Golder Associates Inc.

18300 NE Union Hill Road, Suite 200
Redmond, WA 98052-3333
Telephone (425) 883-0777
Fax (425) 882-5498

WASHINGTON DEPARTMENT OF ECOLOGY
FINAL

CLEANUP ACTION PLAN
NORSELAND SITE
Bremerton, Washington

Prepared by:

Golder Associates Inc.

On behalf of:

The Kitsap Public Authority Team (KPAT)

for the

Washington State
Department of Ecology

May 17, 2000

933-1280.3020
0517djm1.doc

TABLE OF CONTENTS Page No.

LIST OF TABLES

LIST OF FIGURES

APPENDICES

LIST OF ACRONYMS AND ABBREVIATIONS

AMSL	Above Mean Sea Level
ARAR	Applicable or Relevant and Appropriate Requirement
ASIL	Acceptable Source Impact Level
CAP	Cleanup Action Plan
CFR	Code of Federal Regulations
COPC	Chemical of Potential Concern
CQA	Construction Quality Assurance
1,1-DCE	1,1-Dichloroethene (1,1-Dichloroethylene)
DNS	Determination of Nonsignificance
Ecology	Washington State Department of Ecology
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
FML	Flexible Membrane Liner
FS	Feasibility Study
KPAT	Kitsap Public Authorities Team
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MFS	Minimum Functional Standards
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
MSL	Mean Sea Level
MTCA	Model Toxics Control Act
Navy	U.S. Navy
NTU	Nephelometric Turbidity Units
OSHA	Occupational Safety and Health Administration
OVSL	Olympic View Sanitary Landfill
PLP	Potentially Liable Person
ppb	parts per billion by weight
ppbv	parts per billion by volume
ppm	parts per million by weight
ppmv	parts per million by volume
PSAPCA	Puget Sound Air Pollution Control Agency
QA	Quality Assurance
QC	Quality Control
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
RI	Remedial Investigation
SDWA	Safe Drinking Water Act
SEPA	State Environmental Policy Act
SMCL	Secondary Maximum Contaminant Level
TAC	Toxic Air Contaminant
TAL	Target Analyte List

TCL	Target Compound List
TIC	Tentatively Identified Compound
TPH	Total Petroleum Hydrocarbons
U.S.	United States
USGS	United States Geological Survey
ug/kg	micrograms per kilogram
ug/L	micrograms per liter
ug/m^3	micrograms per cubic meter
VOC	Volatile Organic Compound
WAC	Washington Administrative Code
WARM	Washington Ranking Method
WDOE	Washington State Department of Ecology

DECLARATIVE STATEMENT

Consistent with Chapter 70.105D RCW, "Model Toxics Control Act," as implemented by Chapter 173-340 WAC, "Model Toxics Control Act Cleanup Regulation," it is determined that the selected cleanup actions are protective of human health and the environment, attain Federal and State requirements which are applicable or relevant and appropriate, comply with cleanup standards, and provide for compliance monitoring. The cleanup actions satisfy the preference expressed in WAC 173-340-360 for the use of permanent solutions to the maximum extent practicable, provide for a reasonable restoration time frame, and consider public concerns raised during public comment on the draft Cleanup Action Plan.

_______________________ _______________

David L. South Date
Senior Engineer
Toxics Cleanup Program, NWRO
Washington State Department of Ecology

_______________________ _______________

Steven M. Alexander Date
Section Manager
Toxics Cleanup Program, NWRO
Washington State Department of Ecology

1. INTRODUCTION

1.1 Purpose and Scope

This document is the Final Cleanup Action Plan (CAP) for the Norseland Site, which is located near Bremerton, Washington. The Norseland Mobile Estates site (Norseland) is a State of Washington Priority Listed Site under the Model Toxics Control Act (MTCA), Chapter 70.105D RCW. A CAP is required as part of the site cleanup process established by the Washington State Department of Ecology (Ecology) in Chapter 173-340 WAC, which are regulations implementing the Model Toxics Control Act (MTCA). The purpose of the CAP is to identify the proposed cleanup action for the site. A draft CAP was provided to the public for review and comment. This final CAP incorporates changes required by comments that were received during the public comment period.

The Port of Bremerton, Kitsap County, the U.S. Navy, the City of Bremerton, and Messrs. John Banchero and Josie Razore (d/b/a Puget Service Company) have been named by Ecology as Potentially Liable Persons (PLPs) at this site. While all these named PLPs at this site may be jointly and severally liable to perform response actions at this site, Kitsap County, the Port of Bremerton, and the Navy have formed a working group called the Kitsap Public Authorities Team (KPAT) to conduct the remedial investigation/feasibility study (RI/FS) for the Norseland Site under MTCA. Currently, only the Port of Bremerton and Kitsap County are committing to implementing remedial actions at the Norseland site.

1.2 The CAP and the Cleanup Process

This CAP is one of a series of documents used by Ecology to monitor progress of site investigation and cleanup. Figure 1 identifies documents required under the MTCA site cleanup process.

The Remedial Investigation/Feasibility Study (RI/FS) report presents results of investigations into the geology and hydrogeology of a site, the nature and extent of contamination, the risks posed by that contamination, and evaluates the feasibility and alternative methods of remediating the site. Under the terms of the Consent Decree (Ecology 1994a) and Agreed Order (Ecology 1994b), the Norseland RI/FS was to be conducted using a phased approach, if necessary. The scope of work for the first phase was outlined in the *Draft Phase I Remedial Investigation/Feasibility Study (RI/FS) Work Plan for the Norseland Mobile Estates* (Golder 1993a). However, it was determined during the Phase I RI that sufficient data had been collected to support the selection of a final remedy for this site, and that no additional RI phases were necessary. This document, therefore, is considered to represent a complete and final RI and FS set of documents that contains sufficient information to enable Ecology to make a decision regarding the final Cleanup Action Plan (CAP) for the Norseland site. The PLP Group completed the RI/FS and submitted a report to Ecology on May 7, 1997 for public review and comment (Golder 1997).

The CAP identifies the proposed cleanup action for the site based on the results of the RI/FS. Upon completion of a public comment period for the CAP, Ecology, after review and consideration of the comments received, will issue a final Cleanup Action Plan. This final CAP is incorporated into a Consent Decree, which is a legal agreement negotiated between Ecology and the PLP group for implementing the remedial actions outlined in the final CAP.

A number of documents are prepared for implementation of the remedial actions selected in this final CAP. The Engineering Design Report and Construction Plans and Specifications provide the necessary technical drawings and specifications to allow contractors to implement the selected cleanup action. An Operation and Maintenance (O&M) Plan presents technical guidance for effective operations and maintenance under both normal and emergency conditions. The Compliance Monitoring Plan describes the monitoring program intended to confirm that human health and the environment are adequately protected during both remedial action and subsequent operation and maintenance of the remedy. The monitoring program includes performance monitoring to confirm that cleanup standards or other performance standards have been attained, and confirmational monitoring to confirm the long-term effectiveness of the remedial actions.

Construction documentation includes as-built drawings and documentation that cleanup and/or performance standards required to be met during construction were attained, as well as any changes or modifications that were necessary during the course of implementing the remedial action.

The documents used to make the decisions discussed in this CAP are part of the administrative record for the site. These documents are listed in the references (Section 10) and are available for public review at the information repository for the Norseland Site.

2. SITE DESCRIPTION AND HISTORY

2.1 Site Description

2.1.1 General

The Norseland Site is a former adult mobile home park, the Norseland Mobile Estates, located at 8651 State Highway 3, Port Orchard, Washington (Figure 2). The site contained 127 mobile home lots, 21 recreational vehicle spaces, a warehouse, and an office building. The site is part of the Olympic View Industrial Park. It is currently owned by the Port of Bremerton, but was previously owned and used by the Federal Government as a military base.

The Norseland Site is in Kitsap County, Washington and is located near the Bremerton National Airport (0.25 miles east), the Olympic View Sanitary landfill (0.75 miles northwest) and the Olympic View Industrial Park (0.5 miles north). Olympic View Sanitary Landfill (OVSL) is the only operating landfill in Kitsap County. The Norseland Mobile Estates site boundary is the former mobile park leased area as shown on Figure 4. The boundary is enclosed by the following coordinates given in Washington Plane North Zone (NAD 83):

SITE CORNER	EAST (NAD 83)	NORTH (NAD 83)
PT 11	1162042.640	185911.123
PT 10	1162256.773	186386.180
PT 9	1162019.625	186497.181
PT 8	1162250.010	187165.678
PT 7	1162090.916	187277.058
PT 6	1161807.593	187025.055
PT 5	1161389.786	187016.284
PT 4	1160984.916	186184.298
PT 3	1161216.576	185940.440
PT 2	1161031.881	185654.590
PT 1	1161276.435	185442.803

The Norseland Site slopes to the northwest from an elevation of about 470 ft above mean sea level (AMSL) along the eastern and southeastern margin to about 410 ft AMSL on the western and northwestern margin. The current topography of the site is shown in Figure 4. The site formerly contained a mobile home park. The mobile home park has been moved and the site currently contains vacant logs with remnant support buildings, roadways, and disconnected utilities. Much of the area occupied by the landfill is overgrown with blackberry bushes and other shrubbery. The surrounding area is heavily wooded.

2.1.2 Geology

Kitsap County lies in the center of the Puget Sound Lowland, a broad and gently rolling plain whose surface is commonly about 400 to 600 ft AMSL. The Puget Sound Lowland lies between the Olympic Mountains to the west and the Cascade Range to the east and consists of a large glacial drift plain formed by multiple glaciations over the area. This history of glacial erosion and deposition events separated by long-periods of non-glacial deposition has created a very complex mixture of unconsolidated sediments beneath the area. This sediment blanket ranges in thickness from 0 to over 3,600 feet in the lowland. These sediments overlay an irregular bedrock surface which is exposed in the central and eastern portions of Kitsap County on south Bainbridge Island and the Green and Gold Mountain highlands, west of Bremerton.

In the Pleistocene epoch of the last 1.5 million years, the Puget Lowland was occupied by at least five successive continental ice sheets. The most recent of these, the Vashon stade, receded about 15,000 years ago. During this period, an ice sheet 1,000 to 1,400 feet thick covered Kitsap County.

The surficial geology of the Kitsap Peninsula within the area of the Norseland site consists of glacially-derived sediments, either till that was directly deposited by glaciers, or outwash gravels and sands deposited as the glaciers receded following the last continental glaciation. These deposits, which are veneered by topsoil throughout the peninsula, overlie non-marine conglomerate and siltstone of the Blakely Harbor Formation, and tuffaceous siltstone and sandy siltstone of the Blakely Formation. The oldest rocks exposed in the county are the volcanic and plutonic rocks of Green Mountain, which are Tertiary in age. These rocks, including rhyolite, gabbro and granite, andesite, tonalite, and basalt may also underlie the site, but are not exposed in the vicinity.

Geologic structure at the site vicinity is not precisely known. There is no strong indication of major controlling structures at the site, and although faulting does occur in the region, there is no evidence of any faults crossing on or near the Norseland site.

During the RI, monitoring wells MW-1, -2 and -3 were drilled to depths of 50, 55 and 60 ft, respectively. Materials encountered in these boreholes consisted of compact to dense silty, fine to medium sands, and gravelly sands typical of glacial drift deposits. Very few silt or clay zones were noted. The total thickness of the unconsolidated sediments at the site is not known but is at least 200 ft based on well logs of nearby wells.

2.1.3 Groundwater Hydrogeology

To provide local hydrogeologic information and to identify wells that have the possibility of being impacted by the former landfill, a survey of local water wells was conducted as part of the RI. A total of nine wells were identified within a one-mile radius of the Norseland Site. The wells range in depth from 65 to 219 ft below ground surface. All are installed within the unconsolidated glacial drift materials which overlie bedrock, and none completely penetrate to the bedrock. Materials screened primarily include sand and gravel intervals with some clay layers and till. The surveyed wells have a relatively narrow range of yields, from about 6 to 20 gallons per minute.

Three wells were identified about 0.75 miles from the site, the remainder are approximately a mile away. None of the wells are believed to be downgradient from the site.

Groundwater is not used as a resource at Norseland, which receives domestic water supplies from the City of Bremerton municipal system via pipeline and distribution system owned by the Port of Bremerton.

Three monitoring wells were installed at the site during the RI. Perched water was encountered in one well (MW-1). The local water table beneath the site occurs at a depth between about 40 to 60 ft, depending on location. Contours of the groundwater elevations (based on August 1994 water levels) are shown in Figure 5. The direction of groundwater flow beneath the site is to the northwest, consistent with the ground surface topography. Groundwater flows to the northwest beneath the site at an average hydraulic gradient of approximately 0.06 ft/ft.

2.1.4 Surface Water Hydrology

There is no evidence of current streams on the site. There are two unnamed creeks near the site. One is north and one is south of the site. Both are approximately one-half mile from the site. Both creeks discharge to the Union River, located about two miles west of the site. Wetlands are located in the area, although none are directly on the site.

2.2 Site History

The U.S. Navy owned the airport property in 1942, and the U.S. Army acquired additional adjacent property in 1943. During the joint Army-Navy possession, the Army constructed barracks, officer's quarters, and several other outbuildings on a portion of the property. The United States facility was named Camp Christie. According to the Bremerton-Kitsap County Health District, all buildings and debris were removed from the site or burned before the Army relinquished the land. This property was occupied jointly by the two service branches between 1942 and 1944. Subsequently, the entire property was transferred to the Navy in 1944, and then to the General Services Administration. The U.S. Government transferred this property back to Kitsap County in 1948.

In 1951, the Bremerton-Kitsap County Health District granted a permit to Puget Service Company to operate a landfill on property that included a portion of the Norseland Site. The Puget Service landfill was the disposal site for the City of Bremerton's wastes from 1952 to 1961. For much of the time, the landfill was operated as a burning dump. A salvage operation was also located at the landfill. When Puget Service Company lost its contract with the city in 1961, it closed the Puget Service Landfill. Based upon available information, landfill closure was consistent with standards acceptable in 1961.

In 1962 Kitsap County leased property to a developer who created a mobile home park, called Norseland Mobile Estates, on the southeast portion of the area formerly permitted for landfilling. In 1963 Kitsap County gave the property to the Port of Bremerton. Norseland Mobile Estates was run by private companies until recently; it is now owned and operated by the Port of Bremerton.

In September 1991, Ecology received reports that transitory odors at the mobile home park were detected by residents. A variety of health effects were attributed to the odors by some mobile home park residents. In December 1991, Ecology conducted a Site Hazard Assessment of the site. The assessment included air monitoring and soil and water sampling and analyses. On the basis of this assessment, Ecology concluded that the primary concern at the site was the odor problem and potential health impacts. The site was given a ranking of 2 by Ecology using the Washington Ranking Method (WARM) on a scale of 1 to 5 (1 being the highest priority).

In 1992, Ecology formally listed the site under MTCA and determined that a MTCA RI/FS should be conducted. To conduct the RI/FS for the site, the Port of Bremerton and Kitsap County entered into a Consent Decree with Ecology on March 28, 1994. The Navy and Ecology entered into a parallel Agreed Order on March 28, 1994. Kitsap County, the Port of Bremerton and the U.S. Navy formed a working group called the Kitsap Public Authorities Team (KPAT) to address the environmental issues by conducting a MTCA RI/FS for the site.

An Enforcement Order was issued by Ecology requiring the City of Bremerton, another PLP, to participate in the RI/FS and other actions necessary at the site. The City of Bremerton did not participate in the RI/FS despite issuance of the Enforcement Order. Although Messrs. John Banchero and Josie Razore (d/b/a Puget Service Company) were identified by Ecology as PLPs for the site, they also did not participate in the RI/FS.

3. SUMMARY OF ENVIRONMENTAL ISSUES

This section summarizes the Remedial Investigation (RI) conducted for the Norseland Site to address environmental issues.

3.1 Remedial Investigation Activities

A primary focus of the RI was to identify chemicals in the ambient air that could pose health risks to residents, identify potential on-site as well as off-site sources that could contribute to the inhalation exposure pathway, and evaluate the mechanism(s) by which these compounds might be mobilized. A second objective was to investigate other media, principally groundwater, to determine if it had been affected by landfill activities at the site.

The major data collection activities conducted during the RI included:

- Delineation of the landfill boundaries
- Investigation of subsurface soils
- Investigation of groundwater
- Resident Questionnaire and Odor Survey
- Characterization of soil gas
- Investigation of skirt air (air space under homes but above ground surface)
- Investigation of ambient air.

The details of these investigations and the results are documented in the RI/FS report (Golder 1997) and summarized below.

3.1.1 Delineation of the Landfill Boundaries

The landfill was delineated using primarily geophysical techniques (electromagnetics and ground penetrating radar), as shown in Figure 6. It was discovered that a number of occupied residences were either over or partially over portions of the buried Puget Disposal Services landfill.

3.1.2 Investigation of Subsurface Soils

Subsurface soils were investigated by inspection and screening of test pits using a backhoe. Ten test pits were completed which confirmed the location and boundaries of the landfill. Only one test pit location (TP-7), at vacant Lot 62, contained odorous materials. Air monitoring during excavation at this location detected volatile organic compounds exceeding 100 ppm levels. Test pits were screened for volatile organic compounds (VOCs) and radioactivity using field screening monitors. None of the test pits other than at location TP-7 indicated levels of VOCs above ambient background. Radioactivity was not above ambient background levels within all test pits tested. Waste materials were exposed especially in areas of high topographic relief and appear erosionally unstable.

Soils within two different depths within TP-7 were analyzed for a full range of priority pollutant metals, VOCs, semi-VOCs, and PCBs/pesticides. Many analytes were detected in the soil samples but none were at a concentration above regulatory criteria or natural background levels expected in Washington State. Many of the organic compounds detected are commonly associated with petroleum hydrocarbons. Total petroleum hydrocarbon (TPH) analyses on these soil samples indicated concentrations below regulatory limits (<100 ppm). Notably, the vicinity of TP-7 is the only location where methane was detected in soil gas samples.

3.1.3 Investigation of Groundwater

Three monitoring wells were installed and sampled at least twice during the RI. One well (MW-1) was located hydraulically up-gradient to the landfill, while the other two wells (MW-2 and MW-3) were located downgradient. Groundwater samples were analyzed for priority pollutant metals, VOCs, semi-VOCs and PCBs/pesticides. The highest concentrations of compounds were detected in groundwater from MW-1, which was representing background conditions.

3.1.4 Resident Questionnaire and Odor Survey

Written questionnaires were submitted to residents to solicit opinions about odor events, ground stability and sanitary waste issues at the site. In addition, Golder Associates conducted an extensive survey of odors at the site and surrounding areas.

Primary findings regarding the odor questionnaire include:

- Most residents smell odors at the site
- Odors occur infrequently and the most frequently described odor is "garbage"
- "Foggy" and "still" were the most frequent weather conditions typical of odor events
- Early morning was by far the most frequent time of day associated with odors.

Odor surveys conducted during the RI over a three month period were in general agreement with resident questionnaires. Odors were infrequent and typically of short duration and represented an overall low percentage of time. Most odors occurred in the morning hours. The dominant odor was described as sulfur/mercaptan type which is common to landfilled "garbage." Weather conditions during odor events were most frequently during calm wind conditions or when the wind came from the direction of OVSL. It was the opinion of Golder personnel that the primary source of odors at Norseland appears to be the OVSL. The former Puget Service Company landfill on site may also contribute to localized odor events at Norseland.

3.1.5 Characterization of Soil Gas

Soil gas is the gas below the surface of the ground which fills the space between particles of soil. Soil gas was sampled and analyzed during several tasks during the RI. Overall, soil gas was sampled and analyzed from about 50 different locations primarily within a 5 to 6 acre area. Several locations were sampled and analyzed repeatedly during this RI. Analytes included VOCs in all samples but in about half the locations atmospheric gases, sulfide gases, methane, amines and aldehydes were also analyzed.

A number of VOCs were detected within samples of soil gas above screening levels in many locations. This suggests there is subsurface waste at the site which contains compounds that are now defined as hazardous under MTCA. Methane was only detected at one location (Lot 62) within landfill soil gas. Since methane was found only once, data indicate that this old landfill, for the most part, is no longer biologically degrading.

3.1.6 Investigation of Skirt Air

The skirt air is the above-ground air confined by the skirts of the mobile homes. Samples of skirt air was obtained from every mobile home that was over or partially over the former Puget Service Company landfill. Several skirt air samples which had the highest VOCs were obtained and analyzed repeatedly during the RI. The VOCs detected above screening levels were: benzene, chloromethane, carbon tetrachloride and methylene chloride. A number of tentatively identified compounds (TICs) were detected but do not have associated screening values. It must be noted that many VOCs had detection limits above screening values. Methane was not detected in any skirt air.

3.1.7 Investigation of Ambient Air

Two RI tasks involved sampling and analyzing ambient air. The first task (Odor Investigation) involved sampling two odor events with a network of monitoring stations around OVSL and the Norseland site. The odor sampling events occurred on March 9 and March 17, 1995 which were the strongest odor events witnessed by Golder personnel. Numerous compounds were detected at trace concentrations. The only VOCs detected above screening levels include: benzene, chloromethane, formaldehyde and tetrachloroethene. Maximum concentrations of tetrachloroethene (except one time on March 17 at Norseland), benzene, and formaldehyde occurred in the off-site samples around OVSL, while the maximum concentrations of chloromethane occurred at the Norseland site. Tetrachloroethene was only detected off-site during the March 9, 1995 odor sampling event, but was only detected on-site during the March 17, 1995 odor sampling event. Methane, which is associated with active or decomposing landfills, was only detectable in ambient air in off-site samples around OVSL during odor events. It must be noted that most of the odorous sulfur compounds have human odor thresholds 2 to 3 orders of magnitude below analytical detection limits.

The second task (Comparative Ambient Air Study) included sampling air off-site, air on-site, air within selected skirts and selected soil vapors at six different times representing different periods of the day with different wind directions. The repeated events provided data to statistically evaluate whether VOCs detected on site were at different concentrations than ambient air entering the site. The only compounds detected during these six events that were above screening levels in the ambient air were benzene and chloromethane.

3.2 Nature and Extent of Contamination

This section summarizes the conclusions of the RI.

3.2.1 Landfill Waste

The Puget Service Company landfill was developed primarily as a municipal waste landfill to serve the disposal needs of the City of Bremerton. The body of historical evidence suggests that the greatest part of the waste stream disposed at Norseland was comprised of municipal garbage. However, some evidence suggests that other types of waste were also discarded at the site, including petroleum products. Anecdotal evidence, derived from depositions given during litigation, interviews with long-time residents of the area, former truck drivers who delivered waste materials to the site, and others with potential site knowledge, also suggests that some industrial wastes, including pesticides, solvents, paints, and chemical reagents may have been dumped at the site. Mention is made in interviews of various coating materials discarded at the site, as well as debris and residue resulting from the burning of an airport crash truck at the airport. Some speculation also has been made regarding the possibility that radioactive materials may have been discarded at the site, but this is unsubstantiated by documentation or the evidence obtained during site investigations. A radiation survey conducted by the Washington Department of Health on site surficial materials detected no elevated radioactivity above normal background levels.

Landfilled materials are exposed at the surface, particularly on steep slopes and densely vegetated areas. During investigations, landfilled materials were not observed to be exposed within leased properties. The potential for direct exposure and ingestion of landfilled materials is low.

3.2.2 Soil

No chemicals were detected above MTCA cleanup standards in the soil samples collected at the site. However, landfilled materials are typically heterogeneous and very difficult to characterize. Based on the soil gas analyses, landfill waste at the Norseland site probably contains compounds which are considered hazardous under current law. Subsurface sources of VOCs are present on a patchy basis at the site. In addition, some landfill materials are exposed at the site, particularly on steep slopes and densely vegetated areas. These materials are subject to erosion and dispersal in the surface environment.

3.2.3 Groundwater

While some compounds were detected at levels above potential regulatory criteria in groundwater, the source of the compounds does not appear to be associated with the Norseland Site. Some organic compounds were detected, but the highest values were generally associated with the upgradient well. None of the organic compounds detected at the site exceeded any regulatory criteria. Therefore, the former landfill does not appear to be currently impacting groundwater beneath the site, and no Chemicals of Potential Concern (COPCs) were identified for groundwater.

3.2.4 Surface Water

No evidence of any surface streams (permanent, seasonal, or ephemeral) was observed on the Norseland Site during the RI. Surface water sampling was therefore not performed.

3.2.5 Air

3.2.5.1 Subsurface VOC Sources

Subsurface VOC sources have been identified within the former Puget Service Company landfill at the Norseland Site. These sources occur on a spotty or patchy basis, which is consistent with the spatial heterogeneity expected based upon the types of wastes known to have been received at the site. The most significant subsurface sources detected are associated with the vicinity of Lots 62 and 63, where several VOC constituents were consistently observed, including benzene, TICs and methane.

Concentrations of organic vapors in ambient air indicate no site-wide human health risk. Due to the relocation of the Norseland residents, there are no potential receptors left on site that could be subject to localized exposure.

3.2.5.2 Impacts To Skirt Air And Ambient Air From The Former Landfill

Subsurface sources of VOCs exist at the Norseland Site and are emitting to the ambient atmosphere. The incremental increase in VOC concentrations in the local atmosphere (over surrounding ambient air) is estimated to be insignificant. The presence of these sources results in exceedances of certain regulatory screening criteria in soil gas and skirt air in a number of locations; however, due to dilution which occurs when soil gas is emitted to the air, these chemicals are not believed to be result in unacceptable impacts to ambient air. A simple but very conservative model predicts on the average that incremental ambient air impacts from subsurface sources at Norseland would be 10,000 times less than the concentration of VOCs in the subsurface environment, and on the average less than regulatory screening levels.

Benzene and chloromethane were the only compounds consistently observed above screening levels in skirt air and ambient air at the site. Statistical analyses of the skirt and ambient air data showed that skirt air benzene levels were elevated over off-site air benzene at one location (Lot 63). For chloromethane and the TICs, skirt air was not elevated over on-site air, on-site air was not elevated over off-site air, and skirt air was not elevated over off-site air.

Carbon tetrachloride and methylene chloride were observed in several skirt air samples above regulatory screening values. The source of these compounds within these skirts are uncertain, but subsurface sources could be a contributing factor. Since the detected concentrations of these compounds are comparable to average levels expected for ambient rural and suburban air quality, the presence of these compounds may merely represent background.

An important source of detected chemicals in air at the Norseland Site appears to be off-site sources, presumably regional air pollution. Benzene, methylene chloride, and carbon tetrachloride levels occur above screening values in ambient and/or skirt air at the site, but the levels of these constituents appear to be typical of most rural and suburban settings in the United States, and therefore may be representative of general air quality in the area.

3.2.5.3 Odors

Odorous compounds (sulfides, amines and acetaldehydes) were not detected to any significant extent in the soil gas or ambient air at the former landfill. Even though the detection limits of these compounds are 2 to 3 orders of magnitude higher than human odor thresholds, these compounds should have been detected in the soil gas beneath the site if they were present and causing odors that were observed in the ambient air. The fact that these compounds were not detected in the former landfill, combined with the results of on-site odor monitoring conducted during the RI, results in the conclusion that the primary source of odors in the area is the OVSL. The former landfill beneath Norseland may contribute to odors in localized areas under certain meteorological conditions and subsurface emissions. Subsurface odors were observed from one test pit in Lot 62 when exposed by excavation.

3.3 Potential Contaminant Transport

Constituents of landfill waste from the Norseland Site have the theoretical potential for transport in air, surface water, or groundwater.

3.3.1 Air

As indicated in Section 3.2.5, subsurface sources of VOCs exist at the Norseland Site and are emitting to the ambient atmosphere. However, the incremental increase in VOC concentrations in the local atmosphere (compared to surrounding ambient air) is estimated to be insignificant.

3.3.2 Surface Water

No evidence of surface water contamination due to the Norseland Site was observed during the RI. However, the presence of exposed landfill waste in a few locations presents the potential for transport of the waste or waste constituents from these areas in stormwater runoff.

3.3.3 Groundwater

Sampling and analysis of groundwater from the Norseland Site found no evidence that the landfill has adversely affected current groundwater quality. Groundwater monitoring included in the selected remedy would detect groundwater contamination were it to unexpectedly occur in the future.

3.4 Risks to Human Health and the Environment

Most often a remedial investigation includes a human risk assessment. Because the Port of Bremerton and Kitsap County closed Norseland Mobile Estates and relocated the residents, potential future risks to residents will be eliminated. In addition, no current groundwater contamination was detected. Ecology and KPAT therefore determined that a risk assessment was unnecessary.

Concentrations of organic vapors observed in ambient air indicate no site-wide human health risk. Due to the relocation of the Norseland residents, there are no residents left on site.

4. APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The laws, regulations, and standards to be followed for remedial action for the Norseland Mobile Estates site are termed "applicable or relevant and appropriate requirements" (ARARs). Ecology has determined that the ARARs presented in this section are appropriate for the Norseland Site.

4.1 General

ARARs are either "applicable" or "relevant and appropriate" (but not both). To be "applicable," a requirement must be promulgated under state or federal law and must specifically address a hazardous substance, cleanup action, location or other circumstance at the site. "Relevant and appropriate" requirements are limited to those requirements promulgated under state and federal laws that, while not legally applicable, address circumstances sufficiently similar to those encountered at the site such that the use of the requirements is well suited to particular site conditions.

The most significant ARARs for the site are:

- Model Toxics Control Act (MTCA), RCW 70.105D, and MTCA regulations, WAC 173-340;
- Minimum Functional Standards (MFS) for Solid Waste Handling, WAC 174-304;
- Washington Clean Air Act, RCW 79.94 and 43.21A; and
- State Environmental Policy Act (SEPA), WAC 197-11 and 173-802.

These most significant ARARs are discussed in the following sections. The full list of potential ARARs is presented in Tables A-1 and A-2 provided in Appendix A. Several of the ARARs identified in these tables would be ARAR only under conditions which may or may not occur at the site. Therefore, identification of an ARAR in these tables indicates that the ARAR would be considered if and when circumstances warrant.

4.2 MTCA

MTCA is the key law governing the conduct of the overall investigation and cleanup process for the Norseland Site. MTCA regulations describe the requirements for selecting cleanup actions, preferred technologies, policies for use of permanent solutions, the timeframe for cleanup, and the process for making decisions.

Regulations under WAC 173-340 implement the requirements of MTCA. These regulations establish administrative processes and standards to identify, investigate and cleanup facilities where hazardous substances have been released.

WAC 173-340-700 establishes cleanup levels for air, groundwater, soil, and surface water. Three methods are presented for determining cleanup levels: Method A (routine, using tables), Method B (standard), and Method C (conditional, primarily for industrial sites).

However, for all three methods, cleanup levels cannot be more stringent than an established area background for the site. Method A is generally used for routine cleanups with relatively few contaminants. Method A standards are presented in tables in MTCA regulations. Method B is the "standard" method for determining cleanup levels, using risk calculations specified in the regulations, based on limiting excess lifetime cancer risk to one in one million (1 x 10-6) for individual constituents and one in one hundred thousand (1 x 10-5) for combined constituents and pathways. For non-carcinogenic risk, the total hazard index limit is 1 (means concentrations are below the minimum concentration in which adverse health effects have been observed). Method C cleanup levels are used for industrial/commercial sites, or where Method A and B are not appropriate. Under ESSB 6123, which amended MTCA, industrial cleanup levels are appropriate for land zoned for industrial use.

For all three methods of establishing cleanup levels, a "point of compliance" is set for determining when and whether cleanup levels have been met. For cleanup alternatives where waste or hazardous substances remain on-site (i.e., containment remedies), a conditional point of compliance is established. Under WAC 173-340-750(6) and WAC 173-340-720(6)(c), the conditional point of compliance is set "as close as practicable to the source of hazardous substances, not to exceed the property boundary." With containment actions, institutional controls and long-term monitoring are required in accordance with WAC 173-340-360(8)(b).

WAC 173-340-710(6)(c) specifies that "for solid waste landfills, the solid waste closure requirements in chapter 173-304 WAC shall be minimum requirements for cleanup actions."

Recent amendments to MTCA (RCW 70.105D.090) exempt remedial actions conducted pursuant to an Agreed Order or a Consent Decree from the procedural requirements of certain state and all local laws and regulations, including permitting. The substantive requirements of applicable laws, regulations, and ordinances must still be met. However, permits and separate approvals within the exemption are not required for remedial actions at the site.

In addition, MTCA was amended to achieve the following purposes [see RCW 70.105D.010(4)]:

1. to promote the public's interest to efficiently use the finite land base;
2. to integrate land use planning policies;
3. to cleanup and reuse contaminated industrial properties in order to minimize industrial development pressures on undeveloped land; and
4. to make clean land available for future social use.

4.3 Minimum Functional Standards for Solid Waste Handling

WAC 173-304 ("Minimum Functional Standards for Solid Waste Handling") contains requirements for the management of solid waste. The State of Washington has delegated authority for enforcement of WAC 173-304 to the county health districts. The Bremerton

Kitsap County Health District has promulgated their own regulation, Ordinance 1996-11, for solid waste facilities in Kitsap County and is an ARAR for the site. BKCHD Ordinance 1996-11 is functionally equivalent to 173-304 for landfill closure and the following discussion applies to both regulations. Because the Norseland site stopped receiving waste materials prior to the effective date of these regulations and does not meet the definition of a regulated facility, WAC 173-304 is not legally applicable to the Norseland site. However, MTCA regulations [WAC 173-340-710(6)(c)] specify that for "solid waste landfills, the solid waste closure requirements in chapter 173-304 WAC shall be minimum requirements for cleanup actions."

WAC 173-304-407 contains general closure and post-closure standards. There are three separate landfill closure standards: WAC 173-304-460 (for most solid waste landfills), WAC 173-304-461 (for inert waste and demolition waste landfills), and WAC 173-304-462 (for woodwaste landfills). The woodwaste landfill standards are neither relevant nor appropriate to the Norseland site. As discussed below, the -460 and -461 standards are relevant and appropriate for the Norseland landfill. WAC 173-304-700 provides for variances from the WAC 173-304 closure standards.

The -460 standards are intended for typical solid waste landfills. The -460 landfill closure standards include requirements that the closure cap 1) have a minimum of two feet of soil having a permeability of 1×10^{-6} or lower, 2) have surface slopes of at least 2% and side slopes less than 33%, and 3) have a vegetated top cover of six inches of topsoil. An artificial (synthetic) liner with a thickness of at least 50 mils may be used instead of a low-permeability soil liner.

Based on the types of waste received, the -460 standards are relevant and appropriate. However, the -460 standards were developed assuming landfill closure soon after completion of operations and a post-closure period of 20 years. In contrast, the Norseland landfill has not operated in over 30 years.

The -461 landfill closure standards include requirements that the wastes be leveled to the extent practicable, that voids be filled, and that the closure cap include a minimum of one foot of soil cover.

The Norseland landfill received a variety of solid wastes. Much of the waste received at the landfill was reportedly burned, which would leave a relatively inert residual. Inert wastes are defined under WAC 173-304-100(40) as "noncombustible, nondangerous solid wastes that are likely to retain their physical and chemical structure under expected conditions of disposal, including resistance to biological attack and chemical attack from acidic rainwater." Typical municipal landfills generate significant quantities of methane as putrescible waste is degraded anaerobically by microorganisms. However, the Norseland site has low concentrations of methane in soil gas, meaning a low rate of methane generation. This lack of methane generation is more typical of an inert waste landfill. In addition, were waste constituents significantly mobile, given the limited existing soil cover, groundwater under or near the site would be expected to contain waste constituents. However, as would be expected for an inert waste landfill, waste constituents have not been found in site groundwater. Accordingly, based on site conditions, the closure standards of WAC 173-304-461 are also relevant and appropriate.

Because the Norseland landfill has characteristics of both a typical solid waste landfill and an inert waste landfill, the closure standards under both WAC 173-304-460 and -461 are relevant and appropriate. Thus, to meet ARARs, the remedial action should include closure that is appropriate considering the closure standards of both -460 and -461.

In addition, under 173-304-700, a variance to WAC 173-304 standards may be granted if:

> "(a) The solid waste handling practices or location do not endanger the public health, safety or the environment; and
>
> (b) Compliance with the regulation from which variance is sought would produce hardship without equal or greater benefits to the public."

This section provides an additional basis for selecting appropriate closure requirements to meet MFS (WAC 173-304). Because remedial action at the Norseland site is being conducted under a Consent Decree, no permitting or formal submission is required for a variance. Ecology, in consultation with the relevant permitting agencies, considers the appropriateness of any variances necessary for a selected cleanup action when preparing the CAP. Approval of the variance is effectively done when, after public comment and revision if necessary, Ecology signs the decree or order implementing the CAP.

4.4 Washington Clean Air Act and PSAPCA Regulations

The Washington State Clean Air Act is the state equivalent of the federal Clean Air Act. Substantive standards (WAC 173-400) established for the control and prevention of air pollution under this regulation may be applicable to some remediation alternatives. These regulations require that all sources of air contaminants meet emission standards for visible particulate, odors, and hazardous air emissions.

The Puget Sound Air Pollution Control Agency (PSAPCA) has jurisdiction over the regulation and control of atmospheric emissions of contaminants from all sources in King, Pierce, Snohomish and Kitsap counties. PSAPCA has established three regulations: Regulations 1, 2 and 3. The aim of Regulation 1 is to control the emission of air contaminants from all sources, to provide for administration and enforcement of air pollution controls, and to carry out the requirements and purposes of the Washington Clean Air Act. Ambient air quality standards are provided for suspended particulate, lead, carbon monoxide, ozone, nitrogen dioxide, and sulfur dioxide. Regulation 2 provides for control of VOCs, and contains requirements for specific industrial practices. Regulation 3 addresses toxic air contaminants (TACs). TACs are any air contaminant listed in Appendix A of Regulation 3 or listed in 40 CFR Part 372, Subpart D. The ambient impact of emissions of TACs are evaluated by comparing modeled or measured concentrations with Acceptable Source Impact Levels (ASILs). ASILs are used by comparing a concentration of a TAC in the outdoor atmosphere in any area that does not have restricted or controlled public access in order to evaluate the air quality impacts of a single source.

It is not entirely clear whether the landfill meets the definition of a source under Regulation 1. Due to this uncertainty, selected portions of these regulations are considered applicable to the Norseland site. Regulation 2, however, is not considered applicable or relevant and appropriate because the landfill does not fall into any of the specific industrial activities which are identified under the regulation. ASILs identified under Regulation 3 are applicable to the site, but only to "outdoor atmosphere in any area that does not have restricted or controlled public access." Therefore, ASILs are not an ARAR to soil gas, but are an ARAR to the ambient atmosphere at the Norseland site.

4.5 State Environmental Policy Act

SEPA is applicable to remedial actions at the Norseland site. Ecology is the lead agency for MTCA remedial actions performed under a Consent Decree or an Agreed Order pursuant to WAC 197-11-253.

SEPA is triggered when a governmental action is taken on a public or private proposal. Under WAC 197-11-784, a proposal includes both regulatory decisions of agencies and actions proposed by applicants. Ecology has determined that a SEPA checklist is required.

If the proposal is determined by Ecology to have a "probable significant adverse environmental impact," an environmental impact statement (EIS) is required which examines potential environmental problems that would be caused by the proposal and options for mitigation. If in Ecology's opinion, there will be no significant adverse environmental impact, a Determination of Nonsignificance (DNS) is issued and the SEPA process is completed without preparation of an EIS. Under WAC 197-11-259, if Ecology makes a determination that the proposal will not have a probable significant adverse environmental impact, the DNS can be issued with the draft Cleanup Action Plan prepared pursuant to MTCA.

The SEPA checklist and Ecology's SEPA determination are included as Appendix B. A public comment period is required for the SEPA determination. In order to expedite and streamline public input, the SEPA public comment period has been combined with the comment period for this CAP.

5. REMEDIAL ACTION OBJECTIVES AND CLEANUP LEVELS

This section presents the site-specific remedial action objectives (RAOs) and cleanup levels used for development and evaluation of the remedial alternatives for the Norseland Site. The selected cleanup action identified in this CAP was selected to meet these RAOs and cleanup levels.

5.1 Remedial Action Objectives

RAOs are site-specific goals based on acceptable exposure levels that are protective of human health and the environment and consider ARARs. RAOs combine consideration of ARARs and the specific constituents, affected media, and potential exposure pathways of the site. RAOs identify risk pathways that remedial actions should address, and identify acceptable exposure levels for residual constituents of concern.

Based on the data collected during the RI, adverse impacts attributable to the landfill at Norseland include:

- Potential odors to residents of Norseland, although the primary source of odors is believed to originate off-site.
- Landfill gases contain hazardous substances above acceptable regulatory levels.
- Skirt air is affected from landfill gases in several lots.

The RI data did not indicate that current groundwater or surface water conditions are adversely impacted by the Norseland landfill. Ambient air impacts from the Norseland landfill, if any, are not significant and are not statistically above off-site ambient air entering Norseland. The RI investigators believe that the majority of odors at Norseland originate from off-site sources. Remedial actions conducted at the Norseland Mobile Estates will not mitigate on-site impacts due to off-site odors from occurring in the future.

The residents at Norseland have been relocated and Norseland closed for residential uses. Therefore, resident on-site human receptors have been removed and decrease any potential future site risks.

Based on soil gas surveys, landfill waste at the Norseland site may contain what are now considered to be "hazardous substances" under current law. Waste is exposed in a few areas, particularly on the sides of steep slopes. There is therefore the potential for direct contact with the waste and for the waste to be entrained in stormwater run-off and airborne dust. In addition, site topography is irregular and contains many steep slopes. Steep slopes are prone to erosion, which could expose additional landfill waste.

No unacceptable impacts to soils, air, groundwater or surface water from the landfill at Norseland were identified in the RI, based upon regulatory or screening levels. Accordingly, the RAOs for this site are:

- Reduce the potential for migration of landfill waste or waste constituents in surface water run-off or airborne dust.
- Reduce the potential for future direct exposure of human or ecological receptors to landfill waste and waste constituents at the site via direct contact or exposure to potentially hazardous constituents in stormwater run-off or airborne dust.
- Ensure that remedial actions should be consistent with potential future land uses, such as commercial/industrial businesses developed at the site.

5.2 Cleanup Standards

Cleanup standards consist of a cleanup level and a point of compliance. A cleanup level is the maximum acceptable concentration of a constituent of concern to which the human or ecological receptors would be exposed via a specified exposure route (e.g., direct contact) under a specified exposure scenario (e.g., industrial land use). A point of compliance is the location on the site where cleanup levels must be attained.

WAC 173-340-700 establishes cleanup levels for environmental media, including groundwater, soil, surface water, using three methods: Method A (routine, using tables), Method B (standard), and Method C (conditional, primarily for commercial/industrial sites). The site is currently zoned industrial in the draft Kitsap County Comprehensive Plan and is part of the Olympic View Industrial Park. In all remediation alternatives, including the selected cleanup action, the site will be available for commercial/industrial use. Residential and recreational uses will not be allowed. In addition, use of site groundwater will not be allowed. These restrictions will be enforced via institutional controls.

5.2.1 Ambient Air

For ambient air, potential exposure would be to occasional visitors or site workers (commercial/industrial use). MTCA Method B cleanup levels for ambient air apply to the Norseland site. MTCA Method B cleanup levels cannot have concentrations below area background ambient air quality. Comprehensive area background studies have not been conducted, but a limited upgradient (offsite) ambient air quality study conducted during the Norseland Mobile Estates Site RI indicates area background ambient air quality to be similar to national average suburban ambient air quality (ATSDR, 1997 update). Therefore, the ambient air cleanup standard for the Norseland Mobile Estates Site shall be the national average suburban ambient air quality (as defined in the ATSDR 1997 update) or MTCA Method B level if the formula-calculated concentration is higher than the national average. Cleanup levels for the most relevant compounds at Norseland having MTCA cleanup standards are presented in Table 1. Other cleanup levels will be set as appropriate if additional compounds are discovered. These cleanup levels shall be attained in the ambient air throughout the site.

5.2.2 Groundwater

For groundwater, cleanup levels will be used for purposes of monitoring or groundwater removal (should removal become necessary in the future). For groundwater, the highest beneficial use of groundwater is for potable purposes. Although groundwater on the site is not currently used for drinking or other use, groundwater may migrate off-site or may become a future source of drinking water. Groundwater cleanup levels are set as the MTCA Method B for non-carcinogens and the EPA primary drinking water maximum contaminant limits (MCL) for carcinogens for which the carcinogenic risk is equal to or less than 10^{-5}, otherwise the MTCA Method B formula-calculated concentration will be the groundwater cleanup standard for the site. Table 2 gives groundwater cleanup levels for the most relevant compounds at Norseland. Other cleanup levels will be set as appropriate if additional compounds are discovered.

The point of compliance shall be established at the perimeter of the solid waste facilities' active area as that active area existed at closure of the facility (see Figure 6) and extend vertically from the uppermost level of the saturated zone to the lower most depth which could potentially be affected by the site.

5.2.3 Waste and Soil

The site is currently zoned industrial. Soil cleanup levels shall be set at the MTCA Method B level. Table 3 gives cleanup levels for the most relevant compounds at Norseland. Other cleanup levels will be set as appropriate if additional compounds are discovered.

The point of compliance shall be throughout the site to a depth of two feet within the perimeter of the solid waste facilities' active area, as that active area existed at closure of the facility, where soil is placed over waste for containment and throughout the site to a depth of fifteen feet in areas outside the solid waste facility's active area as that active area existed at closure of the facility.

5.2.4 Surface Water

In all remediation alternatives, including the selected cleanup action, surface water will not be allowed to contact landfill waste. Therefore, it is neither necessary nor appropriate to set cleanup standards for surface water at this time. Should site monitoring indicate a need to consider a need to consider cleanup standards for surface water, that will be done at that time.

6. SUMMARY OF REMEDIAL ALTERNATIVES

This section summarizes the alternatives developed for the Norseland Site.

6.1 Development of Alternatives

As the first step in developing remedial alternatives, potential remedial technologies were identified and screened in the FS to eliminate technologies that are not appropriate for site conditions. The remedial technologies were screened using the following criteria:

- Effectiveness;
- Implementability; and
- Cost.

Ecology has determined that consideration of "presumptive remedies" is appropriate at Norseland. Presumptive remedies are remedies which have been demonstrated to work at large numbers of similar sites, such as landfills. This approach is well laid out in policy set by the United States Environmental Protection Agency (EPA); see *Presumptive Remedy for CERCLA Municipal Landfill Sites* (EPA Directive No. 9355.0-49FS, EPA 540-F-93-035).

Because the Puget Service Company landfill received municipal waste, the consideration of presumptive remedies is appropriate. The presumptive remedies appropriate for this site include: (1) preventing contact with landfill materials; (2) curtailing human exposure to residual subsurface landfill gases; (3) containment; and (4) controlling surface water runoff and erosion. Use of presumptive remedies is a recognition that it is more appropriate to simply design and implement conservative remedial measures than to perform additional, time-consuming and expensive investigations and studies.

Based on the site conditions, remedial technologies that were eliminated from further evaluation were: (1) reuse and recycling; (2) treatment; and (3) removal and off-site disposal. Remedial technologies retained were: (1) institutional controls and monitoring; and (2) containment.

Considering MTCA regulations and other ARARs, the RAOs, and the technology screening, a number of remedial alternatives were assembled. All alternatives presented below were developed with the knowledge that residents had been relocated. Hence, remedial alternatives appropriate for a non-residential site were developed.

Alternative 1: No Action
Alternative 2: Institutional Controls and Monitoring
Alternative 3: Permeable Soil Cap
Alternative 4: Low-Permeability Cap

6.2 Alternative 1: No Action

A "no action" alternative was included as a baseline for comparison to the other alternatives. This alternative would leave the site in its current state after Norseland residents are relocated, assuming no restrictions on future site use and no site maintenance or monitoring.

6.3 Alternative 2: Institutional Controls and Monitoring

This alternative would decrease potential site risks by preventing exposure to constituents of concern resulting from waste disposal activities at the site. Exposure would be prevented by a physical barrier in the form of fencing with warning signs, and by preventing site use via deed restrictions.

Long-term maintenance and monitoring would be included to ensure the continued effectiveness of the remedy. Because this alternative relies on institutional controls more than physical covering of the waste for its effectiveness, the site would be dedicated as a waste site and not available for beneficial use.

6.4 Alternative 3: Permeable Soil Cap

This alternative provides a cap over the former landfill consisting essentially of clean soil cover. Because it does not include a low-permeability liner or layer, this cap would not meet all of the landfill closure specifications of WAC 173-304-460. However, this cap would meet the cap thickness requirement of WAC 173-304-460 and would exceed the closure specifications of WAC 173-304-461 for inert waste landfills. In addition, this cap meets the requirements for a variance under WAC 173-304-700.

The permeable soil cap consists of 18 inches of clean fill soil overlain by 6 inches of vegetated topsoil. The vegetative layer would promote evapotranspiration and decrease erosion. The topsoil would not be compacted so that it would provide a loose medium for establishing the vegetative cover. To establish vegetation, the topsoil would be seeded with grasses suitable for the local climate.

Landfill gases would slowly permeate up through the cap into the atmosphere. By providing a more even landfill cap than is currently present, this alternative should prevent potential localized concentration of landfill gas emissions. Gas release at a low rate, dispersed over a large area (approximately 11 acres), should not produce measurable impacts on ambient air quality.

Institutional controls and monitoring are included in this alternative. Cap maintenance would be provided during the post-closure period.

6.5 Alternative 4: Low-Permeability Cap

This alternative provides a low-permeability cap over the entire landfill area. The cap would be designed to meet all of the landfill closure requirements of WAC 173-304-460. For the purposes of the FS, a cap design using synthetic flexible membrane liner (FML) was assumed because a local (i.e., inexpensive) source of clay or other low-permeability soil is not known to be available for this site. This low-permeability cap would reduce water percolating through refuse to the groundwater, thus reducing the risk to groundwater. However, sampling has indicated that the old landfill does not adversely impact the current groundwater conditions.

The low-permeability cap would prevent upward migration of landfill gases. This creates the possibility of buildup of gas pressure beneath the cap, which could lead to landfill gases migrating to the edges of the cap where they could escape off-site. For this reason, the cap would include a gravel layer under the low-permeability liner (FML). With the gravel layer, gases would instead tend to collect and concentrate at cap high points (i.e., the eastern edge). To prevent off-site escape of these gases, an interceptor trench would be installed along the eastern edge of the landfill. The trench would be filled with pea gravel and contain a perforated collector pipe. The pipe would route the collected gases to passive above-ground vents, where the gas composition would be monitored. By collecting the landfill gases and venting them at centralized locations, this alternative creates relatively more chance of localized adverse affects on ambient air.

Institutional controls and monitoring are included in this alternative. Cap maintenance would be provided during the post-closure period.

7. EVALUATION OF REMEDIAL ALTERNATIVES

Under MTCA, evaluation of remedial alternatives is a two-step process. In the first step, remediation alternatives must meet threshold requirements (WAC 173-340-360(2)). The second step requires that remediation alternatives must use permanent solutions to the maximum extent practicable with respect to specific criteria (WAC 173-340-360(5)).

7.1 Threshold Evaluation

Under MTCA, remediation alternatives must meet the following threshold requirements (WAC 173-340-360(2)):

- Protection of human health and the environment;
- Compliance with cleanup standards;
- Compliance with ARARs; and
- Provision for compliance monitoring.

The following alternatives do not meet one or more of the threshold criteria:

Alternative 1: No Action
Alternative 2: Institutional Controls and Monitoring

Alternative 3 (Permeable Soil Cap) requires a variance to WAC 173-304-460(3)(e) to meet the requirements of WAC 173-340-710(6)(c) and hence meet threshold requirements (see Section 6.4 and 8.6.3 for more details). Alternative 4 (Low-Permeability Cap) meets the threshold criteria, including meeting WAC 173-304-460(3)(e) and hence WAC 173-340-710(6)(c) without the need for a variance.

7.2 Permanence Evaluation

WAC 173-340-360(3) specifies that the remediation alternatives must use permanent solutions to the maximum extent practicable. WAC 173-340-360(5) specifies that "Ecology recognizes that permanent solutions [defined at WAC 173-340-360(5)(b)] may not be practicable for all sites. A determination that a cleanup action satisfies the requirement to use permanent solutions to the maximum extent practicable is based on consideration of a number of factors." The specified factors, or criteria, are:

- Overall protectiveness;
- Long-term effectiveness and reliability;
- Short-term effectiveness;
- Reduction in toxicity, mobility, and volume;
- Implementability;
- Cost; and
- Community acceptance.

These criteria are briefly described below.

7.2.1 Overall Protectiveness

Overall protectiveness addresses the degree to which each alternative attains cleanup standards and is protective of human health and the environment, considering both long-term and short-term risks. This criterion is derived from the evaluation of the other criteria. It is not an independent criterion, but more a summary of the overall evaluation. Therefore, the overall comparative evaluation (net benefit) of the other non-cost criteria is taken as the overall protectiveness of the alternative. In addition, overall protectiveness has been evaluated as a threshold criterion (see Section 7.1).

7.2.2 Long-Term Effectiveness and Reliability

This criterion addresses risks remaining at the site after the remediation alternative has been implemented, and the reliability of the alternative at reducing risks over an extended period of time. Risks during the implementation period are addressed under short-term effectiveness. Evaluation of long-term effectiveness involves estimation of the residual risk associated with each alternative, and can be measured by the degree to which remedial action objectives are met. Reliability involves estimating the longevity of the remedy, (e.g., the lifespan of institutional controls or containment) and the chances of remedy failure.

This criterion was evaluated using two sub-criteria: 1) long-term effectiveness, and 2) reliability. The overall score for this criterion was obtained by giving equal weight to the two sub-criteria.

7.2.3 Short-Term Effectiveness

This criterion addresses short-term effects on human health and the environment while the alternative is being implemented. The evaluation includes consideration of the following factors:

- Risk to site workers;
- Risk to the community; and
- Risk to the environment (short-term ecological risk).

Short-term effectiveness was primarily scored based on evaluation of the degree of risk to site workers. The primary risk to site workers would be due to construction accidents and inhalation exposure to landfill gas during grading. In addition, for cap alternatives, the relative complexity of the caps is a measure of the relative man-hours required, and therefore the relative worker risk.

Because remedial action would include controls as necessary to ensure that the remedy does not create an unacceptable risk to the community and the environment, risk to the community and risk to the environment are not as significant in distinguishing between alternatives as worker risk.

7.2.4 Reduction of Toxicity, Mobility, and Volume

This criterion addresses the degree to which a remediation alternative reduces the inherent toxicity, ability of contaminants to migrate in the environment, or the quantity of contaminated material. This criterion is also used to express the preference hierarchy for cleanup technologies under WAC 173-340-360(4), and the use of recycling or treatment under WAC 173-340-360(5). Effectiveness and reliability of the treatment, which are addressed under long-term effectiveness and permanence, are not addressed under this criterion.

7.2.5 Implementability

This criterion addresses the degree of difficulty in implementing each alternative. Implementability issues are important because they address the potential for delays, cost overruns, and failure. Known implementation difficulties with quantifiable cost impacts were included in the cost estimates. The implementability criterion focuses on less quantifiable known and potential difficulties. Implementability was evaluated considering the following:

- Technical feasibility;
- Availability of services and materials;
- Administrative feasibility;
- Scheduling/Timing;
- Complexity and size; and
- Other considerations per WAC 173-340-360(5)(d)(v).

7.2.6 Cost

This criterion is used to consider the costs of performing each alternative, including capital, operation and maintenance, and monitoring costs. Alternative costs are compared on a net present value basis. Known implementation difficulties with quantifiable cost impacts are included in the cost estimates.

Because restrictions on land use affect the sale value and earning potential of the land, these factors were reflected in the cost estimates. In Alternative 2 (Institutional Controls and Monitoring), the land would not be available for beneficial use. Therefore, the value of the land (without use restrictions) and the earning potential of the land would be lost, and have been included as costs of implementing Alternative 2. Alternatives 3 (Permeable Soil Cap) and 4 (Low-Permeability Soil Cap) would allow beneficial reuse of the Norseland Site.

7.2.7 Community Acceptance

Determination of community concerns is based on public comments on the CAP. Ecology evaluates community acceptance after comments on the CAP are received.

The public comments will be addressed in the Responsiveness Summary (Appendix C). The proposed remedial action may be modified to address community concerns based on public comments.

7.3 Comparative Evaluation of Remedial Alternatives

Selection of the cleanup action from the remedial alternatives was based on a comparative evaluation of the alternatives (that satisfy the threshold criteria) using five permanence criteria:

- Long-term effectiveness and reliability;
- Short-term effectiveness;
- Reduction in toxicity, mobility, and volume;
- Implementability; and
- Cost.

Each alternative was scored relative to the other alternatives for the four non-cost permanence criteria. For completeness and perspective, all of the retained alternatives were included in the evaluation, even if they did not meet the threshold criteria. Because of the nature of the criteria and the uncertainties in the evaluation, the scores for these four criteria were expressions of relative qualitative or semi-quantitative professional judgments. A scale of 0 (worst) to 10 (best) was used. The evaluation scores are shown in Table 4. Details of the bases for these scores are provided in the RI/FS (Golder 1997).

The net benefit of the alternatives was determined by combining the criteria scores, weighting the criteria based on the relative values assigned to the criteria. Given the criteria definitions and basis for scoring used in the FS, the relative criteria values shown in Table 4 are considered appropriate for evaluation of the alternatives for the Norseland Site.

Using these scores, the preference ranking of the alternatives before consideration of cost is as follows (most to least preferred):

1. Alternative 3: Permeable Soil Cap
2. Alternative 4: Low-Permeability Cap
3. Alternative 2: Institutional Controls and Monitoring
4. Alternative 1: No Action.

After the non-cost evaluation, a comparison of the cost and benefit of the alternatives was made. Under WAC 173-340-360(5)(d)(vi), "a cleanup action shall not be considered practicable if the incremental cost of the cleanup action is substantial and disproportionate to the incremental degree of protection it would achieve over a lower preference cleanup action." The determination of practicability is made using an analysis of cost vs. benefit. The cost:benefit analysis can be performed quantitatively using the overall scoring of the non-cost criteria as the net benefit.

The MTCA regulations refer to incremental cost and benefit. To evaluate incremental cost-effectiveness, the difference in cost between alternatives is calculated, going from the least costly alternative to the most costly (e.g., institutional cost – no action cost = incremental cost for institutional controls). The corresponding incremental net benefit (overall non-cost score) is then calculated (e.g., institutional net benefit – no action net benefit = incremental benefit for institutional controls). Dividing the incremental benefit by the incremental cost results in a value that represents the incremental cost-effectiveness. These values are shown for the alternatives in Table 4.

Figure 10 shows a graph of cost versus net benefit for the alternatives. The error bars on these graphs show the range from the 10th to the 90th percentiles from the stochastic uncertainty analysis (see Section 8.4.9 of the RI/FS, Golder 1997).

Based on the cost:benefit graph and the incremental cost-effectiveness values, Alternative 3 (Permeable Soil Cap) provides the best incremental cost-effectiveness, in addition to providing good net benefit.

8. SELECTED CLEANUP ACTION

The selected cleanup action selected by Ecology for the Norseland Site is Alternative 3 - Permeable Soil Cap.

8.1 General

The major steps in the selected cleanup action are:

1. Fill and grade the site for stable slopes and good stormwater drainage.
2. The petroleum-contaminated soil from storage of cosmoline drums that was used for dust suppression will be excavated and placed within the landfilled area to be capped.
3. Place a soil cap over the landfill area (minimum 18 inches of clean fill plus 6 inches of vegetated topsoil).
4. Maintain the cap during the post-closure period.
5. Implement and maintain institutional controls and long-term monitoring.

This remedial action provides a cap consisting essentially of clean soil cover. Capping this site would protect against direct contact with landfill waste, and also prevent off-site migration of waste or waste constituents in stormwater. Because direct contact with the waste is prevented, the site would be available for future beneficial uses. Suitable landfill area uses include commercial and/or industrial but not residential or recreational. Any site use will be subject to restrictions to prevent long-term exposure of waste. Short-term exposure of the waste (i.e., during construction) would not be a problem with proper health and safety controls, providing after construction the waste were still recovered to prevent exposure. Special health and safety considerations during grading and construction would need to be implemented in areas exhibiting elevated concentrations of constituents such as in the vicinity of Lots 62 and 63.

Landfill gases would slowly permeate up through the cap into the atmosphere. Subsurface landfill gases contained some hazardous substances. However, the concentration of methane in these gas samples indicated little biodegradation and a low methane generation rate. By providing a more even landfill cap than is currently present, this alternative should prevent potential localized concentration of landfill gas emissions. Gas release at a low rate, dispersed over a large area (approximately 11 acres), should not produce measurable impacts on ambient air quality. Ambient monitoring would verify that no unacceptable ambient air concentrations of landfill waste constituents result from this cleanup action.

8.2 Grading and Surface Water Management

Current site conditions include steep slopes that are not desirable for long-term erosion control. A significant component of the remedial action will be grading the site to keep the terraced appearance and for establishing shallower and more stable slopes over the landfill area and perimeter. Initially, any remaining structures and existing utilities will need to be removed as part of the remediation for implementing the grading plan. A conceptual grading plan is shown in Figure 7, while conceptual cross-sections of the grading plan are shown in Figures 8 and 9. The grading plan can be modeled to facilitate the redevelopment of the site as long as the slopes are stable and storm water management is effective.

The grading will allow improved stormwater management. The grading would route stormwater run-off from the landfill area to the western edge of the landfill terraces as sheet flow (i.e., not collected in ditches). As part of the grading, stormwater ditches will be created at the foot of each terrace and along the eastern and southern edges of the cap to route stormwater run-off from higher elevations around the cap. A stormwater ditch will not be needed along the western and northern edges because the landfill grade would be higher than the surrounding area.

8.3 Permeable Soil Cap

The permeable soil cap consists of 18 inches of clean fill soil overlain by 6 inches of vegetated topsoil. The vegetative layer would promote evapotranspiration and decrease erosion. The topsoil would not be compacted so that it would provide a loose medium for establishing the vegetative cover. To establish vegetation, the topsoil would be seeded with grasses suitable for the local climate. Because of its simplicity, little maintenance would be required for this cap. Any settling after cap installation would be repaired by filling and regrading in the same manner as initial installation.

The clean fill beneath the topsoil would be established as part of site grading. Comparison of the current site topography (Figure 4) and the conceptual grading plan (Figures 7, 8, and 9) reveals that balanced cut and fill can provide sufficient clean soil for the cap fill soil. The fill will be compacted to provide long-term stability, but this cap does not include a permeability specification. The area to be capped will cover all landfill waste at the site.

8.4 Institutional Controls

The property historically has been and currently is zoned Industrial. Following remediation, any activity listed for an industrial zone by Kitsap County Zoning Ordinance Section 370, Industrial Zone (IND), dated June 22, 1998, (Appendix D) is allowed on-site except that residential, child daycare, educational institutions, agricultural, and overnight recreational use is prohibited without prior approval by Ecology. Approval by Ecology shall be at Ecology's sole discretion, and such approval may be contingent on additional cleanup as appropriate for the proposal.

Any commercial/industrial building and associated infrastructure must be developed to not breach the cap and expose landfilled materials. Buildings built on the footprint of the landfill cap must be designed to prevent the accumulation of landfill gases inside the structures. Any site development over the refuse area must be designed to avoid subsurface gas accumulation under structures and insure the remedial action objectives of the Norseland site are not violated.

The State of Washington is currently establishing policies (1994 Wash. Laws Ch. 254, and "brownfields initiatives") that encourage remedial actions allowing beneficial reuse and redevelopment of contaminated sites consistent with current or planned land uses. With proper design and construction, buildings or other structures could be considered over the landfill after installation of a permeable soil cap. Special requirements would be imposed on any structures built on the capped area, such as:

- Load imposed by a building or other structure would be restricted based on the load capacity of the landfill, as determined by geotechnical investigations made during detailed building design in accordance with applicable building codes.
- Support pilings or similar measures into the cap would be acceptable so long as it does not result in long-term exposure of waste.
- Buried utilities would not be placed directly in waste, but would be placed in engineered fill.
- Any excess landfill waste from construction excavation would be disposed off-site at a properly permitted facility.
- Landfill gas controls would be necessary for buildings having building foundation or floor slabs directly in contact with the soil cap to avoid the possibility of buildup of landfill gases with flammable methane or hazardous constituents.
- Basements would not be permitted to avoid excessive waste excavation and to avoid landfill gas buildup.
- For a building or a slab foundation, a passive gas vent system beneath the building consisting of six inches of pea gravel, with above-grade vents outside the building, would be sufficient (or equivalent).

Deed and lease restrictions will be instituted to ensure that site use restrictions remain in force regardless of the property owner, and to notify any prospective purchasers or lessees of the presence of subsurface waste. Site use restrictions will remain in force indefinitely.

Fencing is not needed to achieve remedial action objectives, and is therefore not included. The cap will provide sufficient protection against direct contact with landfill waste.

Periodic site inspections and maintenance of the cap will be provided for the post-closure period. Cap maintenance and monitoring will be presented in detail in the Compliance Monitoring Plan and Operation and Maintenance Plan for the site, which will be subject to public comment.

Groundwater currently meets groundwater cleanup levels. Therefore, no groundwater containment or treatment is currently necessary. However, use of site groundwater will be prohibited to prevent exposure to constituents of concern if site groundwater were to become affected. Exposure to groundwater could then occur only after off-site migration. If a release were to occur, groundwater monitoring would detect constituents of concern in site groundwater prior to off-site migration, which would be followed by appropriate remedial action.

8.5 Monitoring

Separate monitoring programs will be used for the short term (during remedial action) and the long term (following completion of remediation). Detailed monitoring plans will be developed during final design of remedial action and presented in the Compliance Monitoring Plan.

8.5.1 Short-Term Monitoring

Short-term monitoring is conducted during remediation to ensure that there are no adverse effects from remediation activities, to provide quality control, and to confirm the attainment of cleanup standards and/or relevant performance criteria. Health and safety monitoring is also performed to ensure that site workers are not exposed to undue or unexpected risks.

Attainment of cleanup standards by removal is not applicable for this remedial action because no waste removal is involved. Short-term monitoring will primarily consist of construction quality assurance (CQA) to confirm attainment of construction specifications. CQA specifications would address compaction specifications (for stability of fill material), final grades, and other aspects of the remedy that affect performance.

8.5.2 Long-Term Monitoring

Long-term, or confirmational, monitoring is conducted to 1) verify that the remedy performs as expected over time, and 2) allow timely maintenance of a cap and other physical components of the alternative. Periodic site inspections and surveys would be sufficient for determining maintenance needs and monitoring cap performance. Cap performance is also monitored by groundwater monitoring.

8.5.2.1 Cap Monitoring

Cap monitoring will consist primarily of visual inspections for damage and subsidence. The cap will be periodically examined for the presence of off-sets, scarps, low-points, ponded water, odd changes in grade, excessive erosion, and the condition of the vegetative layer. Inspections will be performed semi-annually in the first year, annually for the next four (4) years, and once every five (5) years thereafter until 20 years have elapsed.

8.5.2.2 Groundwater Monitoring

Groundwater monitoring will include periodic groundwater sampling and analysis at selected key locations throughout the site to confirm that concentrations of constituents of concern from waste disposal activities do not exceed acceptable limits. Site groundwater currently meets remediation goals, so the monitoring program will be designed for detection of release of waste constituents into site groundwater, should it occur. Three wells (one upgradient and two downgradient) are sufficient for this purpose.

Because of the long time that has elapsed since original landfill closure without adverse effects on groundwater, quarterly monitoring is unnecessary. Semi-annual monitoring, performed once in the wet season and once in the dry season, is considered sufficient for the first five (5) years. If the monitoring results do not indicate groundwater impacts to be of concern or concentrations of key parameters to be increasing, further groundwater monitoring is unnecessary and will be discontinued after the first five (5) years.

The first semi-annual monitoring event will consist of analysis for landfill indicator parameters (WAC 173-304-490) and for volatile organic compounds (EPA Method 8260) and target metals. The second semi-annual monitoring event will include full analysis for landfill indicator parameters (WAC 173-304-490), volatile and semi-volatile organic compounds (EPA Methods 8260, 8240 and 8080) and a broader list of key toxic metals.

8.5.2.3 Ambient Air Monitoring

Because constituents of potential concern have been detected in subsurface landfill gases, monitoring will be performed to ensure that these gases do not cause problems with ambient air quality. Landfill gas monitoring will be conducted along with the groundwater monitoring. Air samples would be analyzed for hazardous air constituents and methane per EPA Method TO-14. Air monitoring will consist of obtaining and analyzing four (4) samples: one representative sample of air from above the landfill, one upwind air sample, and two downwind air samples.

Landfill gas generation is primarily a result of biological degradation of putrescible waste. RI data indicate that most of the gas generation associated with municipal sanitary landfills has already occurred, as would be expected more than 30 years after closure. Gas generation rates decrease steadily over time as the supply of putrescible waste is exhausted. If a problem with landfill gases were to occur with one of the remediation alternatives, it would be detected soon after remedial action. Air monitoring will continue for five years following remedial action. If the monitoring results do not indicate ambient air impacts to be of concern or concentrations of key parameters to be increasing, ambient air monitoring will cease.

8.6 Evaluation of the Cleanup Action with Respect to MTCA Criteria

8.6.1 Threshold Criteria

The selected cleanup action meets all of the threshold criteria:

- Protection of human health and the environment;
- Compliance with cleanup standards;
- Compliance with ARARs; and
- Provision for compliance monitoring.

As stated in WAC 173-340-710(6)(c), for solid waste landfills, the solid waste closure requirements in Chapter 173-304 WAC are the minimum requirements for cleanup actions. The permeable soil cap in this cleanup action complies with landfill closure standards under WAC 173-304. Because it does not include a low-permeability liner or layer, this cap would not meet all of the landfill closure specifications of WAC 173-304-460. However, this cap would meet the cap thickness requirement of WAC 173-304-460 and would exceed the closure specifications of WAC 173-304-461 for inert waste landfills. In addition, this cap meets the requirements for a variance under WAC 173-304-700 (see Section 8.6.3).

8.6.2 Permanence Criteria

As discussed in Section 7.3 (and in more detail in the RI/FS, Golder 1997), the selected cleanup action provides the optimum combination of long-term effectiveness and reliability, short-term effectiveness, implementability, and reduction of toxicity, mobility, and volume. In addition, this alternative provides good cost:benefit ratio. Considering the criteria and approach specified in WAC 173-340-360(5), the selected cleanup action is the remediation alternative for the Norseland site that is "permanent to the maximum extent practicable."

8.6.3 Basis for Variance under WAC 173-304-700

Minimum functional standards (MFS) for landfills are found in WAC 173-304. These regulations contain three landfill closure standards, two of which are relevant for this site. First, general landfill closure standards under WAC 173-304-460(3)(e) require closure caps to have at least either two feet of low-permeability (10^{-6} cm/sec) soil or a synthetic liner with a minimum thickness of 50 mils. Second, inert waste and demolition waste landfill closure standards under WAC 173-304-461(6) require closure by leveling the waste and covering with one foot of soil cover.

The selected cleanup action (Alternative 3 - Permeable Soil Cap) does not provide a low-permeability cap, and therefore does not meet all of the specific design standards of WAC 173-304-460(3)(e). The selected cleanup action does provide regrading the site and covering with a minimum of two feet of soil cover as required by these standards, and also exceeds the landfill closure standards of WAC 173-304-461(6).

A variance from 173-304-460 closure standards may be obtained if the following conditions are met (WAC 173-304-700):

> "(a) The solid waste handling practices or location do not endanger public health, safety, or the environment; and
>
> (b) Compliance with the regulation from which variance is sought would produce hardship without equal or greater benefits to the public."

The Norseland landfill received municipal solid waste; the general landfill standards of WAC 173-304-460 are therefore considered ARAR. However, much of the waste was burned, which results in a relatively inert ash. In addition, municipal landfill waste degrades biologically over time; it has been over 30 years since initial landfill closure. Therefore, significant waste degradation is expected to have occurred. The current state of the Norseland landfill as containing relatively inert waste is evidenced by the low methane concentrations found in subsurface landfill gas. A normal municipal landfill generates significant volumes of gas with high concentrations of methane, which is the primary gaseous product of anaerobic biological degradation. In addition, the lack of waste constituents in groundwater is further evidence of the relatively inert nature of the landfill. Therefore, the Norseland landfill exhibits characteristics similar to inert waste landfills and unlike typical operating or recently closed municipal sanitary landfills. On this basis, the closure standards of WAC 173-304-460 are not necessarily appropriate. These considerations support that grading and simple soil cover, in compliance with the landfill closure standards of WAC 173-304-461, are sufficient for protection of public health, safety, and the environment.

The landfill does not significantly impact either ambient air or groundwater. The selected cleanup action would decrease the already low potential risk posed by this site. Therefore, the selected cleanup action meets variance condition (a).

A low-permeability cap would cost approximately twice as much as a permeable soil cap (compare Alternatives 3 and 4 in Table 4). Thus, meeting the closure standard of WAC 173-304-460 instead of the closure standard of WAC 173-304-461 would produce the hardship of significant additional expenditure without corresponding environmental benefits. In addition, a low-permeability cap could create localized ambient air quality problems that do not currently exist due to collection and point discharge of landfill gases.

A low-permeability liner (e.g., FML) would decrease infiltration of water through landfill waste, thus minimizing the potential for constituents of concern to reach groundwater via leachate. However, infiltration comparable to the permeable cap of the selected cleanup action has been occurring for more than 30 years without a groundwater problem being created. Thus, the theoretical benefit of a low-permeability cap does not provide significant additional long-term protectiveness for this site. Groundwater at the site will be monitored in the future to determine whether the permeable cap is sufficiently protective of groundwater.

A low-permeability cap would impose the additional hardship of being more difficult and costly to develop for most beneficial uses than a permeable soil cap. Pursuant to the "Ports Bill" (1994 Wash. Laws Ch. 254) and recent "brownfields initiatives," the State of Washington is establishing policies that encourage remedial actions allowing beneficial reuse and redevelopment of contaminated sites consistent with current or planned land uses. Selection of Alternative 3 (Permeable Soil Cap) is consistent with this policy while still protecting human health and the environment.

Considering the above factors, the selected cleanup action meets the conditions for a variance under WAC 173-304-700, and therefore complies with all ARARs including WAC-173-304.

9. IMPLEMENTATION SCHEDULE

The preliminary implementation schedule is shown in Figure 11. The schedule includes the following key elements and anticipated timing:

- The CAP (including SEPA documentation) and draft Consent Decree (implementing the CAP) submitted for public comment during the first quarter of 2000.
- Final CAP and Consent Decree, including responsiveness summaries for public comments, during the second quarter of 2000.
- Engineering field investigations, design reports, and various plans and specifications developed in the first quarter of 2000.
- Bid documents prepared and contractor selection during the second quarter of 2000.
- Cap construction during the summer and fall of 2000.
- Final remedial action report completed by the end of 2000. The final remedial action report will be submitted to Ecology and the Bremerton Kitsap County Health District (BKCHD).

10. REFERENCES

Agency for Toxic Substance and Disease Registry (ATSDR) 1997 Update. Toxicological Profile for Chemical Hazardous Substance Database. National Average Suburban Concentrations of Chemicals Measured in Ambient Air, presented in the Toxicological Profile for Each Chemical. Atlanta, Georgia.

Ecology 1994a. Consent Decree for the Norseland Mobile Estates. Cause No. 94-2-00725-6, Kitsap County Superior Court, March 28, 1994.

Ecology 1994b. Agreed Order 94TC-N-197 for the Norseland Mobile Estates. Washington Department of Ecology, March 28, 1994.

Ecology 1994c. Natural Background Soil Metals Concentrations in Washington State. Publication No. 94-115. Toxics Cleanup Program. Olympia, Washington.

Golder 1993a. Draft Phase I RI/FS Work Plan for Norseland Mobile Estates. Golder Associates, Inc., October 13, 1993.

Golder 1993b. Conceptual Model of Norseland Mobile Estates. Golder Associates, Inc., June 15, 1993.

Golder 1997. Remedial Investigation and Feasibility Study for the Norseland Mobile Estates, Final Report. Golder Associates Inc., May 7, 1997.

TABLES

TABLE 1

Ambient Air Cleanup Levels for Detected Compounds at the Norseland Site[c]

Detected Compound CAS #	MTCA Air Cleanup Levels (ppbv)	MW g/mol
Acetaldehyde	2.9 [a]	
Benzene	1.8 [a]	
1,3-Butadiene	0.32 [a]	
Carbon disulfide	103 [b]	
Carbon tetrachloride	0.19 [a]	
Chlorobenzene	1.7 [b]	
Chlorodifluoromethane 75-45-6 (Freon 22)	6,390 [b] ✓	86.47
Chloroethane	1,730 [b]	
Chloroform	0.06 [a]	
Chloromethane	0.67 [b]	
1,2-Dichlorobenzene (o-)	10.6 [b]	
1,4-Dichlorobenzene (p-)	60.8 [a] ✓	
1,1-Dichloroethane	39.5 [b]	
1,2-Dichloroethane	0.04 [a]	
1,1-Dichloroethylene 75-35-4	0.03 [a] ✓	96.95
1,2-Dichloroethylene 540-59-0	0.326 [a] ✓	96.95
1,2-Dichloropropane	0.396 [b]	
Ethyl benzene	105 [b]	
Formaldehyde 50-00-0	4.0 [a] ✓	30.03
Freon 11 75-69-4	57.1 [b]	
Freon 12 75-71-8	16.2 [b]	
Freon 113 76-13-1	1,790 [b]	
Hexane	25.9 [b] ✓	
Methyl ethyl ketone (2-Butanone)	155 [b]	~~143~~ 72.108 Clare
4-Methyl-2-pentanone	7.8 [b]	
Methylene chloride (Dichloromethane)	~~0.153~~ [b] incorrect	~~141~~ 72.108 Clare
2-Propenenitrile (acrylonitrile) 107-13-1	0.51 [a] ✓	53.0627
Styrene	107 [b]	
Tetrachloroethylene (Perchloroethylene) ?	0.79 [a]	
Toluene	48.4 [b]	
1,2,4-Trichlorobenzene	12.3 [b]	
1,1,1-Trichloroethane	168 [b]	
1,1,2-Trichloroethane	0.028 [b]	

0517djml.xls

TABLE 1

Ambient Air Cleanup Levels for Detected Compounds at the Norseland Site[c]

Detected Compound	MTCA Air Cleanup Levels (ppbv)
Trichloroethylene	0.46[a]
Vinyl chloride	10[a]
Xylenes (m-, o-, p-)	4.0[a]

a. Agency for Toxic Substance and Disease Registry (ATSDR), 1997 Update. Toxicological Profile for Chemical Hazardous Substance Database National Average Suburban Concentrations of Chemicals Measured in Ambient Air.

b. Model Toxics Control Act (MTCA) Method B Ambient Air Cleanup Levels. Represents the lower concentration between carcinogenic and non-carcinogenic cleanup levels.

c. If there is any conflict between cleanup levels listed in this table with concentrations listed in ATSDR, 1997 update of WAC 173-340-750, the maximum of ATSDR, 1997 update ~~or~~ WAC 173-340-750 shall govern.

36 Compounds

TABLE 2

Groundwater Cleanup Levels for
Detected Compounds at the Norseland Site

Detected Compound	Cleanup Water Levels [a] (mg/L)
METALS (and Cyanide)	
Antimony	0.006
Arsenic	0.005
Barium	1.12
Beryllium	0.00002
Cadmium	0.005
Chromium (Total)	0.1
Chromium IV	0.08
Copper	0.592
Cyanide	0.2
Lead	0.005 [b]
Manganese	2.24
Mercury	0.002
Nickel	0.32
Selenium	0.05
Silver	0.08
Strontium	9.6
Thallium	0.00112
Vanadium	0.112
Zinc	4.8
ORGANICS	(μg/L)
Bis(2-ethylhexyl)phthalate	6.25
Butylbenzylphthalate	3200
Di-n-octyl phthalate	320
Diethylphthalate	12,800
OTHER	(mg/L)
Fluoride	0.96
Nitrate	25.6
Nitrite	1.6

[a] Cleanup levels based on the Federal Primary MCL if the MCL represents less than a 10^{-5} cancer risk, otherwise the MTCA Method B is the cleanup standard from MTCA Cleanup Levels and Risk Calculations (CLARC II) Database (WDOE 1996).

[b] MTCA Method A Level.

TABLE 3

Soil Cleanup Levels for Detected Compounds at the Norseland Site

Detected Compound	Cleanup Level (MTCA Method C)[a,b] (mg/kg)
METALS	
Antimony	32
Arsenic[c]	20
Beryllium[e]	2
Cadmium[c]	2
Chromium[c]	100
Copper	2,960
Lead[c]	250
Mercury[c]	1
Nickel	1,600
Selenium	400
Silver	400
Thallium	5.6
Zinc	24,000
ORGANICS	
Acetone	8,000
Benzene[c]	0.5
Bis(2-ethylhexyl)phthalate	71.4
2-Butanone (MEK)	48,000
Butylbenzylphthalate	16,000
Carbon disulfide	8,000
d-n-Butylphthalate	8,000
1,4-Dichlorobenzene	41.7
Diethylphthalate	64,000
Ethylbenzene[c]	20
2-Methylnaphthalene[d]	3,200
4-Methylphenol	1,600
Naphthalene	3,200
Phenanthrene	9,600
Total xylenes[c]	20

[a] Cleanup levels based on Method B Soils in the February 1996 Update to the MTCA Cleanup Levels and Risk Calculations (CLARC II) Database (WDOE 1996).

[b] The lower of the carcinogenic and non-carcinogenic numbers is the cleanup level.

[c] Cleanups level based on on MTCA Method A (residential).

[d] Naphthalene used as a surrogate.

[e] Cleanup levels based on Washington State natural background concentrations (Ecology, 1994c).

0517djm1.xls

TABLE 4

Summary of Remediation Alternative Evaluation

Criteria [a]	Relative Value of Criterion [b]	Calculated Criteria Weights	Alternative Scores [c] 1 No Action	2 Institutional Controls	3 Permeable Soil Cap	4 Low-Permeability Cap
Long-Term Effectiveness and Reliability						
Effectiveness (50% of criterion)		50%	3	4	9	9.5
Reliability (50% of criterion)		50%	1	4	9	8.5
Overall criterion score	1	69%	2	4	9	9
Short-Term Effectiveness	0.2	14%	10	9	6	3
Reduction in Toxicity, Mobility, and Volume	0.05	3%	0	0	0	2
Implementability	0.2	14%	10	9	7	4
Net Benefit	1.45	100%	4.1	5.2	8.0	7.2
Incremental benefit			NA	1.1	2.8	-0.8
Cost (present value, millions)			$0	$1.00	$1.30	$2.66
Benefit : cost (i.e., cost-effectiveness)			NA	5.2	6.1	2.7
Incremental cost			NA	$1.00	$0.30	$1.36
Incremental benefit : incremental cost			NA	1.1	9.3	-0.6

[a] See RI/FS (Golder 1997) for criteria definitions.
[b] The numeric value of one scoring unit of the criterion relative to one scoring unit of the long-term effectiveness and reliability criterion.
[c] See RI/FS (Golder 1997) for score basis.

0517djm1.xls

FIGURES

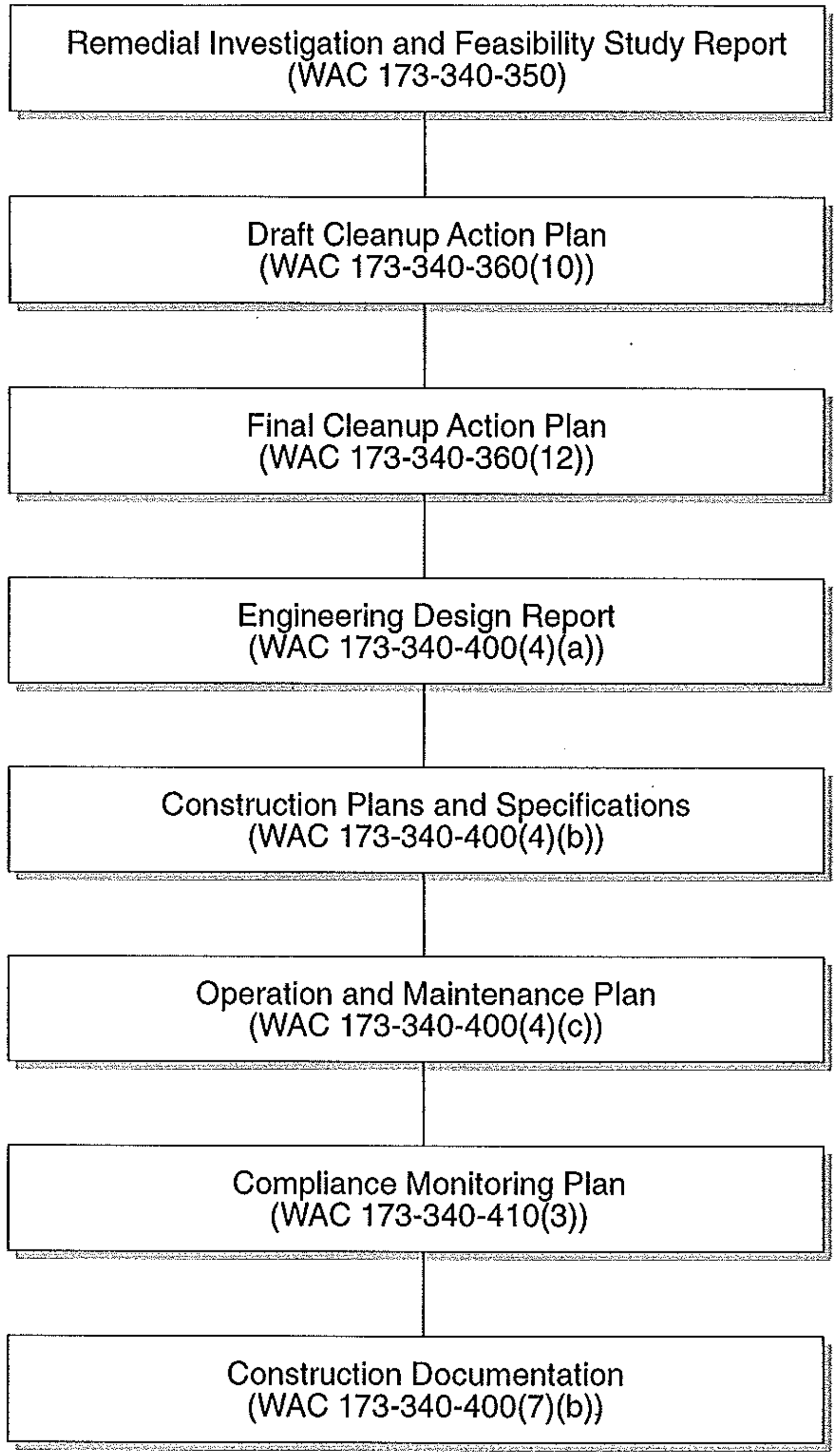
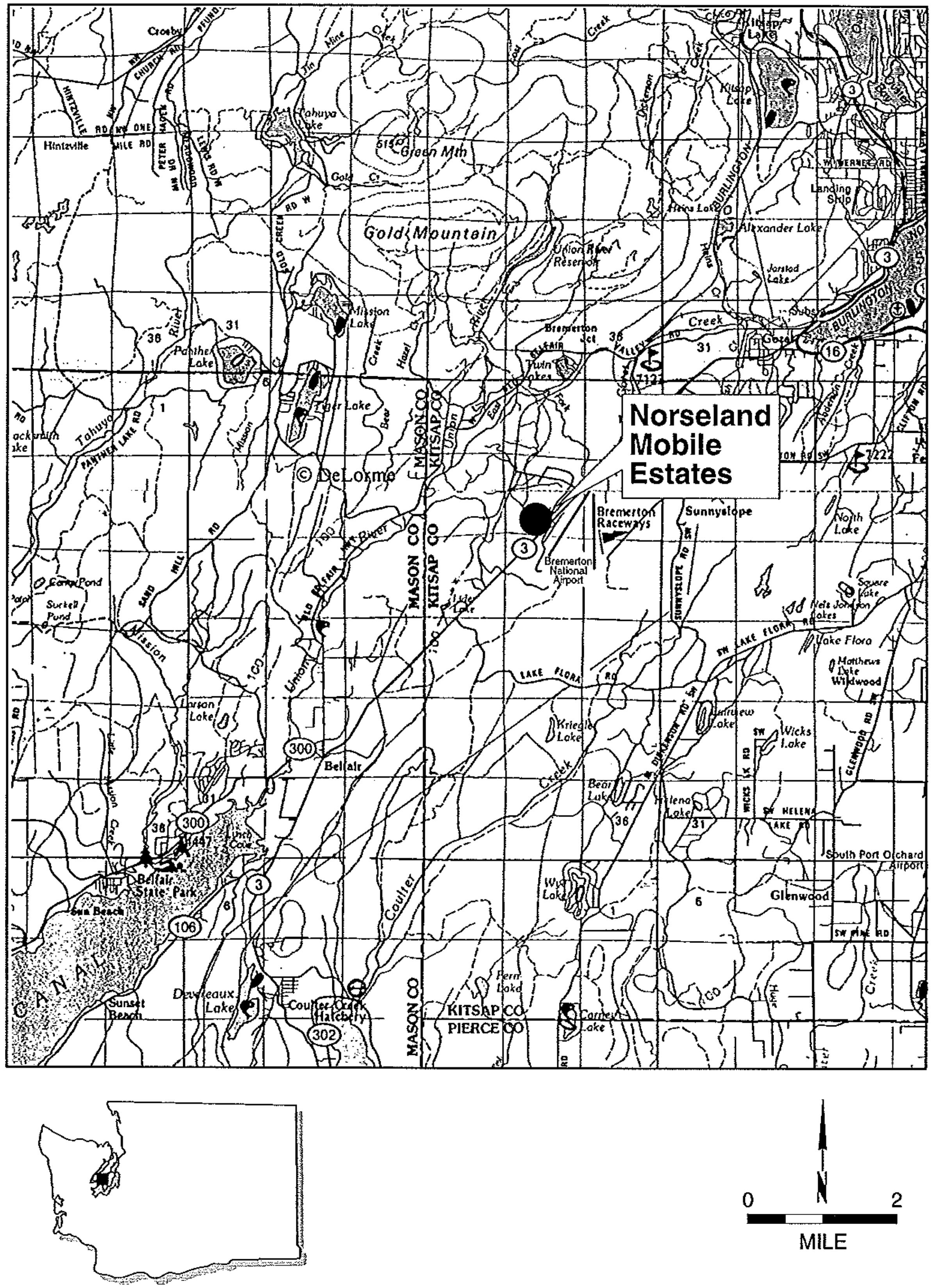


FIGURE 1
DOCUMENTS REQURED UNTER MTCA
PORT OF BREMERTON/NORSELAND CAP/WA

PROJECT NO. 933 1280.3020 DRAWING NO. 74751 DATE 11/21/97 DRAWN BY TK

Golder Associates



REFERENCES: USGS 7.5' Quadrangles
Wildcat Lake, WA
Burley, WA
Belfar, WA
Bremerton West, WA

FIGURE **2**
SITE LOCATION MAP
PORT OF BREMERTON/NORSELAND CAP/WA

PROJECT NO. 933 1280.3020 DRAWING NO. 74752 DATE 11/21/97 DRAWN BY TK

Golder Associates

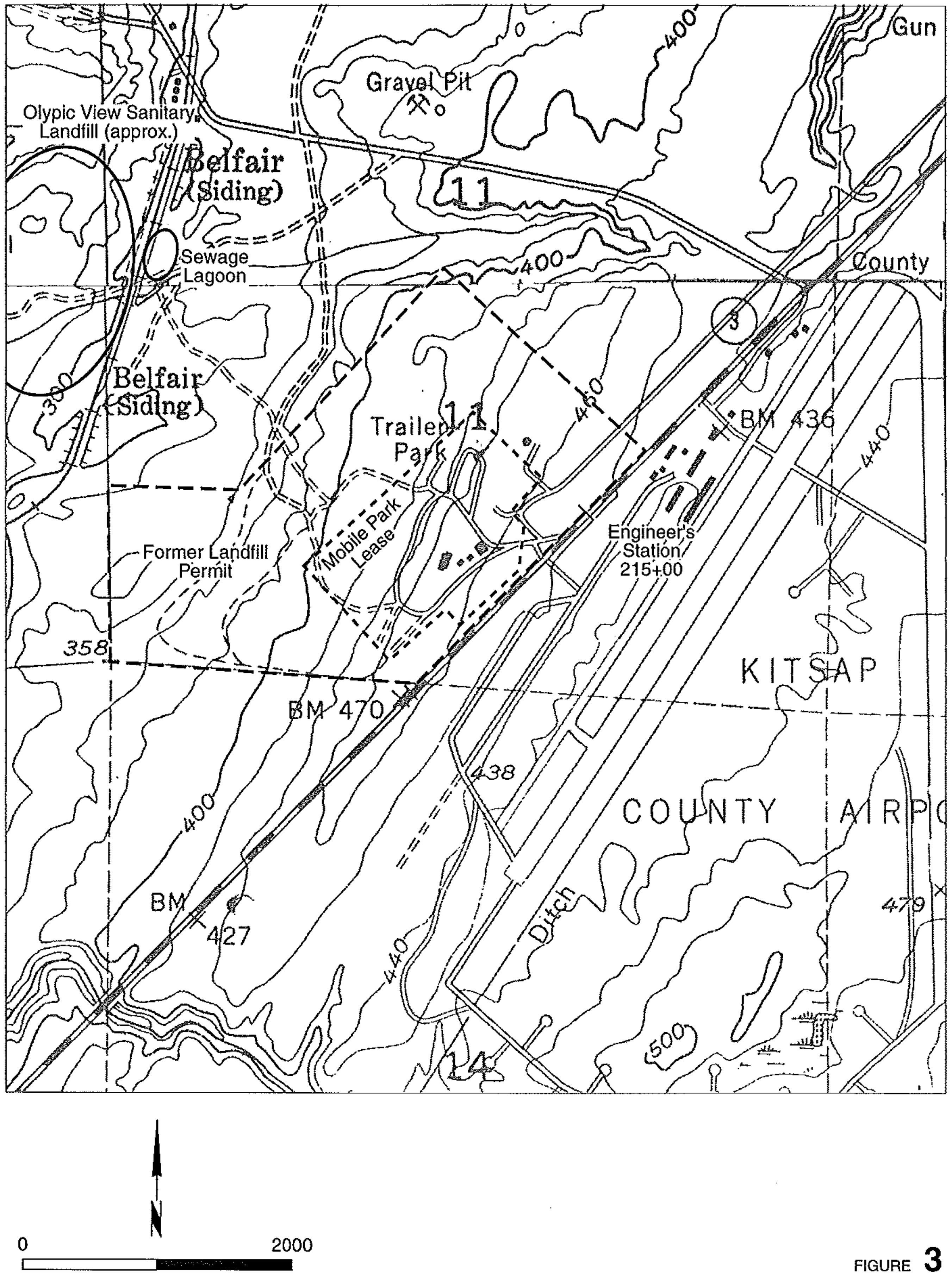
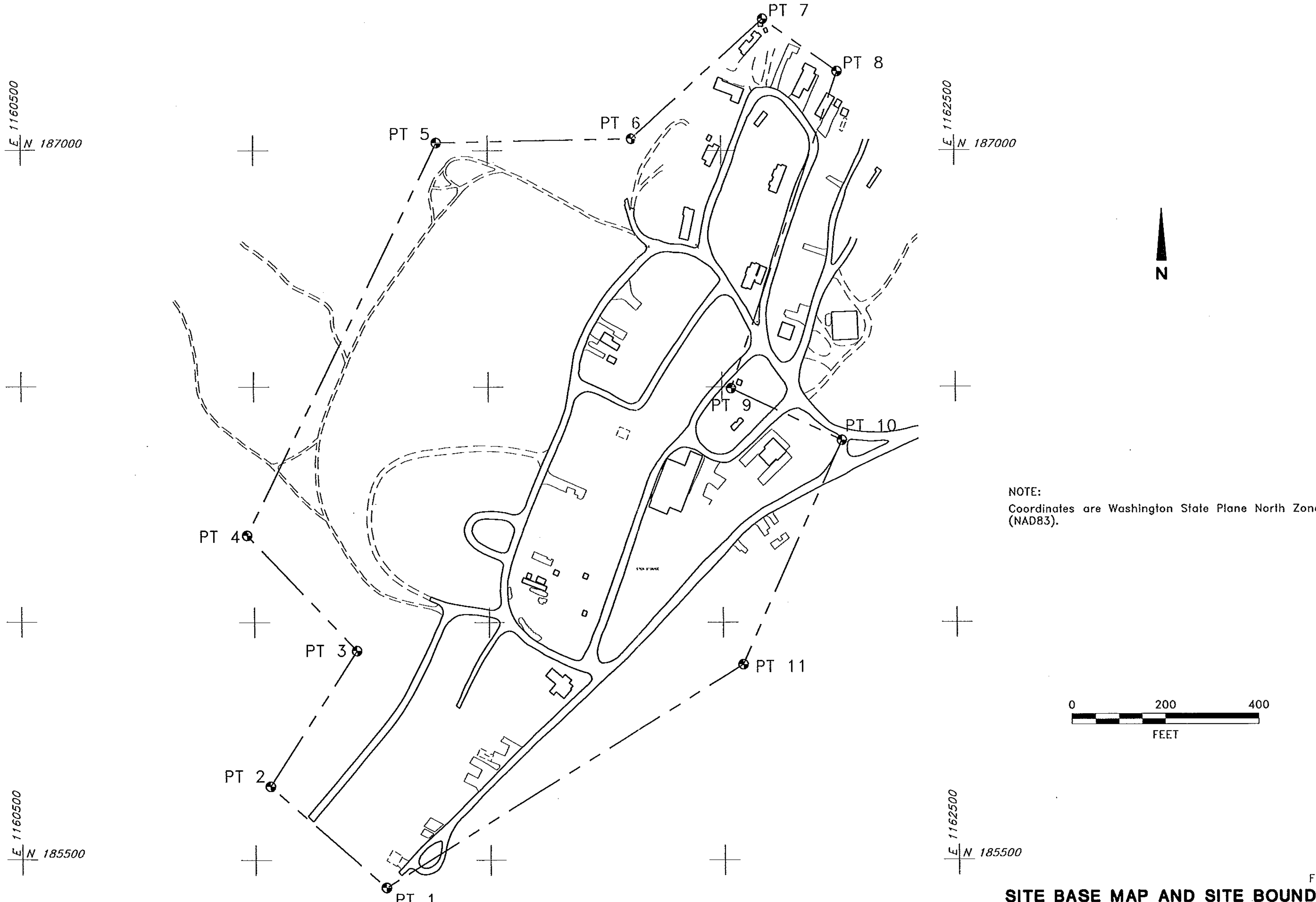


FIGURE 3
NORSELAND SITE VICINITY
PORT OF BREMERTON/NORSELAND RI-FS/WA

PROJECT NO. 933 1280.3020 DRAWING NO. 80193 DATE 8/24/98 DRAWN BY TK

Golder Associates



NOTE:
Coordinates are Washington State Plane North Zone (NAD83).

FIGURE **4**

SITE BASE MAP AND SITE BOUNDARIES

PORT OF BREMERTON/NORSELAND CAP/WA

d_holmer|K:\CAD\SDSKPROJ\9331280\3020\78472.dwg|4-13-99 9:41|x:-|i:-

Golder Associates

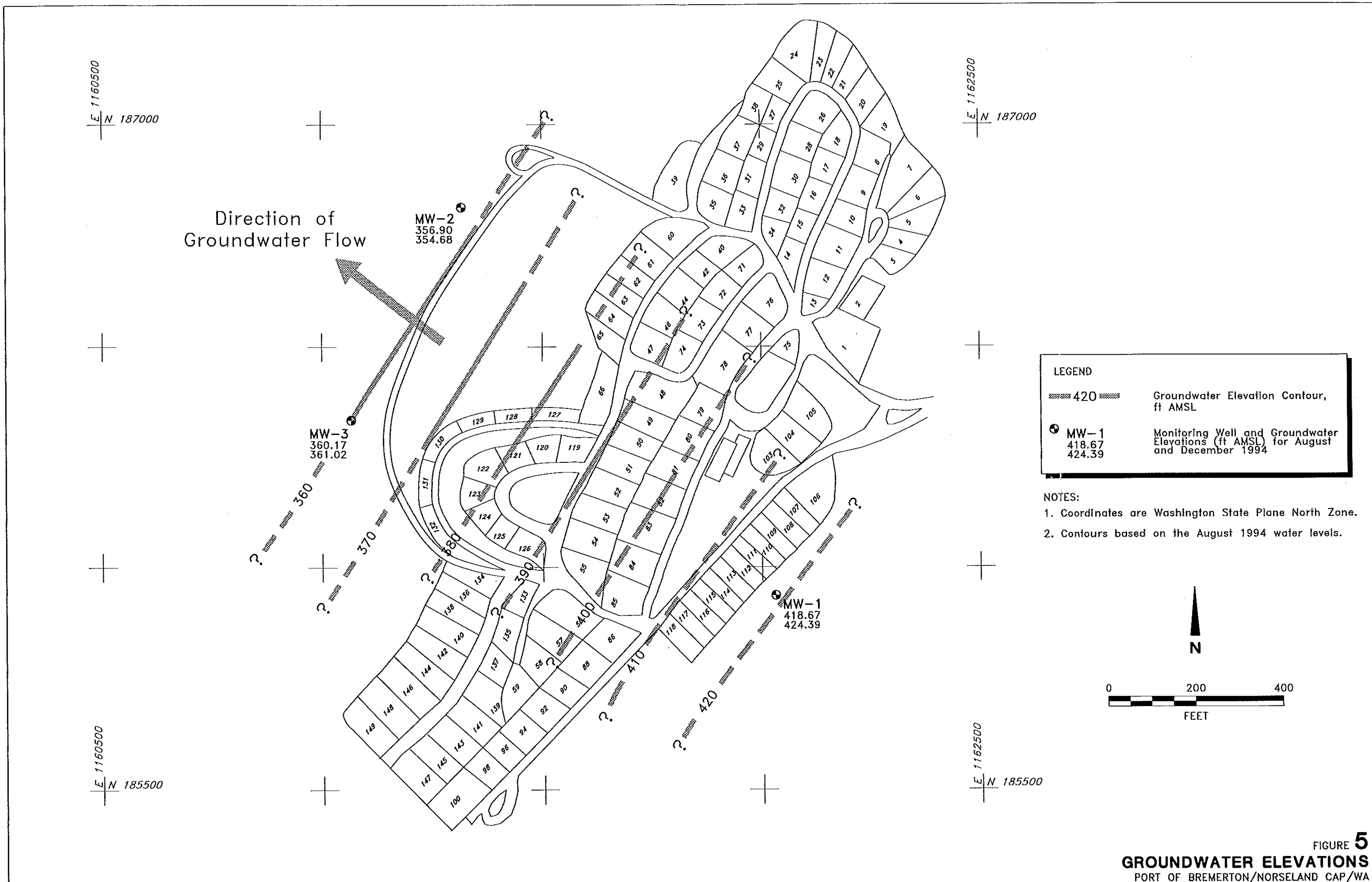
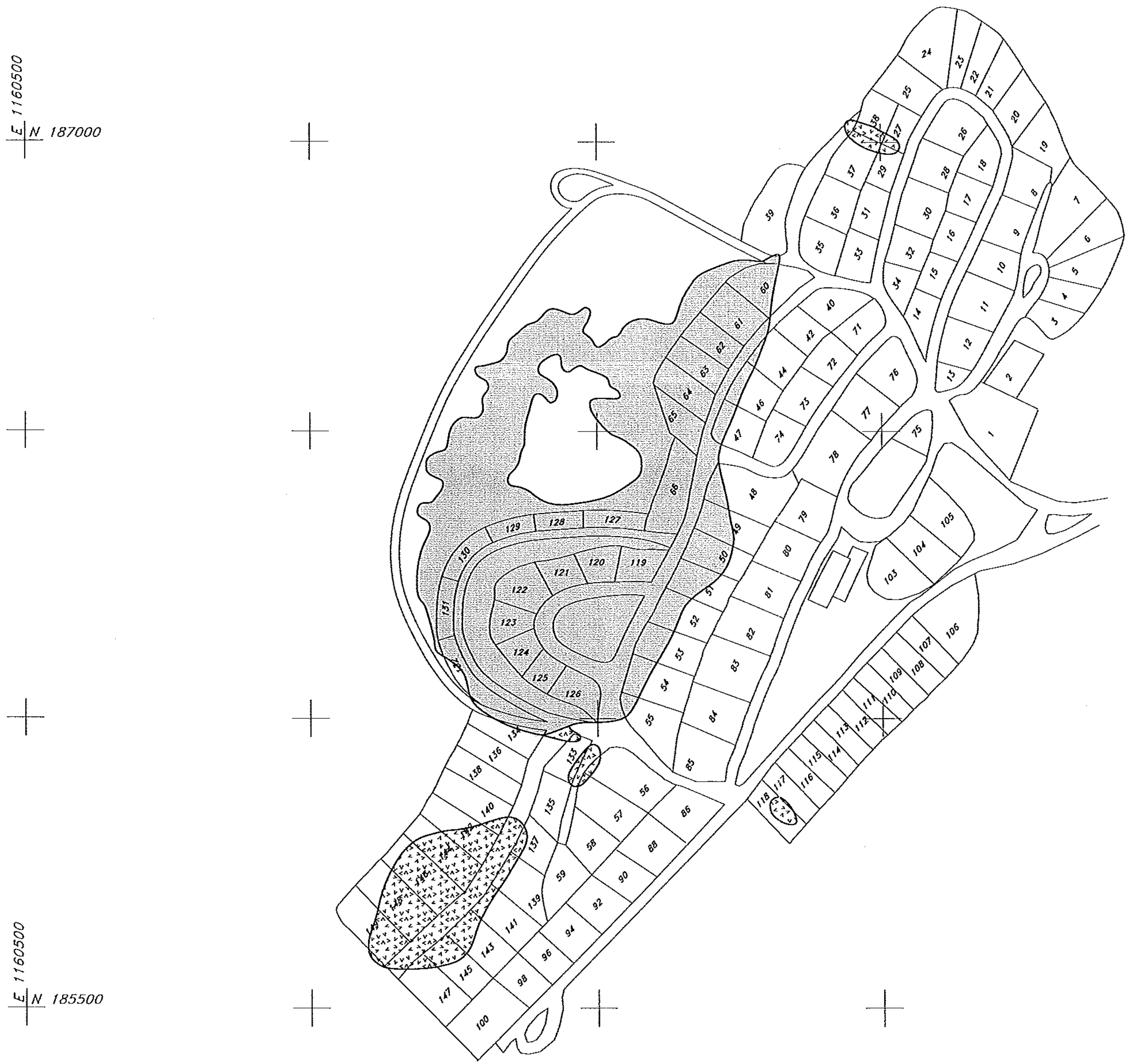


FIGURE 5
GROUNDWATER ELEVATIONS
PORT OF BREMERTON/NORSELAND CAP/WA

D_HOLMER | K:\CAD\SDSKPROJ\9331280\3020\69829.DWG | 11-21-97 13:49 | xrf: NONE

Golder Associates



LEGEND

Landfill Debris (Based on GPR and EM)

Disturbed Ground with Possible Minor Debris (Based on GPR only)

NOTES:

1. Coordinates are Washington State Plane North Zone.

N

0 200 400

FEET

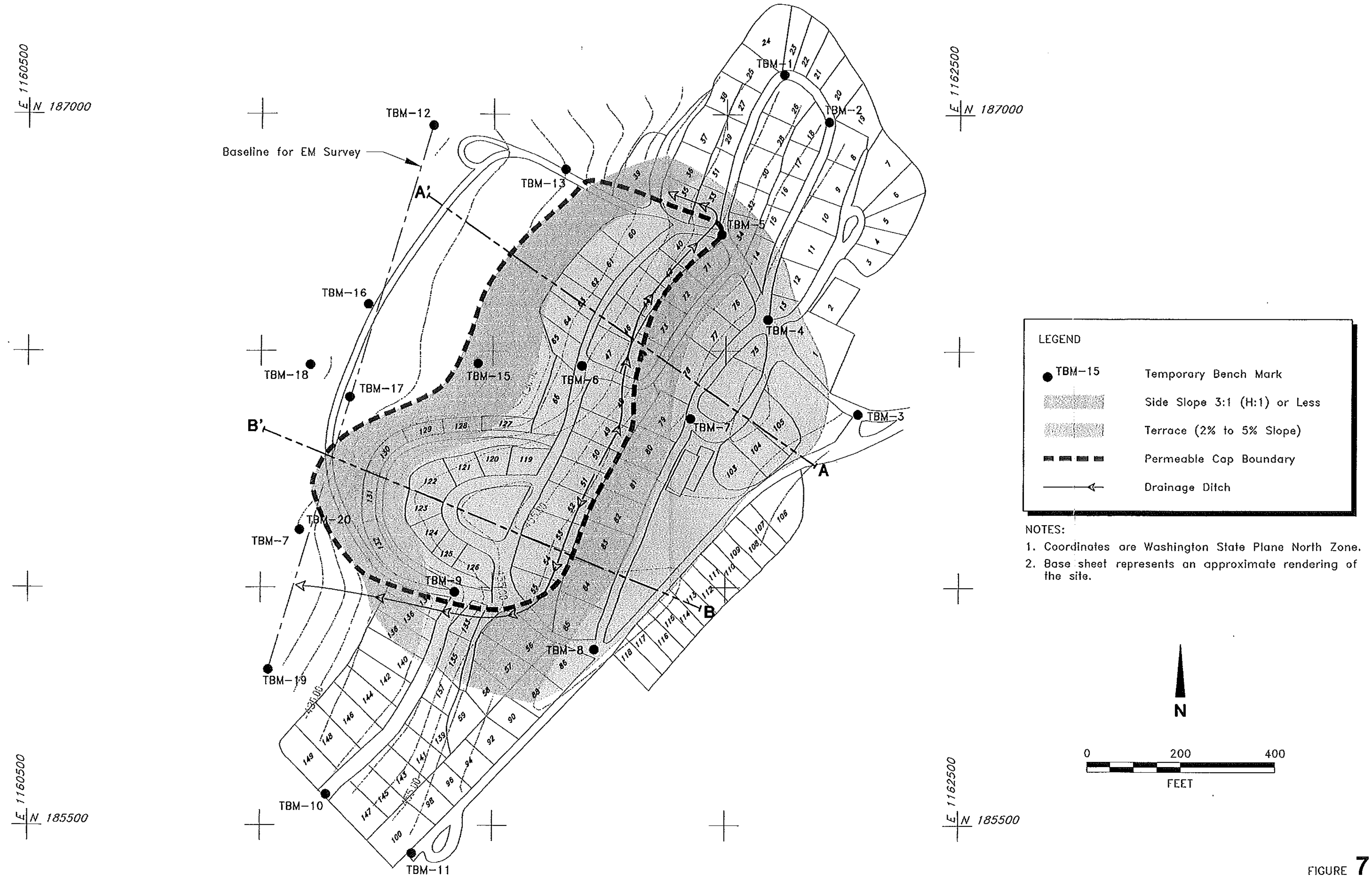
FIGURE 6

LANDFILL EXTENT BASED ON GEOPHYSICAL SURVEY

PORT OF BREMERTON/NORSELAND CAP/WA

D_HOLMER | K:\CAD\SDSKPROJ\9331280\3020\69830.DWG | 11-25-97 15:22 | xrf: NONE

Golder Associates



NOTES:

1. Coordinates are Washington State Plane North Zone.
2. Base sheet represents an approximate rendering of the site.

FIGURE 7
CONCEPTUAL PLAN VIEW OF NORSELAND REMEDIAL ACTION
PORT OF BREMERTON/NORSELAND CAP/WA

J_SNOW|K:\CAD\SDSKPROJ\9331280\3020\69976.DWG|4-20-99 16:28|x:-|i:-

Golder Associates

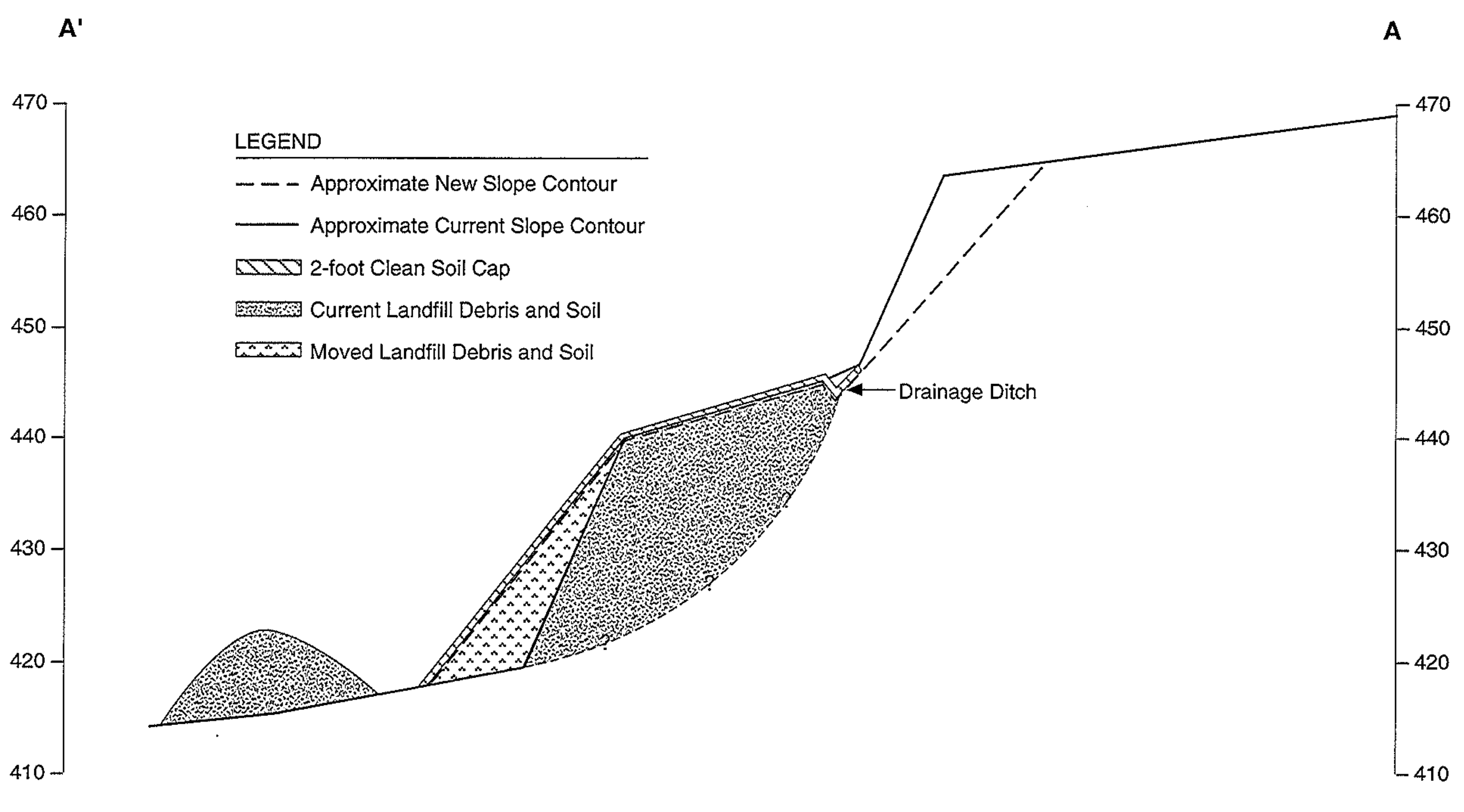


FIGURE 8
CONCEPTUAL CROSS-SECTION IN SLOPE ALONG A-A'
PORT OF BREMERTON/NORSELAND CAP/WA

PROJECT NO. 933 1280.3020 DRAWING NO. 77091 DATE 2/26/98 DRAWN BY EA

Golder Associates

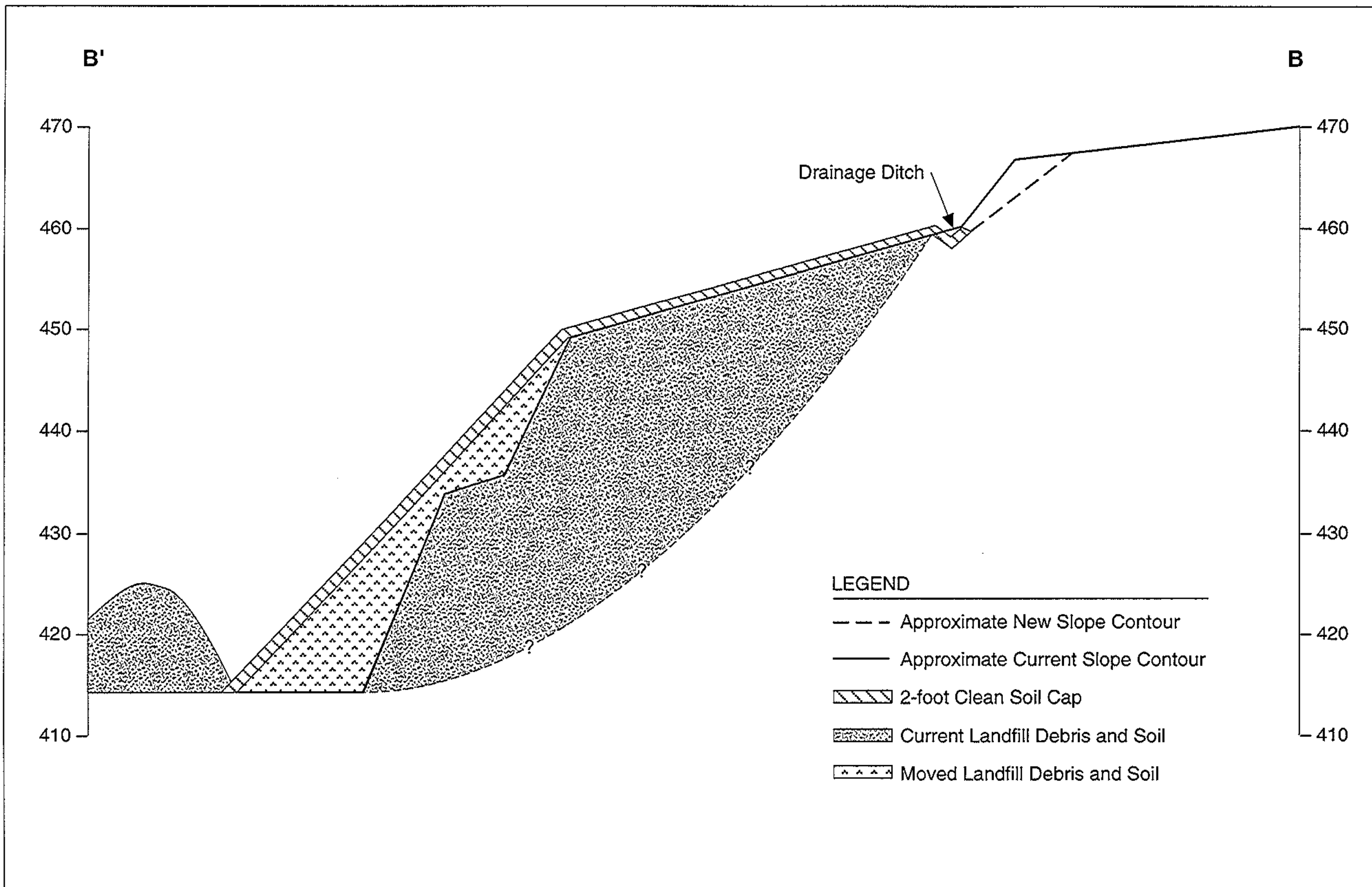


FIGURE 9
CONCEPTUAL CROSS-SECTION IN SLOPE ALONG B-B'
PORT OF BREMERTON/NORSELAND CAP/WA

PROJECT NO. 933 1280.3020 DRAWING NO. 77092 DATE 2/26/98 DRAWN BY EA

Golder Associates

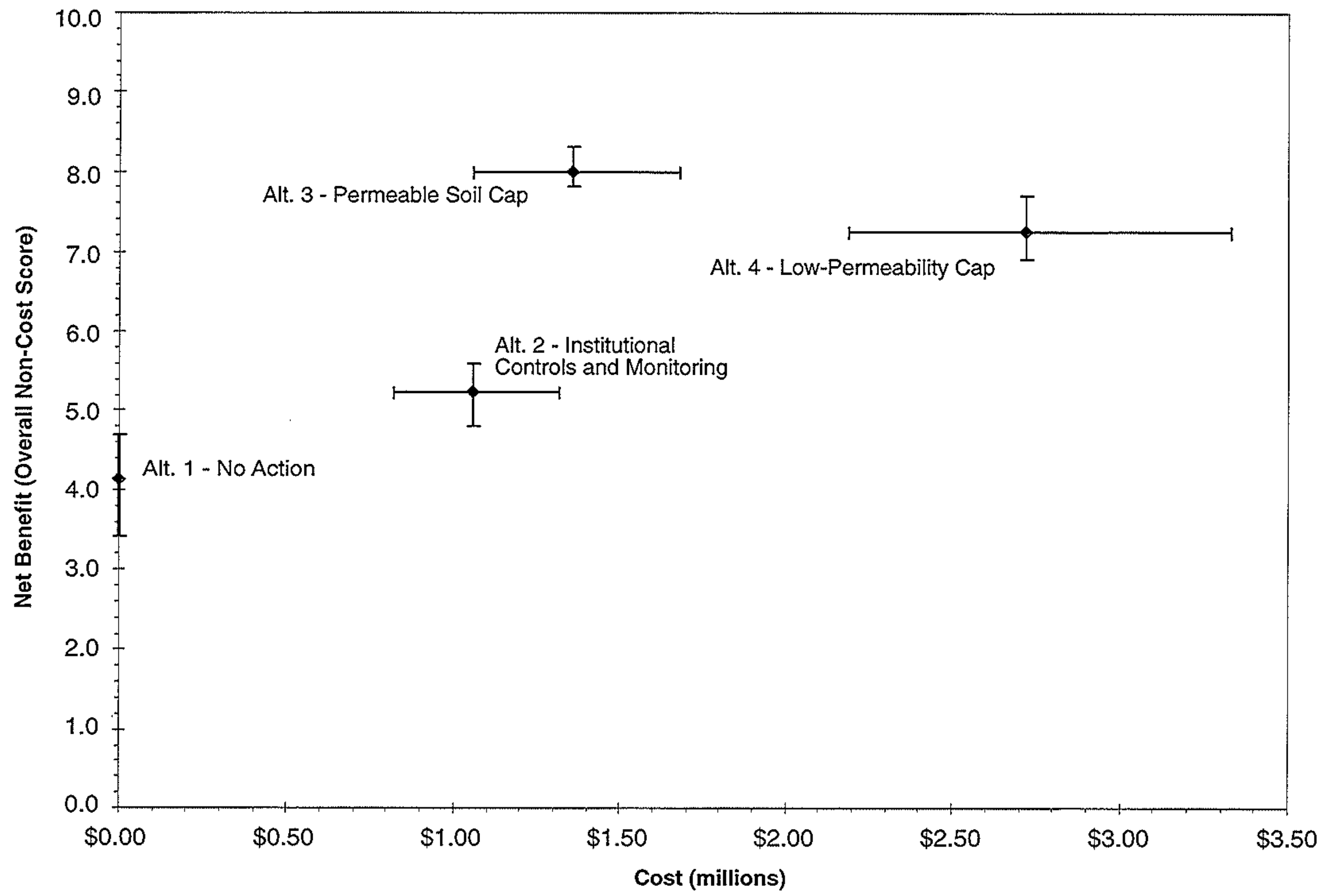


FIGURE **10**
COST VS. BENEFIT FOR ALTERNATIVES
PORT OF BREMERTON/NORSELAND CAP/WA

PROJECT NO. 933 1280.3021 DRAWING NO. 76599 DATE 2/25/98 DRAWN BY TK

Golder Associates

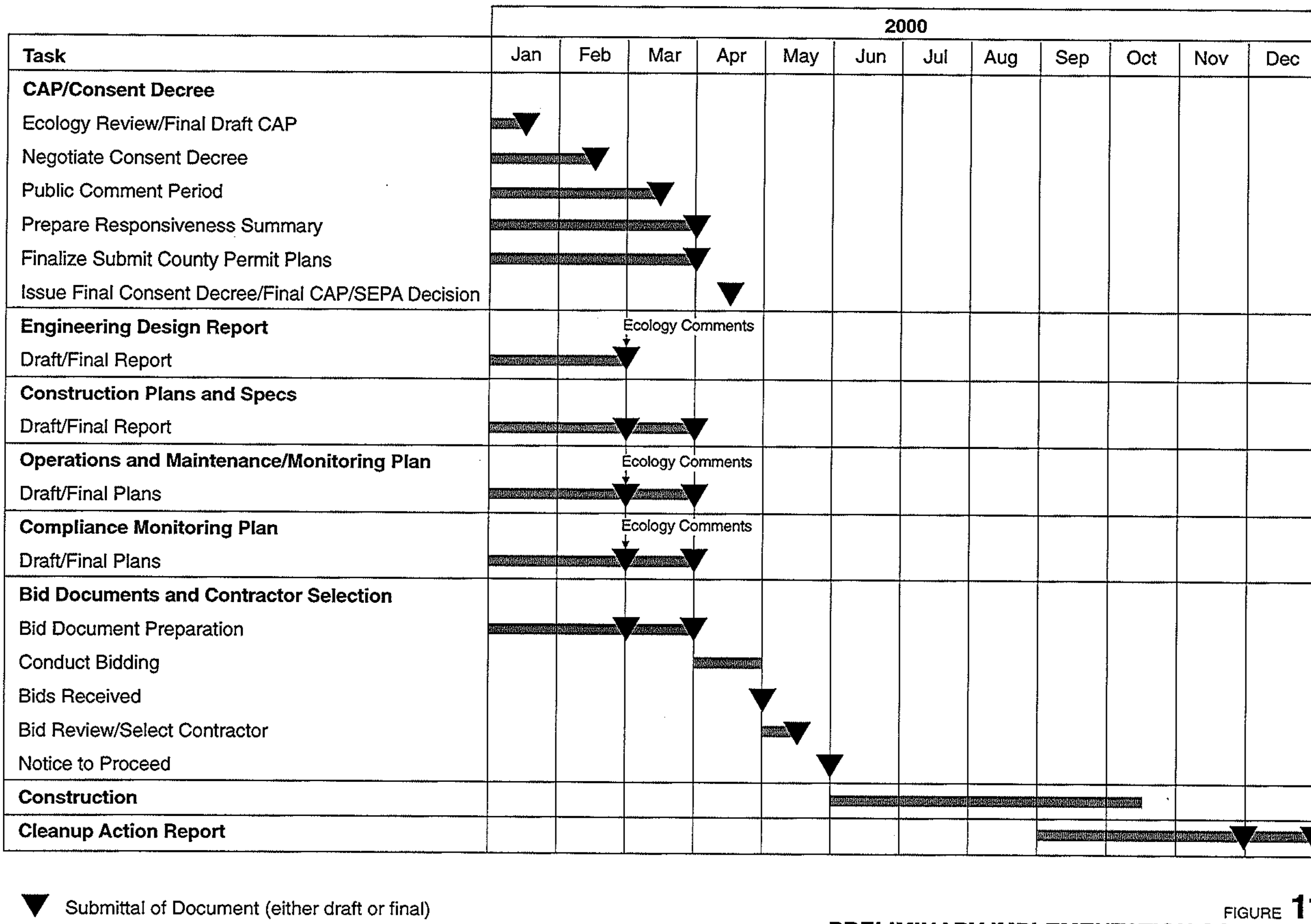


FIGURE 11

PRELIMINARY IMPLEMENTATION SCHEDULE

PORT OF BREMERTON/NORSELAND CAP/WA

PROJECT NO. 933 1280.3020 DRAWING NO. 91526 DATE 1/20/00 DRAWN BY TK

Golder Associates

APPENDIX A

FEDERAL, STATE, AND LOCAL ARARs

TABLE A-1

Identification of Potential Federal Arars for the Norseland Site

Requirements	Applicable or Relevant & Appropriate	Comment
Clean Air Act of 1977, as amended 42 USC 7401 et seq.	Potentially Applicable	The Clean Air Act (CAA) regulates emission of hazardous pollutants to the air. Controls for emissions are implemented through federal, state, and local programs. Pursuant to the CAA, EPA has promulgated National Ambient Air Quality Standards, National Emission Standards for Hazardous Air Pollutants, and New Source Performance Standards. Implementation of the Clean Air Act has been delegated to the State of Washington (see the Washington Clean Air Act, Table 4-2 in the RI). The CAA would be applicable only if remedial action at the site created new sources of regulated air emissions.
Hazardous Materials Transportation Act 49 USC 1801, et seq. Hazardous Materials Transportation Regulations 49 CFR 171 and 172	Potentially Applicable	This act and associated regulations applies to transportation of hazardous materials. These requirements would be applicable only if hazardous waste or other hazardous material (as defined in the regulations) were generated during site remediation for off-site disposal.
Resource Conservation and Recovery Act (RCRA) 42 USC 6901, et seq.		RCRA and the associated regulations defines "hazardous waste" and regulates management of such wastes. The State of Washington has been delegated authority for implementation of RCRA under Washington's Hazardous Waste Management Act and Dangerous Waste Regulations (see Table 4-2).
Closure and post-closure requirements 40 CFR 264 and 265	Not ARAR	The Norseland site was not a hazardous waste facility. In addition, the site stopped receiving waste prior to the effective date of these regulations. Therefore, RCRA closure and post closure requirements of 40CFR264 and 265 for hazardous waste facilities is not applicable to the Norseland site. Because it was a municipal solid waste (rather than hazardous waste) landfill, RCRA is neither relevant nor appropriate for closure of the Norseland site.
Definitions and general requirements 40 CFR 260 and 261 Generator standards 40 CFR 262	Potentially Applicable	RCRA would be ARAR only if hazardous waste were generated during remedial action. The EPA has granted the State of Washington the authority to implement RCRA through the Department of Ecology's dangerous waste program (WAC 173-303), presented in Table 4-2 of the RI
Safe Drinking Water Act of 1974 42 USC 300, et seq. National Primary and Secondary Drinking Water Standards 40 CFR 141, 143	Applicable	MTCA requires that cleanup standards for groundwater be at least as stringent as maximum contaminant levels (MCLs), secondary maximum contaminant levels (SMCLs), and non-carcinogen maximum contaminant level goals (MCLGs) established under the Safe Drinking Water Act where groundwater is a current or future source of drinking water. Since site groundwater could potentially serve as a future source of drinking water, these standards are consider applicable. MCLs, SMCLs and non-carcinogen MCLGs for public drinking water are presented in Table 4-5 of the RI for selected compounds.

TABLE A-2

Identification of Potential State and Local Arars for the Norseland Site

Requirements	Applicable or Relevant & Appropriate	Comment
Model Toxics Control Act Ch. 70.105D RCW Regulations WAC 173-340	Applicable	MTCA is the key governmental regulation governing the site investigation and remediation in the State of Washington. MTCA describes the requirements for selecting cleanup actions, preferred technologies, policies for use of permanent solutions, the time frame for cleanup, and the decision-making process. Recently, MTCA was amended to achieve the following purposes [see RCW 70.105D.010(4)]: 1) to promote the public's interest to efficiently use the finite land base; 2) to integrate land use planning policies; 3) to cleanup and reuse contaminated industrial properties in order to minimize industrial development pressures on undeveloped land; and 4) to make clean land available for future social use. Recent amendments to MTCA (RCW 70.105D.090) exempt remedial actions conducted pursuant to a Consent Decree or an Agreed Order from the procedural requirements of certain state and all local laws and regulations, including permitting. The substantive requirements of applicable laws, regulations, and ordinances must still be met. However, permits and separate approvals within the exemption are not required for remedial actions at the site. Ecology determines substantive compliance with ARARs through review of the RI/FS and draft CAP. Approval of the RI/FS and issuance of the final CAP (after public review and comment pursuant to WAC 173-340-600) constitutes Ecology's determination that the selected remedy will be in substantive compliance with the final ARARs. Regulations under WAC Chapter 173-340, which implement the requirements of MTCA, are the primary regulatory vehicle under which Norseland site remediation is being conducted. MTCA regulations are therefore applicable. These regulations establish administrative processes and standards to identify, investigate and cleanup facilities where hazardous substances have been released. Additional discussion of MTCA as it applies to this site is provided in the text.
Regulation of Public Groundwater Ch. 90.44 RCW Water Quality Standards for Groundwater WAC 173-200	Not ARAR	The rule establishes groundwater quality standards to provide for the protection of public health and existing/future beneficial uses. The rule (WAC 173-200(2)(c)) specifies that cleanup actions approved by Ecology under the Model Toxics Control Act are exempt from WAC 173-200 and shall use ground water cleanup standards developed under the Model Toxics Control Act Regulation, WAC 173-340-720.

TABLE A-2

Identification of Potential State and Local Arars for the Norseland Site

Requirements	Applicable or Relevant & Appropriate	Comment
Department of Health Standards for Public Water Supplies WAC 246-290	Applicable	The rule established under WAC 246-290 defines the regulatory requirements necessary to protect consumers using public drinking water supplies. The rules are intended to conform with the federal Safe Drinking Water Act (SDWA), as amended. WAC 246-290-310 establishes maximum contaminant levels (MCLs) which define the water quality requirements for public water supplies. The requirements of WAC 246-290-310 may not be applicable to the Norseland site because surface and groundwater at the site are not used as a source of public drinking water. However, these standards are applicable since private residences in the area could potentially use groundwater as their source of drinking water. WAC 246-290-310 establishes both primary and secondary MCLs and identifies that enforcement of the primary standards is the Department of Health's first priority. The standards set under WAC 246-290-310 are set at the levels established under the federal SDWA. These levels are shown in Table 4-5.
State Environmental Policy Act (SEPA) Ch. 43-21C RCW SEPA Rules WAC 197-11 SEPA Procedures WAC 173-802	Applicable	SEPA is triggered when a governmental action is taken on a public or private proposal. Under WAC 197-11-784, a proposal includes both regulatory decisions of agencies and actions proposed by applicants. Under WAC 197-11-253, Ecology is the lead agency for site cleanup actions performed under MTCA. SEPA is applicable to remedial actions at the Norseland site. If the proposal is not "exempt", Ecology will require the submission of a SEPA checklist giving information regarding how the proposal will affect elements of the environment, such as air and water. If the proposal is determined by Ecology to have a "probable significant adverse environmental impact", an environmental impact statement (EIS) is required. The EIS examines the potential environmental problems that would be result from the proposed action, and options for mitigation of adverse affects. If there will be no significant adverse environmental impact, Ecology issues Determination of Nonsignificance (DNS) and no EIS is required. Any public comment period required under SEPA must be combined with any comment period under MTCA in order to expedite and streamline public input. According to WAC 197-11-259, if Ecology makes a determination that the proposal will not have a probable significant adverse environmental impact, a DNS can be issued with the draft CAP.

TABLE A-2

Identification of Potential State and Local Arars for the Norseland Site

Requirements	Applicable or Relevant & Appropriate	Comment
Hazardous Waste Management Act 70.105 RCW		This law and associated regulations defines "dangerous waste" and regulates management of such wastes.
Closure and post-closure requirements for hazardous and dangerous waste landfills WAC 173-303-610 and -665	Not ARAR	The Norseland site was not a hazardous or dangerous waste facility. In addition, the site stopped receiving waste prior to the effective date of these regulations. Therefore, the hazardous waste law and dangerous waste regulations are not applicable to the Norseland site. Because it was a municipal solid waste (rather than hazardous waste) landfill, these requirements are neither relevant nor appropriate for closure of the Norseland site.
Designation of dangerous waste WAC 173-303-070 Generator requirements WAC 173-303-170	Potentially Applicable	These requirements would be ARAR only if hazardous or dangerous waste were generated during remedial action. Certain wastes may also be exempt from regulation pursuant to MTCA if the cleanup is performed under a Consent Decree.
Solid Waste Management, Recovery, and Recycling Act Ch. 70.95 RCW Minimum Functional Standards (MFS) for Solid Waste Handling WAC 173-304 BKCHD Ordinance 1996-11	Applicable	WAC 173-304 ("Minimum Functional Standards for Solid Waste Handling" and BKCHD Ordinance 1996-11 contain requirements for the management of solid waste. Because the Norseland site stopped receiving waste materials prior to the effective date of these regulations and does not meet the definition of a regulated facility, WAC 173-304 is not legally applicable to the Norseland site. However, MTCA regulations [WAC 173-340-710(6)(c)] specify that for "solid waste landfills, the solid waste closure requirements in chapter 173-304 WAC shall be minimum requirements for cleanup actions;" i.e., applicable. WAC 173-304-407 contains general closure and post-closure standards. There are three separate landfill closure standards: WAC 173-304-460 (for most solid waste landfills), WAC 173-304-461 (for inert waste and demolition waste landfills), and WAC 173-304-462 (for woodwaste landfills). The woodwaste landfill standards are neither relevant nor appropriate to the Norseland site. For reasons discussed in Section 4.3, both the -460 and -461 standards are applicable for the Norseland landfill. WAC 173-304-700 provides for variances from the WAC 173-304 closure standards.
Water Well Construction CH. 18.104 RCW		
Minimum Standards for Construction and Maintenance of Water Wells WAC 173-160	Applicable	These requirements are applicable to remedial actions that include construction of wells used for groundwater extraction, monitoring, or injection of treated groundwater or wastes. These requirements also include standards for well abandonment.

TABLE A-2

Identification of Potential State and Local Arars for the Norseland Site

Requirements	Applicable or Relevant & Appropriate	Comment
Water Pollution Control/Water Resources Act Ch. 90.48 RCW/Ch. 90.54 RCW Surface Water Quality Standards WAC 173-201A	Not ARAR	Since water quality standards are set at levels protective of aquatic life, these standards are only applicable to surface waters at the site which either support or have the potential to support aquatic life. Since surface water was not observed at the site, these requirements are not considered to be an ARAR.
Washington Clean Air Act Ch. 70.94 RCW and Ch. 43.21A RCW General Regulations for Air Pollution Sources WAC 173-400 Controls for New Sources of Air Pollution WAC 173-460 Puget Sound Air Pollution Control Agency (PSAPCA) regulations	Applicable	The Washington State Clean Air Act is the state equivalent of the federal Clean Air Act. The regulation requires that all sources of air contaminants meet emission standards for visible, particulate, fugitive, odors, and hazardous air emissions. Under WAC 173-340-710(6)(b), air emissions are required to use best available control technologies (BACT) consistent with 70.94 RCW and its implementing regulations. Substantive standards established for the control and prevention of air pollution would be applicable if remedial action created sources of regulated air emissions. The Puget Sound Air Pollution Control Agency (PSAPCA) has jurisdiction over regulation and control of the emission of air contaminants and the requirements of state and federal Clean Air Acts from all sources in King, Pierce, Snohomish and Kitsap county areas. PSAPCA Regulations 1 and 3 are applicable to the Norseland site since the landfill appear to meet the definition of a source. Regulation 2, however, is not considered applicable or relevant and appropriate because the landfill does not fall into any of the specific industrial activities which are identified under the regulation. Acceptable Source Impact Limits (ASILs) identified under Regulation 3 are applicable to the site, but only to outdoor air. Outdoor air is defined as that portion of the atmosphere, external to buildings, which the general public has access. Therefore, ASILs are not ARAR to soil gas.