) surveillance systems such as rarad (radar advisory) and closed-circuit TV.

The VMRS includes reporting requirements for ships and dissemination of navigational safety information to ships while they are navigating within Puget Sound or outside the Strait. The VTS area includes 12 separate radar sites to track ships. Cameras are located in critical waterways.

All power vessels larger than 131 feet are required to participate in the VMRS, as are any towing vessels (tugs) greater than 26 feet and any licensed vessel for hire carrying 50 or more passengers. Other smaller commercial vessels are required to monitor the system, if not participate. This means that all large commercial vessels and tugboats passing Maury Island are required to participate in the system, including all vessels towing barges to and from the site.

All vessel skippers participating in the system must call in by radio at specific times and locations. For example, skippers of vessels using the system south of Marrowstone Island and Possession Point call in on Channel 14 to the Coast Guard to inform them of their intent to depart and enter the shipping lanes. The Coast Guard requires them to call from their moorings approximately 30 minutes before departure (no less than 15 and no more than 45 minutes) and to call again upon actual departure. A destination is required. The vessel also is required to provide name, type, intended route, and speed. The Coast Guard monitor informs the skipper of other marine traffic in the area based on his/her visual observation of active traffic on the VTS screen. The tug skipper, based on the Coast Guard information provided, departs the dock and enters the shipping channels or makes other navigation decisions on his/her own based on the information provided. The Coast Guard does not direct the vessel, except under special or emergency conditions. The skipper will usually hail the skipper of an oncoming boat, if needed, using Channel 13, to inform that skipper of the tug's intentions. In all cases, the Coast Guard has both vessels on radar in the East Passage and other areas within the VTS system.

During periods of poor weather or visibility, the Coast Guard has the authority to impose additional operating requirements including times of movement or departure.

#### *8.2.2.3 Shipping Trends in the Study Area*

Marine traffic in the area includes personal sail and power craft; petroleum, mineral, bulk cargo or container barges; ships carrying bulk cargo, lumber, or containers; log raft tows; passenger ferries; auto ferries; and occasionally petroleum or crude oil tanker or barge.

The amount of Seattle/Tacoma commercial traffic that sails east of Maury Island past the site is less than the total traffic to Tacoma and points south. This is because three factors encourage some of this traffic, particularly the smaller draft and slower vessels, to travel on the west side of Vashon Island, through Colvos Passage. These three factors are described below.

**Tidal Current.** The outgoing tide passing through the Tacoma Narrows increases in velocity as it passes through the Narrows, leaves southern Puget Sound, and enters Colvos Passage. Because Colvos Passage is in a relatively straight line from the Narrows, the Narrows acts almost as a nozzle, forcing water into Colvos Passage at higher speeds and increasing the northward current. This effect is so dominant that Colvos Passage has a net northward flow (i.e., northward currents dominate the tidal exchange in that area.)

To save time, ships and barges that travel northbound from the Tacoma area often try to use Colvos Passage and do not sail by the project site. Tidal currents are lower in velocity in the East Passage and do not have a net northbound flow.

**Distance.** The shortened distance using Colvos Passage is another reason that some skippers use this route. The distance from Alki Point to Pt. Defiance via the East Passage is 5.2 nautical miles (5.9 statute miles). The same trip via Colvos Passage is approximately 4 nautical miles (4.5 statute miles). At an absolute speed of 2 knots, saving 1.2 nautical miles saves approximately 0.6 hour in travel time.

**Lack of Vessel Traffic System.** Colvos Passage is not covered by the VTS. For that reason, fewer oil-carrying vessels or very large vessels use Colvos Passage. These vessels tend to use the East Passage in both directions to take advantage of the safety coverage and reliability of the VTS to track their position and to inform them about other ships and potential hazards. Whereas the factors described above encourage the use of Colvos Passage by slow barges, tows, and smaller ships, the VTS encourages the use of the East Passage by larger ships and oil-carrying vessels. Thus, ships carrying petroleum products and larger ships generally use the East Passage and pass the project site.

#### *8.2.2.4 Volume of Ship Activity*

The total amount of ship activity through the East Passage and Colvos Passage is very low compared to other waterways, such as Tacoma and Seattle.

A summary of all tracked VTS participants who transited either East Passage or Colvos Passage from April 1999 to April 2000 was prepared by the U.S. Coast Guard (Appendix L). Of the 7,338 deep draft and tow vessels, 4,883 (67 percent) used the East Passage and 2,455 (33 percent) used Colvos Passage. During that same time frame, of the 725 vessels transporting oil or hazardous materials, 680 (93 percent) used East Passage and 44 (7 percent) used Colvos Passage.

Based on the VTS tracking data, approximately 13.4 vessels per day travel past the mining site on Maury Island. On average, one to two of these vessels per day contain oil or hazardous materials.

#### *8.2.2.5 Tug and Barge Activity*

Tug and barge activity is more evenly distributed between East Passage and Colvos Passage. The data provided by the U.S. Coast Guard (Appendix L) can be further broken down based on deep-draft versus tow vessels: 1,862 of 1,909 (97 percent) deep-draft vessels used East Passage while 2,053 of 4,336 (47 percent) tow vessels used East Passage.

A 1991 analysis of the VTS system by the U.S. Coast Guard (John A. Volpe National Transportation Systems Center 1991) examined the amount of ferry, ship, barge, and tug operations in Puget Sound and the Tacoma vicinity. These data are discussed here to give the reader an idea of the relative amount of activity at various locations.

The Tacoma area had approximately 20,000 tug movements in 1987 in addition to nearly 5,000 barge tows of bulk products or dry cargo for a total of 25,000 movements in and out of Commencement Bay. In addition, there were 34,500 small-boat passenger trips in the area. All combined, there were 425 movements in the “large ship” category (tugs and barges fall in the “small” category).

In contrast, the central Puget Sound area (which encompasses Seattle and has a very rare collision incidence) had 45,000 tug movements and 17,000 tanker barge and dry cargo barge movements, for a total of 62,000 trips. (There was one tanker barge and one fishing vessel accident in the 10 years leading up to this survey and four groundings of passenger or cargo ships.) There were 227,500 passenger boat trips for the same period and an additional 165,000 small to large dry cargo vessel trips. Overall activity in that area was 454,950 trips. It was predicted to increase to 711,000 trips by the year 2010.

This can be compared to the number of large ship sailings through the East Passage, as described above, and the existing barge tow operations between Seattle and Tacoma at present, which are likely to approximate a dozen trips per day or about 4,900 per year.

#### *8.2.2.6 Ferry Activity*

The only ferry route in the study area that would be crossed directly by barge traffic from the proposed mining operation for any customer to the north is the Vashon/Fauntleroy ferry route (Figure 8-3). There are 34 to 36 crossings, counting both directions, during the week and approximately 30 crossings on weekend days. Assuming an average of 34 crossings per day for purposes of this EIS, running between the 21-hour period of 5:05 a.m. to 1:55 a.m., there are just over 3 crossings per hour. Because each crossing takes 15 minutes, there is a period of up to 45 minutes every hour when there is a ferry crossing between Vashon and Fauntleroy, except generally between the hours of 2 a.m. and 5 a.m.

There is also considerable ferry activity entering Elliott Bay. For example, the Bremerton and Bainbridge auto ferries and car ferries, the Vashon passenger ferry, the summertime West Seattle ferry, and the commercial ferries (ships and catamarans) to Victoria and other points north travel in this area.

## 8.3 Impacts

### 8.3.1 Truck Traffic

Sand and gravel mining involves the use of heavy trucks to transport material from the mining site to local markets. The use of trucks could impact the operation of local roads and intersections in the vicinity of the project site.

Traffic modeling and level of service predictions are not necessary for this analysis because truck traffic for the proposal is minimal (up to 20 trucks per day maximum) with no overall annual growth likely on the island due to practical limits on development.

Mainland trucking impacts are not evaluated in this EIS because future markets and routes from barge delivery points are only speculative at this time, and the Applicant has confirmed that no off-island trucking would occur from the mine. This EIS also assumes that mainland trucking impacts would be evaluated under SEPA on a case-by-case basis, within the jurisdiction where trucking or construction would occur, as has been done for the third runway at SeaTac and other projects. Because locations, volumes, and receiving capacity are uncertain, and trucking impacts are covered in separate project documents where appropriate, truck impacts at specific barge delivery points are not covered in this EIS.

#### *8.3.1.1 Would truck traffic resulting from the project increase congestion or degrade traffic operations on local streets?*

**Proposed Action.** Under the Proposed Action nearly all of the material mined at the site would be transported by barge. Material hauled from the site by truck to serve the local markets is expected to remain nearly the same as under existing conditions. According to the Applicant, the number of daily truck loads would vary greatly, ranging from none to a maximum of 20 trucks per day. Under normal operating conditions there would be a maximum of approximately two truck trips during the afternoon peak hour. In addition, vehicle trips by employees must be considered. The number of employees working at the site currently varies from none to two. Under the Proposed Action a maximum of 20 employees could be present on the site. Therefore, the maximum total daily vehicle trips at the site during the afternoon peak hour under these conditions would be approximately 24 (20 exiting employees, 2 entering truck trips, 2 exiting truck trips). With these small traffic volumes, no traffic impacts are expected to occur as a result of the Proposed Action.

The proposed future activity levels would also be similar to existing conditions, and could possibly increase at 2.5 percent per year, with all truck traffic serving local markets. At a growth rate of 2.5 percent per year, it would take approximately 30 years for the daily truck traffic to double to 40 daily trips.

**Alternatives 1 and 2.** Under Alternatives 1 and 2, truck traffic would be the same as under the Proposed Action and would serve local markets. Under Alternatives 1 and 2 the maximum number of employees on the site at any one time would be 18 and 12, respectively, and traffic volumes generated by the facility would be lower than under the Proposed Action. Thus, no traffic impacts would be expected under Alternatives 1 and 2.

**No-Action.** Under the No-Action Alternative, mining activities would continue as they have in the past with material being mined primarily for on-island markets. Truck traffic would be the same as under the Proposed Action, while the maximum number of employees that would be present on the site at any one time would be five. Traffic volumes generated by the facility would therefore be lower than under the Proposed Action, and no traffic impacts would be expected.

## 8.3.2 Marine Traffic

### *8.3.2.1 Assumptions*

The discussion here is based on a maximum of four barges per day, in each direction, totaling eight trips to and from markets and the Maury Island dock over a 24-hour period. It is also assumed that, due to size and weight, each barge would have its own tug and would travel alone, not tandem with another barge, and thus require four trips for four barges, each way, for a total of eight trips.

A typical scenario might include the use of three to four barges for delivery to a single site. One barge would be loading at the gravel pit dock, another unloading at the destination, and one or two in transit to or from the site, depending upon distance. Other options might include barge deliveries to separate sites at the same time, which would likely disperse the barge traffic at the receiving end, with no change in traffic at the dock. In any case there would be four round trips per day maximum to/from the site.

A large barge capable of carrying 10,000 tons would carry an equivalent of approximately 7,350 cubic yards of material (at 1.36 tons per cubic yard). At 10 cubic yards per truck, each barge would require about 735 truck trips over 6 hours to unload, or 122 trucks per hour – 61 trucks per hour if tandem hoppers were used. These data are relevant to barging because they reflect the practical limits of barge unloading that can occur at any one location. Trucking impacts at receiving sites are not discussed further in this impact analysis for reasons discussed in Section 8.3.1 and Section 1.1.1.2.

#### *8.3.2.2 To what extent would tug and barge traffic affect or be affected by other boat traffic on Puget Sound, including increased risk of collisions or spills?*

**Proposed Action.** No significant impact to marine transportation is expected as a result of the project although there would be a marginal increase in the absolute risk of the waterway. The combination of VTS requirements, tug/barge speeds, and the very low frequency of shipping operations south of Alki Point contribute to an insignificant marine transportation risk. Tugs and barges operate safely in areas of Puget Sound with much greater traffic densities. These conclusions are explained in detail in the following paragraphs.

Barges departing the dock would be controlled by a tugboat that would tow the barge to its destination. Following the required reporting procedures under the VTS, tugboats, the Coast Guard, and oncoming vessels would be aware of their movements. This is a normal procedure for tugs, and the occasional ship sailing past Maury Island is much less frequent than the ferry traffic and shipping that tugs encounter leaving the Chittenden Locks or Elliott Bay.

Perhaps the greatest navigational exposure to tug/barge combinations leaving the dock would be to southbound traffic approaching Point Robinson, on Maury Island just east of the dock. While barges arriving at Maury Island would be in clear sight and on radar, tug/barge combinations leaving the site northbound or southbound would be entering the traffic lane from behind the point. This is a case where tugs would likely wait for ship traffic to pass the point, rather than trying to enter or cross the lanes in front of them. Regardless, skippers would call the Coast Guard before departure, be informed about oncoming ship traffic, contact the oncoming skipper if needed, and depart the dock at an appropriate time based on conditions.

The U.S. Coast Guard analysis (Appendix L) of the proposed barging activity points out that the traffic lanes off Robinson Point are extremely close to the shoreline; and deep draft vessels often transit this area at velocities greater than 20 knots. Additionally, a VTS "radar shadow" exists near the shoreline just south of Robinson Point. This shadow often causes the automatic tracking function of the VTS to drop track, and VTS occasionally loses radar image of the vessels altogether. However, the vessel track and/or radar image is quickly regained once it departs the shadow.

The U.S. Coast Guard concluded that "the elevated risk to tugs/barges departing the mine site will be mitigated through the full participation of the tugs with the VTS". This includes the timely reporting of their Sailing Plan and Position Reports as required by 33 CFR 161.19. Furthermore if the tug were to choose a course of action that the VTS deemed unsafe, the VTS has the authority to issue the tug a direction under 33 CFR 161.11. For example, the VTS could direct a tug/barge not to get underway until traffic within the traffic lanes had cleared Robinson Point.

Another concern noted by the Coast Guard was the significant recreational boating and fishing activity near the Robinson Point area. Most of these vessels are less than 40 meters (130 feet) and therefore not required to participate with VTS. The size and construction of these vessels also may make them less likely to be detected by the VTS radar. The recreational and fishing activity would be of particular concern during periods of reduced visibility.

Contractors transporting mined material would sign an agreement that strictly prohibits oil/fuel dumping and includes provisions for accidental-spill response procedures, financial liability, and notification requirements. A Spill Response and Containment Plan would be prepared specifying accidental-spill provisions and available spill-response equipment. This plan would be prepared and submitted to the WDNR, Department of Ecology, and King County before barge loading could occur.

The U.S. Coast Guard concluded "that Vessel Traffic Service Puget Sound has the ability to safely handle the modest increase in barge traffic described in the EIS".

**Alternatives 1 and 2.** No significant impacts would occur, as discussed for the Proposed Action.

**No-Action.** As defined in Chapter 2, no barge activity would occur at the Maury Island site.

#### *8.3.2.3 Would tug/barge tows cause wake effects?*

**Proposed Action.** Tug/barge tows on Puget Sound are among the slowest transports on the water. They generate essentially no wake when under tow due to their extremely low velocity. Wake effects from barge/tug combinations are insignificant compared to even the low level of existing shipping traffic that does generate wakes.

The U.S. Coast Guard informs vessels participating in the VTS when the tide level is at or above 11 feet. It is then the responsibility of the professional mariner to take this information under consideration, and to adjust speed to minimize excessive wake when appropriate. The tide level information is announced 30 minutes before predicted levels and continues at 30-minute intervals until the 11-foot tidal height has subsided. Thus, ship-generated wake effects during periods of the most likely damage would be minimized by reminders about tidal height.

**Alternatives 1 and 2.** No significant impacts would occur, as discussed for the Proposed Action.

**No-Action.** No impacts would occur because barging would not occur at the Maury Island site.

#### *8.3.2.4 How would the addition of barge traffic affect the Washington State Ferry System?*

**Proposed Action.** Because most barge traffic would come close to or cross the Vashon/Fauntleroy ferry run, this is the most important single route from the standpoint of potential ferry operation conflict. Impacts to other routes have also been evaluated.

Ferries generally give the right-of-way to commercial vessels crossing their routes. Captain Jim Malde of the Washington State Ferry System stated that the ferry system routinely deals with all shipping on Puget Sound, and an increase of eight barge crossings on the Fauntleroy/Vashon run would not cause significant impacts to ferry operation. He said that evasive maneuvers by ferries do delay the runs momentarily, but that the ferries do not give slow barges the same amount of clearance, or as wide a detour, as they do ships. Therefore, no significant delays are expected, and he did not feel that the barges would in any way disrupt ferry operations (Malde pers. comm.).

Captain Malde also felt that deliveries into Elliott Bay would intersect, or be very close to, routes of the Bremerton and Bainbridge ferries, passenger and auto, and the Vashon passenger ferry. Although not a disruption or significant impact, these ferry runs may also have to avoid the proposed barge activities as well, depending on route and timing.

Based on the routine nature of the encounters, and the very low frequency of barge traffic, barge traffic would have no significant impact on Washington State Ferry traffic.

**Alternatives 1 and 2.** The Proposed Action would have no significant impacts on ferry operations, and therefore alternatives requiring less barging would have even less effect.

**No-Action.** Because barging would not occur at the project site, ferry operations would not be affected.

## 8.4 Adverse Impacts and Mitigation

### 8.4.1 Significance Criteria

King County considers the following as indicators of significance for land and marine traffic under SEPA.

- Directly causing a traffic condition that would likely result in one or more of the following conditions at the time any part of the development is completed and able to generate traffic:

    1. A roadway intersection that provides access to a proposed development, and that will function at a level of service worse than “E”, and that will carry thirty (30) or more added vehicles during any 1-hour period as a direct impact of the proposed development, and that will be impacted by at least 20 percent of the new traffic generated from the proposed development in that same 1-hour period; or

    2. A roadway intersection or approach lane where the director determines that a hazard to safety could reasonably result (Ord. 11617 § 60, 1994).

- Increase in marine traffic that results in substantial additional risk of collision and/or interference with recreational, commercial, or state ferry traffic, so that a collision or other major accident would be likely to occur over the life of the project.

### 8.4.2 Measures Already Proposed by the Applicant or Required by Regulation

Due to the small volume of truck traffic resulting from any of the alternatives, no mitigation measures are required or suggested for land-based transportation systems.

The following mitigation measures apply to marine traffic.

a. Coast Guard requirements for vessels operating in Puget Sound will be applied to all operations.

b. Contractors transporting mined material would sign an agreement that strictly prohibits oil/fuel dumping and includes provisions for accidental-spill response procedures, financial liability, and notification requirements. Accidental-spill provisions and available spill-response equipment would be specified in a Spill Response and Containment Plan. This plan would be prepared and submitted to the WDNR, Department of Ecology, and King County before barge loading could occur.

### 8.4.3 Remaining Adverse Impacts and Additional Measures

#### *8.4.3.1 Trans Impact 1. Increased Risk of Interference or Hazard Due to Unannounced Barge Departure and Arrival*

**Specific Adverse Environmental Impact.** Barging is a regular activity in Puget Sound, and the project would not introduce unusual marine traffic conditions or significantly alter existing traffic and safety. Still, any time a barge crosses Puget Sound, it introduces some risks that, while not necessarily significant, would nevertheless be adverse. Moreover, regular reporting of arrivals and departures is waived under VTS rules if a vessel is working within a 3-mile radius. The distance between the site and potential delivery points on the mainland is just over 3 nautical miles and could erroneously be interpreted to fall within the waiver.

#### *8.4.3.2 Trans Mitigation 1*

Require normal reporting of arrival/departure activities under the Vessel Traffic Service Puget Sound (VTSPS) for all tugs serving the dock. Specific reporting procedures would need to be coordinated with the Coast Guard.

**Regulatory/Policy Basis for Conditions.** U.S. Coast Guard regulations require all towed vessels exceeding 40 m (about 130 feet) in length to participate in the VTSPS. The tugs (about 100 feet long) and barges (over 300 feet long) expected to be used at the site fall under this requirement.

## 8.5 Cumulative Impacts

Development of the project under any of the alternatives would add very minor truck volumes to existing roads. The additional volume is not significant and would not have any cumulative impacts in the project vicinity.

This project would add to existing shipping traffic on Puget Sound. The most important marine traffic conflicts would occur when a gravel barge crosses the course of a petroleum barge being towed with the current, such that the petroleum tow has less ability to steer. The gravel barge is likely to be tied directly to the tug, empty or full, and more maneuverable, and it would generally give the tow the right-of-way. The other potential conflict is shipping activity in the passage involving higher speeds. Because the gravel barge would be crossing the shipping channel and ships would be travelling at higher speeds, tug/barge operators are likely to give the ships the right-of-way, whether coming from port or starboard (left or right).

In either case, whenever leaving moorage, the tug skipper would contact the Coast Guard VTS to check for traffic and handle the crossing with the least possible disruption to other marine transportation.

The scope of this EIS is to identify impacts of mining at the site and to explore potential measures to mitigate significant adverse impacts of that mining. An indirect result of the project would be the ultimate use of the mineral products extracted from the site. Depending on the particular contract, some materials from the Glacier Northwest site would eventually be trucked from water-based off-loading points to inland delivery points. Such trucking would increase traffic and related impacts, including road damage, noise effects, increased traffic delays, safety risks, and air quality impacts from traffic-generated dust and emissions.

It is conceivable that the increased supplies of sand and gravel that would result from this project may allow some other projects to progress more rapidly and at a lower cost. Nevertheless, it is reasonable to assume that these other projects would occur with or without the Maury Island mining operation and are therefore not connected actions. Obviously, the decision to revise the Grading Permit at this mining site would not grant permission for trucking to specific sites, nor would it permit construction projects that would use the materials, for those would constitute separate actions under SEPA (WAC 197-11-060). Accordingly, specific impacts of off-loading materials would be addressed under SEPA on a case-by-case basis, within the jurisdiction where trucking or construction would occur.

## 8.6 Significant Unavoidable Adverse Impacts

None expected. No significant impacts are anticipated due to truck traffic under any of the project alternatives. Barging would require tugs and/or barges to cross traffic lanes, resulting in a marginal increase in the absolute risk to the waterway. Barging is a regular activity in Puget Sound and is subject to existing regulations, standards, and protocols to maintain safe and acceptable navigation. Navigation would be overseen by the Coast Guard and by port authorities at delivery points. Protocols to ensure marine traffic safety are likely to be viable and effective in reducing risks to well below significant levels.

## 8.7 Citations

### 8.7.1 Printed References

Art Anderson Associates. 1998. Marine route study, Lone Star Northwest Maury Island project. March 6. Included as Appendix G to: Huckell/Weinman Associates, Inc. 1998. Expanded environmental checklist for Northwest Aggregates Maury Island mining operation. May.

Huckell/Weinman Associates. 1998. Expanded environmental checklist for Northwest Aggregates Maury Island mining operation. May. Huckell/Weinman Associates.

John A. Volpe National Transportation Systems Center. 1991. Port needs study (vessel traffic services benefits). Volume 2 – Appendices, Part 1. August. Cambridge, MA. Prepared for U.S. Coast Guard, Washington, DC.

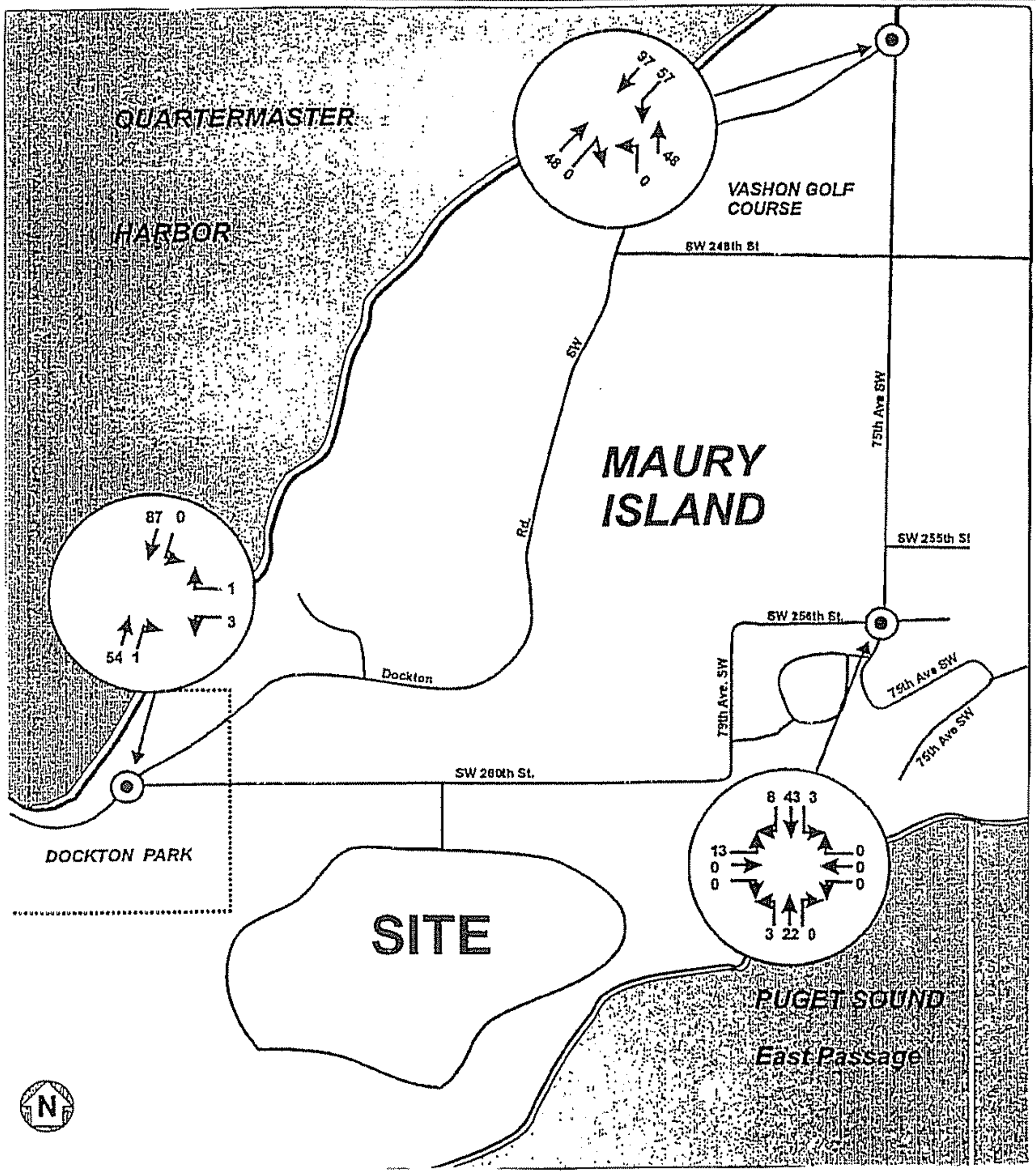
TDA. 1998. Level One traffic analysis. February 19. Included as Appendix F to: Huckell/Weinman Associates, Inc. 1998.

### 8.7.2 Personal Communications

Malde, Jim. Port Captain, Washington State Ferry System. February 3, 1999 – telephone conversation.

## *Table 8-1. Summary of Roads in the Vicinity of the Project Site*

| ***Roadway*** | ***Physical Description*** | ***Comments*** |
|---|---|---|
| ***SW 260th Street*** | Two travel lanes, approximately 11 feet in width, with no center stripe. Shoulders approximately 2 to 4 feet wide along both sides. Shoulder composition varies from grass to gravel. Grade descends to the west. | Provides direct access to the project site via a driveway. |
| ***Dockton Road SW*** | Posted speed limit is 40 mph. Two travel lanes, approximately 10 feet wide, with a center stripe. Shoulders approximately 4 to 6 feet wide along both sides of the road. Shoulder composition varies from gravel to pavement. | Provides access to SW 260th Street from the west. The westbound right turn onto Dockton Road from SW 260th Street is at an acute angle and may present difficulty for trucks turning from SW 260th Street to northeast-bound Dockton Road. |
| ***79th Avenue SW*** | Posted speed limit is 25 mph. Two travel lanes, approximately 11 feet in width, with no center stripe. Shoulders 3 to 4 feet wide along both sides of the road. Shoulder composition varies from grass to gravel. | Provides access to SW 260th Street from the east. |
| ***SW 256th Street*** | Posted speed limit is 25 mph. Two travel lanes, approximately 11 feet in width, with no center stripe. Shoulders approximately 4 feet wide along both sides of the road. Shoulder composition varies from grass to gravel. | Provides access to 79th Avenue SW. |
| ***75th Avenue SW*** | Posted speed limit is 35 mph. Two travel lanes, approximately 10 feet in width. Shoulders 5 to 7 feet wide along both sides of the road. Shoulder composition varies from grass to gravel. | Provides access to SW 256th Street. To the north, 75th Avenue SW merges with Dockton Road, leading to Vashon Island. |




Note: Circular inserts show the number and direction of vehicles at key intersections during peak traffic hours, without the project (per hour, projected for the year 2002).

Source: TDA 1998.

98-306-001
06/14/00

Figure 8-1. Major Roadways in Project Vicinity

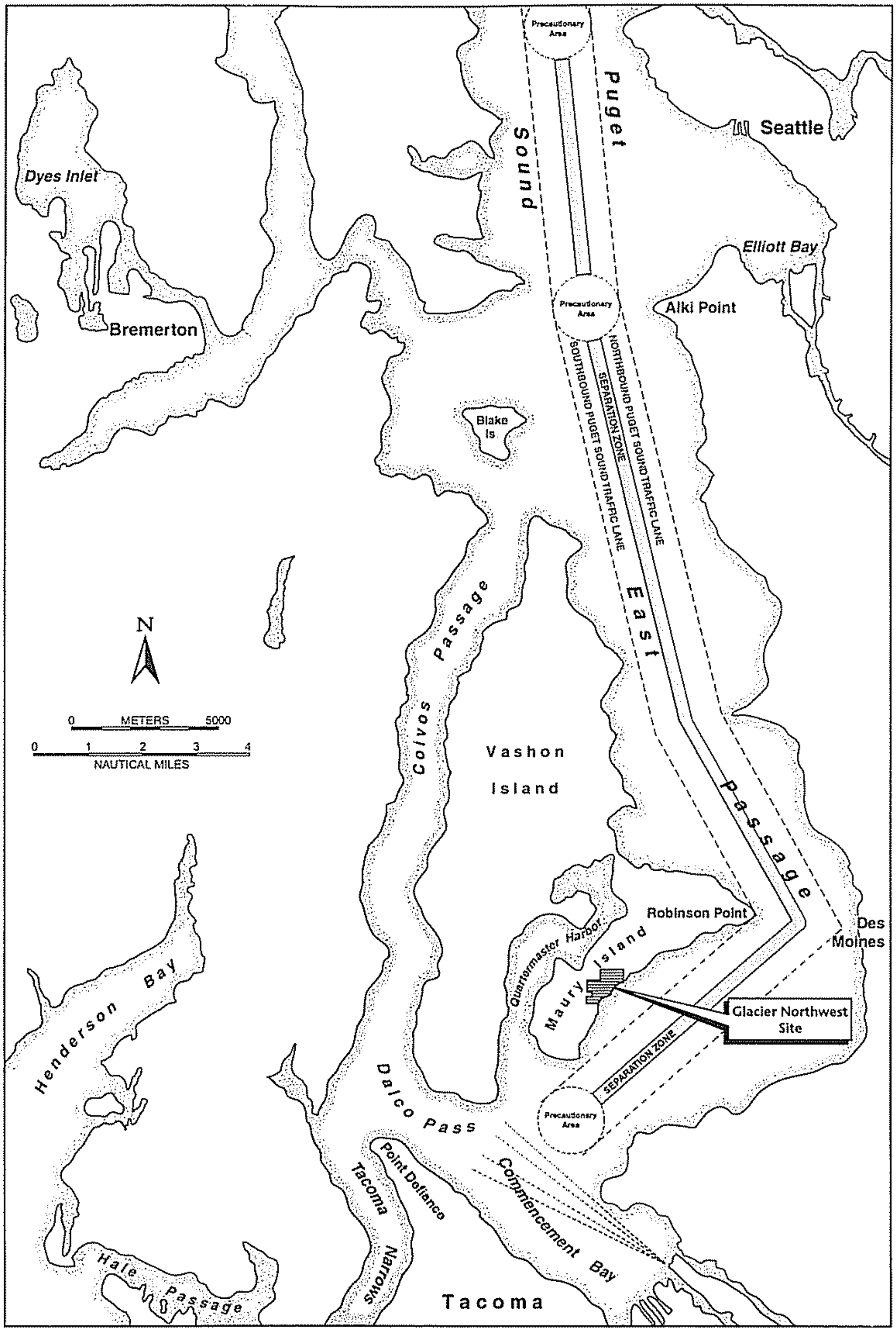
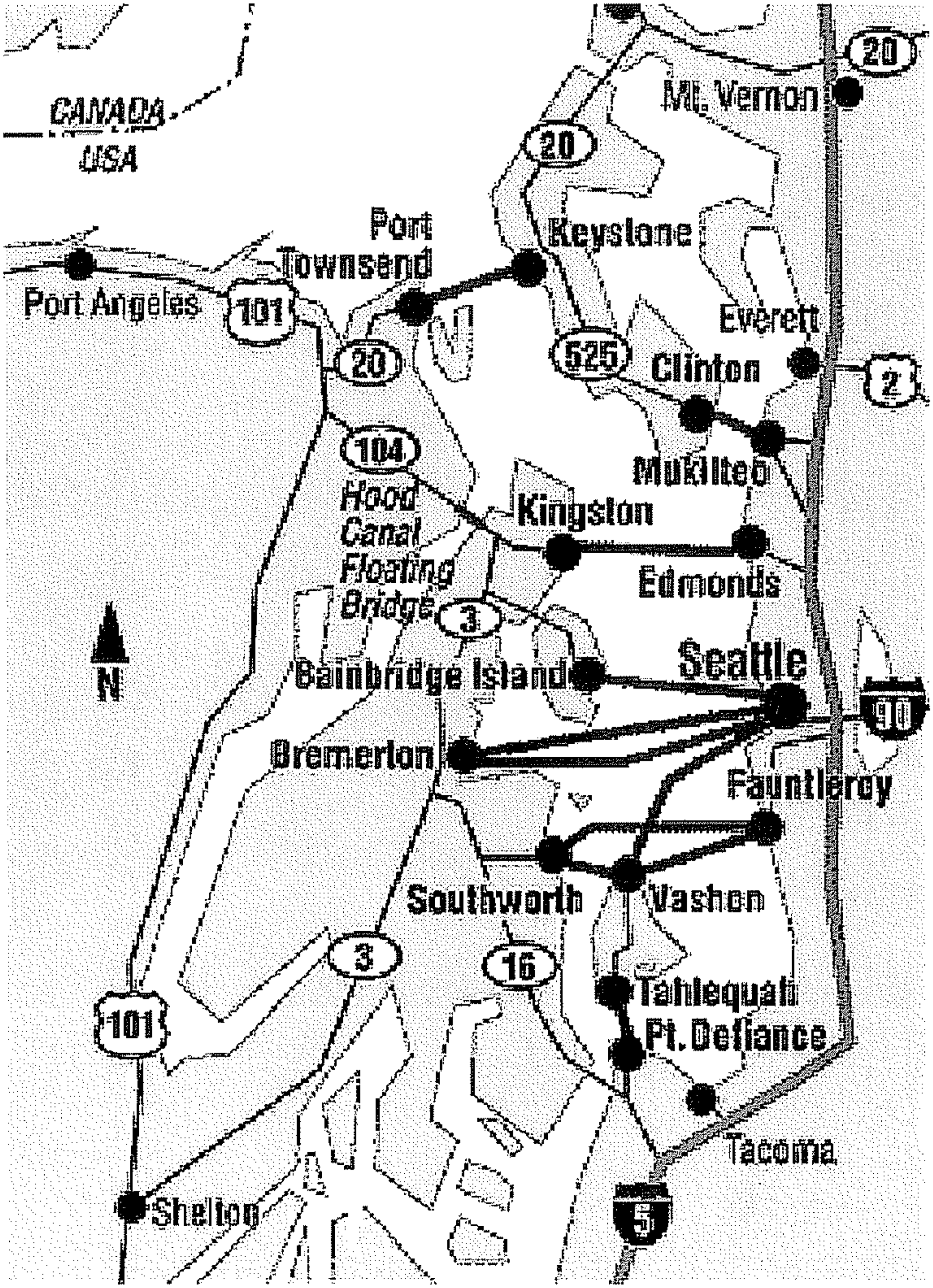



Figure 8-2. Principal Marine Transport Routes in the Vicinity of the Project Site




Source: Washington State Department of Transportaton Web Page
http://www.wsdot.wa.gov/ferries/route-maps. June 2000.

98-306-001
06/14/00

Figure 8-3. Washington State Ferry System Routes on Puget Sound

*Chapter 9*

# Land and Shoreline Use

# Chapter 9

# Land and Shoreline Use

## 9.1 Primary Issues

Compatibility with existing land use plans is typically a key compliance issue. The primary land use issues analyzed in this section are:

- Is the Applicant's proposal consistent with applicable land use policies and regulations?
- What land use changes would occur directly or indirectly, to the project site and adjacent lands, as a result of the proposal?

## 9.2 Affected Environment

### 9.2.1 Current Land Uses

Mining has occurred on the site since prior to World War II. Approximately 40 acres of the site have been mined to date. The site contains a portable screening plant, dock, and conveyor system. Mining activities within the past 20 years have consisted of occasional sand and gravel extraction for local use. Approximately 10,000 cubic yards per year has been extracted from the site under the existing Grading Permit. The removal of gravel has not, however, occured via this site's dock and conveyor system for over 20 years. The remainder of the site is sometimes used for informal recreation (see Chapter 12, Recreation).

Adjacent land uses include the Puget Sound shoreline, the Gold Beach residential community to the northeast, the Sandy Shores residential community to the southwest, and 60 acres of forested land owned by the Washington Department of Natural Resources to the northwest. Other land uses in the site vicinity include residential subdivisions, small 5- to 10-acre farms, some undeveloped parcels, and the community of Dockton.

Several large undeveloped parcels are also located north of the site, across Southwest 260th Street. To the west of the site are single-family homes on approximately 5- to 10-acre lots. The Maury Island community of Dockton is located further west of the site, above and adjacent to Quartermaster Harbor.

### 9.2.2 Growth Management Act, King County Comprehensive Plan, and Vashon Community Plan

The Washington State Growth Management Act, enacted by the 1990 legislature and amended in 1991 and 1992, contains a comprehensive framework for managing growth and coordinating land use planning with infrastructure. GMA requires that local governments designate, where appropriate, "mineral resource lands that are not already characterized by urban growth and that have long-term significance for the extraction of minerals" [RCW 36.70A.170(c)].

King County developed the current Comprehensive Plan in response to GMA, and identified the Maury Island site as a designated mineral resource site (Figure 9-1). To protect such lands, King County has developed policies to assure that adjacent land uses would not interfere with the continued use of these designated lands, in the accustomed manner, and in accordance with Best Management Practices.

According to "Chapter Six: Natural Resource Lands" of the King County Comprehensive Plan (1998), four main steps are necessary to maintain and enhance commercial mineral resource industries. First, mineral resource sites should be conserved through designation and zoning. Second, it is necessary to prevent or minimize land use conflicts between mining, processing, and related operations and adjacent land uses. Third, operational practices are necessary that protect environmental quality, fisheries, and wildlife, but are balanced with the needs of industry. Finally, mining areas need to be reclaimed in a timely and appropriate manner.

Although there are a variety of applicable Comprehensive Plan Rural and Environment policies (see Appendix D), the following Resource Land policies deal directly with existing mineral extraction operations:

***RL-403.*** *In order to not knowingly preclude future use of mineral resources, King County shall identify Potential Mineral Resource*

*Sites in the Comprehensive Plan and subarea plans. With the exception of sites in the Forest Production District, Potential Mineral zoning should be applied to such sites when owner/operators indicate an interest in future mineral resource use for their properties. Identification of Potential Mineral Resource Sites and Potential Mineral zoning does not replace or modify the site-specific zoning, conditional use, and operating approval processes for establishing new mining sites.*

**Discussion.** The site is designated as a Mineral Resource site on the Mineral Resources Map of the King County Comprehensive Plan.

***RL-405.*** *King County should apply zoning or other approvals as appropriate for mineral extraction and processing following site-specific environmental study, sufficient public notice and comment opportunities, when:*

*a. The proposed site contains rock, sand, gravel, coal, oil, gas or other mineral resources, &;*

*b. The proposed site is large enough to confine or mitigate all operational impacts, and;*

*c. The proposal will allow operation with limited conflicts with adjacent land uses when mitigating measures are applied, and*

*d. Roads or rail facilities serving or proposed to serve the site can safely and adequately handle transport of products and are in close proximity to the site.*

*Although extractive operations can control most off-site impacts (see Section C below), concerns about the impacts of mining may effectively preclude mining adjacent to some land uses.*

*In addition, the proximity of conflicting uses to mining sites can increase the cost and difficulty of mining through vandalism to equipment, nuisance complaints and safety problems.*

**Discussion.** This EIS represents an extensive site-specific evaluation consistent with this policy, as do the attendant specialist discussions, inter-department King County review, public debates, interagency consultations, permitting, and SEPA decisions.

This chapter, along with chapters related to noise, air quality, health and safety, and aesthetics, evaluates conflicts with adjacent land use, in accordance with this policy.

***RL-409.*** *King County should prevent or minimize conflicts with mining when planning land uses adjacent to Designated and Potential Mineral Resource Sites. Community plans or other area-specific plans may indicate areas where special circumstances make mining an inappropriate land use. Designated and Potential Mineral Resource Sites and legal non-conforming sites should be shown on comprehensive and community plan maps as they are updated in order to notify nearby property owners and residents of existing and prospective mining activities.*

***RL-410.*** *The periodic review process for M (Mineral) zoned sites and those sites operating in the Forest Production District and as legal nonconforming uses shall include sufficient public notice and comment opportunities. The purpose of the periodic review process is to provide opportunities for public review and comment on the mineral resource facility's fulfillment of state and county regulations and implementation of industry-standard Best Management Practices, and for King County to modify, add or remove conditions to address new circumstances and/or unanticipated project-generated impacts. The periodic review process is not intended to re-examine the appropriateness of the mineral resource use, or to consider expansion of operations beyond the scope of existing permitted operations since that review would be accomplished through the county's permitting process. The periodic review is intended to be a part of King County's ongoing enforcement and inspections of mineral resource sites, and not to be a part of the County's permitting process.*

***RL-411.*** *Conditions and mitigations for significant adverse environmental impacts associated with mining operations should be required, especially in the following areas:*

*a. Air quality;*

*b. Environmentally sensitive and critical areas, such as surface and ground water quality and quantity, wetlands, fisheries and wildlife habitats;*

*c. Noise levels;*

*d. Vibration;*

*e. Light and glare;*

*f. Vehicular access and safety;*

*g. Visual impacts;*

*h. Cultural and historic features and resources;*

*i. Site security; and*

*j. Others unique to specific sites and proposals.*

***RL-413.*** *King County should work with the State Department of Natural Resources to ensure that mining areas are reclaimed in a timely and appropriate manner. Where mining is completed in phases, reclamation also should be completed in phases as the resource is depleted.*

**Discussion.** Policies RL-409 and RL-410 have been implemented via the King County Comprehensive Plan and 1993 zoning code (Title 21A) (see discussion under Section 9.2.3). Polices RL-411 and RL-413 are addressed through the analysis of environmental impacts in this FEIS.

Vashon Community Plan policies have been adopted in “Chapter Fourteen: Community Plans” of the King County Comprehensive Plan (1998 amendment to the 1994 King County Comprehensive Plan). The 1994 King County Comprehensive Plan spelled out the relationship between the Comprehensive Plan and community plans and directed the County to review community plans and repeal or revise them to eliminate conflicts. The County reviewed all community plans adopted between 1973 and 1994 (Vashon Community Plan and Zoning was adopted in 1986) and determined that, while most community plans’ policies are redundant (or in some cases in conflict with the 1994 Comprehensive Plan), some are area-specific and should be readopted as part of the 1998 amendment.

Although the 1986 Vashon Community Plan is no longer in effect as a separately adopted plan, this document contains valuable historical information about Vashon and Maury Islands. It also includes other information that provides background for the new policies adopted in the 1998 “Chapter Fourteen: Community Plans” amendment and for the portions of pre-GMA area zoning that remain in effect.

There are no additional specific mineral resources policies adopted in the 1998 amendment that are new or have been retained from the 1986 Vashon Community Plan. However, a variety of applicable policies that address groundwater, wildlife, and recreation are summarized as follows (the complete text of each policy is found in Appendix D of the DEIS):

**CP-1202.** Importance of Vashon as a recharge area for the single-source aquifer. This subject is addressed in Chapter 4.

**CP-1205.** Protect and preserve the Island's wildlife habitats. This subject is addressed in Chapter 5.

**CP-1209.** Land uses should be planned not to exceed groundwater capacity. This subject is addressed in Chapter 4.

**CP-1210.** No degradation of groundwater should be allowed. This subject is addressed in Chapter 4.

**CP-1211.** Maintain areas deemed highly susceptible to groundwater contamination in residential or non-intensive uses. This subject is addressed in Chapter 4.

**CP-1219 through CP-1221 and CP-1223 through CP-1225.** Encourage preservation and dedication of trails. These subjects are addressed in Chapter 12.

## 9.2.3 King County Zoning Code (Title 21A)

The King County Zoning Code (Title 21A of the King County Code) implements the King County Comprehensive Plan's policies and objectives. The following sections outline the zoning of adjacent lands, followed by a description of King County zoning at the proposed mining site. Subsequent sections outline other elements of the King County Zoning Code that relate to mining and designated mineral resource lands.

### *9.2.3.1 Zoning Designation and Permitted Uses of Adjacent Lands*

Properties to the immediate northeast and south of the site, including the Gold Beach and Sandy Shores communities, are zoned Rural Area 2.5 (one dwelling unit per 5 acres rather than 2.5 acres) (see Figure 9-2). The purpose of the rural zone (RA) is to: "provide for an area-wide long-term rural character and to minimize land use conflicts with nearby agriculture, forest or mineral extraction production industries" (KCC 21A.04.060). Current land use densities in Gold Beach and Sandy Shores are four to five dwelling units per acre, and represent development that occurred prior to the current zoning classification per the 1986 Vashon Community Plan and Zoning designation and the 1995 King County zoning amendment through Ordinance #12065.

Sandy Shores has approximately 70 home sites and Gold Beach has an estimated 220 home sites (Nelson 1997). These existing lots were legally created over the years and are smaller than the zoning allows. They were developed because they met Health Department and King County Code requirements for sewage disposal, water quality, roads, and rural fire protection at the time (1986 Vashon Community Plan and Zoning).

The properties to the immediate north and west of the project site are zoned Rural Area 10 (one dwelling unit per 10 acres) (Figure 9-2). This includes one 40-acre parcel and one 20-acre parcel (totaling 60 acres) owned by the WDNR. Two legal grandfathered 5-acre parcels, bordered on two sides by the project, are zoned Rural Area 10 and owned by Sestrap and Saunders. Properties immediately surrounding the project site are shown in Figure 1-5.

#### *9.2.3.2 Site Zoning Designation and Permitted Uses*

Quarry-mining (Q-M) zoning was originally placed on the site with the adoption of the 1964 Comprehensive Plan former zoning code (Title 21). The 1981Vashon Community Plan and Area Zoning designated the site Q-M potential Suburban Cluster (SC). The subsequent 1986 update to the Vashon Community Plan zoned the project site Q-M potential Rural Area 2.5 (AR-2.5-P). Both plans noted that: "The potential zoning is to ensure consistency with the Plan. When the existing quarrying and mining uses are terminated and the property returned to residential uses, the AR-2.5-P zoning should be designated." The P-suffix conditions dealt with requirements to limit impervious surface and to implement a water use performance standard. They were to be applied at the time of any future residential development.

These designated extraction sites, including the project site, were planned for future residential use. Gold Beach was recognized in the 1986 Vashon Community Plan as a former gravel pit that is now in residential use. All Q-M zoned property was also zoned *potential* AR-2.5 acres (one dwelling unit per 2.5 acres) in the 1986 Vashon Plan and Zoning to indicate long-range plans for residential use of these sites at the conclusion of mining. The 1986 Vashon Community Plan stated (page 31) that rezones for residential development at 2.5-acre densities should be permitted (subject to Vashon Community Plan policies and King County policies and regulations) on Q-M zoned sites following the termination of extractive operations and the "reconditioning of the land".

The zoning was converted to M (Mineral) (potential RA-2.5) in February 1995 to implement the new zoning code (Title 21A), adopted in 1993. The M zone includes mining and processing activities as a permitted use, in the 1995 King County zoning amendment through Ordinance #12065 (see Figure 9-2). The site is also a Designated Mineral Resources Site per the King County Mineral Resources Map (1998).

The purpose of the M zone is "to provide for continued extraction and processing of mineral and soil resources in an environmentally responsible manner" (KCC 21A.04.050). The 1998 King County Comprehensive Plan also specifies (page 107) that designated Mineral Resource Sites are "those properties that are currently either zoned outright for mining or those operating under an approved Unclassified Use Permit. Such sites have undergone a formal review and approval process and, therefore, will permit long-term operations to continue with minimal conflicts with adjacent land uses and continued environmental protection."

The potential RA-2.5 zone is a rural area, one dwelling unit per 2.5 acres zone equivalent to the potential AR-2.5 zoning that existed previously on the site.

In addition to the requirements of the M zone, a special district overlay condition (SO-140) applies to the site as follows:

***SO-140. Ground Water Protection***

*a. The purpose of the ground water protection special district overlay is to limit land uses that have the potential to severely contaminate groundwater supplies and to provide increased areas of permeable surface to allow for infiltration of surface water into groundwater resources.*

*b. For all commercial and industrial development proposals, at least 40 percent of the site shall remain in natural vegetation or planted with landscaping, which area shall be used to maintain predevelopment infiltration rates for the entire site. For purposes of the special district overlay, the following shall be considered commercial and industrial land uses:*

*1. amusement/entertainment land uses as defined by KCC 21A.08.040 except golf facilities;*

*2. general services land uses as defined by KCC 21A.08.050 except health and educational services, daycare 1, churches, synagogues, and temples;*

3. *government/business services land uses as defined by KCC 21A.08.060 except government services;*

4. *retail/wholesale land uses as defined by KCC 21A.08.070 except forest product sales and agricultural product sales;*

5. *manufacturing uses as defined by KCC 21A.08.080; and*

6. *mineral extraction and processing land uses as defined by KCC. 21A.08.090.*

c. *Permitted uses within the area of the ground water protection special district overlay shall be those permitted in the underlying zone, excluding the following as defined by Standard Industrial Classification number and type:*

1. *SIC 4581, airports, flying fields, and airport terminal services;*

2. *SIC 4953, refuse systems (including landfills and garbage transfer stations operated by a public agency);*

3. *SIC 4952, sewerage systems (including wastewater treatment facilities);*

4. *SIC 7996, amusement parks; SIC 7948, racing, including track operation; or other commercial establishments or enterprises involving large assemblages of people or automobiles except where excluded by Section B above;*

5. *SIC 0752, animal boarding and kennel services.*

6. *SIC 1721, building painting services;*

7. *SIC 3260, pottery and related products manufacturing;*

8. *SIC 3599, machine shop services;*

9. *SIC 3732, boat building and repairing;*

10. *SIC 3993, electric and neon sign manufacturing;*

11. *SIC 4226, automobile storage services;*

12. *SIC 7334, blueprinting and photocopying services;*

13. *SIC 7534, tire retreading and repair services;*

14. *SIC 7542, carwashes;*

15. *SIC 8731, commercial, physical and biological research laboratory services;*
16. *SIC 02, interim agricultural crop production and livestock quarters or grazing on properties 5 acres or larger in size, within I zoned lands;*
17. *SIC 0752, public agency animal control facility;*
18. *SIC 2230, 2260, textile dyeing;*
19. *SIC 2269, 2299, textile and textile goods finishing;*
20. *SIC 2700, printing and publishing industries;*
21. *SIC 2834, pharmaceuticals manufacturing;*
22. *SIC 2844, cosmetics, perfumes and toiletries manufacturing;*
23. *SIC 2893, printing ink manufacturing;*
24. *SIC 3000, rubber products fabrication;*
25. *SIC 3111, leather tanning and finishing;*
26. *SIC 3400, metal products manufacturing and fabrication;*
27. *SIC 3471, metal electroplating;*
28. *SIC 3691, 3692, battery rebuilding and manufacturing;*
29. *SIC 3711, automobile manufacturing; and*
30. *SIC 4600, petroleum pipeline operations.*

None of the uses proposed by the Applicant is included in Subsection C of the special district overlay. Subsection B would be addressed through phasing of the project. Forty percent of the site equals approximately 94 acres. No more than two 32-acre phases are proposed to be in mining/reclamation at any one time. The remaining 171 acres would be left in native vegetation or landscaping where appropriate.

#### *9.2.3.3 Development Standards, Operating Standards, and Periodic Review*

The development standards for mineral extraction operations are provided in Chapter 21A.22 of the Zoning Code. Specific site design standards are specified in Section 9.4.2. The King County Zoning Code also requires periodic review of extractive and processing operations in King County (KCC 21A.22.050). Periodic review allows for review of development and operating standards at least every 5 years. The periodic review is conducted by the King County DDES and is used to determine that the site is operating consistent with the most current standards, and to establish other conditions as necessary to mitigate identifiable environmental impacts. The periodic review process also allows for an appeal to the King County Hearing Examiner of the Department's review decision. Although the examiner cannot rule on whether to approve or deny the operating permit, the examiner can determine whether development conditions are adequate to mitigate for environmental impacts. This EIS shall serve as the basis of the County's future periodic review.

#### *9.2.3.4 Sensitive Areas*

Chapter 21A.24 of the King County Zoning Code requires protection of defined sensitive areas including wetlands, streams, and flood, erosion, landslide, seismic, and coal hazard areas. The entire bluff area is an erosion hazard area.

### 9.2.4 King County Grading Permit

The Applicant currently holds a King County Grading Permit (No. 1128) for the project site that has been kept current since 1971. The Proposed Action is considered a revision (King County No. L9800281) to the existing Grading Permit. Per the State Environmental Policy Act, King County has reviewed this permit revision request and issued a Determination of Significance that requires the production, and subsequent review, of this EIS (see Chapter 1).

### 9.2.5 Washington State Surface Mining Act (RCW Chapter 78.44)

The legislature has recognized that the surface extraction of earth minerals for commercial, industrial, or construction purposes is an activity essential to the economic well being of the state. RCW Chapter 78.44 provides that the usefulness, productivity, and scenic values of all lands and waters involved in surface mining within the state should receive the greatest practical degree of protection and restoration. The statute requires submission of a plan for reclamation of mined areas. The reclamation plan must satisfy standards, which are listed in Section 9.4.2.

Administration of this program is conducted through WDNR. The WDNR has review, site inspection, and approval authority over all surface mining reclamation plans.

### 9.2.6 Washington State Shoreline Management Act

The legislature enacted the Shoreline Management Act (SMA) in 1971 to protect the public interest associated with shorelines of the state while, at the same time, recognizing and protecting private property rights consistent with the public interest. The primary mechanism for implementing the SMA is the adoption of Shoreline Master Programs, which must be approved by local governments and the Department of Ecology. King County has adopted a Shoreline Master Program and implementing Shoreline Management Code (updated in 1998) (Section 9.2.7).

The site is located adjacent to Puget Sound and contains "shoreline" area as defined under the SMA. The SMA establishes two basic categories of shoreline:

- *shorelines of state-wide significance; and*
- *shorelines* (all of the water areas of the state, including reservoirs, and their associated wetlands, together with the lands under them).

The SMA does not designate the project site's shoreline as a "shoreline of state-wide significance." Areas of the site from the ordinary high water mark to a line 200 feet landward are regulated under the SMA as "shorelines."

The SMA defines "Substantial Development" as: "Any development of which the total cost or fair market value exceeds two thousand five hundred dollars, or any development which materially interferes with the normal public use of water or shorelines of the state; except that the following shall not be considered substantial development for the purpose of this chapter:

(i) Normal maintenance or repair of existing structures or developments, including damage by accident, fire, or elements; …"

The Applicant's proposal includes work to the existing dock and conveyor system (described in the following section).

### 9.2.7 King County Shoreline Master Program

The King County Shoreline Management Master Program (KCC Title 25) designates the shoreline on the project site as a "Conservancy Environment". This designation is intended to maintain the existing character of this shoreline through the protection, conservation, and management of existing natural resources and valuable historic and cultural areas. The preferred uses in a Conservancy Environment are those that do not consume the physical and biological resources of the area.

The Proposed Action does not include new mining or mining support facilities within 200 feet of the ordinary high water mark (Hillis, Clark, Martin and Peterson 1998a, 1998b, 1998c). The proposal does, however, request authorization for substantial repairs to a dock and conveyor system which are necessary to accommodate the proposed removal and transport of mined gravel material across the shoreline jurisdiction.

Chapter 6 includes more detailed information about the dock.

### 9.2.8 Washington State Department of Natural Resources Aquatic Lands Lease

An Aquatic Lands Lease is required from the WDNR for operations within aquatic lands, including docks. The Applicant has an existing permit for "the express purpose of operating and maintaining a conveyor loading dock". The most recent lease renewal, granted in 1988 for a period of 12 years, states that the "permitted use" of the lease is to "operate and maintain a conveyor loading dock".

## 9.3 Impacts

### 9.3.1 Is the Applicant's proposal consistent with applicable land use policies and regulations?

#### *9.3.1.1 Proposed Action*

**GMA and the King County Comprehensive Plan.** The Proposed Action is consistent with the King County Comprehensive Plan designation of the site as mineral resource lands (see Figure 9-1). This designation is intended to prevent encroachment of residential developments or other uses that may conflict with using the site to provide mineral resources.

Allowing mining to occur on the property at some level will serve to support State Growth Management mandates to conserve and enhance mineral resources of commercial significance (see RCW 36.70A.170). The "County-wide planning policies" of King County require protecting mineral resource land and establish the priority of mineral resource lands in rural areas. See, particularly, Framework Policy FW-9, which encourages the continuation and expansion of resource-based industries in the rural areas.

**King County Zoning Code.** Development of the site is consistent with its zoning as "M" (Mineral Resources) under KCC Title 21A, which includes mining and processing activities as a permitted use (see Figure 9-2). The Applicant has not specifically proposed fences on the site to discourage access to hazardous areas, such as active extracting, processing, stockpiling, and loading areas; unstable slopes; and locations of settling ponds or other stormwater facilities. Specific requirements may be developed as part of mitigation and other conditions for project approval.

Mining of bluffs would eliminate, rather than exacerbate, concerns regarding erosion hazard areas. Such mining is an allowable use.

**Washington State Surface Mining Act.** A modified reclamation plan to meet the statutory requirements of the Surface Mine Reclamation Act (RCW Chapter 78.44) has been submitted to the WDNR by the Applicant. The existing WDNR Reclamation Permit for the site dates back to 1971. In 1991, WDNR reapproved the Applicant's previously modified reclamation plan per RCW 78.44.091.

The Applicant proposes accomplishing site reclamation in discrete segments as mining reserves are depleted in a given area. This phased approach allows revegetation to be initiated at the earliest time practical. Consistent with WDNR requirements, the Applicant proposes site reclamation to be accomplished in four steps:

1. pre-mining site preparation;
2. slope stabilization and erosion control, including stormwater control and temporary erosion control measures (such as hydroseeding and filter fence check dams);
3. final contouring and topsoil placement; and
4. revegetation with grasses, shrubs and trees.

Note that soil augmentation may be required since topsoils would be contained onsite due to concerns about arsenic. See Chapter 2 for further information on the reclamation plan.

**King County Shoreline Master Program.** King County has determined that this proposal requires a Shorelines Substantial Development Permit. Compliance with the Shoreline Master program will be evaluated as part of the SSDP.

**WDNR Aquatic Lands Lease.** The Applicant has regularly renewed its Aquatic Lands Lease with WDNR. The most recent lease renewal, granted in 1988 for a period of 12 years, states that the "permitted use" of the lease is to "operate and maintain a conveyor loading dock". A "plan of operations" included as an exhibit to the lease states that "this lease covers an area which includes a permitted dock used for the shipment of sand and gravel" (Hillis, Clark, Martin and Peterson 1998b).

**Army Corps of Engineers Individual Permit.** The Army Corps of Engineers has determined that the dock facility is no longer "serviceable" and that the standard individual permit process under Section 10 of the Rivers and Harbors Act of 1899 will be required.

#### *9.3.1.2 Alternatives 1 and 2*

Alternatives 1 and 2 would be consistent with area land use plans and policies, with the exception that fencing may need to be added per King County Code, as is the case with the Proposed Action.

Perceived conflicts from residents may be less, since barging and related activities would decrease compared to the Proposed Action.

#### 9.3.1.3 No-Action

Mining under the No-Action Alternative, as defined in Chapter 2, would be consistent with area land use plans and policies as well as the existing Grading Permit.

### 9.3.2 What land use changes would occur directly or indirectly, to the project site and adjacent lands, as a result of the proposal?

#### 9.3.2.1 Proposed Action

The land use of much of the site would change from a low-level to a high-production mining operation. Existing open space features would be removed and reclaimed in phases per the Applicant's proposal. The community's informal recreational use of the property would decrease (see Chapter 12).

The existing land uses in the vicinity of the project site would remain as is or would develop as zoned. It is possible that the residential property that is currently undeveloped would not develop as quickly as under No-Action, due to increased mining activity on the project site. If WDNR disposes of its adjoining 60 acres (currently zoned one dwelling unit per 10 acres), it could be developed as residential properties at that density (Kiehle pers. comm.).

#### 9.3.2.2 Alternatives 1 and 2

Impacts would be the same as the Proposed Action, but changes in land use and subsequent reclamation would occur at a slower rate due to the increased duration of the project. Adjacent land use changes would occur at the same rate as the proposal.

#### 9.3.2.3 No-Action

Development would continue to occur as currently zoned and permitted under the No-Action Alternative. Mining activities on the project site would occur at a very slow pace and therefore would not be as noticeable. In addition, the surrounding RA 10-acre zoned properties would continue to develop residentially as zoned, with single-family homes and small farms.

The existing communities of Gold Beach, Sandy Shores, and Dockton would continue to infill and develop any remaining parcels unless the zoned dwelling density is enforced. The 60 acres of WDNR property adjoining the project site could still change from the existing land use if WDNR chooses to dispose of this property in the future.

## 9.4 Adverse Impacts and Mitigation

### 9.4.1 Significance Criteria

King County considers the following as indicators of significance for impacts on land and shoreline use under SEPA.

- Violating or causing inconsistencies with applicable land-use policies and regulations.
- Rendering existing and approved land uses no longer suitable for such use.

### 9.4.2 Measures Already Proposed by the Applicant or Required by Regulation

The following development measures are required by KCC Chapter 21A.22 (Development Standards – Mineral Extraction):

a. Extractive operations on sites larger than 20 acres must occur in phases.

b. Fences that are at least 6 feet in height above the grade must be provided onsite to discourage access to hazardous areas, such as active extracting, processing, stockpiling, and loading areas; unstable slopes; and any settling pond or other stormwater facility.

c. Fences must have lockable gates at all openings, be no more than 4 inches from the ground to the fence bottom, and be in good repair.

d. Warning and trespass signs advising of the extractive operations must be placed on the perimeter of the site adjacent to RA, UR or R zones at intervals no greater than 200 feet along any unfenced portion of the site where hazardous activities are occurring.

e. Buildings or structures used in the processing of materials must be no closer than 100 feet from UR or R zoned properties; this setback may be reduced to 50 feet when the grade where such buildings or structures are proposed is 50 feet or greater below the grade of the adjacent UR or R zoned property.

f. Buildings or structures used in the processing of materials must be no closer than 20 feet from any other zoned property, except when adjacent to another extractive site, or from any public street.

g. Offices, scale facilities, equipment storage buildings, and stockpiles shall not be closer than 20 feet from any property line, except when adjacent to another extractive site.

h. Landscaping must be provided along any portion of the site perimeter where disturbances, such as site clearing, grading, or mineral extraction or processing, is performed, except where adjacent to another extractive operation.

i. Lighting must be limited to that required for security, lighting of structures and equipment, and vehicle operations, and must not directly glare onto surrounding properties.

Operating standards set forth in KCC Chapter 21A.22 are as follows:

j. Applicable noise standards for operations would be those required by King County Noise Ordinance or as required by project-specific SEPA mitigation, whichever is more stringent.

k. Dust and smoke produced by extractive operations must not substantially increase the existing levels of suspended particulates at the perimeter of the site and must be controlled by watering of the site and equipment or by other methods specified by the County.

l. The Applicant must provide for measures to prevent transport of rocks, dirt, and mud from trucks onto public roadways.

m. The Applicant must provide traffic control measures specified by the County during all hours of operation.

n. The Applicant is responsible for cleaning debris or repairing damage to roadways caused by the operation.

Measures required by the WDNR are as follows:

o. Excavation pits for unconsolidated materials are not to exceed slopes of 1.5:1; banks for open pits in consolidated materials are not to exceed a slope of 1:1; and slopes of quarry walls have no prescribed slope standard but precautions are to be made to provide adequate safety.

p. Strip mining operations must grade spoil banks to match the contours of the surrounding land.

q. Suitable drainage systems must be constructed to prevent any collection of stagnant water.

r. Materials used for backfilling and grading must not be noxious, flammable, or combustible.

s. Acid-forming refuse must be covered with at least 2 feet of clean fill and graded to prevent drainage into the area.

t. Vegetated cover appropriate for the eventual use of the site is required as part of the reclamation plan.

## 9.4.3 Remaining Adverse Impacts and Additional Measures

### *9.4.3.1 LU Impact 1 – Potential Conflict with Residential Uses*

**Specific Adverse Environmental Impact.** While consistent with existing zoning, the project would increase industrial activity next to residential communities. Most concerns are expected at the project boundary, since the Applicant proposes to mine within 50 feet of adjacent properties.

### *9.4.3.2 LU Mitigation 1*

Increasing the vegetated perimeter at selected locations, as necessary, would reduce potential conflicts with or disturbances to adjacent residences. In addition, because land use involves many elements of the environment, mitigation measures for other elements would apply to reduce potential conflicts with adjacent land use.

**Regulatory/Policy Basis for Condition.** The 1994 Comprehensive plan outlines several policies to ensure and protect limited conflicts with adjacent land uses (see RL-405 and RL-411).

## 9.5 Cumulative Impacts

Increased mining would be additive to that which has already occurred on Maury Island, or which is likely to occur under existing zoning.

This project is not part of a series of actions that may cause cumulative effects. However, Vashon and Maury Island are expected to continue to grow. Residential and commercial development will surely continue to increase, and with it will come reduced forest, including madrone, and loss of wildlife habitat.

## 9.6 Significant Unavoidable Adverse Impacts

None expected. The project, however, would create noise, visual, and access changes that would be considered adverse by members of surrounding communities.

The residential environment would be adversely affected by noise and visual disturbance, but such impacts would be in compliance with existing land use law, especially in light of the current zoning of the site.

One of the primary reasons to identify mineral sites is to notify nearby property owners and residents of existing and prospective mining activities (see RL-409).

Decisions regarding the Shoreline Management Act, including additional mitigation, would be resolved prior to King County issuance of a grading permit.

Through the grading permit process, the Applicant is required to comply with all applicable provisions of the King County Zoning Code 21A, in particular, and the Development Standards for Mineral Extraction specified in KCC 21A.22.010 through 090.

Of critical importance is adherence to the periodic review process to ensure ongoing operations are continuing in accordance with the conditions of approval established under the decision, should the project proceed and be approved with conditions. In particular, fencing, Warning/Trespass signs, landscaping, and lighting shall be provided as stipulated in KCC 21A.-.22.060(C),(D),(G), and (H).

## 9.7 Citations

### 9.7.1 Printed References

Hillis, Clark, Martin and Peterson. 1998a. Memorandum to King County Department of Development and Environmental Services. February 19.

______. 1998b. Memorandum to King County Department of Development and Environmental Services. February 24.

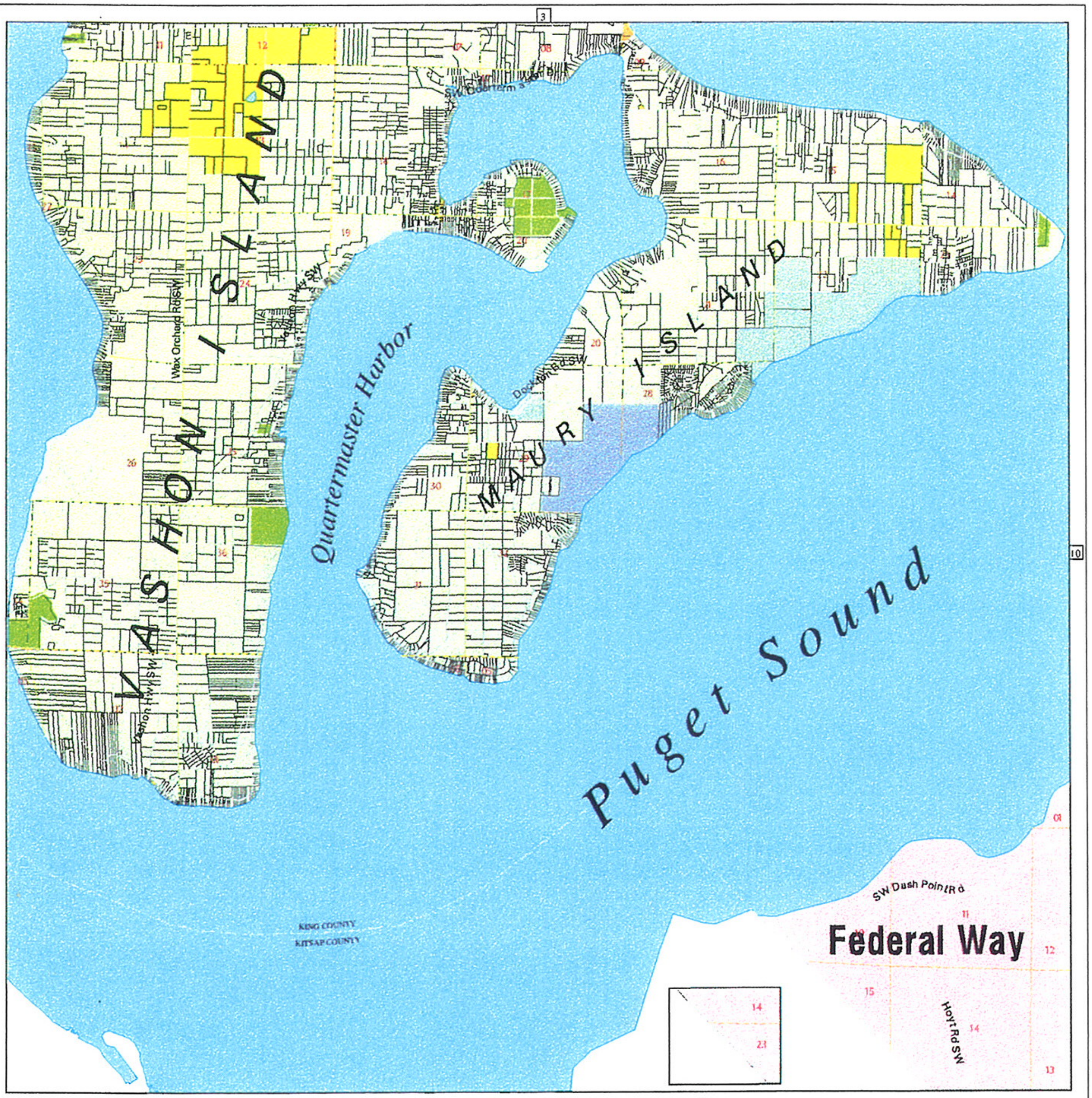
______. 1998c. Memorandum to King County Department of Development and Environmental Services. May 28.

King County. 1997. 1994 King County comprehensive plan, complete with 1997 updates and 1998 amendments. King County Department of Development and Environmental Services. Renton, WA.

Nelson, S. 1997. Letter to King County Department of Development and Environmental Services. December 30.

### 9.7.2 Personal Communications

Kiehle, Dave. Land manager, Department of Natural Resources, Enumclaw Office. January 22, 1999 – telephone conversation.




# KING COUNTY COMPREHENSIVE PLAN LAND USE MAP 1997

Vashon Island South

Includes Comprehensive Plan Land Use changes through Ordinance #12927 (December 1997)

DDES

0 0.2 0.4 0.6 0.8 1

MILES

- Unincorporated Activity Center
- Community Business Center
- Neighborhood Business Center
- Commercial Outside of Centers
- Urban Plan Development
- Urban Residential > 12du/ac *
- Urban Residential 4-12du/ac *
- Urban Residential 1du/ac *
- Rural City Urban Growth Area
- Rural Town
- Rural Neighborhood
- Rural Residential 1du/2.5-10ac
- Industrial
- Forestry
- Agriculture
- Mining
- Greenbelt/Urban Separator
- King County Owned Open Space/Recreation
- Other Parks/Wilderness
- Incorporated City
- Urban Growth Area Boundary

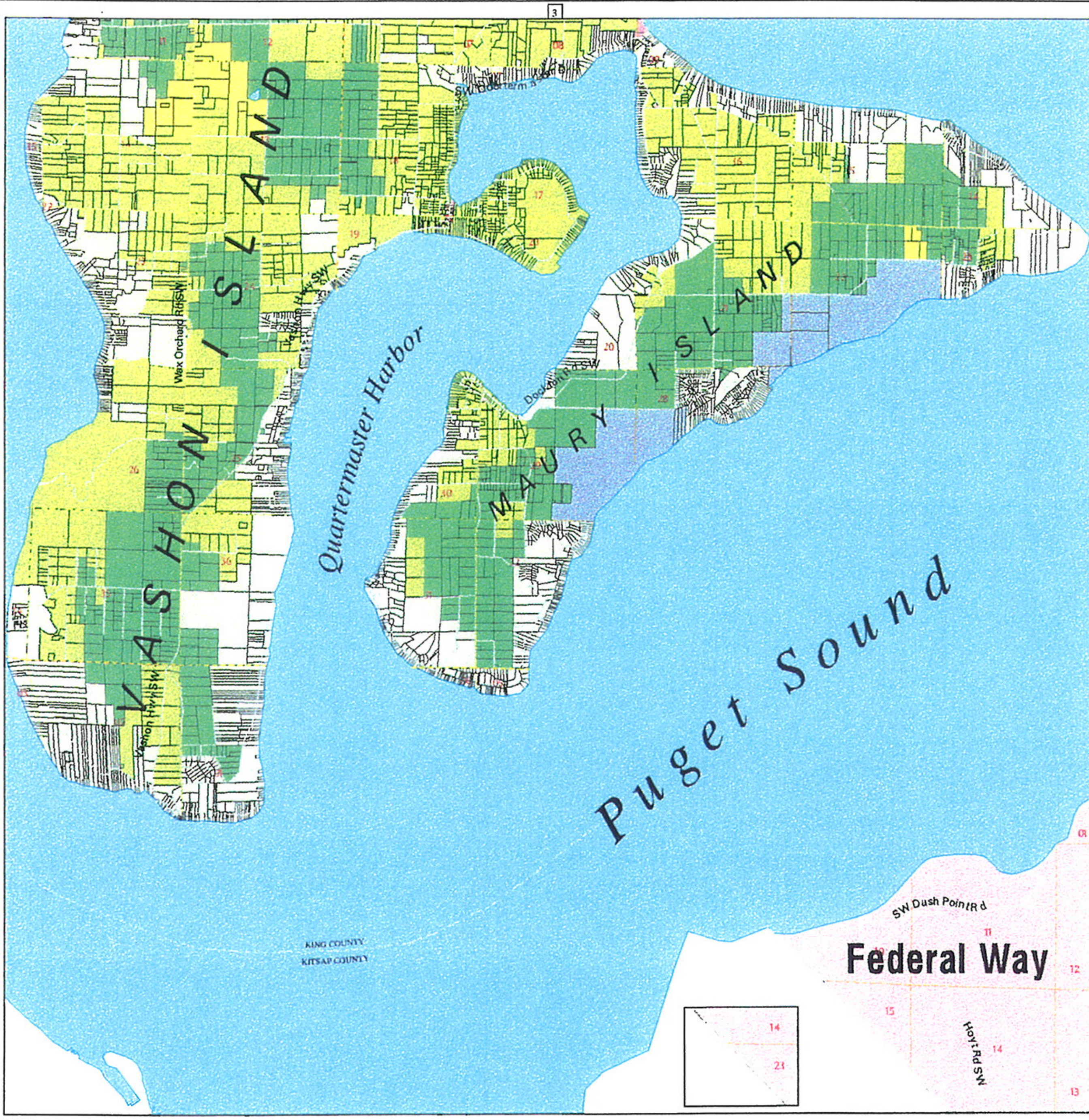
* Densities shown on this map do not include density lost from environmental controls nor additional density achieveable through clustering and allowed bonuses. (du = dwelling unit; ac = acre)

The maps in the King County Comprehensive Plan and its technical appendices and this atlas are produced with a computer geographic information system. For additional information about features depicted on this map or other Comprehensive Plan maps please contact the appropriate agency listed on the information sheet located in the inside front pocket of the Comprehensive Plan Binder, or call the Growth Management Hotline at 296-8777. For parcel-specific land use or zoning inquiries, please call the Department of Development and Environmental Services at 296-6600.

This map is intended for planning purposes only and is not guaranteed to show accurate measurements.

Source:
King County DDES Web site,
www.metrokc.gov/ddes.

Figure 9-1.
Comprehensive Plan
Land Use Designations




KING COUNTY
ZONING ATLAS

Vashon Island South

Includes zoning changes through Ordinance #12814 (February 1998)

- A-10 - Agricultural, one DU* per 10 acres
- A-35 - Agricultural, one DU* per 35 acres
- F - Forest
- M - Mineral
- RA-2.5 - Rural Area, one DU* per 5 acres
- RA-5 - Rural Area, one DU* per 5 acres
- RA-10 - Rural Area, one DU* per 10 acres
- UR - Urban Reserve, one DU* per 5 acres
- R-1 - Residential, one DU* per acre
- R-4 - Residential, four DU* per acre
- R-6 - Residential, six DU* per acre
- R-8 - Residential, eight DU* per acre
- R-12 - Residential, 12 DU* per acre
- R-18 - Residential, 18 DU* per acre
- R-24 - Residential, 24 DU* per acre
- R-48 - Residential, 48 DU* per acre
- NB - Neighborhood Business
- CB - Community Business
- RB - Regional Business
- O - Office
- I - Industrial
- Incorporated City
- Urban Growth Area Boundary

THIS MAP SHOWS ONLY THE BASE ZONING FOR EACH PARCEL OF PROPERTY.

THIS MAP SHOWS ONLY BASE ZONING FOR EACH PARCEL.

THIS MAP DOES NOT SHOW SPECIAL DEVELOPMENT CONDITIONS, SUCH AS P-SUFFIX CONDITIONS, SPECIAL DISTRICT OVERLAYS, OR POTENTIAL ZONING THAT APPLY TO MANY PROPERTIES IN KING COUNTY.

THIS MAP IS A GENERAL COLOR REPRESENTATION OF OFFICIAL ZONING CONTROLS. FINAL DECISIONS ON ANY INCONSISTENCIES ARE BASED ON THE ORDINANCE ESTABLISHING THE CURRENT ZONING.

ALL PROPERTY-SPECIFIC DEVELOPMENT CONDITIONS ARE DISPLAYED ON THE OFFICIAL ZONING CONTROL AT THE DEPARTMENT OF DEVELOPMENT AND ENVIRONMENTAL SERVICES (DDES), 900 OAKESDALE AVE SW, RENTON, WA 98055, TELEPHONE 296-6600.

THE ATLAS IS PRODUCED BY KING COUNTY'S COMPUTER GEOGRAPHIC INFORMATION SYSTEM. COPIES OF THIS ATLAS ARE AVAILABLE FOR REVIEW OR PURCHASE AT DDES.

* DU = Dwelling Unit

DDES

0 0.2 0.4 0.6 0.8 1
MILES

Source:
King County DDES Web site, www.metrokc.gov/ddes.

Figure 9-2.
King County Zoning

*Chapter 10*

# Environmental Health and Safety

# Chapter 10

# Environmental Health and Safety

## 10.1 Primary Issues

This chapter evaluates environmental health issues related to arsenic, cadmium, and lead. These metals are present in surface soils at the site due to deposition from airborne arsenic from past smelter operations in Ruston.

The primary issues analyzed in this chapter are:

- Would mining remobilize the existing arsenic in the site topsoils as air contamination and dust?
- Would mining remobilize the existing arsenic in the site topsoils as surface water contamination?
- Would arsenic be present in soils to be sold and exported from the site?
- Would arsenic enter groundwater as a result of the proposal?
- Would tug propeller wash stir up contaminated sediments and harm endangered fish species or other marine life?

## 10.2 Affected Environment

### 10.2.1 Background

The Glacier Northwest site is located approximately 5 air miles from the now-closed ASARCO smelter. During the operation of this smelter, from approximately 1890 to 1985, fallout containing arsenic, cadmium, lead, and other contaminants was distributed to surrounding areas, including Maury Island and the Glacier Northwest site.

The ASARCO smelter facility and the immediate vicinity have been designated an EPA Superfund site (this designation did not encompass the Vashon/Maury Island area). Site closure and remedial measures are well underway at both the smelter site and the neighborhoods surrounding the smelter.

A series of studies has been performed to evaluate the distribution and exposure pathways of contamination left as a result of the smelter operation.  For the Vashon/Maury Island area, the defining document has been the Ruston/Vashon Arsenic Exposure Pathways Study (University of Washington 1987) (referred to as “the Pathways Study” in this chapter). The Seattle-King County Health Department is currently reviewing the analysis of a new set of soil samples obtained form Vashon/Maury Island and preliminary results were released in April 2000.

Additional studies and background information used for the FEIS analysis include:

- The Potential Water Quality Impacts and Mitigations report (AESI 1998b) and the Soils, Geology, Geologic Hazards, and Groundwater Report (AESI 1998a), both prepared for the environmental checklist; both reports are available at the Vashon Community Library;
- preliminary results of a study of arsenic and lead contamination on Maury/Vashon Islands by King County Public Health (2000);
- an addendum report on groundwater that includes additional groundwater testing from new monitoring wells installed for the EIS analysis (AESI 1999); this report is also available at the Vashon Community Library;
- an additional evaluation of onsite arsenic, including new testing completed for the EIS by Terra Associates in 1999; the memorandum reporting Terra’s findings was included in Appendix B of the DEIS; and
- a memo prepared by Terra Associates summarizing the results of all groundwater monitoring performed on the site by AESI (Appendix E of the DEIS with Addendum in the FEIS).

The results of these studies are described in the following section.

### 10.2.2 Existing Contaminant Distribution

Based on direct testing on the project site, and on previous studies (as cited in text), approximately the top 18 inches of soils at the site contain arsenic, lead, or cadmium in concentrations above natural levels (Table 10-1 and Figure 10-1). This is not surprising since the material arrived at the site through aerial fallout from the ASARCO smelter, leaving what is called a "mantle" of contaminants on the surface.

Arsenic, lead, and cadmium are evaluated in this EIS. Levels of these three metals above MTCA residential cleanup values have been identified in the near-surface soils at the site. Other metals were also present in the plume, but the results of studies both at Ruston and at the Everett Smelter site indicate that these three metals are the best indicator for the plume. Moreover, lead and cadmium levels correspond with elevated arsenic levels. Therefore, the following discussion will focus on arsenic and lead, which will be used as indicators for contamination resulting from the smelter emissions. Wherever arsenic levels on the site are below MTCA Method A Residential levels, the other two metals are also present in concentrations below the applicable cleanup level.

Much of the surface soil at the site contains arsenic and lead levels well above what would be expected to occur naturally. Natural levels of arsenic in western Washington range from 1 to 7 ppm (Ecology 1994), while studies conducted for this EIS found levels of arsenic in project site topsoils ranging from 6 to 330 ppm (see Appendix B of the DEIS). Studies conducted by Landau Associates (1999) and AESI (1998b) also found elevated levels of arsenic in the topsoils at the site. The highest level of arsenic found to date on the site is 477 ppm in a surface sample (Sample GM-8, reported by AGRA). Natural levels of lead in western Washington range from 5 to 30 ppm. The levels of lead found in the surface soils on the site ranged from less than 5 ppm up to 840 ppm. The elevated levels of lead correspond to areas where the arsenic levels were also elevated with respect to background or natural levels of theses two metals. Elevated arsenic levels occur throughout Vashon and Maury Island, as documented in the Pathways Study, which found levels ranging from 2 to 290 ppm (University of Washington 1987), and by King County (King County Public Health 2000).

The Pathways Study focused on human exposure, with soil sampling concentrated in areas where children would be exposed to near-surface soils. The sampled areas included homes, schools, and playgrounds. No testing was done in the forested areas of the Islands. As such, the levels of arsenic in tested areas were diluted by cultural activities, such as lawn mowing, tilling, and earth grading activities.

Supplemental soil sampling and analytical testing was conducted by Foster Wheeler (Appendix C of the DEIS). The Foster Wheeler testing showed a peak lead value of 840 ppm in a surface sample. The highest level found in samples collected by Terra was 830 ppm. Testing by Foster Wheeler also showed a surface sample with a cadmium level of 9.8 ppm. The highest cadmium level in samples collected by Terra was 9.3 ppm. These variations are not significant, and the results of the supplemental site sampling is consistent with the testing done by Terra Associates. [Note: Table 3 in Appendix C of the DEIS contained typographical errors for three entries: surface arsenic concentrations for Samples 10 and 11, and surface lead concentration for Sample 12. The correct values are: Sample 10, surface, arsenic: 4.3; Sample 11, surface, arsenic: 1.9; Sample 12, surface, lead, 5.8. The correct data for Table 3 of Appendix C in the DEIS is included with the FEIS as an erratum to Appendix C.]

The amount of arsenic within some topsoils at the site exceeds cleanup levels established by the EPA for the ASARCO cleanup in Ruston and North Tacoma, as well as industrial and residential cleanup levels defined in the MTCA. During the EPA evaluation and cleanup of the area nearest the ASARCO smelter, within the Ruston/North Tacoma study areas, EPA set an "action" level at 230 ppm for arsenic. The action level was that concentration at or above which required removal or containment of contaminated soils to protect human health. Under the MTCA, the limit for arsenic is 20 ppm in residential areas and 200 ppm for industrial areas. Since the project site is zoned and managed as a mining site, it falls under the industrial area classification of the MTCA. However materials to be mined from the site would need to meet residential cleanup standards. Hence the remedial action will need to clean up site soils to meet MTCA residential cleanup standards.

In contrast to the contaminant concentrations found in surface soils, subsurface sand and gravel deposits on the site (the material that would be exported from the site) contain natural levels of arsenic, lead, and cadmium, based on direct testing of these materials. "Natural" levels are those that occur naturally throughout the Puget Sound region. As shown in Table 10-2, none of the subsurface samples analyzed contained elevated levels of these contaminants (sample locations shown in Figure 10-2).

Likewise, levels of these contaminants in groundwater at the site and throughout Vashon/Maury Islands are also within natural levels, based on the direct testing done at the site and on previous testing conducted by the University of Washington (1987) and others. The ambient levels of arsenic in the advance sand aquifer in the vicinity of Naval Submarine Base Bangor were found to be less than 1 μg/l for the 50th percentile value (average value range) and 4 μg/l for the 90th percentile value (upper range of the ambient water quality) (Greene 1997). The geologic conditions beneath Maury Island are similar to the geologic conditions in the area covered by the Greene report in Kitsap County. Testing conducted by AESI (1999) found arsenic levels in groundwater on the project site to range between 0.002 and 0.004 ppm (the MTCA groundwater cleanup level is 0.005 ppm). Tests conducted for the Pathways Study identified levels at less than 0.010 ppm. Prior groundwater testing summarized by Carr and Associates (1983) and Vashon-Maury Island Groundwater Advisory Committee (1998) also found groundwater levels of arsenic, lead, and cadmium to be within natural limits on Vashon and Maury Islands.

Surface water on the site is essentially absent, so none is contaminated. Rain tends to percolate rapidly into the porous sand and gravel deposits at the site. Some drainage was observed along roadsides during heavier rainfall events. The areas that generate runoff are disturbed areas that have been found to have arsenic at naturally occurring background levels. Thus, runoff from roadways and disturbed areas would not be exposed to elevated arsenic. Overall there is no significant surface water on the site and, therefore, no contaminated surface water is present.

## 10.3 Impacts

### 10.3.1 Would mining remobilize the existing arsenic in the site topsoils as air contamination and dust?

#### *10.3.1.1 Proposed Action*

The Applicant proposes to excavate materials that have been exposed to arsenic fallout from 1890 to 1995. Since falling on the site, the arsenic has remained relatively stationary in a shallow "mantle" over the site, being concentrated in the uppermost levels of the topsoils and declining with depth, with little arsenic present below 18 inches. The arsenic has chemically bound to organic materials in the topsoil, and does not easily wash out of the soil with water.

In its current state, the arsenic poses relatively little danger to anyone off the site, since it is essentially trapped in firm soils contained by roots. The primary risk would be to people using the site, with direct contact with contaminated soils being the biggest concern.

However, with continued mining at the site, these soils would be excavated, removed, and contained each time a previously undisturbed area is prepared for mining. The Applicant proposes to segregate and isolate the impacted topsoils as a Voluntary Cleanup Action under MTCA. A Cleanup Action Plan would be developed that would include a soils management plan. During this containment process, contaminated materials would be in contact with the air and, therefore, vulnerable to being blown away as dust. Chapter 3 describes how the operator would be required to prepare a dust control plan in consultation with the Puget Sound Clean Air Agency. However, because of concerns regarding arsenic, additional measures must be taken to address potential impacts from dust generated from contaminated soils. These measures are described in Section 10.4, and include covering exposed materials and limiting soil clearing operations to 2-acre parcels at any one time.

With these mitigation measures in place, significant risks to the environment or human health would be effectively mitigated.

#### *10.3.1.2 Alternatives 1 and 2*

The risk of arsenic becoming airborne would be effectively mitigated under either of the action alternatives for the same reasons stated for the Proposed Action.

#### *10.3.1.3 No-Action*

No impact would occur even though limited mining would continue under No-Action. The Applicant would still be required to manage soils at the site according to measures prescribed by Ecology, since this issue has been brought to the attention of the Applicant, the public, and Ecology.

### 10.3.2 Would mining remobilize the existing arsenic in the site topsoils as surface water contamination?

#### *10.3.2.1 Proposed Action*

Because there are no streams or other surface waters on the site, arsenic or other contaminants cannot travel offsite via surface water flows.

In addition, direct laboratory testing of arsenic-containing soils from the site has demonstrated that arsenic at the site is in a stable form, being bound tightly to surface soils. Leachability analyses (the ability of a material to be washed down through soils with rainwater) of soils containing the highest concentrations showed that arsenic deposits in soils at the site are resistant to leaching (see Appendix B of the DEIS). The fact that sampling also showed that arsenic has remained within the top 18 inches of soils further demonstrates that the arsenic is not very leachable.

Finally, the Applicant is proposing to contain contaminated soils (see Appendix C of the DEIS). With such containment, the end result of the project would include remediation of the site, with arsenic being contained rather than mobilized.

#### *10.3.2.2 Alternatives 1 and 2*

Arsenic would not enter the surface waters under either of the action alternatives for the same reasons stated for the Proposed Action.

#### *10.3.2.3 No-Action*

Under No-Action, limited mining would continue, but again, for the reasons already stated, arsenic would not enter surface waters.

### 10.3.3 Would arsenic be present in soils to be sold and exported from the site?

#### *10.3.3.1 Proposed Action*

Under the Proposed Action, contaminated soils would be segregated from materials to be exported. Sampling has demonstrated that the sands and gravels proposed for export from the site have only naturally occurring levels of arsenic, cadmium, and lead. Contaminated materials would be contained onsite, as described in Section 10.4.

#### *10.3.3.2 Alternatives 1 and 2*

Arsenic would not be exported from the site under either of the action alternatives for the same reasons stated for the Proposed Action.

#### 10.3.3.3 No-Action

Under No-Action, limited mining would continue, but again, for the reasons already stated, arsenic would not be transferred offsite.

### 10.3.4 Would arsenic enter groundwater as a result of the proposal?

#### 10.3.4.1 Proposed Action

Mining at the site, as proposed, would not result in arsenic entering the groundwater. The primary fact that leads to this conclusion is that arsenic is tightly bound to topsoils at the site. Arsenic has not entered the groundwater or subsurface sand and gravel deposits since arsenic first drifted onto the site from the ASARCO smelter more than 70 years ago. Testing of groundwater conducted by Carr and Associates, Geraghty and Miller, and AESI, and tests of the Gold Beach water supplies, show that groundwater levels of arsenic are within natural levels on Vashon/Maury Islands.

The Applicant is proposing to completely contain contaminated soils onsite, using a lined and covered containment cell, as described in Section 10.4 and in Appendix C of the DEIS.

#### 10.3.4.2 Alternatives 1 and 2

Arsenic would not enter groundwater under either of the action alternatives for the same reasons stated for the Proposed Action.

#### 10.3.4.3 No-Action

As with the Proposed Action, no impacts on groundwater are expected. While mining activity is assumed to be much lower under No-Action, the Applicant would still need to resolve the issue of the impacted soils during mining.

### 10.3.5 Would tug propeller wash stir up contaminated sediments and harm endangered fish species or other marine life?

#### 10.3.5.1 Proposed Action

Residents in the area raised this question during public scoping. The likelihood of this occurring is negligible for several reasons.

First, the deposition of arsenic through water is not nearly as direct as that through air. Arsenic deposited on the waters of Puget Sound was greatly diluted and dispersed by wave action and currents.

Second, the sands and sediments themselves are subject to much greater agitation and movement than are terrestrial soils. Wave action causes beach sands to move along shorelines (a process called littoral drift). Winter storms also mix and wash sands away, thereby diluting arsenic into very low concentrations.

Third, the tugs are not expected to cause significant amounts of sediment disturbance. The tugs would be positioned in deep water, with propeller wash directed either parallel to or away from the shoreline and, in many cases, tugs would be located on the seaward side of the barge. They would not stir up significant amounts of sediment (see Chapter 6).

With all of these considerations, arsenic risks to endangered fish or other marine life would not change significantly due to barging.

#### *10.3.5.2 Alternatives 1 and 2*

Propeller wash would not cause arsenic-related impacts on endangered fish species or other marine life for the same reasons stated for the Proposed Action.

#### *10.3.5.3 No-Action*

Under No-Action, barging would not occur. There would be no concerns regarding arsenic and propeller wash.

## 10.4 Adverse Impacts and Mitigation

### 10.4.1 Significance Criteria

King County considers the following to be indicators of significance for environmental health and safety impacts under SEPA:

- posing long-term risks to human health or the environment, such as storage, handling, or disposal of toxic or hazardous material; or
- violating the Model Toxic Control Act or other laws aimed at handling and storage of hazardous waste.

### 10.4.2 Measures Already Proposed by the Applicant or Required by Regulation

a. **Cleanup Action Plan.** At the request of King County, the Applicant has prepared a draft soils management plan to allow public and agency review and comment on proposed measures (included as Appendix C in the DEIS). Following public and agency review of the draft soils management plan, King County will require the Applicant to prepare a final Cleanup Action Plan (CAP). The plan shall be accepted and approved by King County prior to issuance of a permit for mining above current levels at the site.

   The draft management plan (Appendix C of the DEIS) proposes to contain contaminated soils in a lined and covered containment cell located on the north side of the property. No topsoils would be removed from the site. The containment cell would be built in phases (Figure 10-3). At full capacity (when mining is complete), the berm would measure up to 30 feet high and 2,100 feet long. The berm would have clean soil placed on top of it, and it would be vegetated. As recommended in Chapter 5, revegetation with native species would be preferred.

   Over the course of mining at the site, about 271,000 cubic yards of material containing arsenic above residential cleanup levels (as defined under the MTCA, Method A) would be excavated and contained. Of this total volume, approximately 50,520 cubic yards would contain arsenic concentrations that are also above industrial cleanup levels (again, using MTCA Method A). Soils containing arsenic concentrations above industrial cleanup levels would be managed in a separate phase of the cell.

   The containment cell would be provided with an impermeable bottom liner. The bottom liner would be placed above a leveling pad of native sand. Prior to placing the arsenic-impacted oils, a layer of sand would be placed above the liner to protect it from damage during subsequent fill placement.

   A single-layer geosynthetic clay liner is proposed. GCLs are made with a layer of refined clay, with permeabilities in the range $1 \times 10^{-8}$ to $1 \times 10^{-9}$ cm per second, bound between layers of geotextile. A GCL is considered equivalent to 2 to 4 feet of clay with a permeability of $1 \times 10^{-7}$ cm per second. The clay in GCLs swells when exposed to water and this swelling action closes possible openings in the liner.

To protect the GCL liner from damage during installation and construction, a layer of bedding sand 6 inches thick would be placed over the subgrade to protect the liner from puncture by the gravelly soil. The bedding sand would be screened to remove all material with a diameter greater than 0.5 inch.

The GCL would then be covered with a 6-inch layer of drain sand. The drain sand should consist of material with 100 percent of grain sizes finer than 0.5 inch, and less than 3 percent of grains finer than the U.S. No. 200 sieve (0.003 inch).

A 6-inch diameter perforated pipe would be installed along the north (downslope) side of the cell. This drain would lead to a manhole on one end of the cell. This drain would serve to prevent build-up of water over the liner and to provide sampling access. A 2-inch diameter perforated pipe would be installed in the bedding sand (under the liner) along the north side. This would also lead to a manhole on one end of the cell and could be used to monitor water under the liner.

The contaminated soil would be placed over the drain sand in horizontal layers and compacted. The purpose of placement and compaction is to provide a stable slope and firm support for the final cover. Trees and brush would be removed from contaminated areas prior to excavation of contaminated soil.

The Applicant proposes a single-layer synthetic membrane or GCL for the cover, to be installed above the contaminated soil. The cover would provide the same barrier to infiltration as the liner. The base for the cover would be screened soil with 100 percent of grain sizes finer than 0.5 inch. The base sand could be contaminated soil originating onsite that has been screened. The flexible membrane would be covered with a geotextile fabric to protect it from damage.

The cover would be covered with a 6-inch layer of screened drain sand or synthetic drain layer, with the same specifications as the sand placed over the bottom liner. The drain layer would be covered with 18 inches of soil, and the surface would be vegetated. Topsoil would not be required as long as the cover soil had sufficient nutrients to support a healthy vegetation cover. Vegetation is needed to prevent surface erosion and for aesthetic purposes.

The containment cell would be constructed in steps to match the mine operation. The first step would start at the downslope (north) end, to collect rainwater infiltration and potential leachate. The first step is expected to accommodate soil from Phase 1 and 2 of the mine operation (or about 46,000 cubic yards of contaminated soil). During soil placement, temporary berms would be constructed upslope to prevent rainfall runoff from entering the cells. Some rainfall would seep into the sand drain layer over the bottom liner during soil placement. This water would drain into the perforated pipe on the downslope side.

Any water collected from the berm would be tested and handled according to procedures outlined in the MTCA. Soils placed in the containment cell would not generate significant leachate. Leachate could occur during construction of the berm prior to placement of the top liner. This leachate would consist of precipitation that fell directly on the soils and infiltrated the stockpiled soils. Thus leachate would be expected to occur only during the initial construction of each cell of the containment berm. If leachate continued to collect, it would be a sign that the cover had been compromised and the liner would then need to be repaired.

b. **Air Emission Control Methods.** Air emission control methods would be implemented during all excavation and cleanup activities that have the potential to generate air pollutants. These methods include the use of controlled excavation methods, wetting, material covering, housekeeping, and use of covered trucks.

c. **Dust Monitoring Plan.** The Applicant has proposed to monitor ambient air quality on the property perimeter during cleanup activities at the site. The ambient air-monitoring plan would describe the basis of design for the monitoring program; general program procedures; air sampling procedures; meteorological monitoring procedures; laboratory methods; and reference standards.

The objectives of the air-monitoring plan would be to:

1. monitor ambient air quality for potential pollutants related to onsite activities;

2. quantify potential offsite transport of project-related emissions; and

3. assess the effectiveness of onsite emission control methods used during excavation and cleanup activities.

As part of the monitoring program, a “wind rose” would be generated based on annual data obtained from the closest meteorological station. (A wind rose is a graph showing the frequency and strength of wind from various directions in a given area.) The results of this wind rose would be used to establish the location of air quality sampling stations at the site.

As a conservative assessment of particulate matter (dust) emissions, sampling would be conducted for total suspended particulate (TSP) for comparison to the PM10 action level (see Chapter 3 for discussion of PM10). PM10 is only a portion of the TSP, so a measurement for TSP always includes a greater range of particulate matter than would a PM10 measurement.

Lead, cadmium, and arsenic concentrations will also be assessed by collection of particulate matter on TSP filters.

Air quality action levels would be used as an indicator of the effectiveness of onsite emission control methods used during excavation and cleanup activities. In the event that single data point concentrations exceeded action limit criteria, a contingency plan detailing additional control measures would be implemented. Action levels for the potential air pollutants monitored would be established in conjunction with the Puget Sound Clean Air Agency, the King County Health Department, and the Washington State Department of Ecology.

d. **Worker Safety.** Workers onsite must have sufficient training and safety equipment to control their potential exposure to soil contaminants during site clearing and restoration. Exposure monitoring must be done during topsoil management to determine if the action level is reached or exceeded. If the action level of 5 $\mu$g per $m^3$ (averaged over an 8-hour period) is exceeded, additional engineering controls and worker protection would be required as mandated by state law. The additional measures could consist of workers wearing respiratory protection or using water to reduce dust generation.

## 10.4.3 Remaining Adverse Impacts and Additional Measures

### *10.4.3.1 Health Impact 1*

**Specific Adverse Environmental Impact.** During excavation and movement of contaminated soils, airborne dust containing arsenic and other metals could leave the site and potentially pose a public health hazard.

#### *10.4.3.2 Health Mitigation 1*

The following measures would reduce risks associated with arsenic leaving the site as dust during soil extraction and containment procedures:

a. Contaminated soils should be cleared and collected in manageable phases.

b. Contaminated soils should be covered while being temporarily stockpiled or transported to the containment cell. Soils should be transported by covered truck, rather than by conveyor or open-bed truck.

c. Temporary covers should be placed over contaminated material within containment cells prior to final sealing of the cell.

**Regulatory/Policy Basis for Condition.** Title 10 of the Code of the King County Board of Health specifies a number of requirements for solid waste management. The topsoils with elevated levels of metals are classified as a problem waste (10.08.345). The King County Solid Waste Regulations provide some exemptions for landfills that contain problem wastes, however, other provisions of the regulations apply.

Section 10.28.120 defines the authority for the health officer to regulate excavated soils as solid waste if the material contains significant levels of contamination above that specified by the MTCA (WAC 173-340).

Section 10.28.010 describes the requirements for storage of solid waste until it is removed to a disposal site. The disposal site in this case would be the permanent lined containment system that is planned for the site. This section requires that materials shall be contained to prevent blowing. The use of temporary, durable plastic sheeting can be used for temporary stockpiles that will accumulate prior to the placement of the final cover over the accumulated waste in the containment cell.

The Puget Sound clean air regulations, Section 9.11, specify the requirements for emission of contaminants. This section states "It shall be unlawful for any person to cause or allow the emission of any air containment in sufficient quantities and of such characteristics and duration as is or is likely to be, injurious to human health, plant or animal life or property, or which unreasonably interferes with enjoyment of life and property." Section 9.15 specifies the requirements for fugitive dust control. The requirements include the need to use enclosures and wet suppression techniques, as practical, and curtailment during high winds.

#### *10.4.3.3 Health Impact 2*

**Specific Adverse Environmental Impact.** Arsenic in soils within the containment cells could be mobilized in the event the bottom liner or cover fails.

#### *10.4.3.4 Health Mitigation 2*

The following measures related to the soil containment system should be considered to reduce the possibility for leachate or subsurface flow through or within the containment cell, as recommended by the Department of Ecology (2000):

a. A "linear low-density polyethylene" geo-membrane should be used to line and cover the cell instead of bentonite clay. This would minimize potential leakage and improve constructability.

b. Additional sand should be used in the cell liner and cover.

c. A berm with a height of 3 feet or greater should be constructed at the toe of the cell to provide sufficient freeboard to contain the maximum allowed accumulation of leachate, which is 2 feet.

d. The slope angles and drainage properties of the cover system should be designed carefully to ensure that it does not fail, causing offsite erosion.

e. The site grading plan should be revised to eliminate the direct-runoff pathway to Puget Sound at the cell's east end.

**Regulatory/Policy Basis for Condition.** Title 10 of the Code of the King County Board of Health spells out requirements for solid waste management. The bottom liner should be constructed with at least 2 feet of recompacted clay with a permeability of no more than 1 X 10 $^{-6}$ cm per second and sloped no less than 2 percent (10.36.050 B. 2). The use of an equivalent design is allowed, provided the liner is at least as effective as the liners required in the regulation (10.36.050 A and B). The Ecology review (Ecology 2000) summarizes the issue of using the GCL liner with regard to constructability. The Applicant would need to submit adequate information to the County to justify the design of the bottom liner.

Section 10.36.050 also spells out the requirement for the cover of the containment cell. The standard design requires that the liner be constructed with at least 4 feet of recompacted clay or other material with a permeability of no more than $1 \times 10^{-7}$ cm per second or a synthetic liner of at least 50 mils in thickness. Again, the use of alternative designs requires County review.

Section 10.36.040 requires the installation of a leachate control system sized according to water balance calculations or using other accepted engineering methods either of which shall be approved by the Health officer. Paragraph B states that the leachate control system shall be designed to prevent no more than 2 feet of leachate from developing in the low point of the active area.

#### *10.4.3.5 Health Impact 3*

**Specific Adverse Environmental Impact.** Placement of the containment cell in the northern edge of the property may result in instability of the sea bluff due to the extra weight along the top of a sensitive slope. In addition, normal erosion and retreat of the top of the slope could undermine the containment cell causing an uncontrolled release of soil with elevated concentrations of metals.

#### *10.4.3.6 Health Mitigation 3*

Final placement of the containment cell should be chosen to minimize adverse effects based on the final design specifications for the mine. The location and final placement of the cell should be specified in the CAP.

**Regulatory/Policy Basis for Condition.** Chapter 21A.24 of the King County Code outlines requirements related to development in environmentally sensitive areas. The eastern portion of the site contains a wave-eroded bluff with a height in excess of 300 feet. Shallow instabilities have occurred in the past and will occur in the future due to undercutting of the toe by wave erosion. Chapter 21A.24.280 A requires a minimum buffer of 50 feet from all landslide hazard areas. The buffer shall be extended as required to mitigate a steep slope or erosion hazard or as otherwise necessary to protect the public health, safety, and welfare.

#### *10.4.3.7 Health Impact 4*

**Specific Adverse Environmental Impact.** Placement of an impermeable liner and cover above and below the containment cell could trap methane gas that would be generated naturally from organic matter in the soil.

#### *10.4.3.8 Health Mitigation 4*

A provision for collection and venting of the gases would be needed. Generation of methane gas would take place over a period of a few years. It is unlikely that sufficient gas would be generated to support a flare. Installation of a methane-collection system in the containment cell would allow for the collection and proper venting of the methane gas. No offsite migration of methane gas to adjacent structures would be expected. Any venting of methane gas would require a permit from the Puget Sound Clean Air Agency.

**Regulatory/Policy Basis for Condition.** Title 10 of the Code of the King County Board of Health outlines requirements for solid waste management. Chapter 10.76 contains requirements for the control and monitoring of methane. These requirements apply to all landfills with the exception of inert waste landfills.

## 10.5 Cumulative Impacts

Since site soils can be managed to avoid significant impacts, the Proposed Action and alternatives would not result in cumulative impacts to environmental health and human safety.

## 10.6 Significant Unavoidable Adverse Impacts

None expected. The CAP would be consistent with the MTCA, and the MTCA has established action levels to protect human health and the environment. Based on the evidence presented in this EIS, and on the feasibility of known containment methods, the project would not result in a significant adverse risk to human health due to arsenic contamination or other health concerns.

## 10.7 Citations

### 10.7.1 Printed References


AESI. See "Associated Earth Sciences, Inc."

Associated Earth Sciences, Inc. 1998a. Soils, geology, geologic hazards and groundwater report, existing conditions, impacts and mitigation, Maury Island Pit, King County, Washington. Included as Appendix A to: Huckell/Weinman Associates, Inc. 1998. Expanded environmental checklist for Northwest Aggregates Maury Island mining operation. May.

______. 1998b. Potential water quality impacts and mitigations, Maury Island Pit, King County, Washington. Included as Appendix B to: Huckell/Weinman Associates, Inc. 1998. Expanded environmental checklist for Northwest Aggregates Maury Island mining operation. May.

______. 1999. Draft addendum geology and groundwater report. Maury Island Pit, King County, Washington. March 3. Prepared for Lone Star Northwest, Inc.

Carr and Associates. 1983. Vashon/Maury Island water resources study. December 1. Prepared for King County Department of Planning and Community Development.

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Greene, Karen E. 1997. Ambient Quality of Groundwater in the Vicinity of Naval Submarine base, Bangor, Kitsap County, Washington, 1995. USGS Water Resources Investigations Report 96-4309.

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Landau Associates. 1999. Letter to Vashon-Maury Island Community Council regarding final sampling results: NW Aggregated Maury Island Gravel Mine. January 19.

University of Washington. 1987. Final report, Ruston/Vashon arsenic exposure pathways study. March 31. School of Public Health and Community Medicine. Prepared for Washington Department of Ecology.

Vashon-Maury Island Groundwater Advisory Committee. 1998. Vashon-Maury Island groundwater management plan and supplement, area characterization. King County Department of Natural Resources.

Washington Department of Ecology. 1994. Natural background soil metals concentrations in Washington State. (Publication 94-116.) October.

______. 2000. Maury Island gravel mining impact studies, mid-study fact sheet. January. (Publication 00-10-007.) Olympia, WA.

## Table 10-1. Analytical Test Results for Surface Soil Samples on the Glacier Northwest Site (ppm)[a]

| Sample Number[b] | Site Type[c] | Surface | | | 9-Inch Depth | | | 18-Inch Depth | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Arsenic | Cadmium | Lead | Arsenic | Cadmium | Lead | Arsenic | Cadmium | Lead |
| 1[d] | F | **330*** | 2 | 830 | 37 | 0.84 | 27 | 43 | 0.66 | 19 |
| 2 | F | 120 | 2.3 | 390 | 25 | 1.2 | 10 | 8.7 | 0.56U | 5.6U |
| 3 | F | 150 | 0.79U[e] | 280 | 110 | 0.91 | 81 | 10 | 0.62 | 8.6 |
| 4 | F | 160 | 1.5 | 450 | 19 | 0.72 | 25 | 4.2 | 0.53U | 5.3U |
| 5 | F? | 47 | 0.92 | 54 | 47 | 0.84 | 59 | 43 | 0.63U | 51 |
| 6 | F | 100 | 9.3 | 470 | **270*** | 2.9 | 120 | 64 | 1.1 | 30 |
| 7 | F? | 17 | 0.58U | 13 | 19 | 0.56U | 18 | 13 | 0.53U | 11 |
| 8 | F | 190 | 3 | 550 | 67 | 0.94 | 41 | 10 | 0.58U | 7.6 |
| 9 | F | 98 | 1.6 | 510 | 110 | 0.95 | 30 | 9.2 | 0.77 | 7.1 |
| 10 | GP | 4.3 | 0.53U | 5.3U | 1.6U | 0.53U | 5.3U | 1.6U | 0.52U | 5.2U |
| 11 | GP | 1.9 | 0.53U | 5.3U | 1.6U | 0.55U | 5.5U | 1.6U | 0.53U | 5.3U |
| 12 | F? | 6.1 | 0.54U | 5.8 | 6.2 | 0.54U | 5.4U | 5.7 | 0.55U | 6 |
| 13 | F | **220*** | 1.2U | 470 | 130 | 0.82 | 45 | 8.2 | 1.5 | 8.3 |
| 14 | F | 18 | 0.91 | 70 | 130 | 1.2 | 37 | 2.0U | 0.92 | 36 |
| 15 | GP | 1.6U | 0.53U | 5.3U | 1.6U | 0.53U | 5.3U | 1.6U | 0.53U | 5.3U |
| 16[d] | F | **280*** | 1.6 | 730 | 39 | 0.84 | 17 | 40 | 0.89 | 23 |
| 17 | F | 61 | 6 | 240 | **260*** | 1.2 | 35 | 11 | 0.52U | 5.2U |
| 18 | GP | 11 | 0.59U | 7.1 | 8.2 | 0.57U | 5.7U | 5.9 | 0.57U | 6.1 |
| 19 | F | 100 | 6 | 470 | **270*** | 1.4 | 67 | 3.8 | 0.59U | 5.9U |
| 20 | F | 140 | 5.4 | 710 | 11 | 0.59U | 11 | 7.6 | 0.59 | 6.6 |
| MTCA[f] | | 200 | 10 | 1,000 | 200 | 10 | 1,000 | 200 | 10 | 1,000 |
| MTCA[g] | | 20 | 2.0 | 250 | 20 | 2.0 | 250 | 20 | 2.0 | 250 |

Note: This table replaces Table 3 of Appendix C for the DEIS, which contained typographical errors. All analyses in both the DEIS and the FEIS are/were based on the correct data presented here.

* Exceeds MTCA Method A cleanup values for industrial sites.

[a] All units are parts per million (ppm), milligrams/kilogram.

[b] Sample numbers correspond to Terra Associate sample locations shown on Figure 10-1.

[c] Site Type: F is forested area; F? is forested area but has signs of recent grading or disturbance; GP is in the area of the existing gravel pit.

[d] Sample No. 16 is a field replicate of Sample No. 1

[e] U indicates that the metal was not detected at the stated detection limit.

[f] MTCA Method A cleanup values for industrial sites.

[g] MTCA Method A cleanup values for residential sites.

Source: Terra Associates, Appendix B of the DEIS.

## Table 10-2. Analytical Test Results for Sand and Gravel Samples on Glacier Northwest Site (ppm)[a]

| Sample Designation[b] | Sample Location | Arsenic | Cadmium | Lead |
|---|---|---|---|---|
| EP-15 @ 9 | Exploration Pit EP-15, 9 feet below ground surface, sample of sand beneath surficial till soils. | 4.3 | 0.58U[c] | 5.8U |
| EP-16 @ 10 | Exploration Pit EP-16, 10 feet below ground surface, sample of sand beneath surficial till soils. | 4.5 | 0.54U | 5.4U |
| EP-17 @ 8.5 | Exploration Pit EP-17, 8.5 feet below ground surface, sample of sand beneath surficial till soils. | 2.7 | 0.61U | 6.1U |
| EP-18 @ 10 | Exploration Pit EP-18, 10 feet below ground surface, sample of sand beneath surficial till soils. | 2.4 | 0.53U | 5.3U |
| EP-19 @ 10 | Exploration Pit EP-19, 10 feet below ground surface, sample of sand beneath surficial till soils. | 3.9 | 0.54U | 5.4U |
| EP-20 @ 10 | Exploration Pit EP-20, 10 feet below ground surface, sample of sand beneath surficial till soils. | 2.4 | 0.54U | 5.4U |
| EP-21 @ 10 | Exploration Pit EP-21, 10 feet below ground surface, sample of sand beneath surficial till soils. | 3.5 | 0.54U | 5.4U |
| EP-22 @ 10 | Exploration Pit EP-22, 10 feet below ground surface, sample of sand beneath surficial till soils. | 3.1 | 0.54U | 5.4U |
| EP-23 @ 10 | Exploration Pit EP-23, 10 feet below ground surface, sample of sand beneath surficial till soils. | 4.6 | 0.54U | 5.4U |
| EP-24 @ 10 | Exploration Pit EP-24, 10 feet below ground surface, sample of sand beneath surficial till soils. | 6.9 | 0.58U | 5.8U |
| EP-25 @ 10 | Exploration Pit EP-25, 10 feet below ground surface, sample of sand beneath surficial till soils. | 3.1 | 0.54U | 5.4U |
| EP-26 @ 10 | Exploration Pit EP-26, 10 feet below ground surface, sample of sand beneath surficial till soils. | 3.3 | 0.54U | 5.4U |
| EP-27 @ 10 | Exploration Pit EP-27, 10 feet below ground surface, sample of sand beneath surficial till soils. | 4.0 | 0.56U | 5.6U |
| EP-28 @ 10 | Exploration Pit EP-28, 10 feet below ground surface, sample of sand beneath surficial till soils. | 2.2 | 0.52U | 5.2U |
| G-1 | Grab sample from existing vertical cut into native sands. | 1.6U | 0.53U | 5.3U |
| G-2 | Grab sample from existing vertical cut into native sands. | 2.2 | 0.53U | 5.3U |
| G-3 | Grab sample from existing vertical cut into native sands. | 1.6 | 0.53U | 5.3U |
| G-4 | Grab sample from existing vertical cut into native sands. | 1.8 | 0.54U | 5.4U |
| OBW-6 @ 95 | Observation Well OBW-6, approximately 95 feet below ground surface, sample of sand. | 1.9U | 0.63U | 6.3U |
| OBW-7 @ 270 | Observation Well OBW-7, approximately 220 feet below ground surface, sample of sand. | 2.4 | 0.67U | 6.7U |

## Table 10-2. Continued

| | | Arsenic | Cadmium | Lead |
|---|---|---|---|---|
| | Median | 3.1 | n/a | n/a |
| | Mean | 3.27 | n/a | n/a |
| | Standard Deviation | 1.29 | n/a | n/a |
| | Puget Sound Background[d] | 7 | 1 | 24 |
| | MTCA industrial cleanup value[e] | 200 | 10.0 | 1,000 |
| | MTCA residential cleanup value[f] | 20 | 2.0 | 250 |

[a] All units are mg/kg, parts per million (ppm).

[b] Sample locations are shown in Figure 10-2.

[c] U indicates that the analyte was not detected at the stated detection limit.

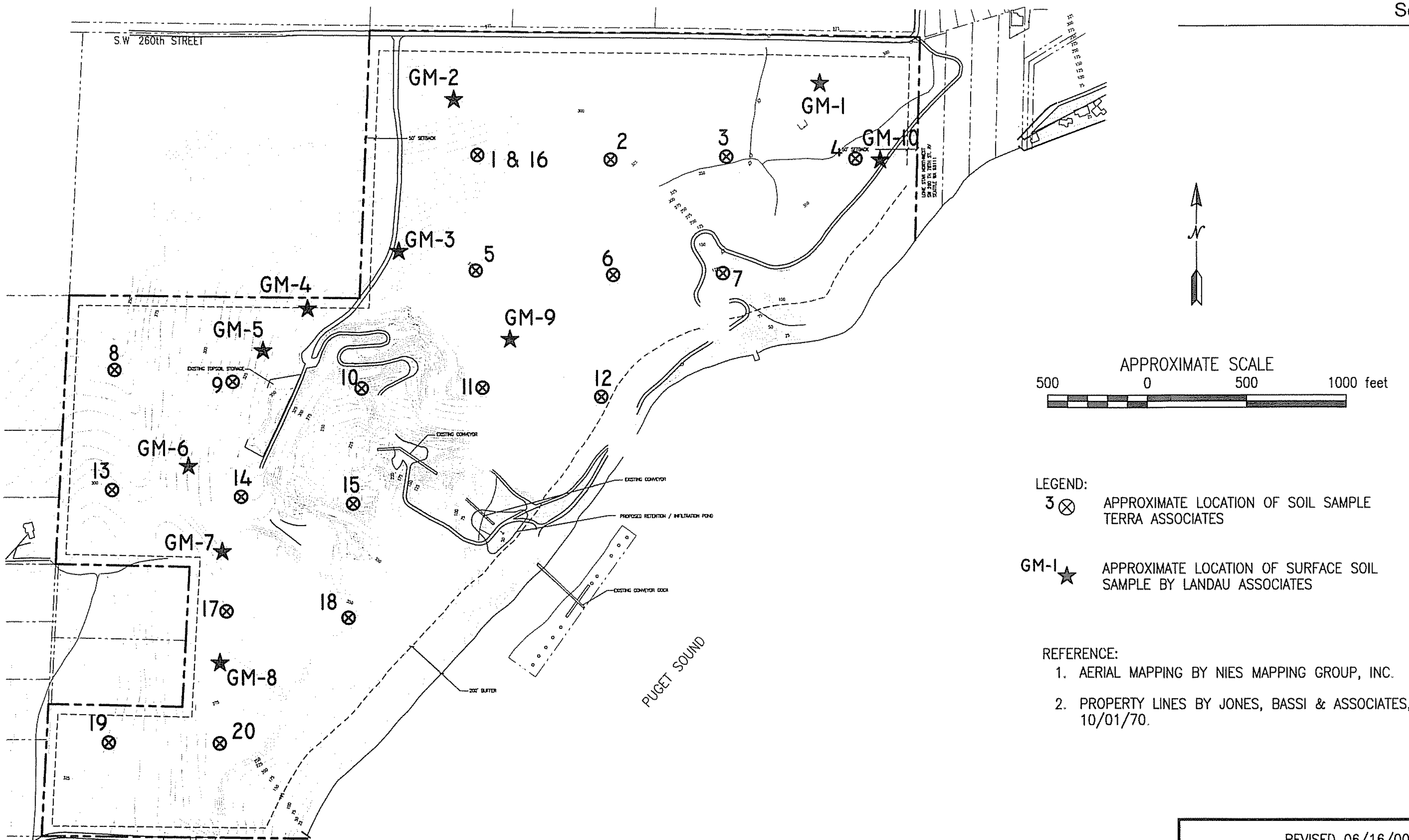
[d] 90th percentile levels from Ecology Publication #94-115, *Natural Background Soil Metals Concentrations in Washington State.*

[e] MTCA Method A cleanup values for industrial sites.

[f] MTCA Method A cleanup values for residential sites.

Source: Terra Associates, Appendix B of the DEIS.

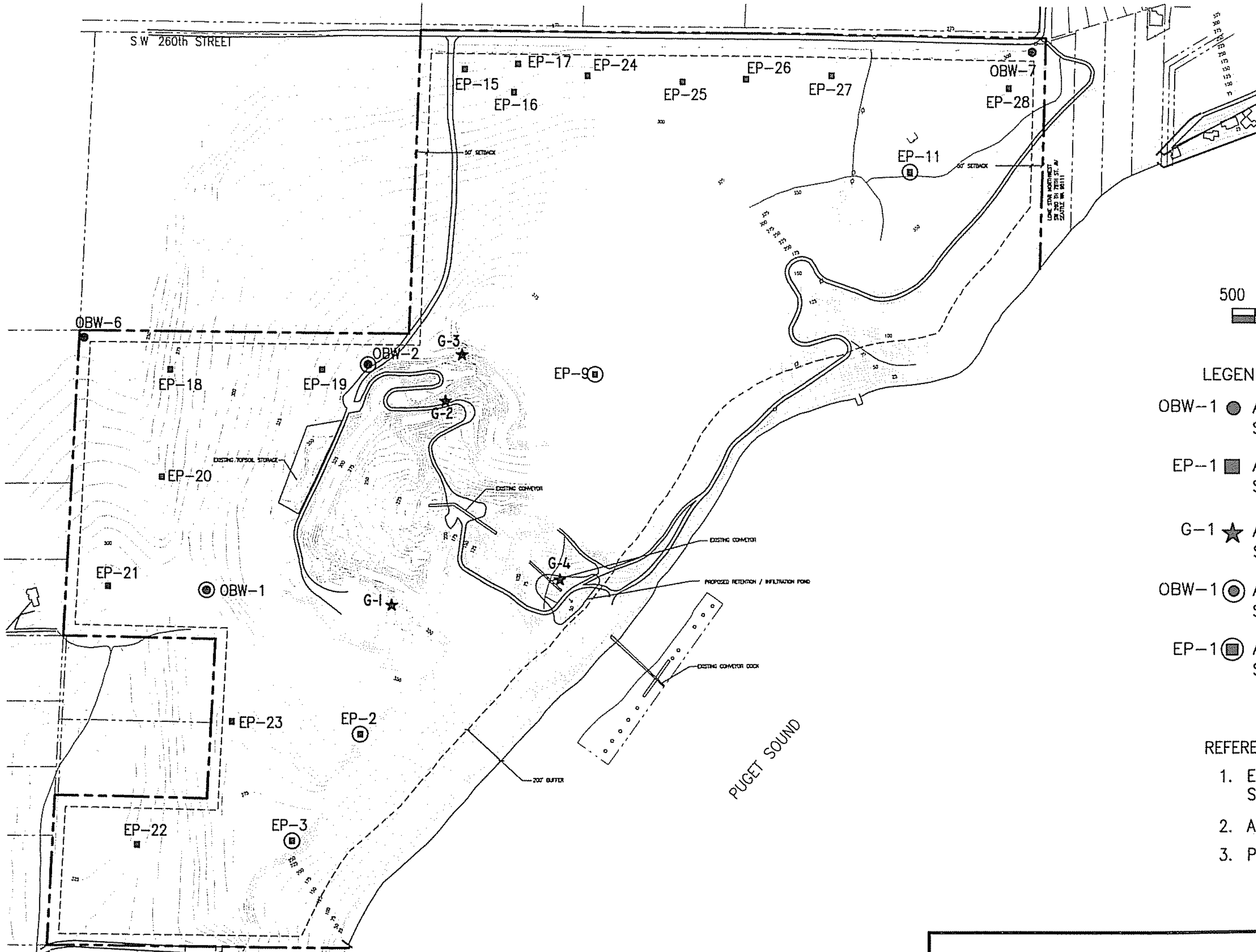
Figure 10-1. Locations of Surface Soil Samples




TERRA ASSOCIATES
Geotechnical Consultants

| | | |
|---|---|---|
| REVISED 06/16/00 | | |
| SURFACE SAMPLE PLAN<br>LONE STAR GRAVEL PIT<br>MAURY ISLAND<br>KING COUNTY, WASHINGTON | | |
| Proj.No. 4169-1 | Date MAR. 1999 | Figure |

Figure 10-2. Locations of Subsurface Resource Samples




LEGEND

OBW-1 ● APPROXIMATE LOCATION OF OBSERVATION WELL SAMPLED BY TERRA ASSOCIATES

EP-1 ■ APPROXIMATE LOCATION OF EXPLORATION PIT SAMPLED BY TERRA ASSOCIATES

G-1 ★ APPROXIMATE LOCATION OF RESOURCE GRAB SAMPLE SAMPLE BY TERRA ASSOCIATES

OBW-1 ◉ APPROXIMATE LOCATION OF OBSERVATION WELL SAMPLED BY AESI

EP-1 ▣ APPROXIMATE LOCATION OF EXPLORATION PIT SAMPLED BY AESI

REFERENCE:

1. EXPLORATION LOCATION PLAN BY ASSOCIATED EARTH SCIENCES, INC. (AESI).
2. AERIAL MAPPING BY NIES MAPPING GROUP, INC.
3. PROPERTY LINES BY JONES, BASSI & ASSOCIATES, 10/01/70.

REVISED 06/16/00

TERRA ASSOCIATES
Geotechnical Consultants

RESOURCE SAMPLE LOCATION PLAN
LONE STAR GRAVEL PIT
MAURY ISLAND
KING COUNTY, WASHINGTON

Proj.No. 4169-1 | Date MAR. 1999 | Figure

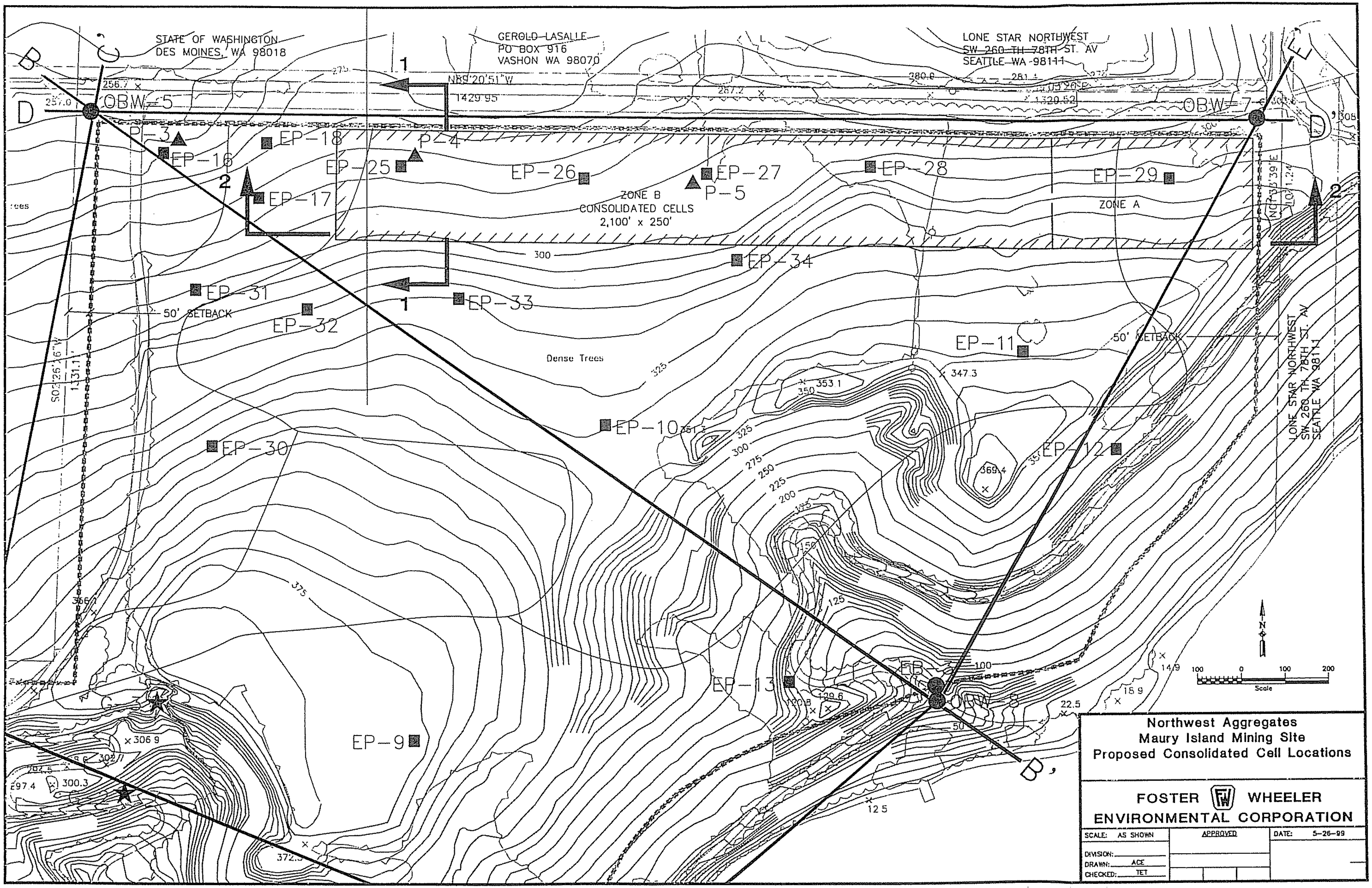



Figure 10-3. Proposed Consolidated Cell Locations

*Chapter 11*

# Light, Glare, and Aesthetics

# Chapter 11

# Light, Glare, and Aesthetics

## 11.1 Primary Issues

Several residents of Vashon/Maury Island have voiced concerns about how the project would change views and the overall quality of life on the island. In addition, some residents from across Puget Sound have expressed concerns that the project would change their views. The mining operation, while zoned and operated as such for over 50 years, would accelerate in terms of activity, volume removed, and the area of exposed sand and gravel visible from outside the site. Barges, which have not been used at the site for 20 years, would become a common sight. In addition, the dock, tugs, and portions of the mining site would be lighted as required for safe operation.

The primary issues analyzed in this section include:

- What aesthetic changes would occur in the character of the existing landscape on the mine site?
- How would the reintroduction of barging affect the visual environment?

## 11.2 Affected Environment

The views of the project site for the last 20 years have consisted of primarily the existing gravel pit operation, which has resulted in about one-third of the site (81 acres) containing sparse vegetation and open ground. The remainder of the site contains forest, exposed bluffs, and shoreline, including the existing barge loading dock (Figures 11-1 and 11-2).

The visual components of the site vicinity include developed shoreline (at Sandy Shores and Gold Beach), undeveloped beaches, forested bluffs, and the open water of Puget Sound. The dock has been an idle fixture in the environment, typical of many shoreline areas along Puget Sound. The two adjacent communities impart black-gray, brown, and white tones amidst the darker tones of surrounding forest areas, the whitish-gray tones of the beach, and the variable gray and blue tones of open waters. The existing cleared area of the mine is visible from several locations and can be seen from across Puget Sound on the mainland to the west (Figure 11-3).

The shoreline curves slightly inward toward the site, so that half or more of the site is behind bluffs and out of sight from many surrounding viewpoints. Prominent bluffs on either side of the project site also shield some of the interior portions of the property from some viewpoints, particularly views from the Gold Beach community. The inward curve of the shoreline also allows residents of Gold Beach to see the Sandy Shores community, and vice versa. Existing views of the project site from Gold Beach and Sandy Shores are shown in Figures 11-4 through 11-7. As can be seen from the views, homes within both communities are oriented toward Puget Sound and do not directly face the Glacier Northwest property. Nevertheless, the site and dock are major features of the landscape.

The overall character of the Gold Beach and Sandy Shores communities is that of a quiet, shoreline community, with observable features and activities typical of residential areas, including motorized equipment (chainsaws, lawnmowers); passenger car and small-truck traffic; and pedestrians, horseback riders, and bicyclists. Such activities are most typical during weekends, especially during good weather and near midday through the afternoons. Mornings are often quiet, with shoreline sounds including waves and the calls of seabirds. In addition, sail boats, pleasure craft, kayaks, and other recreational boating occurs in the area and commercial ship traffic is visible in the shipping lanes located between the island and the mainland.

At night, lighting can be seen along the Gold Beach and Sandy Shores communities. The project site is unlit. Viewed from the east across East Passage, the nighttime shoreline includes strings of lighting where residences have been developed along the shoreline and scattered lighting along the bluffs. These lights are interspersed among unlit areas, including the existing dock, mining site, and surrounding forested bluffs.

## 11.3 Impacts

### 11.3.1 What aesthetic changes would occur in the character of the existing landscape on the mine site?

#### *11.3.1.1 Proposed Action*

Aesthetic changes would be limited to views of the site. The project would not alter people's views of other areas, including views of Puget Sound, the eastern shoreline, Tacoma, and Mount Rainier (on clear days).

Most people who would see the site have expansive views of Puget Sound, and these views dominate over other views. Notably, almost all of the homes in Sandy Shores and Gold Beach are oriented to the water and not to the site (Figures 11-5 and 11-6). These water views, which are typically the most valued, would not be affected by the project.

Viewers from Upper Sandy Shores (Figure 11-4) would see the barge against a backdrop of water within the foreground, and barge traffic would be regularly seen coming and going from the site. However, most views of the dock and loading would be framed against the background of the site or of the opposing developed community. While clearly visible, the barge loading would still not interfere with the more dominating views of Puget Sound.

Still, views of the site would obviously change if the site were rapidly mined. Under the Proposed Action or any large-scale mining scenario, views of the site from surrounding areas would change in steps as phases are cleared, mined, and reclaimed. For this analysis, visual changes of the site have been classified into four categories: changes in topography, changes in surface cover (vegetation and exposed materials), changes in activity levels, and changes in views from across Puget Sound. The following sections address these four categories of change.

**Changes in Topography.** Many people have remarked that the physical loss of the minerals that make up the site is a major impact in its own right. Such topographic changes are inevitable with surface mining, and the Applicant is proposing to remove a very large amount of material, leaving a site quite different in shape than what exists now (Figures 11-9 through 11-11). The area the site occupies would not change, but a good deal of the land mass would be removed.

Physically, Maury Island is a massive deposit of glacial materials left during Puget Sound ice advances.  Mining of the site would physically remove approximately 60.5 million cubic yards of material and would greatly change the elevation and shape of the existing property.

Figures 11-9 through 11-11 show a simulation of topographic changes that would result from the project, based on terrain modeling of existing surface elevations (Figures 11-9a, 11-10a, and 11-11a) and surface elevations following completion of proposed mining based on the conceptual contouring plan in Figure 2-2a (Figures 11-9b, 11-10b, and 11-11b).  The visual changes represented in Figures 11-9 through 11-11 are more obvious than actual visual changes would be for two reasons.  First, simulations are based solely on topographic changes, and do not take into account changes in surface cover.  Second, the color scheme on the drawings was chosen to emphasize the resulting contrasts.

These topographic changes would, quite obviously, change how the site looks.  Although mining has already altered site topography, the overall "form" of the site still reflects that of southern Maury Island, with a relatively flat upland gently sloping to bluffs, which then drop off steeply about 250 feet to the shoreline.  This form is interrupted by the two, horse-shoe shaped excavations left from past mining (see Figure 11-9a).

Mining would remove materials between and beyond these two excavations, leaving a relatively flat, irregularly shaped, 150-acre "floor,"  framed by steep slopes on three sides (Figures 2-2A and 11-9b).  The floor would be exposed to the shoreline by an opening near the loading dock area.  Remaining bluffs along the shoreline would define this opening.  These bluffs would slope from about 150 feet elevation at the site boundaries to near 20 feet at the opening near the dock. The bluffs would continue to block views to the interior of the site from both Sandy Shores and Gold Beach, but to a much lower degree than do the current bluffs (Figures 11-10 and 11-11).

This physical change of the site is one of the most pronounced and noticeable changes that would result from mining the site as proposed.

The first three phases would progress in a triangle pattern around the existing horseshoe-shaped depression in the central portion of the site (located above the dock).  This depression was created in part by mining and in part by natural topography.  The first phase would cut behind the eastern bluff, located along the shoreline and partially blocking views from Gold Beach (see Figures 11-6 and 11-7). The second phase then would progress westward, cutting slopes below the WDNR parcel to the northwest of the site and eventually clearing to the western edge of the site (near the Adams parcels). The third phase would excavate the western edge of the site, the portion most visible to Gold Beach.

This third phase would be most disruptive to the Sestrap and Saunders properties, as these two properties would be adjacent to the mining site on three sides. Mining would clear surrounding forest up to 50 feet from these properties and would create slopes ranging from between 2:1 and 3:1 (horizontal to vertical). These slopes would start at the edge of the vegetated buffer. As elsewhere, 15-foot-wide benches would be added to the slope as needed to control erosion and sedimentation.

Also during the third phase, the project and contrasting visual appearance of the site would be most visible from the Gold Beach community, including views from Gold Beach Drive, the Gold Beach shoreline, and the Gold Beach Community Club. People would be able to see the exposed "working face" of the mine, with bulldozers pushing material downslope to collection points.

The fourth phase would then move back in an eastward direction through the central portion of the site, completing final grades for the majority of the site. At the end of this fourth phase, mining would occur adjacent to low-density housing within three parcels along the northern portion of the site. Phases 5 and 6 would then mine out toward the eastern bluff, completing final grades of the site. During Phase 6, which would occur between 15 and 40 years from the start of mining, the operation would be at its closest to the Gold Beach community. Existing topography would shield a great deal of this activity until excavation reaches the easternmost boundaries of the mining footprint, when the upper half (approximately) of the slope facing Gold Beach would be removed (Figures 11-10a and b). This would be the closest point at which active mining would be visible to many people in the community. This area would also be seen from the Sandy Shores community, which would have direct views of this phase of the operation (see Figures 11-4, 11-5, 11-11).

**Changes in Surface Cover.** Initial clearing would eliminate the green, natural appearance of forested areas, and active mining areas would appear light-gray, tan, or whitish. These lighter tones would contrast visually with the dark tones of remaining forest along the vegetated site perimeter, in unmined areas, and on adjacent lands.

The visual "texture" would also change within active mining areas. Texture refers to the shape, outline, and overall surface features of views. Forests, with their varying heights and rough outlines, impart a soft appearance, while active mining and recently reclaimed areas can appear "flat" or linear.

Edges between cleared areas and uncleared areas would also create linear contrasts on the site. The vegetated buffer along the perimeter, along with forested areas not yet cleared, would contrast vertically with the cleared areas, creating a perceptible line. Such lines can appear unnatural in the landscape, projecting an image similar to that seen in clearcuts that are present throughout commercial forest lands in the Puget Sound region.

At any one time, up to 64 acres would be relatively void of vegetation and would impart the visual characteristics just described. As portions of the site are mined out, final reclamation would eventually restore the visual character of the surface to more natural conditions, with darker tones (mostly green) and softer texture, blending in more evenly with adjacent vegetated areas, although topographic changes would, of course, be permanent. Should mining be completed rapidly, then essentially all of the mining footprint would contrast visually with surrounding forest.

As proposed, the Applicant would hydroseed slopes and plant the floor of the mine with Douglas-fir. Grassy slopes would appear lighter green than surrounding forests and, during late summer and early fall, brown tones may predominate. Grasses and other low-growing vegetation would do little to conceal terracing, so unnatural "benches" would appear along the slope at final grade. The containment berm, which may be up to 30 feet high, would also appear unnatural without vegetative cover. Vegetation may grow in linear strips along terracing and along the containment cell, caused by variations in available groundwater and angle to the sun. With additional reclamation efforts to restore madrone forest, visual contrasts would be less apparent (see Section 5.4.3). Assuming restoration of madrone forest, mined out areas at final grade would develop similar tones and textures as existing forests within about 20 years, with noticeable improvement within about 5 to 15 years, as madrone and other vegetation take hold.

These visual changes would slowly shift about the site as mining progresses according to the plan proposed by the Applicant (Figure 2-1).

Because mining rates are market driven, the site could be mined in as few as 11 years or as many as 75 or more years. The rate of mining would have a great effect on how views would change over time, and the amount of area that would be affected at any one time.

Should mining be done rapidly, then essentially the entire visible footprint of the mine would show sharp contrasts with surrounding areas. The probable life of the mine would be in the range of 30 years, so visual changes are expected to be more gradual, and some softening of impacts is expected through restoration of vegetation in mined out areas.

**Changes in Activity Level.** In addition to visual changes in topography and groundcover, mining activities themselves would be visible elements of the environment.

Some mining would occur during hours of darkness, and lights from heavy equipment and trucks would be visible to some residents. To reduce noise, the Applicant proposes to use strobe lights at night instead of beeping alarms for required backup warning systems on heavy equipment. Residents at Sandy Shores would likely see these during nighttime operation, particularly during winter, when more work is required under darkness. Gold Beach residents would see these during some phases of the mine, particularly in the third phase during excavation of the western portion of the mine. When the mine is inactive, the nighttime landscape would appear essentially the same as it is now.

During the day, heavy equipment (bulldozers, wheel loaders, and water and fuel trucks) would be visible moving about the site. Bulldozers would be visible on the upper slopes of mining areas as they push materials down to a collection point. As under all alternatives, some material would be transported by truck, averaging five trucks per day, 6 days a week.

When present, the portable crushing plant may be visible to some residents, depending on placement. The conveyer belt system would also be visible, and its location would change as mining progresses on the site.

**Changes in Views from across Puget Sound.** A more distant viewer from across Puget Sound would also see the visual changes occurring on the project site (Figure 11-3). Reclaimed areas would appear "natural" much sooner from this perspective because of the distance. The major change in view would be caused by the contrasting colors of cleared and actively mined areas compared to forested and reclaimed areas. Long-term topographical changes would be visible although not necessarily obvious. Some terracing may be visible and appear unnatural, especially before shrubs, trees, and groundcover begin to grow.

While people from across the Sound could see the site, being visible does not categorically indicate a significant adverse impact.

The visual impact must be evaluated within the visual context in which it is occurring. Development along the shores of Puget Sound, including Vashon/Maury Island, is commonplace. The communities of Gold Beach and Sandy Shores are also visible from many locations, as is the existing mining area.

The visual changes at the site that would occur from the Proposed Action must be considered within the context of these visual features in the immediate vicinity. Based on these considerations, the overall visual change on the site would be noticeable, but would not be so severe as to eliminate the use and enjoyment of areas.

Visual characteristics of proposed barging operations are described in Section 11.3.2.

#### *11.3.1.2 Alternative 1*

Under Alternative 1, changes in the visual character of the site would occur more gradually and over a longer time than under the Proposed Action.

The estimated annual amount of extraction under Alternative 1 is 5.72 million tons, rather than 7.5 million tons as under the Proposed Action. The lower annual rate would not necessarily change visual impacts and, in some ways, may be greater since the mining operation under Alternative 1 is projected to last 5 years longer—40 years instead of 35 years under the Proposed Action. As with the Proposed Action, up to 64 acres would be essentially cleared of vegetation at any one time.

The Applicant's proposed 50-foot vegetated perimeter buffer and 200-foot shoreline buffer remain the same for Alternative 1. As with the Proposed Action, these buffers would assist in obscuring the views of mining.

Other impacts would be essentially the same as the Proposed Action, except they would occur at a slower speed and would continue over a longer period of time.

#### 11.3.1.3 Alternative 2

Like Alternative 1, Alternative 2 differs from the Proposed Action by extending the expected life of the mining operation (up to 50 years, depending on market conditions).

In addition, the hours of operation under the No-Action Alternative would remain the current 7 a.m. to 7 p.m. Monday through Friday and 9 a.m. to 6 p.m. Saturday, rather than the more extended hours of mining under the Proposed Action and Alternative 1.

The Applicant’s proposed 50-foot vegetated perimeter buffer and 200-foot shoreline buffer remain the same with Alternative 2. As with the Proposed Action, these buffers would assist in obscuring the views of mining.

Other impacts would be essentially the same as the Proposed Action, except they would occur at a slower speed and would continue for a longer period.

#### 11.3.1.4 No-Action

The visual and aesthetic impacts associated with the No-Action Alternative would be less than the Proposed Action, Alternative 1, and Alternative 2. The estimated annual amount of extraction under No-Action would be substantially less (20,000 tons annually). It is assumed that this decrease in annual and corresponding net volume compared to the action alternatives would have a positive effect on the views of the site under No-Action because of the expected decrease in the amount of site disturbance and other associated mining activities.

However, the mining operation and associated visual impacts under the No-Action Alternative would occur indefinitely, rather than a finite 50 years (Alternative 2), 40 years (Alternative 1), or 35 years (Proposed Action).

In addition, the hours of operation under the No-Action Alternative would remain the current 7 a.m. to 7 p.m. Monday through Friday and 9 a.m. to 6 p.m. Saturday, rather than the more extended hours of mining with the Proposed Action and Alternative 1.

The Applicant’s proposed 50-foot vegetated perimeter buffer and 200-foot shoreline buffer remain the same under No-Action. As with the Proposed Action, these buffers would assist in obscuring the views of mining.

### 11.3.2 How would the reintroduction of barging affect the visual environment?

#### *11.3.2.1 Proposed Action*

The barge loading operation would be visible to residents, since the dock facility juts out from the shoreline and is clearly visible from surrounding communities. During times of active mining, barges could be loaded almost constantly at the site. The activity would introduce industrial characteristics to the beach, which, for the past 20 years, has been rural and residential in nature. Other tugs with barges may also be seen as they hold offshore to wait as another barge is being loaded. Up to four 10,000-ton barges (or a greater number of smaller barges) would be visible under the Proposed Action, potentially 24 hours a day.

At night, barge loading would be visible due to lighting on tugs and on the dock. The dock would not be lit up in its entirety, since lighting is required only at specific locations where people are working. Lighting may include lighting of the distribution point, where sand and gravel is actually placed on the barge. Lighting would be shielded to direct light into the barge. Tug pilots may use spotlights or bright deck lights as needed to maneuver barges back and forth to distribute the load.

#### *11.3.2.2 Alternative 1*

Under Alternative 1, the reduction of barging may offset some changes in nighttime character at the site. The barge operation under Alternative 1 would be 16-hour days (rather than 24-hour days in the Proposed Action) which would leave a portion of the day with no visible mining activity. Under this alternative, there would be barge loading and tugboat activity only between the hours of 6 a.m. and 10 p.m. Monday through Friday and 9 a.m. and 6 p.m. Saturday. Under Alternative 1, two 10,000-ton barges loaded each weekday and one on Saturday (or a greater number of smaller barges) would be seen entering, being loaded, and then leaving the site. In contrast, up to four 10,000-ton barges could be seen with the Proposed Action, 24 hours a day. With Alternative 1, some material would be transported by truck, averaging five trucks per day, 6 days a week.

#### *11.3.2.3 Alternative 2*

Under Alternative 2, during active mining, barges would be expected to be seen at the site up to 12 hours per day (7 a.m. to 7 p.m.) except Sundays, when no barging would occur.

#### *11.3.2.4 No-Action*

Under No-Action, as defined in Chapter 2, there would be no barge loading and tugboat activity. The existing dock would remain in its existing condition, with no additional use. All material would be transported by truck, averaging five trucks per day, 6 days a week. The views of the shoreline and dock area would remain the same as under current conditions.

## 11.4 Adverse Impacts and Mitigation

### 11.4.1 Significance Criteria

King County considers the following as indicators of significance for light, glare, and aesthetics impacts under SEPA.

- Violating King County Codes for light and glare.
- Producing sufficient visual changes in the landscape so as to severely restrict or eliminate the use and enjoyment of areas currently used by people for housing and/or recreation.

### 11.4.2 Measures Already Proposed by the Applicant or Required by Regulation

The following measures have been proposed by the Applicant to mitigate impacts or restore the natural character of the landscape during and following mining under the action alternatives:

a. A 50-foot vegetated perimeter buffer and 200-foot shoreline buffer would be maintained.

b. As required by the Washington State Surface Mining Act, active mining/reclamation activities would be limited to 64 acres at a time, with up to two 32-acre phases (one being mined, the other being actively reclaimed).

c. The Applicant would hydroseed slopes and plant the floor of the mine with Douglas-fir, as described in Chapter 2.

Per KC 21A.22, Mineral Extraction:

*Lighting shall (1) be limited to that required for security, lighting of structures and equipment, and vehicle operations; and (2) not direct glare onto surrounding properties.*

### 11.4.3 Remaining Adverse Impacts and Additional Measures

#### *11.4.3.1 Visual Impact 1 – Change in Overall Visual Character of the Site*

**Specific Adverse Environmental Impact.** Mining would physically change the site. Open excavations and moving machinery would be visible from many locations during mine operation. At the completion of mining, site topography would be different than it is now.

#### *11.4.3.2 Visual Mitigation 1*

Additional measures that could further offset visual disturbances under any of the action alternatives include the following:

a. Restore forest wherever possible, as described in Chapter 5.

b. To provide a more natural appearance, contour slopes with undulating terracing, rather than traditional linear terracing.

c. Increase the buffers at the western and eastern corners of the property to increase screening and reduce the visual presence of the operation to the Gold Beach and Sandy Shores Communities. Increased buffers designed to protect the existing forested bluffs would be most effective. Hypothetical locations for increased buffer areas are shown in Figure 11-8. The larger buffers would also help to reduce potential impacts of noise and dust on adjacent communities (see Chapters 3 and 7).

**Regulatory/Policy Basis of Condition.** King County Resource Land Policy RL-411states that conditions and mitigations for significant adverse environmental impacts associated with mining operations should be required, especially in the following areas:

(a) Air quality;
(b) Environmentally sensitive areas;
(c) Noise levels;
(d) Vibration;
(e) Light and glare;
(f) Vehicular access and safety;
(g) Visual impacts;
(h) Cultural and historic features and resources;
(i) Site security; and

(j) Others unique to specific sites and proposals.

## 11.5 Cumulative Impacts

Development of the site would add to changes that have occurred on Maury and Vashon Islands, including the development of several gravel mines and the construction of residential subdivisions. These prior disturbances have resulted in permanent change in the character of the area. The proposed mining operation would increase the visual presence of people and activity in the area over what has already occurred.

## 11.6 Significant Unavoidable Adverse Impacts

Increased mining and barging would result in an obvious change in topography and overall visual character of the site. Because the site is located near a shoreline, activities at the site would be visible from many vantage points. Nevertheless, the types of visual changes that would occur are to be expected under the Mineral zoning which the site is currently designated.

While views of the site would undoubtedly change, the overall impact is limited, since the only views that would be impacted are direct views of the site and associated dock. The predominant and highly valued views of Puget Sound and Mount Rainier would not be affected.

Several mitigation measures are available that would greatly reduce the total area that would be visible at any one time. In addition, vegetation management measures to restore madrone forest and riparian habitat would be effective in softening the visual character of the site. Mining would not result in the entire site being exposed, but rather exposure would occur in 32-acre patches.

The existing site already contains many of the visual elements that would occur with the proposed project, including exposed sand as well as a dock.

The project would not direct glare onto surrounding properties (per KC 21A.22.070).

With these considerations, it is expected that visual changes, while adverse and expected to be disliked by surrounding communities, are not sufficient to be considered significant under SEPA.

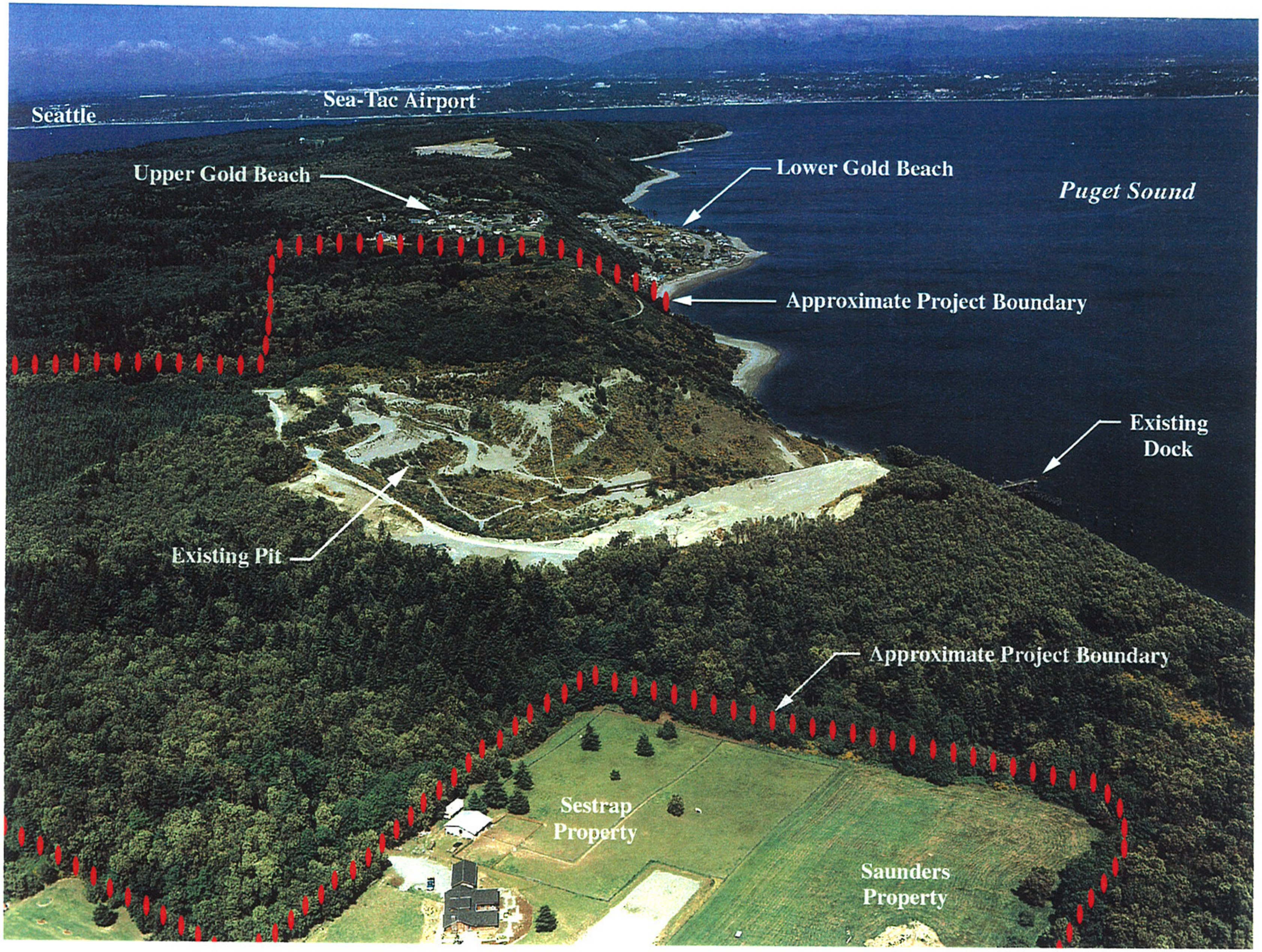



**Figure 11-1**
**Aerial Photograph of Glacier Northwest's Maury Island Site**

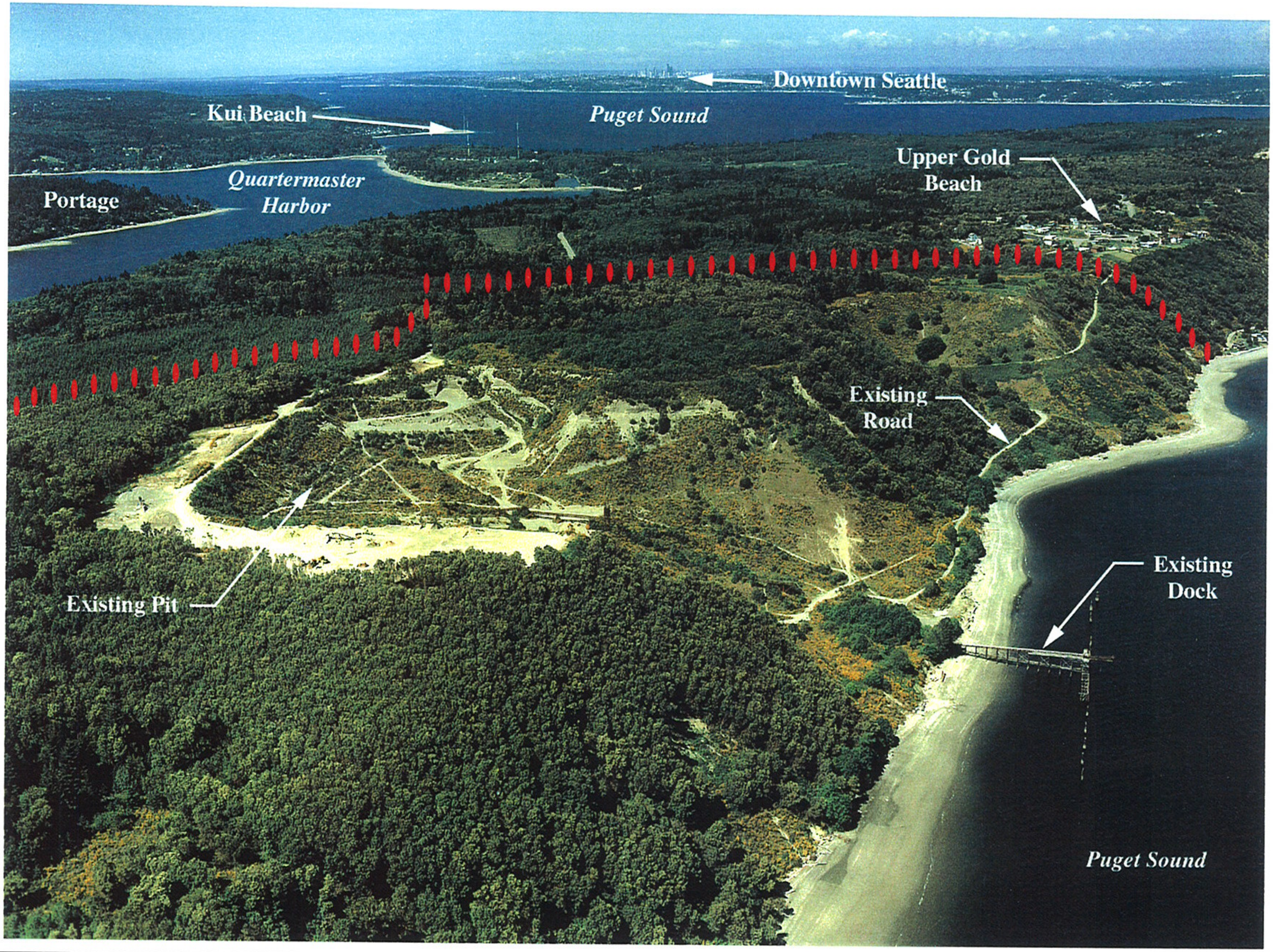



**Figure 11-2**
**Aerial Photograph of Glacier Northwest's Maury Island Site Showing Puget Sound Shoreline**

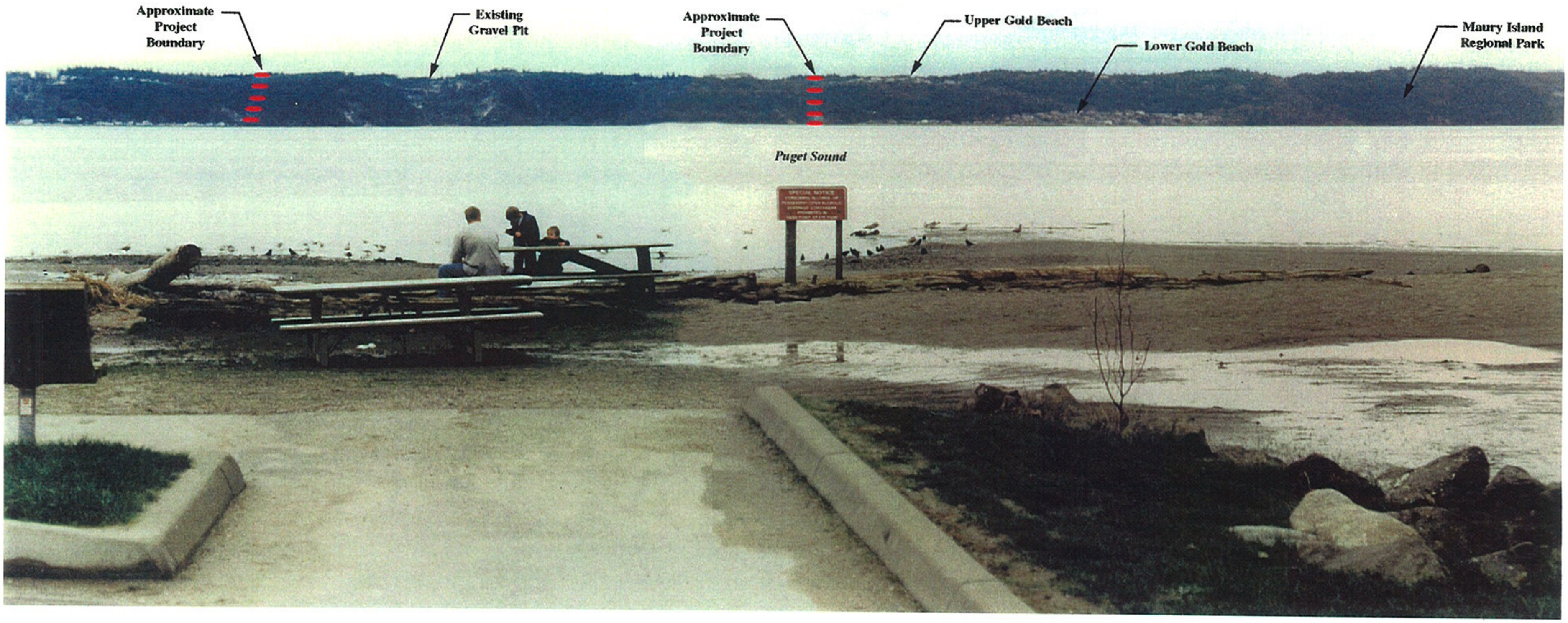



**Figure 11-3**
**View of Maury Island from across Puget Sound**


**Figure 11-4**
**View taken from Upper Sandy Shores (Eggert Residence)**
**Looking Northeast**

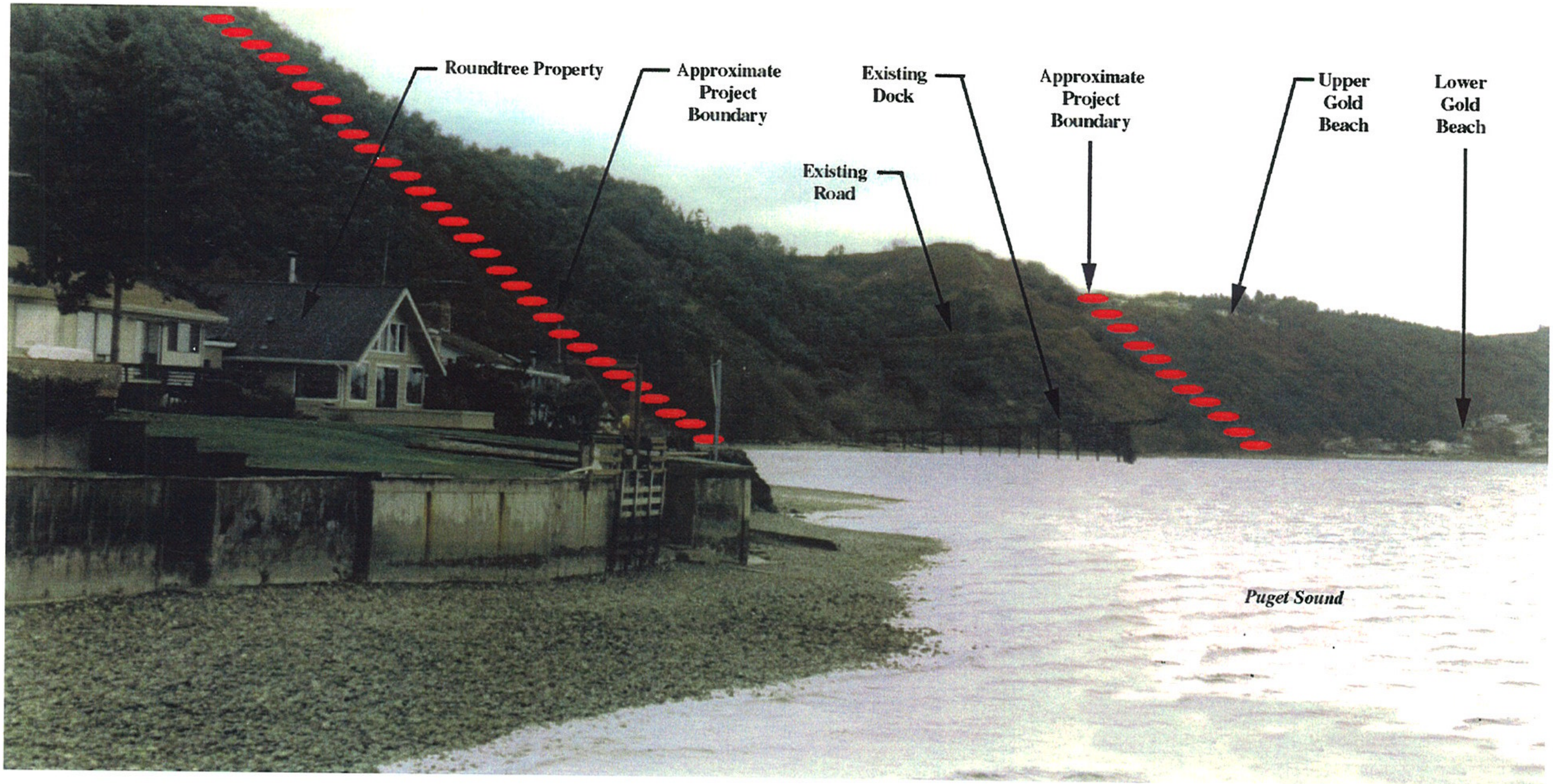



**Figure 11-5**
**View of the Project Site Taken from Lower Sandy Shores Looking Northeast**

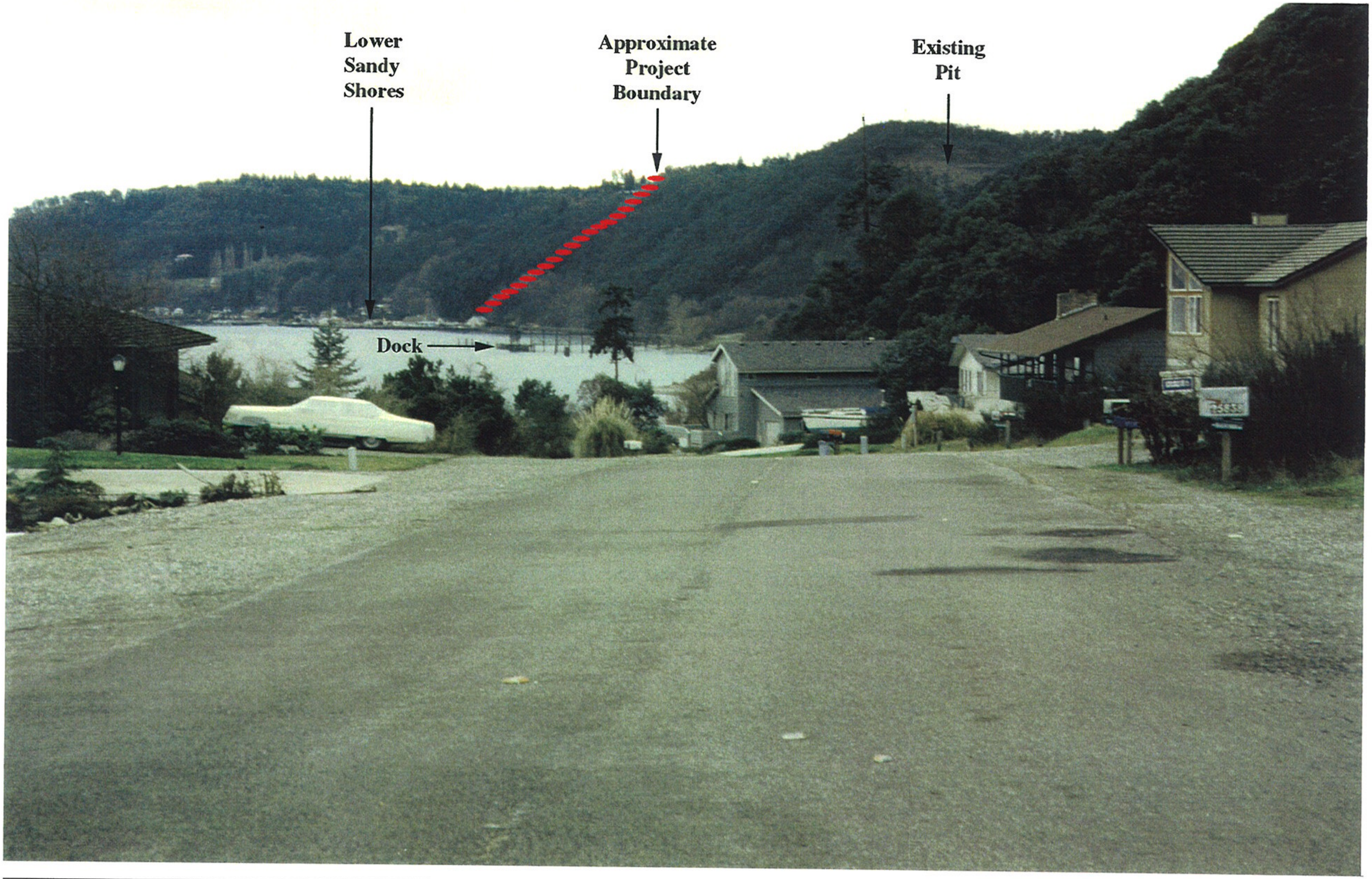



**Figure 11-6**
**View of the Project Site Looking Southwest from Gold Beach Drive, Lower Gold Beach**

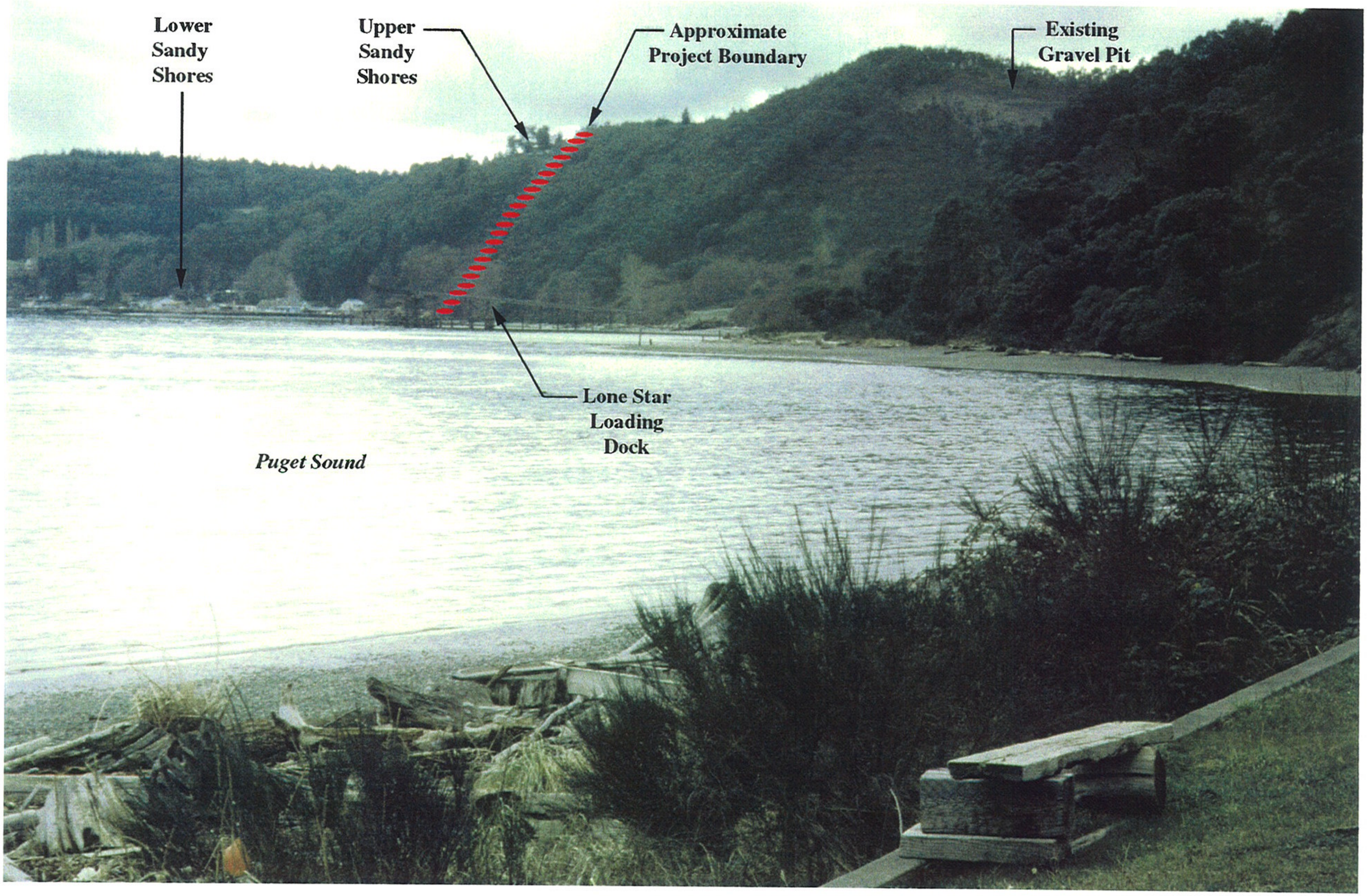



**Figure 11-7**
**View of the Project Site from Gold Beach Community Club Looking Southwest**

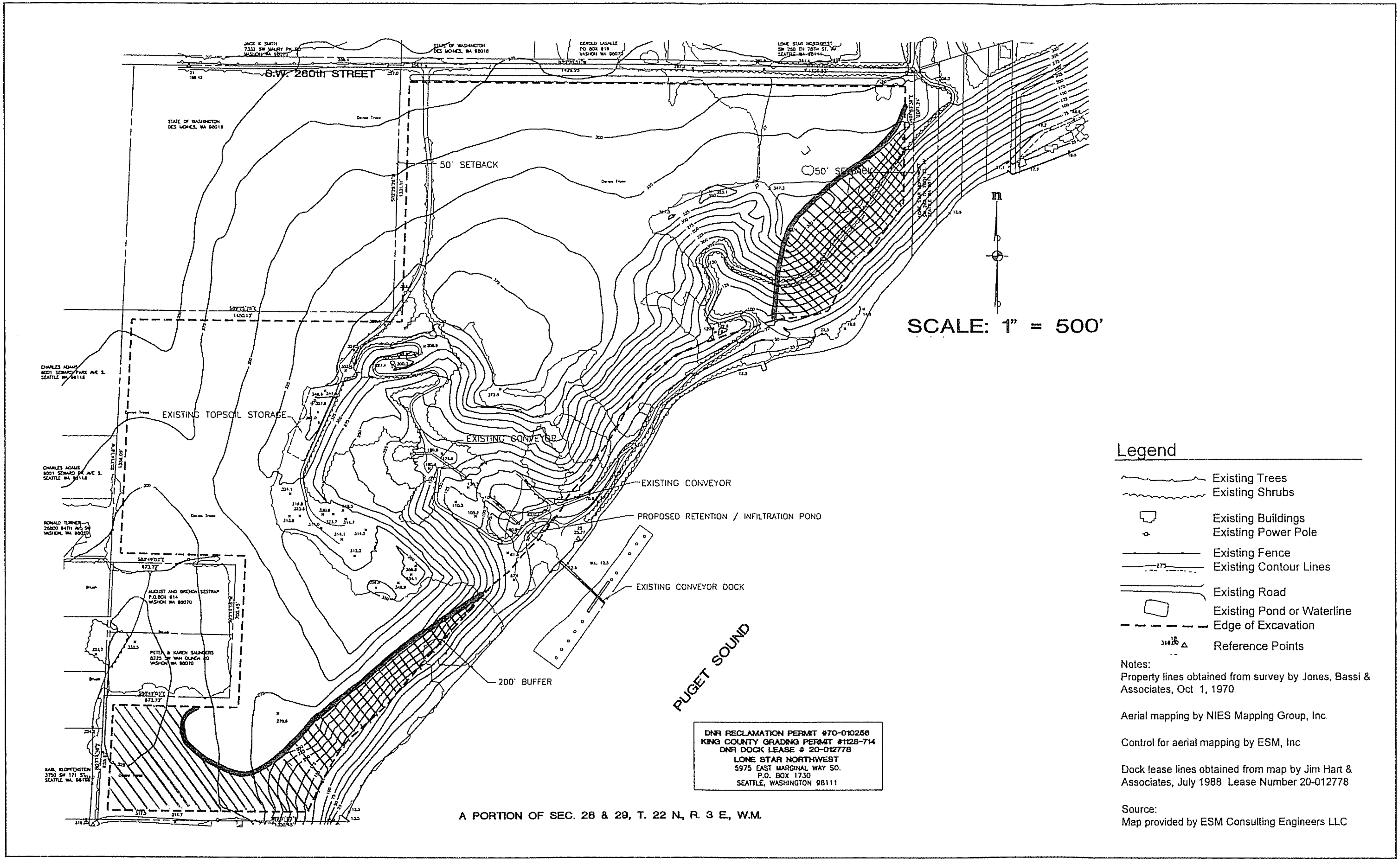



Figure 11-8. Potential Enlarged Site Buffer Areas (shown with diagonal hatching)

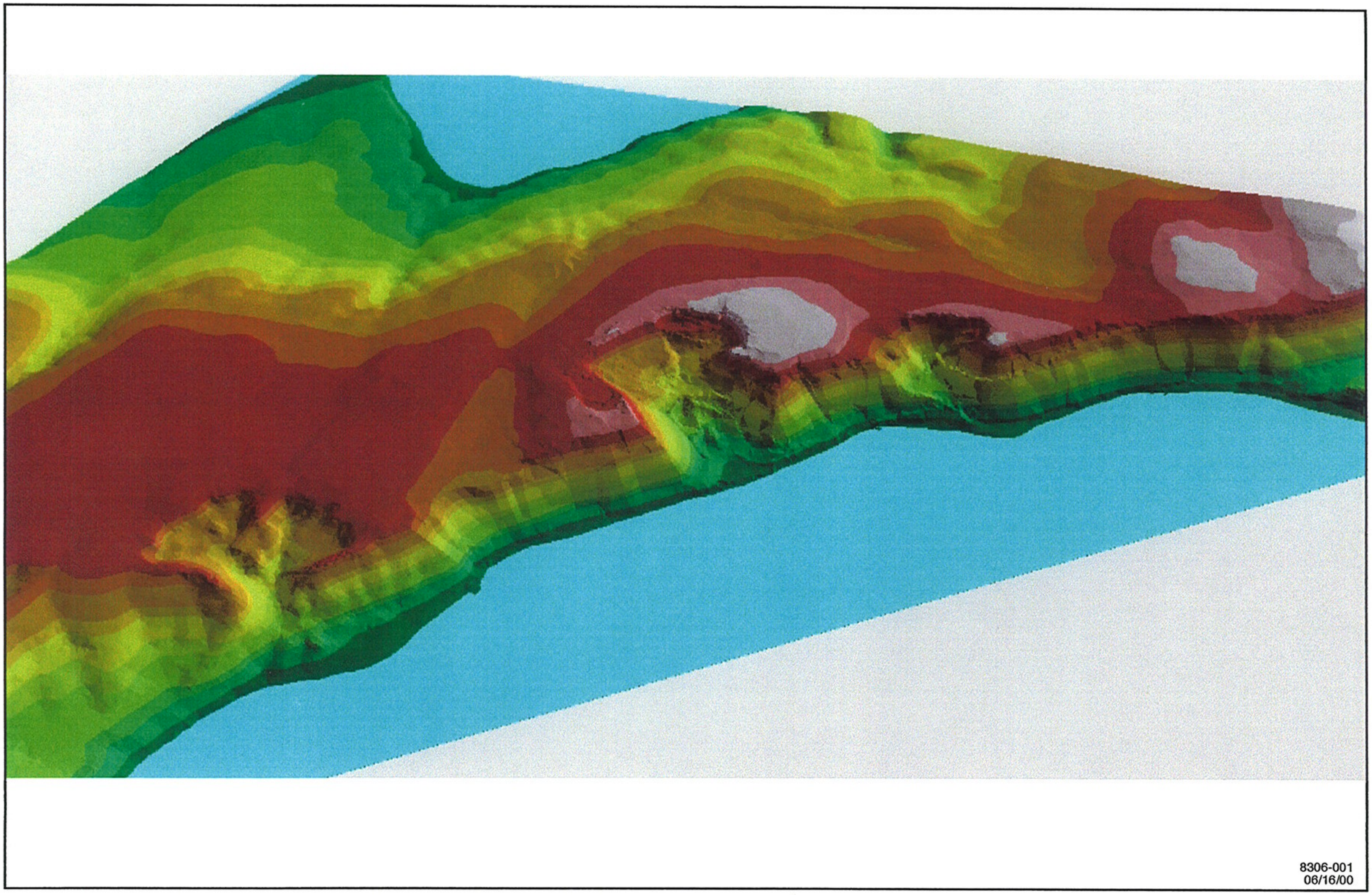



Figure 11-9a. Simulated Aerial View of the Site – Existing

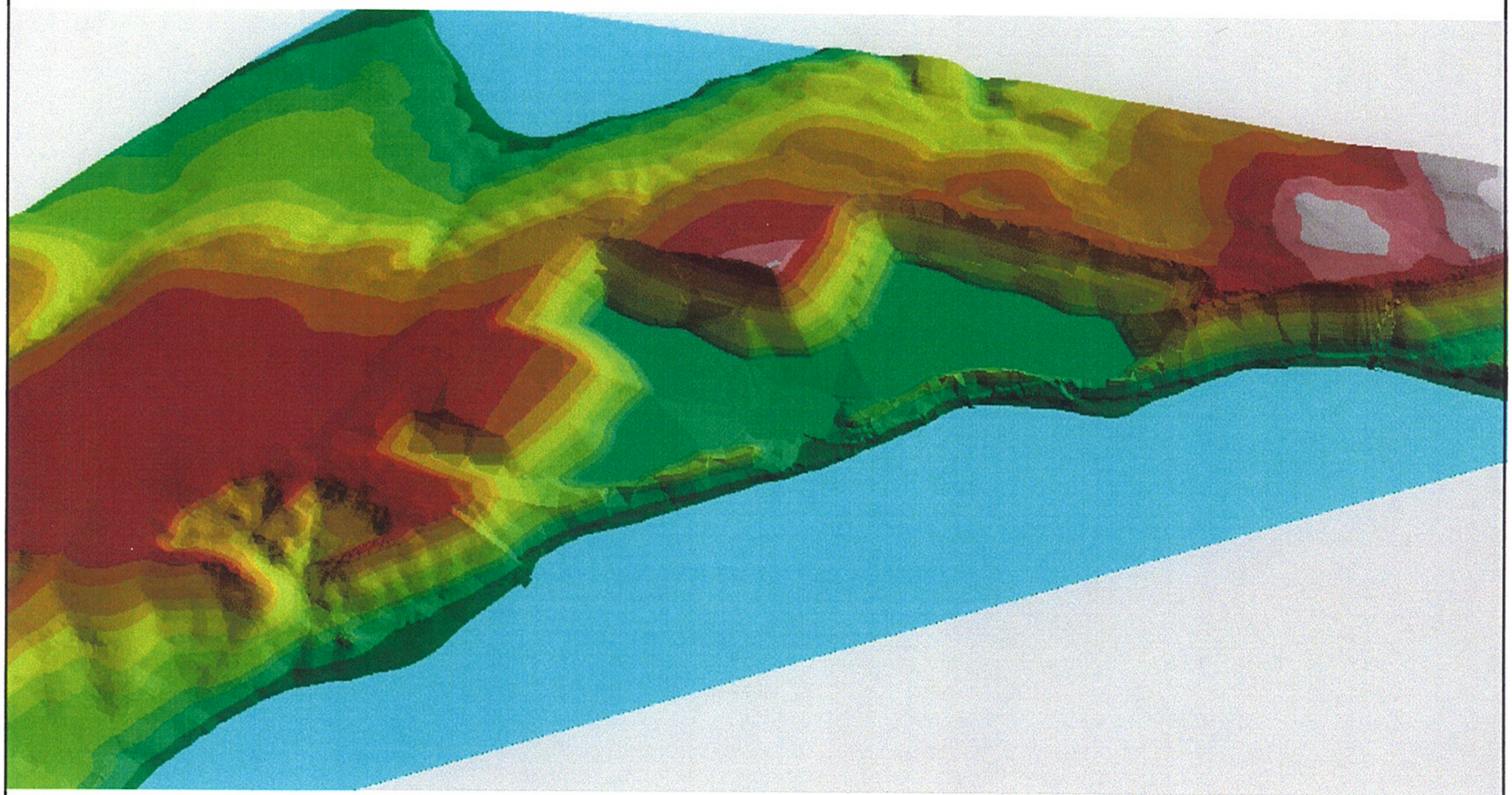


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Figure 11-9b. Simulated Aerial View of the Site – After Mining as Proposed

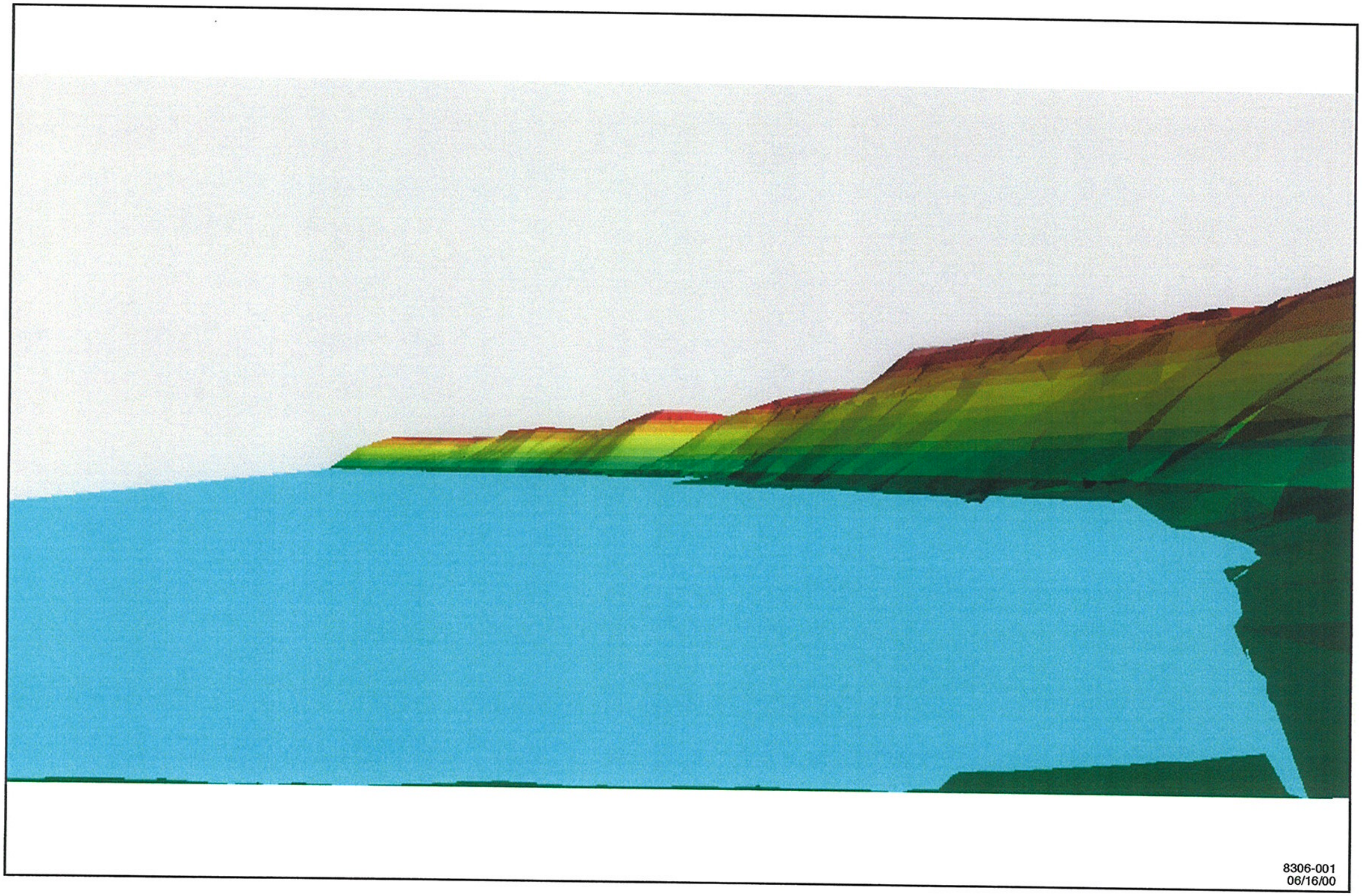


Figure 11-10a. Simulated View of the Site From the Gold Beach Area — Existing

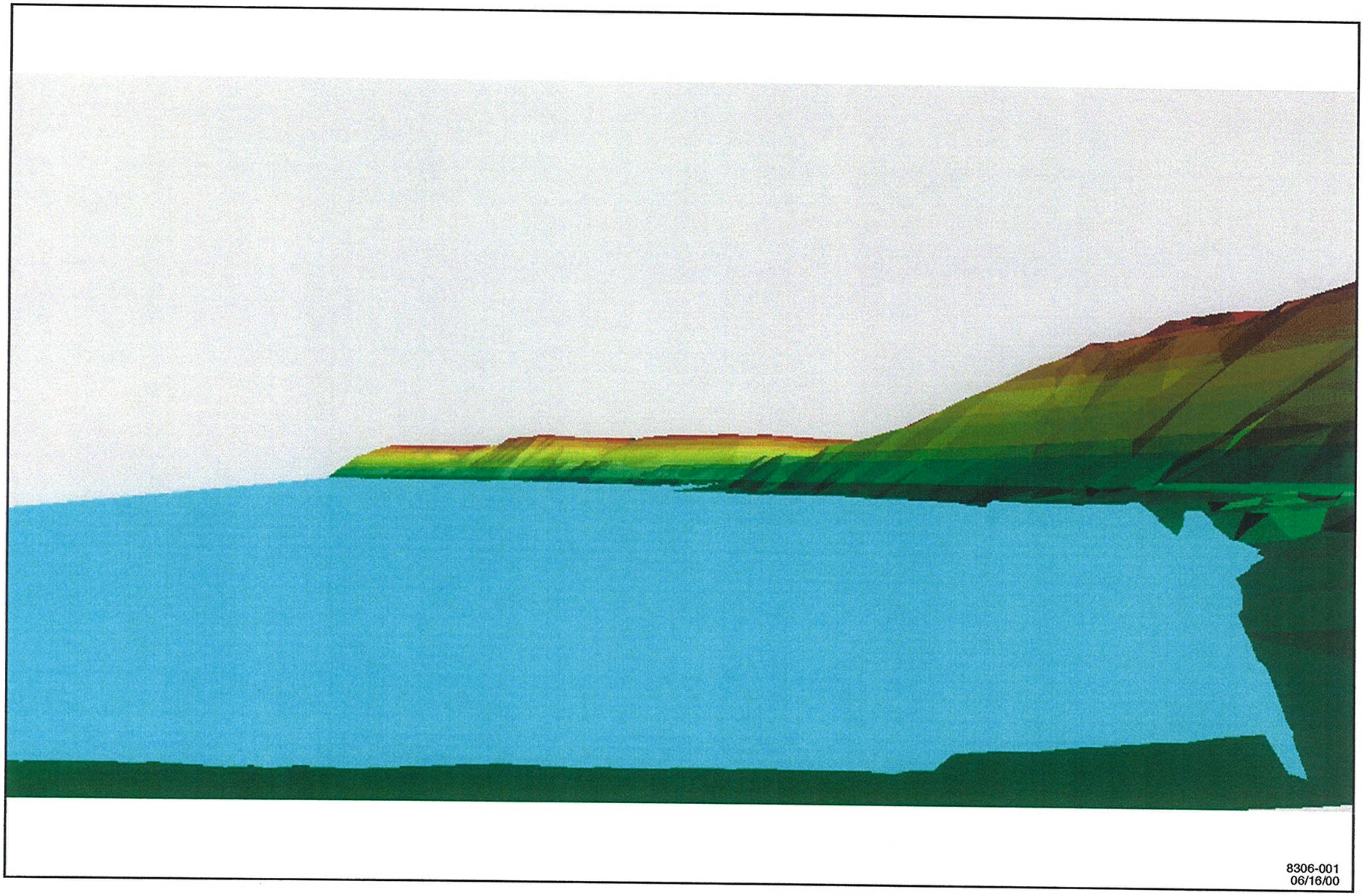


Figure 11-10b. Simulated View of the Site From the Gold Beach Area —At Final Grade

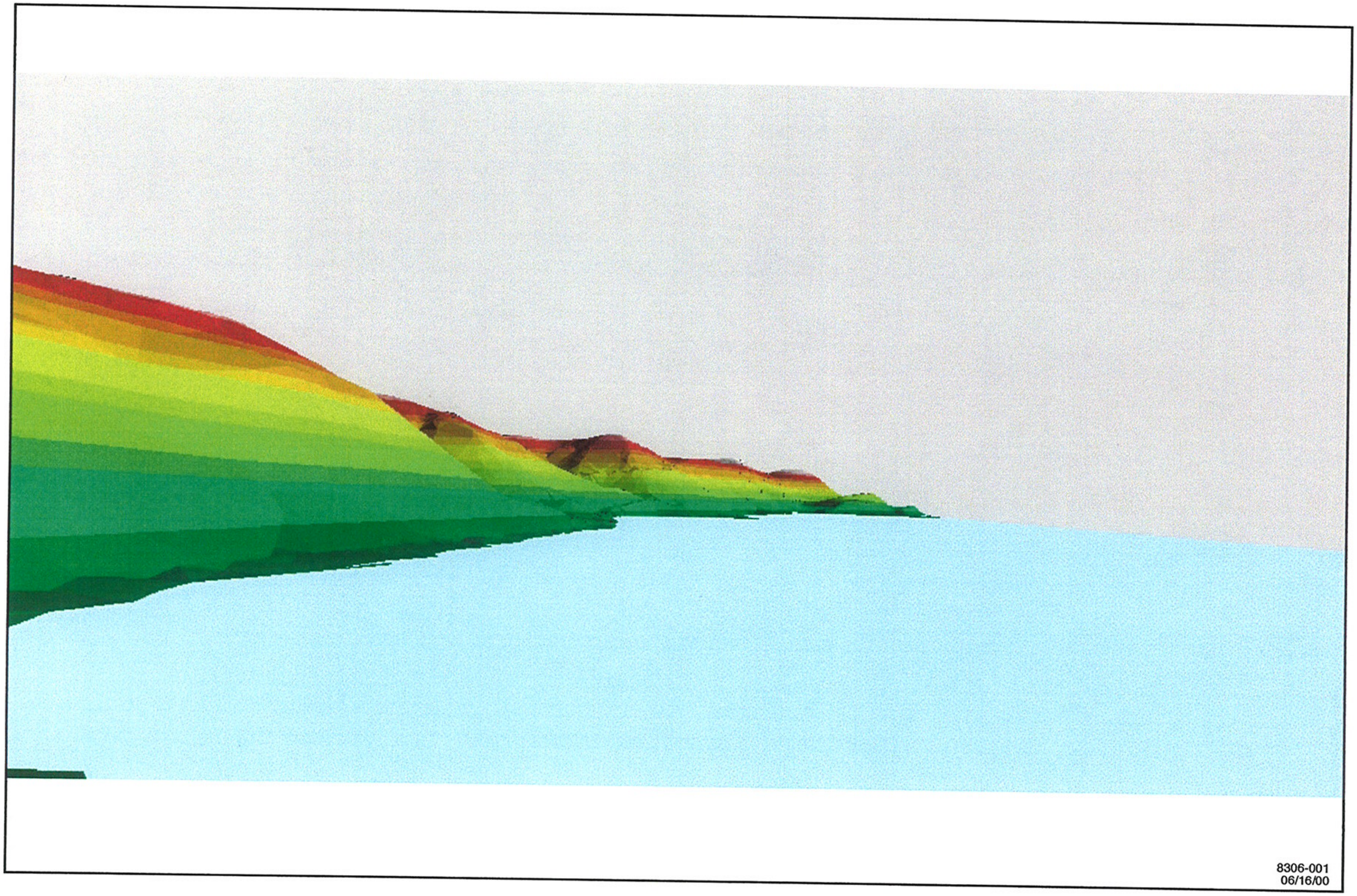


Figure 11-11a. Simulated View of the Site From the Sandy Shores Area — Existing

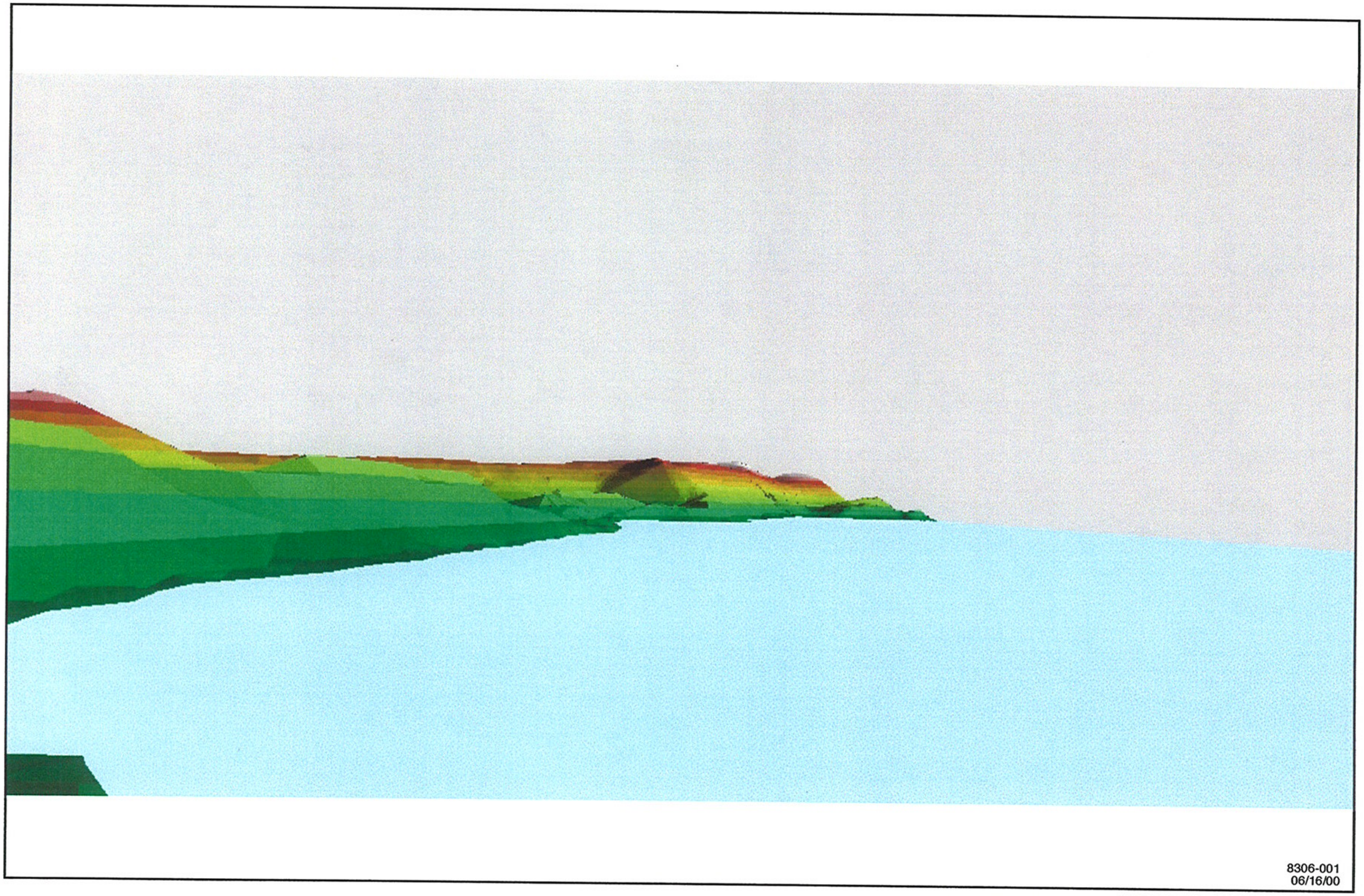


Figure 11-11b. Simulated View of the Site From the Sandy Shores Area —At Final Grade

*Chapter 12*

# Recreation

# *Chapter 12*

# Recreation

## 12.1 Primary Issues

Outdoor recreation is an important part of life for many Maury Island residents. Beach walks, horseback riding, bicycling, and evening and weekend strolls are common activities enjoyed by the community.

The project site is privately owned and operated for the sole purpose of gravel extraction, as it has been since the 1940s. However, the low level of mining activity over the past 20 years has allowed informal and non-authorized use of the site for recreation. Many residents are concerned that reactivation of large-scale mining at the site would eliminate this use that they have become accustomed to.

The primary issue addressed in this chapter is:

- Would the project interfere with the public use and enjoyment of any formal or informal recreational sites in the area?

## 12.2 Affected Environment

### 12.2.1 Existing Recreational Facilities in the Vicinity

Notable recreational sites on Maury Island include Dockton Park, Maury Island Marine Park, Point Robinson Park and Lighthouse, and Vashon Golf Course.

Dockton Park is a 23-acre park located on the west end of Southwest 260th Street, on the north side of the island along Quartermaster Harbor. The park is about one-quarter mile northwest of where mining would occur. The park provides picnic areas, hiking trails, swimming beach, a boat launch, and moorage.

Maury Island Marine Park is a newly acquired, undeveloped county park on the southeast side of Maury Island, located along the shoreline northeast of the Gold Beach community. The park is accessed by a 10- to 15-minute walk downhill to the beach from the parking lot. The park is also accessed via the shoreline for some residents of Gold Beach and Sandy Shores. The entrance is off of Southwest 244th Street.

Point Robinson Park is located on the east end of Southwest Point Robinson Road, about 1 mile northeast of the project site. The 10-acre park includes the Point Robinson Lighthouse, picnic tables, trails, and beach access.

### 12.2.2 Informal Recreational Use of the Project Site

People have accessed the site, largely without permission, and other undeveloped lands in the area for walking on informal trails, existing roads, and the shoreline; horseback, mountain bike, and motorcycle riding; and other activities. The project site contains no constructed recreational facilities, trails, or access since the property is managed solely for sand and gravel mining. People use existing dirt roads and informal trails to access the site. Recently, the Applicant has taken steps to prohibit unauthorized use of the site. These efforts have included placing ads in the Vashon-Maury Island Beachcomber and informing the King County Sheriff's office of trespassing.

A brief survey conducted in January 1999 by the EIS Team identified residents' use of the site. Of the 24 people surveyed, the following uses were identified (the percentages indicate the proportion of respondents who said they use the site for each activity):

- horseback riding (75 percent),
- wildlife viewing (42 percent),
- walking trails (42 percent),
- hiking (33 percent),
- motorized or nonmotorized bike riding (33 percent),
- beach walking (25 percent), and
- other uses (less than 25 percent each).

In addition, the dock area is popular for recreational scuba diving.

## 12.3 Impacts

### 12.3.1 Would the project interfere with the public use and enjoyment of any formal or informal recreational sites in the area?

#### *12.3.1.1 Proposed Action*

Impacts on recreation would be limited to the site and adjacent lands. Parks in the vicinity are not sufficiently close to be affected by traffic, equipment, or noise. Visitors to the Maury Island Marine Park would see barge traffic entering and leaving the site. This would not significantly alter the opportunities or experiences provided by the park. Many popular shoreline parks around the Puget Sound region have views of shipping and barging.

The site would not be visible from Dockton Park, Point Robinson Park, and the Vashon Golf Course, nor would it complicate traffic or parking for these areas.

The area available for informal recreation on the site would be reduced as the site is mined. At any given time, active operations would occur on up to 64 acres of the site (for mining and active reclamation areas). Some of the active area may require fencing per King County Code, but the Applicant has not proposed to fence the site perimeter.

Land yet to be mined may be available for use, and reclaimed areas may be available for some use as well. The site is expected to be periodically inactive or operating at very low levels. During periods of inactivity, much of the site could be available for informal uses, although liability and safety issues would need to be addressed by the operator of the mine.

During inactive periods, the beach area would be essentially unchanged from current conditions and would provide opportunities similar to those currently available. During active, full-production periods at the mine, the shoreline would still be available for public use. The Applicant plans to construct safety features in the conveyor system and dock (e.g., overhead protection) to allow for safe pedestrian passage under the facility along the shoreline.

Noise and activity at the mine may detract from the recreational experiences currently available at the site and adjacent lands. The shoreline environment would be much more active, and people could see or hear barges and tugs, the conveyor system, exposed sand and gravel, and equipment and workers. Some of the mining would occur behind the shoreline bluffs or within the interior portions of the site and would be somewhat removed from the shoreline area.

The attractiveness of the waterfront for recreational boaters would be reduced. For example, the area provides an attractive place to anchor overnight for sailboaters (potentially guests of Maury Island residents), but with 24-hour barging, the area would not be as attractive for such use. However, many boaters currently use Dockton Park, since it has a marina. This is on the other side of the island along Quartermaster Harbor, so this use would not be affected.

Over time, mining and barging would become a common sight and, eventually, a part of the overall character of the area until the site is closed.

Safety concerns regarding public access include the active facilities and equipment that would be part of the working mine. In addition, the working "face" of the mine could contain steep slopes and unstable ground, and moving vehicles and equipment can be dangerous. While people would tend to avoid active portions of the mine, it is conceivable that people could venture into these areas without authorization. Workers would be present in active areas and would directly control access within the active mining areas. In addition, as described in Chapter 9, several measures identified in King County Code specifically address public safety and prevention of public nuisances and hazards.

Diving opportunities along the site shoreline would be essentially eliminated during active mining periods.

#### *12.3.1.2 Alternative 1*

Reduced hours of barging would not greatly affect the way recreation would be impacted by the project. Early morning, evening, and Sunday walks for residents along the shoreline or on adjacent bluffs may be more peaceful since barge loading would not occur at these times. Recreational scuba divers would be able to dive on Sundays.

#### 12.3.1.3 Alternative 2

As with Alternative 1, reduced hours of barge loading would reduce the distracting effect of noise and activity during evening and early morning hours and on Sunday.

#### 12.3.1.4 No-Action

Under No-Action, the Applicant is likely to continue to restrict public access to the site (except for beach access).

## 12.4 Adverse Impacts and Mitigation

### 12.4.1 Significance Criteria

King County considers the following as indicators of significance for recreation impacts under SEPA.

- Interference with public use and enjoyment of designated recreational facilities.

### 12.4.2 Measures Already Proposed by the Applicant or Required by Regulation

a. While two decades of low-level mining activity has allowed people to use the site, the site is a privately owned and operated gravel mine, and the Applicant is not obligated to provide access for recreation. To the extent that liability issues can be resolved, the Applicant would allow access to the shoreline.

b. The Applicant plans to construct safety features in the conveyor system and dock (e.g., overhead protection) to allow for safe pedestrian passage under the facility along the shoreline.

### 12.4.3 Remaining Adverse Impacts and Additional Measures

#### 12.4.3.1 Recreation Impact 1 – Loss of Recreational Use

**Specific Adverse Environmental Impact.** Since the site is private property, the Applicant is not obligated to provide access or recreational use and may be restrained from doing so, since the

Applicant could be liable for public safety. Still, people are accustomed to accessing the site, and mining as proposed would eliminate these unauthorized uses.

#### *12.4.3.2 Recreation Mitigation 1*

a. To offset the reduction in accustomed (yet unauthorized) use of the site by residents, the Applicant could allow recreational use along the perimeter or inactive areas of the site. For example, a trail and viewpoint could be established overlooking the shoreline and the site. To ensure safe operation of the mine and compatible recreational use, access would need to be controlled. Control measures could include fencing or posting of signs. More elaborate techniques to control access could include development of areas to attract or direct people away from active mining areas or other hazardous locations.

b. The Applicant could coordinate with the community and King County to identify and to inform the public on appropriate recreational uses of the property. Cooperation between the mine operator and King County (for Maury Island Marine Park) and the Sandy Shores and Gold Beach communities could produce some new recreational opportunities for the community.

**Regulatory/Policy Basis for Condition.** None. This mitigation measure would be voluntary.

## 12.5 Cumulative Impacts

Reduced recreational opportunities at the site would be additive to similar reductions that have occurred due to other mining activity on the island and continued development of private lands. Past developments in the area have altered recreational opportunities and needs. Developments include the subdivisions along the southern shoreline of Maury Island, along with overall infilling of residential properties throughout the island. These developments have removed lands available for public use, altered the natural shoreline condition, introduced people and associated disturbances to the area, and increased the demand for recreational facilities and shoreline access. Developed parks in the area have offset much of the opportunity lost due to residential growth, as well as meeting some of the increased demands for parks and open space.

It is expected that population levels and dwellings would increase on the island over time, along with the associated loss of private lands for informal recreational use and shoreline access, and the increased demand for recreational facilities.

Considered collectively with past, planned, and reasonably foreseeable future land uses, the proposal would not contribute to a major cumulative impact on recreation because of continued recreational opportunities on the island, including future development of Maury Island Marine Park.

## 12.6 Significant Unavoidable Adverse Impacts

None expected. Mining activity could distract from outdoor uses of adjacent lands. However, the site is zoned for mining and has been owned and operated as a mine for over 50 years. Loss of recreational opportunities outside of shoreline areas is not considered a significant impact since the operator has not authorized such use, nor is the operator obligated to provide such use.

# *Chapter 13*

# Cumulative Effects and Interdisciplinary Analysis

*Chapter 13*

# Cumulative Effects and Interdisciplinary Analysis

## 13.1 Primary Issues

This chapter contains two tables that note the major interrelationships among the ten environmental topics addressed in Chapters 3 through 12. Table 13-1 notes the existing interrelationships and Table 13-2 notes interrelationships among project impacts and mitigation measures.

In a complicated assessment such as this, environmental issues often overlap. For example, vegetation restoration involves slope stability, water quality, groundwater recharge, wildlife habitat, visual effects, and the marine environment.

The primary issues analyzed in this chapter are:

- How do the current elements of the environment relate to one another?
- How do project-specific impacts and mitigation measures relate among the various elements of the environment?
- How do resource-specific mitigation measures affect impacts and mitigation for other elements of the environment?

## 13.2 Affected Environment

The SEPA Rules define the environmental elements to be considered under SEPA (WAC 197-11-444). But the environment is more than a group of separate elements; it is the product of all these elements combined.

The environment of the site is the product of human, geologic, climatic, and biological processes and features. The environment is dynamic, constantly in flux, and involves complex interactions between these processes and features.

Table 13-1 illustrates the existing interactions among the various elements of the environment.

## 13.3 Impacts

### 13.3.1 How do project-specific impacts relate among the various elements of the environment?

Table 13-2 lists the major interactions among project impacts and mitigation measures. The following sections provide more detail regarding two particularly noteworthy areas of interaction.

**Shoreline Bluffs.** The bluffs along the shoreline of the site involve more environmental topics that perhaps any other site feature.

Air quality is related to the bluffs in that the required shoreline buffer would create a "wall" between the shoreline and the interior portion of the site. Figures 2-3 and 11-9b show the final grade and the bluffs that would remain under the Proposed Action (see also Chapter 11). The remaining bluffs would serve to reduce the potential of airborne materials moving from the interior to the shoreline, although impacts on air quality are not expected, even without considering the effects of the bluffs (Chapter 3). Still, the bluffs would serve to protect air quality.

Similarly, the bluffs could reduce project-generated sound where the bluffs separate residences from noise sources.

The bluffs also shield much of the site from view, and are themselves the most visible part of the site. Diminishing the height of the bluffs would change the visual character of the site, and this change could be seen from the shoreline of Maury Island, as well as from across Puget Sound.

In terms of geology, the bluffs are related to the potential for major slope failure. Major slides have occurred throughout Puget Sound, and many fear that mining at the Maury Island site might trigger such slope failures. However, mining would actually reduce the chance of slope failure. The existing slopes are prone to failure and removing a portion of these bluffs would reduce the total area prone to failure. The remaining bluffs could be maintained stable using appropriate landscaping and grading, as would be defined in the final plans (and refined during final grading operations).

Mining of the bluffs would also affect madrone forest and associated wildlife habitat, as described in Chapter 5. The amount of plant material and soils transported to the shoreline would be reduced by about half the levels under current conditions.

**Relationship between Reclamation and Containment of Arsenic and Lead.** Since the site is contaminated with arsenic and lead, vegetation could contain some of these hazardous materials. However, this is not a major concern, since this concern could be eliminated by testing and, if necessary, proper disposal of the materials. Arsenic is expected to be present in plants at trace levels and, if present, would be managed appropriately.

Under Alternative 1, reducing hours of mining would reduce much of what people would see and hear during nighttime. In addition, many marine organisms are nocturnal, and the elimination of barge loading during nighttime would reduce the amount of noise disturbance.

Under Alternative 2, the further reduction in mining hours would increase the number of hours during the day when people would hear and see relatively little activity from the mine. This increase would mostly add hours when most people are awake.

Under No-Action, the bluffs would probably remain as is indefinitely.

### 13.3.2 How do resource-specific mitigation measures affect impacts and mitigation for other elements of the environment?

Some potential mitigation measures for one element of the environment can affect other elements of the environment, either positively or negatively.

**Bluff Protection – Visual Mitigation 1.** Because the bluffs involve so many elements of the environment, protection of the bluffs would provide environmental benefits for many elements of the environment. Retention of the bluffs was included as a potential mitigation measure in Section 11.4.3.2.

Many people object to the visual effects the mining operation would have, feeling that such a sight would be a major impact on quality of life. As proposed, much of the site would be shielded by the bluffs retained within the shoreline setback required under the Shoreline Management Act. However, visual screening could be increased with a greater proportion of the bluffs being preserved (Section 11.4.3.2).

Protecting and preserving a greater portion of the bluffs would also:

- reduce the potential for dust to move from the interior of the site to along the shoreline;
- protect and preserve more madrone forest, including habitat for band-tailed pigeon (a species of local importance, as defined in the King County Comprehensive Plan);
- maintain the current flow of sand, dirt, wood, leaves, and other materials to the shoreline; and
- provide greater achievement of KC Policy NE-604, which, in part, calls for protection of riparian corridors (riparian areas are land and vegetation that interacts with aquatic areas, such as streams, lakes, and marine areas).

**Containment of Contaminated Soils.** The contamination of the site precludes use of top soils for reclamation. This obviously relates to site reclamation. Madrone can be established without top soil augmentation, as has been demonstrated by natural colonization within previously mined areas. Some soil augmentation may be necessary to encourage other plants to develop. Over time, soils would develop naturally.

## 13.4 Cumulative Effects

Cumulative effects (impacts) involve the collective consideration of several individual impacts. Many actions that have relatively minor effects on the environment when considered by themselves can have major effects when considered collectively with impacts from other sources. For example, impacts on regional air quality from one source can be negligible, as is the impact of a single car on traffic. However, as is evident throughout King County, collectively, all cars have tremendous impact on air quality, traffic, and the quality of life.

Cumulative impacts can be viewed in two ways. First, the impacts of a specific project can be considered together with impacts from independent projects, including those occurring in the past, present, and reasonably foreseeable future. Chapters 3 through 12 addressed this type of cumulative impact by considering impacts directly attributable to the proposal together with similar impacts attributable to independent sources. For example, loss of madrone forest due to mining at the site was considered collectively with the loss occurring throughout the region due to development.

The second way cumulative impacts can be viewed is to consider multiple impacts that occur at the project scale. As noted in SEPA, WAC 197-11-330, “several marginal impacts when considered together may result in a significant adverse impact.” Many public comments on the DEIS stated that King County did not adequately address cumulative impacts across elements of the environment. The DEIS addressed cumulative effects for each resource but did not address all the effects collectively. This section addresses this second way of considering cumulative effects.

Predicting significance of the cumulative effect of project impacts requires judgement, since no formula is available to interpret and define such impacts. For this section, the most notable impacts are simply presented collectively for review, consideration, and disclosure of the cumulative effect of the project.

Surface mining, by its very nature, is an intensive land use, involving large-scale clearing of vegetation and movement of soils and minerals. It requires heavy equipment, trucks, conveyer systems, sorting machines, and transportation systems. These, in turn, create many unavoidable adverse impacts on the environment, including loss of wildlife habitat, visual and physical changes to the landscape, and creation of noise and traffic.

King County Resource Land Policy RL-411 lists the following impact areas as being particularly associated with mining operations:

(a) Air quality,

(b) Environmentally sensitive areas,

(c) Noise levels,

(d) Vibration,

(e) Light and glare,

(f) Vehicular access and safety,

(g) Visual impacts,

(h) Cultural and historic features and resources, and

(i) Site security.

For this project, the most notable adverse impacts were determined to be on environmentally sensitive areas (Chapters 5 and 6) and the visual environment (Chapter 12). These impacts are as follows:

- Rockfish, cod, and other sensitive species would be reduced or eliminated underneath and near the barge loading area.

- Mature madrone forest would be converted to young madrone forest. These young forests would take 50 years or more to approximate the functional values of existing forests and may never totally replace the loss. This loss would reduce wildlife habitat values on the site, including habitat for band-tailed pigeon and other sensitive species.

- Mining would visually and physically alter the site. People living along the shoreline in the Sandy Shores and Gold Beach communities would regularly see barges come and go as well as the exposed active areas of the mine. Some views would be screened by the existing bluffs.

As documented in Chapters 3 through 12 and in Table S-2, large scale mining at the Maury Island site would cause many other adverse impacts that cannot be completely avoided. These impacts should be considered collectively by the decision-maker when making decisions regarding the proposal.

Finally, one last consideration related to cumulative effects is the potential for the project to establish a precedent for future actions with significant effects. However, the project, and King County's decisions regarding it, would not set a precedent that would result in more gravel mines being developed. The number of potential sites is very limited, as defined in the King County Comprehensive Plan. The Maury Island site is the only shore-based area zoned for mining on King County. With this lack of available sites, additional shore based mining being proposed in King County is unlikely.

Some decisions about the proposal may establish a precedent for how projects are evaluated and conditioned in shoreline areas. This is the first major shore-based proposal evaluated by King County since the listing of the Puget Sound Chinook salmon as threatened. During consultations with the WDFW, their biologist assigned to this project noted concern that impacts and project conditions established for this project may be applied at others projects that are reasonably likely to occur throughout Puget Sound.

## Table 13-1. Interrelationships Among Various Elements of the Environment

| Air | Geology/ Hydrogeology | Terrestrial Plants and Animals | Marine Environment and Fisheries | Noise | Transportation | Land Use | Environmental Health and Safety | Visual and Aesthetics | Recreation |
|---|---|---|---|---|---|---|---|---|---|
| ***Air*** | | | | | | | | | |
| | | | | | Fog and bad weather can complicate shipping | People who live on Vashon/ Maury island enjoy many aspects of rural life, including clean air | Arsenic and other materials have settled on the site from polluted air. | | |
| ***Geology/Hydrogeology*** | | | | | | | | | |
| The site contains open areas from past mining that are exposed to wind erosion, although this is not currently a major problem at the site. | | Dry, well-drained soils at the site, as well as the steep bluffs, provide ideal conditions for madrone forest. | The steep bluffs contribute soils to the shoreline. The topography of the site continues into offshore water, where ridges jut out, and then slope sharply into deeper water. | | The shoreline location provides opportunity for sea-based transportation. | The site is rich with sand and gravel that make excellent structural fill, a resource that is in high demand as the region grows. | | Past mining has created a large open area in the central portion of the site. The topography creates bluffs and shoreline that are a major part of the visual environment. | The beach along the site provides recreation opportunities. |
| ***Terrestrial Plants and Animals*** | | | | | | | | | |
| | Madrone on the bluffs help prevent erosion and landslides. | | Forested bluffs contribute organic and inorganic material to the shoreline. | Artificial noises can affect many wildlife species. | | | | Forests on the site impart a natural appearing view of most of the site. | |

## *Table 13-1. Continued*

| Air | Geology/ Hydrogeology | Terrestrial Plants and Animals | Marine Environment and Fisheries | Noise | Transportation | Land Use | Environmental Health and Safety | Visual and Aesthetics | Recreation |
|---|---|---|---|---|---|---|---|---|---|
| ***Marine Environment and Fisheries*** | | | | | | | | | |
| | The shoreline is a dynamic geologic system, involving complex interactions of tides, currents, and wave action that act on and interact with the physical and biological elements of the marine and terrestrial environments. | The shoreline introduces diversity to the site, with some species, such as bald eagle, using both marine and terrestrial environments. | | | | The shoreline is protected under the Shoreline Management Act as well as various policies defined in the King County Comprehensive Plan | | The shoreline is a major element of the visual environment. | The dock is a major attraction for recreational divers, and the shoreline is used by residence as open space. People fish near the site and sometimes collect shellfish at the site. |
| ***Noise*** | | | | | | | | | |
| | | Animals are sensitive to noise. | Marine animals are sensitive to noise and vibration. | | | The relatively quiet nature of the area is valued by local residents. | | Noise is an important element of the overall aesthetic environment. | The quietness of the site is part of the experience enjoyed by people that currently use the site. |

## *Table 13-1. Continued*

| Air | Geology/ Hydrogeology | Terrestrial Plants and Animals | Marine Environment and Fisheries | Noise | Transportation | Land Use | Environmental Health and Safety | Visual and Aesthetics | Recreation |
|---|---|---|---|---|---|---|---|---|---|
| ***Transportation*** | | | | | | | | | |
| Existing shipping from Tacoma produce some air pollution. | Roads on the site affect surface water flow and create compacted and impermeable surfaces. | | Many large commercial vessels and many recreational vessels travel past the site and Quartermaster Harbor. The existing dock and sunken barges create artificial "reef" habitat. | Recreational and commercial vessels can often be heard along the Maury Island shoreline. | | The waters of Maury Island are an important shipping corridor. | | Recreational and commercial vessels can often be seen along the Maury Island shoreline. | Recreational and commercial vessels must negotiate movement around other vessels. |
| ***Land Use*** | | | | | | | | | |
| | The site is a designated mineral site. | Natural Resource Lands, such as designated mineral sites, also preserve wildlife by preventing other types of development on such lands. | The shoreline is protected under the Shoreline Management Act as well as various policies defined in the King County Comprehensive Plan. | Loud, intrusive noises can conflict with the rural designation and character of surrounding areas. | | | | The rural character of the surrounding areas is protected under King County Code and the Comprehenisve plan, as is the use of the site for mineral extraction. | The site is private and recreational use is done without permission. Recreational use of the shoreline, however, is protected under King County's Shoreline Master Program. |
| ***Enviromental Health and Safety*** | | | | | | | | | |
| | Arsenic and other metals have contaminated the upper layers of the soil. | Plants may have taken up trace amounts of arsenic and other materials. | The existing dock is leaching creosote. | | | | | | |

## Table 13-1. Continued

| Air | Geology/ Hydrogeology | Terrestrial Plants and Animals | Marine Environment and Fisheries | Noise | Transportation | Land Use | Environmental Health and Safety | Visual and Aesthetics | Recreation |
|---|---|---|---|---|---|---|---|---|---|
| ***Visual/Aesthetics*** | | | | | | | | | |
| | | | | | | The site provides views of forested bluffs, which are valued by nearby residents. | | | The existing natural appearance of much of the site attracts recreational use at the site. |
| ***Recreation*** | | | | | | | | | |
| Unauthorized use of the site by motorcycles produce dust. | | People enjoy hiking and horsebacking through the forests and seeing wildlife that use the site. | The shoreline is an important recreational resource. | Unauthorized use of the site by motorcycles produces dust. | Recreational and commercial vessels must negotiate other vessels. | | People are using areas contaminated by metals. | | |

## *Table 13-2. Interaction Among Elements of the Environment – Impacts and Mitigation*

| ***Air*** | ***Geology/ Hydrogeology*** | ***Terrestrial Plants and Animals*** | ***Marine Environment and Fisheries*** | ***Noise*** | ***Transportation*** | ***Land Use*** | ***Enviromental Health and Safety*** | ***Visual and Aesthetics*** | ***Recreation*** |
|---|---|---|---|---|---|---|---|---|---|
| ***Air*** | | | | | | | | | |
| | | | | | | Dust would not travel to adjacent properties or roads, or otherwise conflict with existing land use. | Dust from topsoil removal could contain arsenic. Burning of vegetation could also contain arsenic. | | |
| ***Geology/Hydrogeology*** | | | | | | | | | |
| The moist sand and gravel at the site is not likely to become air borne. | | | Alterations of the bluffs would reduce the flow of soils to the marine environment. | | | Standard engineering would be applied to prevent slides that could affect adjacent land use. | | The light colored sands, once exposed, would present visual contrasts. | |
| ***Terrestrial Plants and Animals*** | | | | | | | | | |
| Retention of more of the bluffs may reduce the potential for dust to leave the site. | Establishing vegetation following mining also prevents erosion. | | Protection of more bluffs would enhance riparian functions of the bluff. | Protection of more bluff area could reduce some noise leaving the site. | | | | Retention of more bluffs would increase visual screening of active mining areas. | |
| ***Marine Environment and Fisheries*** | | | | | | | | | |
| | | Shoreline enhancement for salmon would also enhance habitat for terrestrial plants and animals. | | Fitting a downspout on the end of the conveyor may reduce noise from barge loading. | | | | | Active mining areas would not be available for recreational fishing or diving. |

## Table 13-2. Continued

| Air | Geology/ Hydrogeology | Terrestrial Plants and Animals | Marine Environment and Fisheries | Noise | Transportation | Land Use | Enviromental Health and Safety | Visual and Aesthetics | Recreation |
|---|---|---|---|---|---|---|---|---|---|
| ***Noise*** | | | | | | | | | |
| | | Animals would avoid active areas of the mine, in part due to noise. | Noise and vibration from barge loading would cause some fish to avoid the area. | | | Residents would be able to hear the mining operation, although the King County Noise Ordinance would not be violated. | | Noise from the conveyor belt and active mining would affect the overall character of the surrounding communities. | |
| ***Transportation*** | | | | | | | | | |
| Heavy equipment, tugs, and trucks would produce some dust and exhaust emissions | | | Tug and barge traffic would introduce additional disturbance to the marine environment. | Tugs and barge loading would produce noise and vibrations that would cause some marine organisms to avoid the area. | | Barging and elements of mining would occur within the shoreline, which is designated as a conservancy environment. | | Barges and tugs would be visible to residents of the Maury Island shoreline. | Tugs and barges would prevent recreational diving at the site. |
| ***Land Use*** | | | | | | | | | |
| | | | | Mining, with associated noise, is an allowed use within rural areas. | The shoreline is designated as conservancy, and barge operations would be a non-permitted use. | | | | Recreational access to the shoreline would need to be allowed, although the experience would be altered due to active barge loading. |

## *Table 13-2. Continued*

| *Air* | *Geology/ Hydrogeology* | *Terrestrial Plants and Animals* | *Marine Environment and Fisheries* | *Noise* | *Transportation* | *Land Use* | *Enviromental Health and Safety* | *Visual and Aesthetics* | *Recreation* |
|---|---|---|---|---|---|---|---|---|---|
| ***Enviromental Health and Safety*** | | | | | | | | | |
| Arsenic and lead would need to be managed to avoid air pollution. | | Arsenic and lead in topsoils would prevent its use for reclamation. Cleared vegetation would need to be checked for contamination. | | | | | | | |
| ***Visual/Aesthetics*** | | | | | | | | | |
| | | | | | | | | | Changes in views would adversely affect recreational experiences. |
| ***Recreation*** | | | | | | | | | |
| | | People using the site could disturb wildlife | | | | | | | |

# Distribution List

# Distribution List

## Federal Agencies

Army Corps of Engineers
Environmental Protection Agency, Region X
Fish and Wildlife Service, Division of Ecology Services
National Marine Fisheries

## Tribal Entities

Puyallup Indian Tribe
Muckleshoot Indian Tribe
Tulalip Tribes of Washington
Snoqualmie Indian Tribe
Suquamish Indian Tribes

## State of Washington

Office of Archaeology and Historic Preservation
Department of Ecology
Department of Fish and Wildlife
Department of Natural Resources
Department of Transportation

## Regional Agencies

Puget Sound Air Pollution Control Agency
Puget Sound Regional Council
Puget Sound Water Quality Action Team

## King County

Ron Sims, County Executive
King County Councilmember Cynthia Sullivan
King County Councilmember Louise Miller
King County Councilmember Peter Von Reichbauer

King County Councilmember Rob McKenna
King County Councilmember Greg Nickels
King County Councilmember Kent Pullen
King County Councilmember Larry Gossett
King County Councilmember Jane Hague
King County Councilmember Brian Derdowski
King County Councilmember Chris Vance
King County Councilmember Dwight Pelz
King County Councilmember Larry Phillips
King County Councilmember Maggi Fimia
Department of Public Works
    Solid Waste Division
    Operations Division
    Traffic and Planning Section
    Transportation Planning (2 copies)
    Engineering Services
    Surface Water Management Division (2 copies)
Seattle-King County Department of Public Health, Environmental Health Division
Parks and Cultural Resources
Department of Natural Resources

## Local Jurisdictions

City of DesMoines
City of SeaTac
City of Burien

## Public Review Locations

King County Library Documents Section
Vashon Library
Seattle Public Library

## Newspapers

Seattle Times
Beachcomber

A Notice of Draft EIS Availability was sent to all parties of record for the proposal.