REPORT

CONSENT DECREE & EXHIBITS

Landsburg Mine Site
MTCA Remediation Project
Ravensdale, Washington

Submitted To: Washington Department of Ecology
3190 – 160th Avenue SE
Bellevue, WA 98008

Submitted By: Golder Associates Inc.
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Submitted On Behalf Of: The Landsburg Mine Site PLP Group

June 7, 2017 **Project No. 923-1000-002.R154**

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CONSENT DECREE

EXHIBIT A

SITE DESCRIPTION

Exhibit A
Table 1
Landsburg Mine Site Location Details

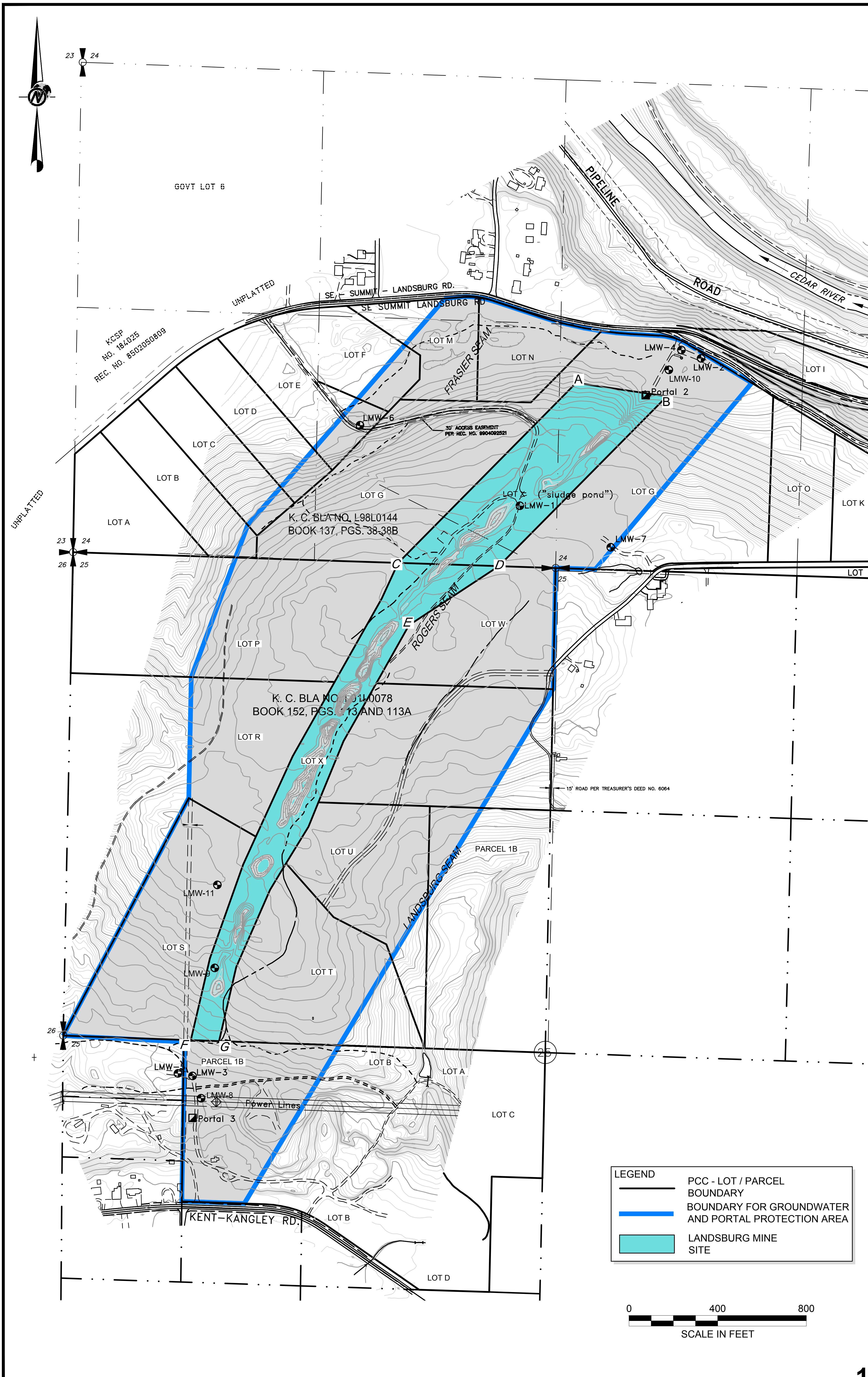
Landsburg Mine Site

Lot X **(Final site boundary will be determined from the As-Built drawing with the Cap and Storm Drain System Installation.)**

King County Tax Parcel # 242206-9126
Sections 24 & 25, Township 22 N, Range 6 E
BLA# L01L0078
Recording #20020516900007

Property Corner ID	X Coordinate	Y Coordinate
A	1715174.983	139002.5184
B	1715665.858	138929.9459
C	1714211.093	138028.2212
D	1714756.152	138010.4175
E	1714270.17	137690.6646
F	1713089.238	135444.1854
G	1713241.984	135438.8322

Horizontal Datum: NAD 83 Washington State Planes, North Zone, US Foot.



NOTE:
1. LETTERS AT LOT X PROPERTY CORNERS CORRESPOND TO THE COORDINATES IN TABLE 1

FIGURE 1
SITE DIAGRAM
PALMER/LANDSBURG MINE/WA

K:\CAD\Projects\1992\9231000\x002\R154\Exhibit A\923_1000_002_1.dwg | 1 SITE DIAGRAM | Mod: 08/05/2013, 08:00 | Plotted: 08/05/2013, 11:09 | JAsprinio

Golder Associates

EXHIBIT B

CLEANUP ACTION PLAN

Appendix A – Landsburg Mine Site ARAR
Appendix B – SEPA Determination of Nonsignificance
Appendix C – Responsiveness Summary

FINAL

CLEANUP ACTION PLAN

Landsburg Mine Site
MTCA Remediation Project
Ravensdale, Washington

June 7, 2017

Washington State Department of Ecology
Toxics Cleanup Program
Northwest Regional Office
3190 – 160th Avenue SE
Bellevue, Washington 98008

LANDSBURG MINE SITE

DECLARATIVE STATEMENT

Consistent with the Model Toxics Control Act, Chapter 70.105D Revised Code of Washington (RCW) as implemented by the Model Toxics Control Act (MTCA) Cleanup Regulation, Chapter 173-340 Washington Administrative Code (WAC), it is determined that the selected cleanup actions are protective of human health and the environment, attain federal and state requirement that are applicable or relevant and appropriate, comply with cleanup standards, provide for compliance monitoring, use permanent solutions to the maximum extent practicable, provide for a reasonable restoration time-frame, and consider public concerns raised during public comment.

Jerome B. Cruz Date
Site Manager
Toxics Cleanup Program Northwest Regional Office

Robert W. Warren Date
Regional Section Manager
Toxics Cleanup Program
Northwest Regional Office

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LIST OF ACRONYMS AND ABBREVIATIONS

ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
CAP	Cleanup Action Plan
cm/sec	centimeters per second
CQA	construction quality assurance
DCAP	Draft Cleanup Action Plan
DNS	Determination of Non-significance
DOH	Department of Health
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
Eh	oxidation potential
EPA	United States Environmental Protection Agency
ERA	Expedited Response Action
FCAP	Final Cleanup Action Plan
FML	flexible membrane liner
FS	feasibility study
GCL	geosynthetic clay liner
HASP	Health and Safety Plan
LMW	Landsburg Monitoring Well
MCL	Maximum Contaminant Level
MFS	Minimum Functional Standards
MDL	Method Detection Limit
mgd	millions of gallons per day
MRL	method reporting limit
MSL	mean sea level
MTCA	Model Toxics Control Act
O&M	operation and maintenance
PCB	polychlorinated biphenyls
PCC	Palmer Coking Coal Company
PLP	Potentially Liable Party
POTW	Publically Owned Treatment Works
QA/QC	quality assurance/quality control
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
RI	remedial investigation
RWSS	Regional Water Supply System (RWSS)
SEPA	State Environmental Policy Act
SHA	Site Hazard Assessment
SMCL	Secondary Maximum Contaminant Level
SVOC	semi-volatile organic compound
TCE	trichloroethene
TDS	total dissolved solids
TPH	total petroleum hydrocarbon
USGS	United States Geological Survey
VOC	volatile organic compound
WAC	Washington Administrative Code
WDOH	Washington State Department of Health

1.0 INTRODUCTION

1.1 Purpose and Objectives

This document is the Cleanup Action Plan (CAP) for the Landsburg Mine site (Site) located near Ravensdale, Washington. The Site is defined in the Consent Decree and shown in Exhibit A to the Consent Decree. This CAP is required as part of the Site cleanup process under Chapter 173-340 Washington Administrative Code (WAC), Model Toxics Control Act (MTCA) Cleanup Regulations as amended February 12, 2001 and is Exhibit B to the Consent Decree. The purpose of the CAP is to identify the proposed cleanup action for the Site and to provide an explanatory document for public review. Specific items to be included as outlined in WAC 173-340-380, CAP, consist of the following:

- A general description of the proposed cleanup action including compliance monitoring.
- A brief summary of other alternative cleanup actions evaluated in the Site's Remedial Investigation/Feasibility Study.
- Justification for selecting a cleanup action that uses cleanup technologies having a lower preference than higher preference representative cleanup technologies.
- Site cleanup levels and points of compliance for each hazardous substance and for each medium of concern.
- The schedule for implementation of the cleanup action including, if known, the restoration time frame.
- Required institutional controls and site use restrictions, if any, for the proposed cleanup action.
- Applicable state and federal laws for the proposed cleanup action, when these are known at this step of the cleanup process.
- A preliminary determination by Washington State Department of Ecology (Ecology) that the proposed cleanup action will comply with WAC 173-340-360 and -370.
- Where the cleanup action involves on-site containment, specification of the types, levels, and amounts of hazardous substances remaining on site and the measures that will be utilized to prevent migration and exposure to those substances.

1.2 Previous Work

The CAP presents a brief description and history of the Landsburg Mine. Results from applicable studies and reports are summarized to provide background information pertinent to the CAP. These studies and reports include, among others, the Landsburg Phase I Remedial Investigation/Feasibility Study (RI/FS) Work Plan (Golder Associates Inc. [Golder] 1992a), the Conceptual Model of the Landsburg Mine Site (Golder 1992b), and the Remedial Investigation and Feasibility Study for the Landsburg Mine Site (Golder 1996). Portions of the CAP text are taken directly from these documents.

1.3 The CAP and the Cleanup Process

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

The 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 an evaluation of the feasibility of alternative methods of remediating the site. These investigations, assessments, and evaluations for the Landsburg Mine were performed according to an Ecology-approved work plan, *the Landsburg Phase I Remedial Investigation/ Feasibility Study (RI/FS) Work Plan* (Golder 1992a). This work plan was incorporated into an Agreed Order (Order No. DE 983TC- N273 [Ecology 1993]) signed on July 21, 1993. The Agreed Order directed the Landsburg Mine Site Potentially Liable Parties (PLPs) to conduct the RI/FS. The PLPs for the Landsburg Site are Palmer Coking Coal Company, LLP; Weyerhaeuser Company; the BNSF Railway Company; PACCAR Inc.; and Browning-Ferris Industries of Illinois, Inc. (collectively, the “PLP Group”). The PLP Group completed the RI/FS and submitted the report to Ecology on February 1, 1996 for public review and comment.

The RI/FS Report represents a complete and final RI and FS set of documents sufficient to enable Ecology to identify and evaluate cleanup alternatives. Public comments on the RI/FS Report, the First Amendment to the Agreed Order, and Ecology’s comment responses were formally documented in the Responsiveness Summary for the Landsburg Mine Site RI/FS (Ecology 1996) completed in November, 1996. The RI/FS Report and the Responsiveness Summary are currently available for review at state repository locations. The PLP Group submitted a Draft CAP (DCAP) to Ecology in 2002. On July 31, 2013, the PLP Group submitted an updated DCAP to Ecology that incorporated Ecology’s comments on the 2002 DCAP.

In 2013, the public was invited to review and comment on the draft Consent Decree and its exhibits.

Ecology made available the following documents for public review and comment:

- Consent Decree and exhibits, including the DCAP.
- State Environmental Policy Act (SEPA) Checklist.
- SEPA Determination of Non-Significance (DNS).

The initial public comment period ran from October 11 through November 11, 2013. In response to a request from the public, the comment period was extended through December 12, 2013.

Ecology held a public meeting at Tahoma Junior High School on October 24, 2013 to provide information and take comments. Twenty-one people attended this meeting. The public meeting included an open question and answer session. The question and answer session was designed to provide immediate responses to the public’s questions and concerns.

In December 2013, the City of Kent requested that the Washington State Department of Health (WDOH) provide a health consultation to review the Consent Decree and its exhibits including the DCAP and to conduct a Site investigation "of threat of exposure to hazardous substances that may pose a risk" to public health, safety, and water resources. WDOH concluded its consultation in November 2016, and presented their recommendations in their Health Consultation report dated November 16, 2016. In December, 2016, Ecology in coordination with the PLP Group agreed to address certain issues identified in WDOH's consultation conclusions (see the Responsiveness Summary contained in Appendix C).

This final CAP has been revised in response to public comments and to address WDOH's recommendations. The CAP identifies the proposed cleanup action for the Site based on the site investigation results and remedial action alternatives presented in the RI/FS Report. This final CAP (FCAP) is now incorporated as an exhibit to the Consent Decree, which is a legal agreement negotiated between Ecology and the PLP Group for implementing the remedial actions outlined in the final CAP.

The Compliance Monitoring Plan (Exhibit D, Part A to the Consent Decree) includes the following: (1) protection monitoring to confirm that human health and the environment are adequately protected during construction, operation, and maintenance periods of the cleanup action; (2) performance monitoring to confirm cleanup standards or other performance standards have been attained; and (3) confirmational monitoring to confirm the long-term effectiveness of the cleanup action.

The Operation and Maintenance (O&M) Plan (Exhibit D, Part B to the Consent Decree) presents technical guidance to assure effective operations and maintenance under both normal and emergency conditions.

The Contingent Groundwater Extraction and Treatment System Plan (Exhibit D, Part C to the Consent Decree) contains a contingency groundwater treatment plan in the event that groundwater treatment may be required at a future date at the Site.

Before remedial actions begin, an Engineering Design Report (EDR) and Construction Plans and Specifications will provide the necessary technical drawings and specifications to allow contractors to implement the methods described in this CAP for remediating the Site.

Remediation construction documentation will include 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.

For this CAP, its associated appendices, and other exhibits to the Consent Decree, the use of the word 'indefinitely' does not mean "temporary," but rather means that there is no timetable to terminate the long-term requirements of the CAP, which will remain in place continuously until such time as Ecology says otherwise (e.g., approval of a new remedial technology that permanently remediates the wastes to below MTCA cleanup levels and/or discovery of other conditions that affect contaminant concentrations such that they no longer pose a risk, present or future, to human health and the environment).

1.3.1 Additional Investigations Since 2002 DCAP Submission

Since the completion of the RI/FS in 1996 and the submission of the DCAP in 2002, several additional investigations and routine monitoring events have been conducted at the Site. In May of 2004, a hydrogeologic investigation was completed at the south end of the Site (Golder 2004). This investigation was initiated to understand groundwater movement at the south end of the Rogers Seam Coal Mine (Rogers Seam). Two monitoring wells and a piezometer (LMW-8, LMW-9, and P-2) were installed. Well LMW-10 was installed during this investigation as well, although its location is at the north end of the Site. Static water level conditions in the month of May 2004 at the south end of the Site indicated that Portal #3 is an area where groundwater from the south end of the mine exits the mine. Furthermore, the water levels from LMW-3, LMW-5, and LMW-9 indicate that a groundwater divide exists and may be near the south end of the Rogers Seam. In May of 2005, SubTerra, Inc. completed the "Landsburg Mine Coal Mine Hazard Assessment" which was reviewed by the King County Department of Development and Environmental Services. A Notice of Availability of the Coal Mine Hazard Assessment Report was recorded at the King County recorder's office and noted on the title of the property.

In the late summer and fall of 2005, a deep groundwater monitoring well was installed to monitor the condition of the aquifer at the bottom elevation of the mine (Golder 2006). LMW-11 is a 700-foot monitoring well that is near the south end of the Rogers Seam. Monitoring the groundwater conditions in LMW-11 was intended to determine whether contaminants were present at the bottom elevation of the mine resulting from historic mine dewatering and waste migrating along the bottom of the mine toward the south.

Interim groundwater monitoring was conducted periodically from 1994 to 2003, quarterly in 2004, and semi-annually from 2005 to the present. The analytical results from the interim groundwater monitoring events over the years indicate no significant changes in groundwater quality from that observed during the RI. The primary parameters detected in groundwater samples are metals that are naturally occurring and at concentrations consistent with background levels. All other analytes using EPA Methods 8260, 8270, 8081, and 8082 plus total petroleum hydrocarbons (TPH) were either not detected or were at concentrations well below MTCA cleanup levels. The method reporting limits (MRLs) and method detection limits (MDLs) for all analytes are at or below acceptable concentrations under MTCA. In order to provide a conservative remedy that is protective of human health and the environment, this CAP includes a contingency plan for groundwater treatment in the event that concentrations of hazardous substances exceed applicable regulatory thresholds at the points of compliance identified in the CAP. In the summer of 2008, the infrastructure components for the contingent groundwater treatment system were installed at the Site. The infrastructure was installed before it would be needed because it is the portion of the contingency plan that would take the most time to install (with regards to permitting). By having the infrastructure components installed ahead of time, an appropriate modular treatment system can be efficiently installed at the Site and brought into operation in a relatively short time if groundwater treatment becomes necessary at some future time. The infrastructure that was installed in 2008 included a gate access road, a treatment facility area pad surrounded by a security fence, underground power and telephone lines to the treatment pad, and a discharge pipe extending from the treatment facility pad to the west along Summit-Landsburg Road. The treatment system itself will be designed, built, and operated only if groundwater from the Site exceeds predetermined levels at sentinel wells or at the established points of compliance.

2.0 SITE DESCRIPTION AND HISTORY

2.1 Site Description

The Site consists of a former underground coal mine located approximately 1.5 miles northwest of Ravensdale in a rural area of southeast King County, Washington. The Site is situated directly south and east of the S.E. Summit-Landsburg Road, and north of the S.E. Kent-Kangley Road. Downtown Seattle is approximately 20 miles to the northwest. The Cedar River passes within approximately 700 feet of the Site to the north. The location of the Site is shown in Figures 2 and 3. The topography of the Site and general Site features are depicted in Figure 4.

The Site occupies a single parcel of land owned by Palmer Coking Coal Company (PCC) and is located within sections 24 and 25, Township 22 N., Range 6 E. The Site is defined in Exhibit A of the Consent Decree. A defined Study Area for the Site, prescribed by Ecology for the purposes of the RI/FS, is depicted in Figure 3. Along the mine footprint are a series of subsidence trenches (the trenches) extending from the north approximately 4,200 feet to the south. In general, the Study Area was intended to include the area within an approximately one-half mile radius of the Rogers Seam (Golder 1992a).

The Site and most of the immediate surrounding land is currently used for forestry. Apart from the Site, the developments in the Study Area include a new junior high school and rural residential dwellings (about 130 residences) within the Study Area. The school is located about 0.65 miles northwest of the Site. The nearest residences are to the southwest approximately 800 feet from the Site. Drinking water for area residences is supplied by groundwater, either through private wells or small community water supply systems. Domestic sewage disposal throughout the Study Area is provided by residential septic systems. Water and sewer service is provided to the junior high school from utility lines extending west from Four Corners in Maple Valley.

Several gravel roads provide access to the Site from public thoroughfares, and walking/horse trails run parallel to the east and west sides of the trenches. The primary access road to the Site begins near S.E. Summit-Landsburg Road and follows along the northern portion of the mine trenches. A second access road begins near where S.E. 256th Street bends to the south and continues onto the Site to the mine trenches where waste was disposed. A third gravel road begins across the street from the Tahoma Junior High School along S.E. Summit-Landsburg Road and provides access to LMW-11. A fourth access road begins at Kent-Kangley Road and provides access to neighboring houses and Portal #3. Locked gates secure the Site at all of the access road entrances, and the portion of the trenches where disposal occurred is currently enclosed by a 6-foot tall chain link security fence. Dense vegetation covers the Site. Electrical transmission lines and a Bonneville Power Administration property easement cross the southern portion of the Site in an east-west direction.

The Landsburg Mine property is situated atop a gently sloping hill, which reaches a maximum elevation of approximately 800 feet above mean sea level (MSL) near the central portion of the Site. This hill slopes steeply downwards towards the S.E. Summit-Landsburg Road and Cedar River at the Site's northern end, and more gradually downwards towards the Kent-Kangley Road and Rock Creek drainage at the southern end. The Site is bounded to the east by a somewhat larger hill, which rises to a maximum elevation of approximately 940 feet MSL.

2.2 Site History

PCC operated an underground coal mine, known as the Landsburg Mine, from the late 1930s until approximately 1975. The Landsburg Mine consisted of two adjacent coal seams: the Landsburg Seam and the Rogers Seam. Mining began in the Landsburg Seam in the late 1930s and continued until 1959. In 1959, mining of the Landsburg Seam ceased and mining began on the Rogers Seam. The Rogers Seam was mined from 1959 until 1975. The two seams are separated by about 600 feet. In addition to these two seams, mining has also been conducted at the nearby Frasier Seam in an area historically called Danville. This seam, located approximately 800 feet northwest of the Rogers Seam, was mined intermittently from the late 1800s to the mid-1940s.

The mined section of the Rogers Seam has a near vertical dip and consists of coal and interbedded shale approximately 16 feet wide. The mined section is about a mile in length. Mining occurred at depths up to 750 feet below the ground surface. Mining was accomplished by causing the coal seam to cave into mine workings (locally called "booming"), from which the coal was hauled to the surface. As a result of this caving, subsidence trenches developed on the land surface above the mine workings. The dimensions of the trenches vary from about 60 to 100 feet in width, between 20 to 60 feet in depth, and about 3/4 mile in length. The trenches are not continuous along the whole length of the Rogers Seam, but are instead comprised of a series of separate subsided trench segments. Each trench segment is separated by a wall of intact rock (called a pillar wall).

Based on available information, the northern portions of these trenches from the Summit-Landsburg Road (depicted in Figure 4) were used in the late 1960s to the late 1970s for disposal of various industrial waste materials, construction materials, and land-clearing debris. Industrial wastes were contained in drums or dumped directly from tanker trunks. Based on invoice records from PCC, an estimated 4,500 drums of waste and about 200,000 gallons of oily wastewater and sludges were disposed of in the trenches. Available documented interviews with waste haulers indicate that wastes included paint wastes, solvents, metal sludges, and oily water and sludge (Ecology 1990). It is expected that many of the drums were only partially full. Disposal of land clearing debris continued until the early 1980s when all waste disposal stopped. Currently, this portion of the Site is secured by a fence and locked gates, which enclose the northern portion of the trenches. Figure 4 depicts the current Site features and topography.

Several preliminary environmental investigations were performed at the Site. These include a limited soil gas survey (Applied Geotechnology 1990), sampling of area private wells (WDOH 1992), sampling surface water emanating from mine portals (Geraghty and Miller 1990), and limited sampling of ponded surface water, drum contents, and soils for a site hazard assessment (SHA) (Ecology and Environment 1991). These investigations detected hazardous substances in drum contents, adjacent soils, and ponded surface water within the trenches. Hazardous substances were not detected, however, in adjacent private or public water supply wells, mine portal groundwater discharge, or soil gases.

In 1991, Ecology designated the Site a high priority for cleanup, and in late 1991 at Ecology's request, four of the PLPs implemented an Expedited Response Action (ERA) involving the removal of the most accessible drums from the trenches and construction of a fence to restrict access to the Site. The ERA involved the removal of over 100 55-gallon drums (Landsburg PLP Steering Committee 1991).

Following the removal of the drums, Ecology and the PLP Group negotiated and entered into an Agreed Order (Ecology 1993), which directed the PLP Group to conduct an RI/FS to evaluate the need for remedial action. The scope of work for the RI was outlined in the *Landsburg Phase I Remedial Investigation/Feasibility Study (RI/FS) Work Plan* (Golder 1992a), which was incorporated by reference into the 1993 Agreed Order. The RI/FS, which consisted of a comprehensive investigation of environmental conditions at the Site and evaluations of potential remedial action alternatives, was conducted by the PLP Group over the period of mid-1993 to early 1996. The results of the RI/FS Report are described below.

3.0 SUMMARY OF ENVIRONMENTAL ISSUES

3.1 Methods of Investigation

The approach taken during the RI was to focus environmental sampling efforts on potential pathways of contaminants leaving the Site and not on wastes that may be present within the trenches themselves. Investigation of wastes in the trenches was limited due to physical constraints, dangers, and difficulties associated with taking samples in the trenches. As such, data collection activities conducted under the RI included the following primary tasks:

- Air Monitoring. A series of air surveys was conducted along the centerline of the trenches to monitor for the presence of organic vapors, which could be associated with waste disposal.
- Source Characterization in Rogers Seam (Geophysical Investigation). A magnetometer survey was conducted along the centerline of the Rogers Seam trenches to identify areas of potential buried waste.
- Well Survey. A well survey was conducted to identify private and public wells within the Study Area, and to inform the selection (in consultation with the WDOH and Ecology) of wells for quarterly sampling.
- Monitoring Well Drilling and Installation. Eleven new monitoring wells (LMW-1 through -11) were installed at the Site (see Figure 5). Wells LMW-2/4 and LMW-3/5 consist of nested well pairs installed within the coal seam at each end of the trenches, at the points of expected mine groundwater discharge. LMW-1 was installed at the suspected location of a fault and tunnel connecting offset portions of the Rogers Seam. Wells LMW- 6 and -7 were installed in adjacent coal seams (Frasier and Landsburg Seams) to provide indications of water quality typical of adjacent coal seams. Well LMW-8 was installed to monitor groundwater discharging from the southern Portal #3. Well LMW-9 was installed to further monitor the flow of groundwater in the southern extent of the Rogers Seam. LMW-10 was installed to further monitor groundwater discharge from the Rogers Seam on the northern end of the Site. LMW-11 was installed to investigate groundwater at the bottom of the mine. Angled drilling methods were used at the LMW-4 and LMW-7 well locations to intercept the vertical coal seam.
- Quarterly Monitoring of Surface Water and Groundwater. Surface water associated with Rogers Seam Portals #2 and #3, and groundwater from the 7 on-site monitoring wells and 14 selected area privately-owned wells (see Figure 5) were sampled for chemical analysis over four rounds of quarterly sampling. The samples were submitted for a broad range of chemical tests including metals and cyanide analyses, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), and general chemical parameters. The fourth round of sampling was conducted on a reduced set of wells.
- Interim Groundwater Monitoring. Groundwater from 10 on-site monitoring wells (LMW-2 through LMW-11) has been sampled for chemical analysis on a semi-annual basis since 2005. All sampling activities are conducted in accordance to the Draft Interim Groundwater Monitoring Plan, Landsburg Mine Site (Golder 1997). The samples were submitted for analysis of VOCs, SVOCs, PCBs, metals, pesticides, and petroleum hydrocarbons. Groundwater sample results from each of the semi-annual events have indicated no significant changes in groundwater conditions from those observed during the RI.
- Surface Soil Sampling. Surface soils around the rim perimeters of the trenches and downslope of Portal #3 were sampled for chemical analysis.

- Topographic Survey and Geodetic Control. Using aerial photogrammetry techniques, a topographic base map of the Site was prepared to 2-foot contours. Horizontal control was established based on the Washington State Plane Coordinate System as required under MTCA.
- Geologic Reconnaissance. Geologic reconnaissance activities consisted of limited geologic mapping to confirm the understanding of surficial geology presented in the Conceptual Model (Golder 1992), and the excavation of backhoe test pits to examine subsurface lithology in the immediate vicinity of the Rogers Seam.
- Ecological and Social Data. Relevant ecological and social data were obtained for the Site and Study Area, including information on meteorologic and surface water characteristics, land use (zoning) and water use at the Study Area, endangered species, priority habitats, and sensitive areas. This information was obtained largely from readily available sources.

The results of these investigations are described below.

3.2 Source Characteristics

The RI approach focused the investigation on exposure pathways and risks from the Site and is considered protective of the public. Since the RI focused environmental sampling efforts on potential pathways of contaminants migrating from the Site, and not on wastes present within the trenches, what is known regarding the contents of the waste in the trenches is based on visual reconnaissance, records searches, and geophysical surveys. On the basis of these sources of information, previous waste disposal and any potential remaining wastes appear to be confined to the northern half of the trenches. Magnetic anomalies, which are indicative of buried ferrous metallic objects, which may include drums, were detected in these areas. Given that up to 4,500 drums were reportedly placed in the trenches and over one hundred were recovered during the ERA, it is reasonable to expect that wastes potentially remaining include a significant number of drums buried at some depth. Based on the condition of the drums observed during the ERA, the length of burial, physical damage during placement, reported fires, etc., the vast majority of drums were ruptured upon placement or have subsequently deteriorated. The amount of waste remaining at the Site is unknown, but a significant portion may have been burnt during historical fires, which occurred during placement.

3.3 Site Geology and Hydrogeology

3.3.1 Geology

The glacial drift materials at the Site are comprised primarily of till and recessional outwash. The till consists of a compact mixture of gravel in a clayey, silty sand matrix. Recessional outwash is comprised of a well-sorted mixture of sand and gravel. Till mantles the hillsides and recessional outwash generally fills in the lowlands. The total thickness of the glacial deposits ranges from less than a few inches thick near the hilltops to possibly in excess of 100 feet in the lowland areas and stream channels. In most areas of the Site, the thickness of the drift is probably between 10 to 50 feet.

The Puget Group is composed of non-marine sandstones and siltstones with numerous carbonaceous shale and coal beds and minor amounts of claystone and conglomerate. All gradations between sandstone and siltstone are present, and most of the rocks are either silty sandstone or sandy siltstone. These materials are typically fine-grained, and, except for the coal, which is typically very weak and friable, are generally well cemented and strong. The thickness of the Puget Group rocks at the Site is not known but is probably at least several thousand feet.

A typical east-west section through the Rogers Seam is shown in Figure 7, and additional cross-sections are shown on Figures 8, 9, and 10. On the east side of the seam is a massive sandstone bed and one foot thick layer of shale. The coal seam itself is approximately 10 to 12 feet wide, but the collapsed width of the Rogers Seam is about 15 to 16 feet in width. On the west side there is a 4- to 7-foot thick carbonaceous shale, and massive sandstone. The thickness of individual beds varies from a few feet to many tens of feet.

The rocks in the Study Area have been displaced by numerous faults. Most noteworthy is an east-west striking fault in the northern portion of the mine. Approximately 75 feet of displacement (PCC 1992) required a 130-foot long rock tunnel to reconnect mining operations to the coal seam. The fault extends vertically through all four levels of the Rogers Seam to land surface where the unmined and hence uncollapsed rock pillar is used for a crossover roadway. Water inflows into the mine from this fault were not noted by mine personnel. A review of mine records found no evidence of fault gouge. In fact, reports by all interviewed personnel revealed that mining through fault zones did not result in increased mine water inflow.

3.3.2 Hydrogeology

The primary hydrogeologic system at the Site consists of a continuous to semi-continuous groundwater system comprised of the Puget Group bedrock materials and the surrounding glacial outwash aquifer. Minor occurrences of groundwater in till overlying the bedrock are likely perched and of secondary importance. The bedrock materials, which make up the hills within the Study Area, protrude up through and discharge groundwater to the glacial outwash, which fills the surrounding valleys and lower elevations around the perimeter of the Study Area.

Within the bedrock deposits, groundwater occurs at depths ranging from about 10 feet to in excess of about 200 feet below ground surface (bgs), depending on topographic position. Deeper groundwater occurs beneath the higher elevations of the Study Area and Site. For instance, depths to groundwater at wells LMW-1, LMW-7, and PW-6, located in the central portion of the Site (Figure 4), are about 140, 215, and 235 feet bgs, respectively. Groundwater occurs relatively close to the ground surface in wells located around the base of the Site hill. At wells LMW-2, -3, -4, -5, and -6, the depth to groundwater is all generally less than 20 feet bgs.

Within the Site trenches, the depth to groundwater varies from about 150 feet in the central portion of the trenches to near zero at either end. The variability in depth to water is primarily a function of changes in topography and hydraulic gradient. This water occurs under water table or unconfined conditions as any potential confining layers are now absent due to mining. Bedrock groundwater elsewhere in the Study Area may occur locally under confined to semi-confined conditions due to the presence of till which mantles much of the area or from lower permeability lithologies lying over more permeable lithologies. LMW-10, located near the north end of the Site, is under artesian conditions and the static water level is above the top of the well.

The mined/backfilled Rogers Seam is a highly permeable conduit with hydraulic conductivities on the order of about 1 to 5 centimeters per second (cm/sec) as investigated and documented in the RI/FS (Golder 1996). The mine may be thought of as forming one relatively continuous, highly conductive zone. The fine-grained Puget Group sediments located to either side of the seam are at least several orders of magnitude less permeable than the mined out seam. Faults through the Rogers Seam appear tight and do not act as significant conduits, based on the regional state of stress, mine reports, miner interviews, water level measurements, and geochemical analyses. Groundwater flow in the mine, therefore, occurs horizontally and along strike through the highly permeable mined-out Rogers Seam. Groundwater flows in the lateral direction away from the mine (across bedding or via faults) are considered negligible. The trenches can therefore be thought of as highly conductive “slots.” Groundwater within these “slots” moves longitudinally with very little movement laterally away from the trenches. Wells installed in Puget Group materials and located laterally away from the mine are hydraulically isolated from the mine workings. These include wells LMW-6 and -7, and private wells PW-5 through -8, and PW-14 and -15 (Figure 5).

Recharge of the Rogers Seam is primarily by direct infiltration. The trenches collect and concentrate rainfall and runoff from the surrounding area. This runoff readily infiltrates through the porous structure of the mined out seam. Due to the preference for longitudinal flow within the trenches and Site topography, and as evidenced by the discharge observed at Portals #2 and 3, discharge from the mine appears to occur at either end. A groundwater divide appears to be present within the trenches. To the north of this divide, flow is to the north, and to the south of the divide, flow is to the south. There is some uncertainty with respect to the location of this divide; however, based on the high hydraulic conductivity of the trenches, topography, presence of ponded water in the southern portion of the trenches and hydraulic head of the mine water table and portal springs, the divide occurs within the southern portion of the Site. The majority of groundwater flow from the mine is therefore toward the north. All groundwater flow beneath the subsidence trenches that were utilized for waste disposal is toward the north.

3.4 Mine History and Condition

3.4.1 History

The Rogers Seam was mined from four different levels accessed from three portal declines as shown in Figure 7; a "water level" tunnel was also constructed to facilitate water removal from the upper level. The seam was mined from 1959 until 1975 when all active mine openings were closed by blasting. During this time frame, approximately 490,000 tons of coal were extracted.

3.4.2 Mining Methods

Due to the vertical orientation of the coal seam, mining of the Rogers Seam utilized a system of coal extraction involving the development of "levels" with coal extracted by "booming" between underlying and overlying levels. This mining term simply refers to the process of blasting pillars of coal isolated between adjacent crosscuts/entries and chutes. The booming round was initially fired in the uppermost pillar to start the cave. Coal was then "pulled/drawn" through the first open chute and loaded into mine cars. Groundwater control was accomplished by grading the gangway at a slight incline with positive drainage back towards the bottom of the mine access slope. Water drained by gravity, via a shallow ditch dug in the footwall, to a small sump at the slope bottom and was pumped, from there, out of the mine.

3.4.3 Mine Stability

Trench Bottoms: Slabbing/failure of the sandstone footwall was reported by retired PCC mine personnel. As coal was drawn down during mining operations, areas of the sandstone sidewall were observed to “slide” into the bottoms of the trenches. It is believed that these slabs could mask underlying voids. Voids may also remain at great depth due to the incomplete collapse of the workings, however, because of their greater depth these voids are of less concern with regard to trench bottom stability. Using an approximate method of analysis, the overall volume of remaining voids was estimated to be less than 10 percent. Although it is likely that a majority of trench bottom subsidence has already occurred, it is prudent to allow for further subsidence when evaluating and designing any remedial measures.

Trench Sidewalls: The mapped sequence of strata forming the sidewalls of the trenches included interbedded sandstone, shale, and siltstone; no evidence of sidewall instability was observed. However, slabbing/failure, similar to that observed by retired PCC personnel, may occur if material is removed from the bottoms of the trenches or if further subsidence occurs.

Potential for Waste Movement after Dumping: A majority of the drummed waste was deposited in the trenches north of the rock bridge (major fault in northern part of mine). The last mining beneath this area was completed at the end of 1967, approximately one year prior to waste deposition. Fourth level mining beneath the trenches immediately to the south of the rock bridge began in September of 1970 and was completed in 1974. While there was some potential for movement of the barrels containing waste after deposition north of the rock bridge, it is considered unlikely that significant subsidence occurred. There is a modestly higher probability that waste barrels in the trenches to the south of the rock bridge have settled since deposition. Additional mine settlement below the waste barrels could result in debris moving deeper into the trenches.

3.5 Nature and Extent of Contamination

The air, soil, groundwater, and surface water analytical data collected as part of the RI, as well as other data collected during the preliminary investigations (the SHA and ERA), were evaluated in the RI to assess the nature and extent of chemical constituents in environmental media at the Site. The primary purpose of this evaluation was to identify the chemical compounds potentially posing a human or environmental health risk and/or which exceed potential regulatory criteria, and which are the result of the prior waste disposal activities. Such compounds are termed "mine waste contaminants." In order to accomplish this, the data were evaluated through a step-wise screening process which considered laboratory and field blank data, background concentrations (if available), and applicable or relevant and appropriate requirements (ARARs).

On the basis of the data screening performed, the following conclusions were drawn:

Air: Throughout nearly the entire length of the trenches, VOCs were not detected above background in air. Detectable levels of VOCs in air were comparable to background. The only detection of VOCs slightly above background was restricted to a small area within the trenches in the vicinity of a sludge pond in trench number 9 (see Figure 11). Air monitoring conducted during drilling did not detect levels of VOCs above background.

Groundwater: The Site, specifically the Rogers Seam, represents a unique hydrogeologic setting. The mine traverses a steep hillside that has prominent streams/rivers (Rock Creek to the south and the Cedar River to the north) on each side of the hill. The Rogers Seam is situated between these prominent surface water bodies and crosses their drainage divide. The data collected at the Site indicates that the groundwater divide between these surface water bodies also exists within the Rogers Seam. Therefore, groundwater in the southern portion of the mine flows and discharges to the south towards Rock Creek, while groundwater in the northern portion flows north toward the Cedar River.

A typical background study would monitor groundwater up-gradient of the area that could be affected by waste disposal to understand the groundwater quality before any impacts could occur. Because a groundwater divide exists within the Rogers Seam, this typical method for determining background groundwater quality cannot be made. Water quality within the mine cannot definitively represent natural groundwater quality because of the potential for impacts to have occurred from waste disposal within the trenches. Since wastes were disposed in the Rogers Seam during mining operations when the mine was dewatered, the groundwater impacts, if any, may have migrated south to or near the groundwater divide.

Interim groundwater monitoring of Site compliance wells (LMW-2 through LMW-11) was conducted periodically from 1994 to 2003, quarterly in 2004, and semi-annually from 2005 to the present. There have been no detections of contaminants that are attributable to contamination by waste materials during any of the interim groundwater monitoring events. Furthermore, the analytical results from the interim groundwater monitoring events over the years indicate no significant changes in groundwater conditions from those observed during the RI. The primary parameters detected in groundwater samples are metals that are naturally occurring. The MRLs and MDLs for all analytes are at or below acceptable concentrations under MTCA.

As indicated in Section 5.3.2.1 of the RI/FS Report, arsenic has been detected sporadically throughout the Study Area, while iron and manganese are very prevalent throughout the Study Area, including private wells and on-site monitoring wells that are hydraulically separated from the wells completed in the mine workings. These are naturally occurring metals in most groundwater. The U.S. Environmental Protection Agency (EPA) has established Secondary Maximum Contaminant Levels (SMCLs) for iron and manganese. However, these numeric secondary drinking water standards are based on aesthetics (taste, color, and odor) and are not enforceable standards. The EPA has established a primary drinking water standard for arsenic, which is considered a human carcinogen. Detected concentrations of arsenic in the on-site monitoring wells have been below federal and state drinking water standards.

Iron, manganese, and arsenic are typically elevated in groundwater associated with coal mines. The RI/FS Report (Section 5.3.2.2) identified that the Site groundwater quality is similar to that of 100 abandoned coal mines in western Washington State studied by the U.S. Geological Survey (USGS) (Fuste et al. 1983). Fuste and Meyer (1987) report that consistently higher concentrations of iron and manganese are present in streams receiving coal mine drainage water. Organic materials (i.e., coal) are identified by Hem (1985) as a common source of iron in groundwater, and Fuste and Meyer (1987) suggest a dependence on oxidation potential (Eh) and dissolved oxygen for elevated dissolved iron and manganese levels in mine water. Because of the geochemical conditions near the bottom of the Rogers Seam (700 feet deep at MW-11), arsenic concentrations are slightly above the MTCA groundwater cleanup level (maximum concentration to date has been 0.012 mg/L in MW-11), which is based on typical shallow groundwater concentrations in the State of Washington, but is typically below the federal and state drinking water MCLs.

Although a few organic compounds were detected in private wells sampled, all of the detected compounds were at very low concentrations and detections were inconsistent (not repeated in more than a single round). In addition, none of the organic compounds exceeded any established regulatory standards, except for one instance of bis(2-ethylhexyl)phthalate, a common laboratory contaminant, which was detected slightly above the MTCA Method B standard in a single privately-owned well, but was not detected during either of the other three monitoring periods from this well. Overall, there is no indication of organic or metal contamination in groundwater at the Study Area.

The observed distribution of chemical constituents (iron, manganese, and arsenic) in groundwater around the Study Area indicates that waste disposal at the Site is not the source of these compounds. The levels of compounds observed in the groundwater are consistent with reports in the literature, which indicate that coal is a natural and well-known source for these chemical constituents. The levels observed fall within the range of reported values considered typical for coal mine drainages in the State of Washington. Therefore, although concentrations of iron and manganese exceeded the secondary MCLs and arsenic concentrations exceeded the MTCA Method A cleanup level in monitoring well LMW-11 (but were typically below the federal and state drinking water standards), the occurrence of these compounds does not appear to be related to prior waste disposal activities at the Site, but rather to natural background levels that are typical of coal-bearing strata under reducing conditions. Therefore, based on groundwater sampling results, Ecology has determined that none of the contaminants in the groundwater are directly attributable to waste disposed of in the trenches at the Site.

Surface Water: Arsenic in surface water at the Site does not exceed the MTCA Method A standard for water discharging at Portals #2 and #3. No analytes were detected above MTCA cleanup levels. Arsenic concentrations in the surface water samples collected at the portals were consistent with concentrations detected in the groundwater sampled at the Site. As discussed above, the occurrence of arsenic in groundwater (and surface water) is a result of natural background conditions (i.e., the coal seam). Therefore, Ecology has determined that none of the contaminants detected in the surface water are directly attributable to waste disposed of in the trenches at the Site.

Soil: There are no contaminants of concern for soils outside of the trenches. Within the trenches, chromium, lead, PCBs, bis-(2-ethylhexyl)phthalate, methylene chloride, trichloroethylene (TCE) and TPH exceeded applicable MTCA cleanup level standards during the early 1990s in an area confined to the northern portion of the trenches where waste disposal is known to have occurred in the past. Soil testing confirmed that contamination was not identified outside the northern portion of the trenches. These compounds are designated as mine waste contaminants for soil inside the trenches. However, on the basis of trench sampling conducted to date, and in conjunction with historical information and geophysics, potential contamination is believed to be restricted to the northern portion of the trenches.

Therefore, apart from soils located within the subsidence trenches in the area of known prior waste disposal activities, soil, groundwater, and surface water media in the Study Area do not exhibit concentrations of chemical constituents above naturally occurring background levels. The contaminants identified in the RI are the seven compounds indicated below for soils inside the trenches:

- chromium and lead
- PCBs
- bis(2-ethylhexyl)phthalate
- methylene chloride
- TCE
- TPH

3.6 Risks to Human Health and the Environment

As noted above, the only locations where chemicals were observed at concentrations above applicable MTCA cleanup levels are within the trenches, in the vicinity of where waste disposal occurred in the past. MTCA Method A and B cleanup levels, were exceeded for several compounds in these trench soils. The northern portion of the Site containing the wastes disposed of in the trenches is currently fenced to prevent access. Therefore, no direct human exposures to these chemicals are occurring. Also, no chemicals (in concentrations exceeding federal or state standards) are known to have migrated off the Site in air, surface water, or groundwater; nor has soil outside of the trenches been impacted. In summary, there are no operative exposure pathways from the Site for chemicals that are directly attributable to disposal of waste in the trenches. Given the absence of exposure pathways, the Site does not pose a significant risk to human health or the environment under current known conditions.

3.7 Potential Contaminant Transport

Based on available data, contaminant migration has not been detected to date at the Site monitoring points. However, as part of the RI, it was necessary to evaluate the potential future pathways for contaminant migration from the Site. The groundwater pathway represents the most significant potential pathway. Waste present in the trenches is believed to be confined to the northern half of the Site. Groundwater flow beneath this portion of the Site is to the north through the mined out and highly permeable Rogers Seam. Flow laterally away from the mine is negligible due to the tightness of faults and the vertical orientation and layering of low-permeability strata. The primary pathway for contaminants potentially migrating from the Site through the Rogers Seam is through the groundwater flowing to the north. Contaminant migration from the southern end of the trenches is unlikely given the direction of groundwater flow and the absence of waste or contaminated water in this portion of the mine; however, both the northern and southern ends of the Site will continue to be monitored in the future for the detection of potential releases.

Potential contaminants in the groundwater beneath the northern portion of the trenches would flow to the north and northeast towards the Cedar River, consistent with the local ground surface topography. This flow would occur within the Rogers Seam and within the glacial outwash materials that overlie the coal. No drinking water wells are currently located along this primary pathway of groundwater flow. The three on-site monitoring wells located along this pathway (LMW-2,-4, and -10) have not shown any evidence of contamination during the RI and similarly subsequent monitoring events.

While the primary groundwater flow direction is to the north, towards the Cedar River, it is also possible that some flow may occur to the northwest within the glacial outwash deposits located to the north of the Site. If groundwater were to flow in this direction, potential receptor points would include the wells located to the northwest of Portal #2, along Summit-Landsburg Road. Well PW-4 is the closest well and is approximately 1,500 feet away from Rogers Seam. This private well was sampled during the RI, and no contaminants attributable to the mine were detected. It is not considered likely, however, that groundwater would flow to these wells given the strong topographic gradient towards the Cedar River.

At the southern end of the mine, potential receptors include the cluster of wells along Kent-Kangley Road just southwest of Portal #3, and the Clark Springs facility. The eastern boundary of the Clark Springs facility is approximately 2,500 feet from Portal #3, and the facility's groundwater infiltration gallery is located approximately 4,100 feet from Portal #3. It is not likely that these wells would be impacted;

because the groundwater flow direction beneath the waste disposal portion of the mine is towards the north. These groundwater wells, including the Clark Springs facility, were tested during the RI and the City of Kent routinely tests the Clark Springs water supply. No contaminants have ever been detected that are potentially associated with the mine Site.

3.8 Ecological and Social Data

The Site qualifies for exclusion to a formal terrestrial ecological evaluation pursuant to WAC 173-340-7491(1)(a) because the remedial actions and residual impacts will be greater than 15 feet below the top surface of the cap cover with the selected remedial alternative. The following summarizes key ecological and social data and information for the Study Area.

3.8.1 Zoning and Sensitive Areas

The bulk of the Study Area, including much of the central portion of the Site and the former mine workings, has been assigned an RA-5, Rural Area residential zone classification. The western portion of the Study Area from the Site west to Four Corners in urban Maple Valley, has been designated RA-5 for rural residential use. In addition to these zoning classifications, the City of Kent and City of Seattle maintain municipal watershed lands along the southwestern and eastern boundaries of the Study Area, respectively, for the protection of drinking water supplies associated with Rock Creek and the Cedar River. Also, under the Shoreline Management Plan of King County, the Cedar River shoreline throughout the Study Area vicinity has been designated a “Conservancy” environment.

Sensitive areas as defined by the King County Sensitive Areas Ordinance (Ordinance 9614) include wetlands, areas prone to stream and flood hazards, erosion hazards, seismic hazards, and coal mine hazards. Development of land within identified sensitive areas requires special development standards as well as special studies to assess impacts and to propose adequate mitigation, maintenance, monitoring, and contingency plans for those areas.

There is one wetland area (approximately 2 acres in size) within the southern Site boundary identified in the Ordinance 9614 map. This area is located over 1,000 feet from the trenches.

Streams are considered sensitive areas because of their aesthetic values, their ability to provide recreation and to support wildlife, and their potential for flooding and erosion. The Cedar River is identified as a Class I stream for its length from Landsburg to Renton. This indicates the river is inventoried as a Shoreline of the State of Washington under the King County Shoreline Management Plan. Rock Creek, to the south of the Site, is a Class II stream that flows year-round during years of normal rainfall and is used by salmonids. Rock Creek is ephemeral to the east of where it crosses beneath the Kent-Kangley Road. Upper Georgetown Creek (a tributary of Rock Creek) is located over 1,000 feet east of the trenches.

No site-specific landslide or seismic hazard areas were identified. Two large areas of the Site are described as susceptible to erosion. The first of these areas is the steep northern slope along the Cedar River. The second is the steep hillside in the eastern portion of the Study Area between the trenches and the Study Area boundary. The portions of the Site where coal removal occurred or where coal mine waste rock is stockpiled are mapped as coal mine hazard areas. A Coal Mine Hazard Assessment report was prepared by SubTerra, Inc. in May 2005 and was reviewed by geologists at the King County Department of Development and Environmental Services in September 2005. A Notice of Availability of that report was recorded on the title to the property under King County recording number 20051010000420.

3.8.2 Water Use

Surface Water: The City of Seattle has operated a large water diversion structure on the Cedar River upstream of the Site at Landsburg since 1901. The structure diverts approximately 150 million gallons per day (mgd) from the Cedar River.

Groundwater: Groundwater at the Study Area is used for domestic supply, small community water supply systems, and municipal water supply for the City of Kent. A survey of wells in the area identified a total of 56 wells within the Study Area at the time of the RI/FS (Figure 5, although at the time of the DCAP there were approximately 20 new water wells that had been installed since 1998). These 76 wells serve approximately 130 homes and more than 200 people in the Study Area. The wells range in depth from less than 20 feet to a maximum depth of about 400 feet. Many of the shallow wells were hand dug and range between 20 and 30 feet in depth. At the time of the RI/FS, the available information indicated that 46 of the wells were domestic service wells providing water to a single residence. Two wells (Wells U and X in Figure 5) provide water to two residences, and one well (PW-2) services four residences. Four of the wells service community water supply systems. These wells—New Arcadia (PW-1), Landsburg Estates (PW-4), Well 429641 (PW-3), and Bridal Trails South (PW-9)—provide water to 37 residences within the Study Area. All of the community supply wells were sampled during the RI. Information on 23 wells was not available, and it is not known whether these wells still exist or are in use.

The City of Kent's Clark Springs water supply system (PW-13 in Figure 5) is a protected area of approximate 320 acres that is comprised of three separate, but conjunctively managed sources and/or water rights (City of Kent, 2011): Clark Springs Trench, Rock Creek Surface Water Diversion, and Clark Springs Wells. The Clark Springs facility supplies approximately 60 percent of the City of Kent's municipal water, which distributes water to over 14,000 service connections. The Clark Springs Trench is an infiltration gallery adjacent to Rock Creek consisting of a branched lateral gravity drainage system installed approximately 13 to 15 feet bgs that has been used by the City of Kent since 1957 as a supplement to their municipal water sources. The Rock Creek Surface Water Diversion is an extension of the infiltration gallery that extends under Rock Creek channel. The Clark Springs facility also contains three groundwater production wells located in close proximity to and within the same property as the infiltration gallery. The wells extract groundwater from the same formation (Qvr aquifer) that provides water to the Clark Springs Trench and to Rock Creek. The Clark Springs water supply system is approximately 4,100 feet straight-line distance from the southern end of the Rogers Seam, near Portal #3. Groundwater modeling conducted under the City of Kent's Wellhead Protection Program (Hart Crowser 1996) has the southern end of the Site within the 1-year capture zone for groundwater to be drawn to the Clark Springs system. The Clark Springs facility was sampled as part of this RI and was referred to as well PW-13 (Figure 5).

The Covington Water District has well fields that draw water from the Qvr aquifer. The nearest well field is the Witte well field and the 264th well field, which are located approximately 3 miles west of the Site (Covington 2016). The Witte well field contains four wells ranging in depth from 190 feet to 205 feet. The 264th well field contains one well approximately 230 feet deep. The Covington Water District uses water from these two wells field, other well fields, and the Green River Regional Water Supply System (RWSS) to supply water to the District's over 17,000 water connections (Covington 2016). Currently the District receives 80 percent of its supply from the RWSS and the remaining 20 percent from its wells.

The northern part of the Site groundwater system has connections with the Cedar Valley Aquifer, which supplies water to various communities including the City of Renton. Approximately 87 percent of Renton's water is supplied by the Cedar Valley Aquifer; although, none of the City of Renton's wells are within 10 miles of the Site. The CAP, monitoring systems (including well numbers, locations, and sampling frequency), and contingent groundwater treatment systems described in the following sections have been designed to protect these valuable resources from potential impacts.

4.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The laws and regulations to be adhered to under the Site cleanup are termed the applicable or relevant and appropriate requirements (ARARs). ARARs are determined by Ecology and include, among other items, soil and groundwater cleanup standards, design standards, and permitting and monitoring requirements. The following discussion focuses on the most significant ARARs. The full list of ARARs is presented in Tables A-1 and A-2 (Appendix A).

4.1 General

The most significant ARARs for the Site include the following:

- MTCA, Revised Code of Washington (RCW) 70.105D, and MTCA Cleanup Regulations, WAC 173-340
- Minimum Functional Standards (MFS) for Solid Waste Handling, WAC 174-304

In addition, portions of the dangerous waste regulations (WAC 173-303 Dangerous Waste Regulations) are relevant and appropriate. These are discussed below.

MTCA, RCW 70.105D, and MTCA Cleanup Regulations, WAC 173-340. MTCA is the key governmental regulation governing the conduct of the overall investigation and cleanup process for the Site. MTCA describes the requirements for selecting cleanup actions, preferred technologies, policies for use of permanent solutions, the time frame for cleanup, and the process for making decisions.

RCW 70.105D.090 exempts remedial actions conducted pursuant to an Agreed Order or a Consent Decree from the procedural requirements of several state laws, although substantive compliance with these laws is still required. These include the State Clean Air Act (RCW 70.94), Solid Waste Management - Reduction and Recycling Act (RCW 70.95), Hazardous Waste Management Act (RCW 70.105), Water Pollution Control Law (RCW 90.48), Shoreline Management Act (RCW 90.58), and Construction Projects in State Waters (RCW 75.20). The exemption only applies to the procedural requirements of any laws requiring or authorizing local governmental permits or approval for the remedial action. Therefore, while substantive compliance is necessary, permits and approvals are not required for remedial actions at the Site. The Agreed Order or Consent Decree will specify the substantive compliance requirements to be achieved during the remedial actions.

WAC 173-340-700 establishes three cleanup levels for environmental media, including groundwater, soil, surface water, and air: The three MTCA cleanup level categories are called: Method A (routine, using tables), Method B (standard), and Method C (conditional, primarily for industrial sites). These MTCA cleanup levels are discussed in detail below in Section 4.2.

Dangerous Waste Regulations - WAC 173-303. The Washington State Dangerous Waste Regulations (WAC 173-303) are the state equivalent of the federal hazardous waste (Resource Conservation and Recovery Act [RCRA]) regulations, and contain a series of rules relating to the generation, handling, storage, and disposal of “dangerous waste.” In addition, RCW 70.105.035 provides a conditional exemption for state-only dangerous wastes generated from a remedial action that is conducted pursuant to a Consent Decree under RCW 70.105D. The exemption is not applicable to material that is designated as a hazardous waste under RCRA.

The substantive requirements in WAC 173-303 pertaining to dangerous waste generation, handling, storage, and disposal will be applicable, if non-exempt dangerous waste is generated during remedial actions and/or transported off the Site during cleanup. However, because the remedy selected in this CAP consists of capping, it is not expected that any dangerous wastes will be generated. The following are applicable or relevant and appropriate to the Site: WAC 173-303-610 (Closure and Post-Closure), -645 (Releases from Regulated Units), and -665 (Landfills).

Minimum Functional Standards (MFS) for Solid Waste Handling - WAC 173-304. WAC 173-304-407 and -460 describe closure and post-closure standards and landfill standards, respectively. Under MTCA, MFS must always be used as the “minimum requirements” for landfill closure conducted as a MTCA cleanup action. On this basis, the MFS are applicable to this Site and must be met. WAC 173-304-460 capping requirements include a minimum 2 feet thick soil layer having a permeability of 1×10^{-6} or lower. Alternately, a synthetic liner material may be substituted for the soil layer. The MFS are the primary capping criteria for the Site.

State Environmental Policy Act (SEPA) WAC 197-11. SEPA is applicable to remedial actions at the Site. A SEPA environmental checklist was prepared and published with the DCAP. Ecology’s decision that the Site qualifies for a DNS is included in Appendix B.

4.2 Cleanup Levels and Points of Compliance

Cleanup levels are numeric expressions of remedial action. 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). Cleanup levels are generally established for constituents of concern as the lower of a numeric chemical-specific ARAR or a risk-based cleanup concentration.

For the Site, the only contaminants identified are associated with soils in the trenches where wastes were disposed. No contaminants attributable to wastes disposed of in the trenches were identified in groundwater, surface water, or air samples collected during the RI/FS, or in groundwater samples collected since completion of the RI/FS.

Nevertheless, the general framework that will be used to determine cleanup levels for any potential contaminants identified in the future (and attributable to disposal of wastes in the trenches) can be established. Under MTCA (WAC 173-340-700), three methods are established for determining cleanup levels for environmental media, including groundwater, soil, and surface water. The three methods are

Method A (routine, using tables), Method B (standard), and Method C (conditional, primarily for industrial sites). All three MTCA methods for determining cleanup levels require compliance with other federal or State ARARs, and consideration of cross-media contamination.

Method A is generally used for routine cleanups with relatively few contaminants. Since the cleanup at the Site is not considered routine, Method A, alone, is not applicable to this Site. Method A cleanup levels were used for compounds that do not have an established Method B cleanup level (e.g., TPH and lead), for compounds where MTCA and/or ARARs establish cleanup levels based on background concentrations in the State of Washington (e.g., arsenic), and for compounds where the Method B cleanup level is below laboratory analytical detection limits in accordance with WAC 173-340-705(6).

Method B is the standard method for determining cleanup levels and assumes a residential use scenario. Since the Site is also within a mine subsidence hazard zone, residential development is already prohibited and Method B cleanup levels for soils may not be applicable. Because groundwater may be used as a drinking water source in the future, Method B cleanup levels are appropriate for Site groundwater. Method B cleanup levels are determined using risk-based equations specified in MTCA regulations. For individual carcinogens, the cleanup levels are based on the upper bound of the excess lifetime cancer risk of one in one million (1×10^{-6}). Total excess cancer risk under Method B for multiple substances and pathways cannot exceed one in one hundred thousand (1×10^{-5}), and the total hazard index for substances with similar types of toxic response must be less than 1. In addition, Method B levels must comply with applicable state and federal regulations or criteria (MCLs, for instance). However, no cleanup level shall be more stringent than an established area background concentration for the Site.

Method C cleanup levels are used where Method A and B are not appropriate. Total excess cancer risk for Method C, and the risk associated with individual compounds, cannot exceed 1 in 100,000 (1×10^{-5}), and the total hazard index for substances with similar types of toxic response must be less than 1. Method C cleanups must comply with applicable state and federal laws, must use all practicable levels of treatment and must incorporate institutional controls as specified in WAC 173-340-740 and -720. To use Method C levels, one of the following must occur: Method A or B cleanup levels must be below area background concentrations; cleanup to Method A or B levels has the potential for creating greater overall threat to human health and the environment than Method C; cleanup to Method A or B is not technically possible; or the Site meets the definition of an industrial site. The requirements for qualification as a Method C industrial site are specified in WAC 173-340-740 and -745. Because the Site is in a mine subsidence hazard zone, residential land use is prohibited and Method C cleanup levels may be appropriate for Site soils. Because groundwater at the Site may be used for drinking water in the future, Method C cleanup Levels for groundwater are not appropriate for the Site.

For all three methods of establishing cleanup levels, a “point of compliance” is selected for determining whether the cleanup level has been met. The point of compliance is defined as the point or points throughout the Site where cleanup levels are established in accordance with the cleanup requirements for groundwater and soil. The point of compliance for soil cleanup levels based on the protection of groundwater is to be achieved in all soils throughout the Site. For soil cleanup levels based on human or terrestrial ecological exposure via direct contact, the point of compliance shall be established throughout the Site from the ground surface to a depth of 15 feet. These depths represent the extent that soils may be potentially excavated or disturbed as a result of Site development or terrestrial ecology. Where a cleanup action involves containment of soils with hazardous substance concentrations exceeding cleanup levels, under WAC 173-340-740(6)(f), the cleanup action may be determined to comply with cleanup standards, provided:

1. The selected remedy is permanent to the maximum extent practicable.
2. The cleanup action is protective of human health.
3. The cleanup action is protective of terrestrial receptors.
4. Institutional controls are put in place.
5. Compliance monitoring and periodic reviews are designed to ensure long-term integrity of the contaminant system.
6. The types, levels, and amount of hazardous substances remaining on-site and the measures to prevent migration and contact are specified in the CAP.

For groundwater, WAC 173-340-720(8)(c) and (d) provide that if it is not practicable to meet groundwater cleanup levels throughout the site within a reasonable time frame, Ecology may approve a conditional point of compliance for groundwater cleanup which shall be as close as practicable to the source of hazardous substances and not to exceed the property boundary.

Therefore, cleanup levels and points of compliance at the Site will consist of the following:

- It is anticipated that remedial actions will eliminate any concern for ambient air; therefore ambient air monitoring will not be conducted on a routine basis. However, if ambient air issues arise during health and safety monitoring during remedy construction, Method B cleanup levels will be used as the basis for evaluating compliance. Cleanup levels established under this section shall be attained in the ambient air throughout the Site.
- Since the selected cleanup action involves containment, soils cleanup levels may not be met at the standard points of compliance. The cleanup action involves containment, and the cleanup action is determined to comply with cleanup standards. Institutional controls specified in Section 5.5.6 and compliance monitoring and periodic reviews specified in Section 5.5.5 will ensure the long-term effectiveness of the containment remedy. If soil issues arise, soil cleanup levels will be based on Method B cleanup levels. Two points of compliance are established for soils at the Site: (1) one from 0-15 foot depth for the protection of humans, terrestrial ecology, and groundwater; and (2) a second for soils below 15 feet for the protection of groundwater.
- Groundwater and surface water cleanup levels will be Method B or applicable Method A as described above. Conditional points of compliance will be established for groundwater and surface water (because completed removal of contaminants is not practicable [see Section 5.3.2]) at the locations of groundwater and surface water discharge from the portals as defined in Figure 11. The entire conditional point of compliance boundaries are within property owned by PCC. Specifically, for the north end of the Site, the point of compliance will be the PCC property boundary north of monitoring wells LMW-2, LMW-4, and LMW-10 to the right-of-way of the Summit-Landsburg Road. For the south side of the Site, the point of compliance shall be the PCC property boundary south of monitoring wells LMW-3, LMW-5, and LMW-8 at the right-of-way of the Kent-Kangley Road. For the

east and west conditional compliance boundary for groundwater, monitoring wells LMW-7 and LMW-6, respectively, will be used for compliance monitoring.

- Specific monitoring plans, the number and locations of wells, sampling frequencies, and data analysis and evaluation procedures will be defined in the Compliance Monitoring Plan (Exhibit D, Part A). The Compliance Monitoring Plan has been reviewed and approved by Ecology.

5.0 LANDSBURG MINE SITE REMEDIAL ACTION

5.1 Summary of the FS Remedial Alternatives

The FS for the Site consisted of the following primary elements:

- **Development of remedial action objectives.** Remedial action objectives (RAOs) were established, which provided the basis for developing and evaluating alternatives for remediation of the Site.
- **Identification and screening of remediation technologies.** Candidate technologies were screened to obtain a list of feasible technologies for use in assembling remediation alternatives.
- **Identification and screening of remediation alternatives.** Screened remediation technologies were assembled into a wide range of alternatives for remedial action at the Site. The alternatives were then screened to obtain a focused list of alternatives for further detailed consideration.
- **Development and evaluation of remediation alternatives.** Alternatives remaining after screening were further developed and subjected to detailed evaluation. Consideration of the evaluation resulted in a preferred alternative for the Site.

5.1.1 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 identify risk pathways that remedial actions should address, and identify acceptable exposure levels for residual constituents of concern. The RAOs identified for this Site are:

- Minimize the potential for future direct exposure of human or ecological receptors to any waste constituents that may remain at the Site.
- Reduce the potential for migration of any waste constituents from the trenches in groundwater, surface water, or airborne dust.

5.1.2 Identification and Screening of Remediation Technologies

Potentially applicable remediation technologies were identified for each of the following general response action categories:

- Institutional Controls including deed restriction and fencing
- Groundwater monitoring
- Containment
- Removal
- Ex-Situ Treatment (including reuse and recycling)
- In-Situ Treatment
- Disposal

The technologies were screened based on effectiveness, implementability, and cost to obtain a set of technologies that could be applied at the Site.

5.1.3 Identification of Remediation Alternatives

Remediation technologies retained following the screening process were then assembled into remediation alternatives. The technologies were combined to create a wide range of alternatives that represent various approaches to achieving RAOs. Remediation alternatives were developed to meet the following MTCA requirements:

- Protect human health and the environment
- Comply with cleanup standards
- Comply with applicable laws and regulations
- Provide for compliance monitoring
- Use permanent solutions to the maximum extent practicable
- Provide for a reasonable restoration time frame
- Address public concerns

Ecology considered and addressed public concerns that were raised during the 2013 public comment period on the DCAP and Consent Decree. These public concerns led to minor modifications to the remedial action proposed in the DCAP. These modifications have been incorporated into this Final CAP.

The following alternatives were developed for remediation of the Site:

Alternative 1: No Action. This alternative would leave the Site in its current state, assuming no restrictions on future Site use and no Site maintenance or monitoring. A "no action" alternative was eliminated from further consideration in the RI/FS because it does not meet threshold requirements of MTCA.

Alternative 2: Institutional Controls and Monitoring. Institutional controls include deed restrictions, fencing and warning signs, and groundwater use restrictions, as well as periodic Site inspections and maintenance of the physical components of the controls. Groundwater use restrictions would be employed to prevent human exposure to Site groundwater. Thus, if Site groundwater were to become affected by waste constituents, there would be no immediate exposure. Exposure could occur only following off-site migration to potable water sources. Routine, periodic monitoring would detect mine waste contaminants in groundwater were it to become affected. This alternative was eliminated because a combination of institutional controls and monitoring by itself does not meet threshold requirements of MTCA.

Alternative 3: Trench Backfill. This alternative would consist of filling the trenches only in the area where waste disposal occurred, combined with grading to provide proper stormwater drainage and to prevent stormwater collection in the trenches. Institutional controls and periodic maintenance and monitoring would also be included. This alternative would protect human health and the environment by providing long-term containment of any waste and affected soil in the trenches.

Alternative 4: Soil Cap. As with Alternative 3, the trenches would be filled only in the area where waste disposal occurred, combined with grading to provide proper stormwater drainage and to prevent Stormwater collection in the trenches. Under this alternative, the backfill would additionally be covered by a soil cap to provide a vegetated surface for improved evapotranspiration and erosion control (see Figure 14). Institutional controls and periodic maintenance and monitoring would also be included. This alternative would protect human health and the environment by providing reliable long-term containment of any waste and affected soil in the trenches.

Alternative 5: Low-Permeability Soil Cap. This alternative is very similar to Alternative 4, except that a low-permeability liner, constructed by compacting suitable soil, would be included in the cap design to decrease the amount of precipitation that would infiltrate through the cap, thus decreasing the potential for affecting groundwater (see Figure 14). Institutional controls and periodic maintenance and monitoring would also be included. This alternative would protect human health and the environment by providing reliable long-term containment of any waste and affected soil in the trenches.

Alternative 6: FML Cap. This alternative is very similar to Alternative 5, except that the low-permeability liner would be constructed using a synthetic flexible membrane liner (FML) instead of compacted soil (see Figure 14). Institutional controls and periodic maintenance and monitoring would also be included.

Alternative 7: FML/GCL Cap. This alternative is very similar to Alternative 6, except that a geosynthetic clay liner (GCL) would be added to provide two low-permeability liners instead of one. Two liners do not provide lower infiltration than a single liner, but they would provide additional reliability for long-term protection (see Figure 14). Institutional controls and periodic maintenance and monitoring would also be included.

Alternative 8: Excavation and Off-Site Disposal of Surficial Affected Soil and Capping. This alternative would consist of removal of surficial soil in the trenches containing concentrations of mine waste contaminants above remediation goals followed by off-site disposal. The trenches would then be backfilled and graded for proper stormwater drainage. Because waste and affected soil would presumably remain buried in the trenches, a cap meeting MFS under WAC 173- 304 would be placed over the trenches. Institutional controls and periodic maintenance and monitoring would also be included.

Alternative 9: Excavation and Off-Site Disposal of All Waste and Affected Soil. In this alternative, all waste and affected soil would be removed from the trenches for off-site disposal. Appropriate disposal facilities would be used, depending on the waste designation (hazardous, dangerous, or non-hazardous). Institutional controls, maintenance, and monitoring would not be necessary for this alternative because all waste and affected soil would be removed from the Site.

5.2 Screening of Alternatives

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

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

Alternatives 1, 2, 3, and 4 did not meet one or more of the MTCA threshold criteria for selection as the preferred alternative. The remaining alternatives meet the minimum requirements of the MTCA threshold criteria. However, Alternative 8 was also eliminated during the screening evaluation because the marginal benefits provided to groundwater protection with only surficial trench soils removed would come at much higher cost than several other alternatives providing comparable levels of protection.

The remaining remediation alternatives summarized above that were not eliminated during the screening evaluation were then evaluated based on effectiveness, implementability, and cost. Based on the screening evaluation, the following alternatives were retained for detailed development and evaluation:

- Alternative 5: Low-Permeability Soil Cap
- Alternative 6: FML Cap
- Alternative 7: FML/GCL Composite Cap
- Alternative 9: Excavation and Off-Site Disposal of All Waste and Affected Soil

5.3 Evaluation of Remediation Alternatives

5.3.1 Evaluation Criteria

WAC 173-340-360(2)(b)(i) specifies that the remediation alternatives must use permanent solutions to the maximum extent practicable. Ecology recognizes that permanent solutions (defined at WAC 173-340-200) may not be practicable for all sites. When selecting a cleanup action, preference shall be given to permanent solutions to the maximum extent practicable. To determine if a cleanup action uses permanent solutions to the maximum extent practicable, a disproportionate cost analysis is used and compares the costs and benefits of the cleanup action alternatives identified in the feasibility study. The specified factors, or criteria, for the disproportionate cost analysis include:

- Overall protectiveness
- Long-term effectiveness and reliability
- Short-term risks
- Permanence by reduction in toxicity, mobility, and volume
- Technical and administrative implementability
- Cost

- Community acceptance

These criteria are defined in more detail in the sections below.

5.3.1.1 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 of 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 is evaluated as a threshold criterion.

5.3.1.2 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 in comparison to baseline risk, and can be measured by the degree to which RAOs are met. Reliability involves estimating the longevity of the remedy, (e.g., the life span of institutional controls or containment) and the chances of remedy failure.

This criterion was evaluated using the two sub-criteria of long-term effectiveness and reliability**.** The overall score for this criterion was obtained by giving equal weight to the two sub-criteria.

5.3.1.3 Short-Term Risks

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

- Risk to Site workers
- Risk to the community
- Risk to the environment (short-term ecological risk)
- Time needed to complete remedial action

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. In addition, for cap alternatives, the relative complexity of the caps was 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, risk to the community was not as significant in distinguishing between alternatives as worker risk. However, Alternative 9 (Excavation and Disposal) would create the potential for human exposure to off-site releases of excavated waste during the remedial action, and this risk was considered in the evaluation. The considerations for ecological risk are very similar to those for community risk, in that Alternative 9 would create potential for ecological exposure to release of excavated waste during remedial action. The other alternatives do not involve these risks.

Time to complete the remedial action includes preparation of MTCA planning documents, remedial design, Ecology and public review, and implementation. Time estimates were from completion of the CAP.

5.3.1.4 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 173-340-360(4), and the use of recycling or treatment under WAC 173-340-360(5). Effectiveness and reliability of the treatment, which were addressed under long-term effectiveness and permanence, were not addressed under this criterion.

5.3.1.5 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 remedy 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.** The potential for problems during implementation of the alternative and related uncertainties. The evaluation includes the likelihood of delays due to technical problems and the ease of modifying the alternative, if required.
- **Availability of Services and Materials.** The availability of experienced contractors and personnel, equipment, and materials needed to implement the alternative. Availability of disposal capacity is also included in the evaluation.
- **Administrative Feasibility.** The degree of difficulty anticipated due to regulatory constraints and the degree of coordination required between various agencies.
- **Scheduling.** The time required until remedial action would be complete, and any difficulties associated with scheduling.
- **Complexity and Size.** The more complex or larger a remedial action, the more difficult it is to construct or implement. In addition, the chance of failure that could affect remedy effectiveness increases with the complexity of the remedial action.
- **Other Considerations.** Monitoring requirements, access for construction and operation and maintenance, integration with existing operations and current or potential remedial action, and other factors were also considered.

5.3.1.6 Cost

This criterion was used to consider the costs of performing each alternative, including capital, operation, maintenance, and monitoring costs. Alternative costs were compared on a net present value basis. Known implementation difficulties with quantifiable cost impacts were included in the cost estimates. Additional details on the cost comparison for alternatives are provided in the RI/FS Report.

5.3.1.7 Community Acceptance

After the FS was finalized in 1996, an alternative was selected as the proposed remedial action in the 2013 DCAP. Ecology evaluated community acceptance after DCAP comments were received in 2013. The public comments have been addressed in a Responsiveness Summary released on April 6, 2017. The chosen remedial action was slightly modified to address community concerns based on public comments and the Responsiveness Summary on the DCAP.

5.3.2 Evaluation of Alternatives and Selection of a Site Remedy

Selection of a remediation alternative was based on a comparative evaluation of the alternatives (which satisfy the threshold criteria) using five of the protectiveness criteria: 1) long-term effectiveness and reliability, 2) short-term effectiveness, 3) reduction in toxicity, mobility, and volume, 4) implementability, and 5) cost. Overall protectiveness and community concerns were not included in the comparative evaluation as indicated in the definitions above.

Each alternative was scored relative to the other alternatives for the four non-cost protectiveness 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 alternative evaluation details and scores are presented in the FS and are summarized in Table 1.

The relative values of the non-cost criteria were then determined. The relative criteria values were expressions of what a scoring unit of one criterion is worth compared to a scoring unit of another criterion. The assigned relative values were converted to criteria weightings (i.e., percentage of the overall score). The scores for the four non-cost criteria were combined using the criteria weightings to give overall alternative scores. These scores express the net benefit of the alternatives. The net benefit, or overall non-cost score, is presented in Table 1. Using these scores, the preference ranking of the alternatives before consideration of cost is as follows (most to least preferred):

1. Alternative 5 (Low-Permeability Soil Cap)
2. Alternative 6 (FML Cap)
3. Alternative 7 (FML/GCL Cap)
4. Alternative 9 (Excavation and Disposal)

The selected Alternative 5 has the highest preference using non-cost criteria and is considered the most protective cleanup action for the Site. Alternative 9 (Excavation and Disposal) is a permanent remedy, but had the overall lowest score for non-cost criteria and net-benefit. This ranking reflects the many problems associated with excavation and the uncertain benefits (i.e., lack of reliability). The lack of reliability for Alternative 9 as a cleanup solution stems from the inability to actually remove all of the waste materials and the commingled impacted mine/bedrock materials. The removal of waste and mine collapse debris is not considered technically possible and is therefore impracticable. The mine collapse debris was found to flow during the drilling of deeper wells (i.e., LMW-11). Because the mine debris would flow toward an excavation, mine debris removal/excavation would create a constant flow of mine debris to the excavation area, rendering it either impossible or impracticable to extend the excavation deeper into the mine workings. In addition, the mine is not completely vertical, which makes excavation more difficult at depths. Furthermore, specific locations of the waste within the Rogers Seam are not well known and cannot feasibly be determined because detailed sampling cannot provide definitive locations of all impacted areas to allow reliable and complete removal. Total removal of all wastes could not be verified by observation or detailed confirmation sampling. As a result of the inability to confirm total waste removal, it is likely that another alternative would have to be implemented for protection. Alternative 9 (Excavation and Disposal) would be much more likely to cause actual harm to humans in the form of construction accidents for Site workers (difficult and dangerous excavations with potential mine subsidence) and traffic accidents in the community (truck traffic). Remediation workers would also be much more likely to be exposed to waste constituents during implementation of Alternative 9, than from the other alternatives. These known risks were balanced against the potential risks of the other alternatives and resulted in Alternative 9 not being selected.

Alternatives 6 and 7 are also less preferred than Alternative 5 mainly because of the difficulty in compacting the trench fill materials and maintenance problems that would develop with continuing subsidence or compaction using an FML cover cap.

After the non-cost evaluation, a comparison of the cost and benefit of the alternatives was made. As shown in Table 1, Alternative 5 (Low-Permeability Soil Cap), which is the highest ranked alternative on non-cost criteria, is also the least expensive alternative. Alternative 9, which is the lowest ranked alternative on non-cost criteria, is the most expensive alternative. Alternatives 6 and 7, which are both ranked lower than Alternative 5 on non-cost criteria, are also both more expensive than Alternative 5. Accordingly, the cost of the various remedies does not change their ranking for purposes of remedy selection. Therefore, Alternative 5 is the preferred alternative.

5.4 Reasonable Restoration Time Frame

The cleanup action alternatives shall be evaluated on whether the restoration time frame is reasonable. The factors to be considered include [WAC 173-340-360(4)(b)]:

1. Potential risks posed by the Site.

2. Practicability of achieving a shorter restoration time frame.
3. Current use of the Site, surrounding areas, and associated resources that are, or may be affected by releases from the Site.
4. Potential future use of the Site, surrounding areas, and associated resources that are, or may be affected by releases from the Site.
5. Availability of alternative water supplies.
6. Likely effectiveness and reliability of institutional controls.
7. Ability to control and monitor migration of hazardous substances from the Site.
8. Toxicity of the hazardous substances at the Site.
9. Natural processes that reduce concentrations of hazardous substances at the Site.

The evaluation of reasonable restoration time frame determined that all cleanup alternatives have long restoration time frames because they include containment as a component of the cleanup alternative, except for Alternative 9 (Excavation and Off-Site Disposal of All Waste and Affected Soil), assuming it would be successful. Alternative 9 was determined to not be a practicable cleanup action because of the mine site environment and difficulty of removing waste materials beneath the area of waste disposal. The mine site and mine workings are 750 feet deep with only about a 16 foot width. The mine and geologic bedding is nearly vertical in the area of waste disposal, but does dip at a small angle towards the west. It is therefore not practicable to ensure removal of all contamination and any effort to do so would pose considerable risks to workers both from potential hazardous substance exposure and to construction/mine hazards. Furthermore, there is no practicable manner to verify whether an effort to remove all hazardous substances is successful, resulting in a situation where an alternative such as Alternatives 5, 6, or 7 would need to be implemented anyway.

Alternatives 5, 6, and 7 all use containment as a remedial component; therefore, the restoration time frame is the same for these alternatives, extending into the foreseeable future. The selected remedy, Alternative 5, has a reasonable restoration time frame for the mine site conditions, because shorter restoration time frames are not technically practicable. The Site will have restrictions regarding land uses through institutional controls and will be monitored indefinitely to ensure protection of human health and the environment. If Site contaminants migrate to the conditional compliance boundaries at concentrations exceeding one half of MTCA cleanup levels, a Contingent Groundwater Extraction and Treatment System will be operated to capture and contain contaminants for the protection of human health and the environment (see Sections 5.5.3 and 5.5.5, below).

5.5 Selected Cleanup Action Plan

The remedy selected for the Site is Alternative 5 (low permeability soil cap). A conceptual design of this alternative is shown in Figure 14. This alternative provides a low-permeability soil cap over the backfill of the trenches. The permeability of this soil will be no higher than 10^{-6} cm/sec, and the cap will thus meet MFS specifications in WAC 173-304. The major steps in this alternative are:

1. Backfill the trenches as required for capping (as described below).

2. Allow the backfill to consolidate.
3. Place a low-permeability soil cap over the backfill of the trenches, including grading and surface water management (as described below).
4. Cap maintenance will continue until residual hazardous substance concentrations no longer exceed cleanup or remediation levels as described in the CAP resulting from either (1) the application of new remediation technologies currently unavailable or (2) other circumstances or conditions that affect residual concentrations such that they no longer pose a risk to human health or the environment.
5. Implement and maintain institutional controls, groundwater monitoring and any instituted contingency plan (as described below) until residual hazardous substance concentrations no longer exceed cleanup or remediation levels as described in the CAP resulting from either (1) the application of new remediation technologies currently unavailable, or (2) other circumstances or conditions that affect residual concentrations such that they no longer pose a risk to human health or the environment.

The areas that will be capped (areas 7, 8, and 9) are shown in Figure 15. This delineation is based on the areas of waste disposal identified in the RI/FS Report. The cap will extend slightly beyond the trenches on both sides to provide anchor zones and “overhang.” Fill material may extend into area 6 if necessary and as appropriate to provide a buttress to the narrow pillar wall separating areas 6 and 7. Furthermore, it has been determined through the RI/FS Report and accompanying RI/FS Responsiveness Summary that capping and in-filling of the trenches (i.e., including the southern portion of the trenches in the proposed cleanup action) would not provide additional protection. Capping or in-filling the southern trenches would not provide beneficial protection from waste materials because:

- There is no indication that wastes were deposited in the southern trenches, therefore waste cannot be mobilized by infiltrating water in the southern trenches.
- Groundwater quality emanating from the mine, including the southern portion of the mine, is not currently impacted from waste disposal, therefore reducing the amount of groundwater infiltrating to the south half of the Rogers Seam has no benefit.
- The groundwater divide in the southern portion of the Rogers Seam keeps groundwater in the northern portion that is beneath the deposited waste materials from migrating toward the south and toward the City of Kent water supply watershed.
- Infiltration of rainwater into the open subsidence trenches in the south half of the mine ensures the permanency of the mine groundwater divide and the hydraulic isolation of the south half of the mine from the north half where waste were disposed.

These reasons provide the justification for only capping trenches in areas 7, 8, and 9.

Surface water runoff from the cap will be collected in drainage ditches and directed as appropriate. The cap will be sloped to optimize stability and encourage rainwater runoff to minimize rainwater infiltration to the maximum extent possible. The cap slope will include doming the centerline of the cap (option not shown in Figure 14) or sloping from one side of the trenches to the other where elevations differ (option shown in Figure 14).

The major benefit of capping will be to reduce rainfall from entering and infiltrating through any waste remaining on-site, to reduce the amount of groundwater flowing through the Rogers Seam workings, and to prevent the groundwater divide located in the southern portion of the mine from shifting toward the north. Another common benefit of capping, prevention of direct contact and off-site migration in stormwater or dust, is provided by the backfill of the trenches.

The cap will need periodic inspection and maintenance and if damage does occur, repair of the soil cap will be relatively easy, requiring only removal of the vegetative soil and adding additional low- permeability soil.

The cap design is shown as Option B in Figure 14 and will include a top layer of vegetated soil to promote evapotranspiration and decrease the potential for erosion. While it is still to be determined during the final design stage of the project, this material may be obtained from the area immediately adjacent to the trenches. No moisture conditioning is expected, and this soil will not be compacted, in order to provide a loose medium for establishing the vegetative cover. To establish vegetation, the topsoil will be seeded with grasses suitable for the local climate. The low-permeability soil cap consists of 24 inches of compacted low-permeability soil beneath 6 inches of vegetated topsoil. The suitability of potential sources of cap material, in terms of both quality and quantity, will be confirmed during final design. Final haul road location and source material specifications will also be detailed in the final design.

Installation of this cap could be performed using standard earth-moving equipment. A large number of qualified contractors are available. Construction Quality Assurance (CQA) would primarily consist of verifying the soil cap meets the permeability specification, as well as verifying cap thickness and grading.

Because of its simplicity, only minor long-term maintenance will be required for this alternative. Any settling after cap installation can be repaired by filling, compacting, and regrading in the same manner as initial installation. The thickness of the cap will provide long-term protection against erosion. The planted vegetative cover will be mowed as needed.

5.5.1 Trench Backfill

The selected alternative includes first filling the trenches to provide a surface for cap construction. The backfill will also provide a thick physical barrier that will greatly enhance the effectiveness and reliability of the cap.

The trenches also present physical hazards, which are the result of coal mining rather than waste disposal activities. Remediation at this Site is limited to environmental effects of waste disposal activities, therefore, removal of physical trench hazards is not a remedial action goal at this Site. The trenches will not require final backfilling to current grade, as long as good stormwater drainage is provided (see below). However, backfilling the trenches as part of environmental remediation will result in incidental reduction of physical hazards. Only trenches in areas 7, 8, and 9 (depicted in Figure 15) will be filled and capped, while a portion of area 6 may be backfilled as necessary and appropriate to buttress the narrow pillar wall between areas 6 and 7. Additional work to soften the slopes of the trench walls outside the described trench fill areas may be performed in conjunction with the primary remedial activities. Outside the trenches, the ground surface will be cleared and grubbed to remove organic debris. The topsoil will be stockpiled for use in the vegetative cover layer of the cap. In the trenches, trees and large brush will be removed to prevent vertical transmissive zones through the backfill, when the trees eventually decay. This will also prevent excessive settlement of the backfill, which might occur if backfill is placed on top of a “mat” of small trees. Suitable fill material would include any inert material capable of bearing overlying loads without excessive settlement. The most economical local source of suitable fill will be used; the selection of the source(s) of backfill for the trenches will be identified in the EDR. On this basis, the backfill is assumed to consist of a silty sand and gravel (till), sand and gravel (outwash), and/or excavated carbonaceous shale / coal / rock fill (which would likely breakup into a silty granular fill).

Filling the trenches may induce settlement of the waste material, which must be accounted for in the design and installation of a cap. The existing waste materials in the trenches are expected to be moderately compressible due to their loose nature and inclusion of construction debris and organic materials. Backfilling is expected to induce compression of these materials, which may result in eventual surface settlement on the order of 6 to 12 inches. Settlement of the new fill depends on the type of fill used and the method of placement. End-dumped fill of poor quality could settle on the order of 2 to 6 feet. A better quality fill with moderate compaction effort might settle on the order of 3 to 9 inches.

About 75 percent of the settlement is expected to occur soon after fill placement provided the cover restricts future infiltration of water. The remainder of the settlement will continue gradually for many years at a decreasing rate. The trenches could be over-filled by about 4 feet for a period of about three months or more to both add a small "surcharge" and to allow time for most of the settlement to occur. After the surcharge period, the backfill would be graded for cap placement.

In response to a recommendation by the WDOH in its 2016 health consultation, soil samples will be taken just outside of the proposed cap edge at the trench rim and analyzed for VOCs. Details of the soil sampling will be presented in the EDR, to be submitted in accordance with Exhibit C to the Consent Decree (Schedule).

A conceptual cross section of the backfilled trenches is shown in Figure 14 for the situation where the elevation differs from one side of the trenches to the other. If elevations are similar between the sides, the cap will be domed in the center to enhance rainwater run-off and minimize infiltration. The slope or dome grade will be determined in the final cap design with consideration of slope stability. The lower zone of the backfilled trenches may not be compacted because of the unacceptably high safety risk of sudden trench collapse caused by heavy vibrating equipment. The upper portion of the backfill will be compacted to reduce the settlement of the cap foundation.

There will be a tendency for differential settlement to occur at the location of the sidewalls of the trenches. In addition, the use of poor quality and variable fills can result in differential settlements away from the sidewalls. To limit abrupt differential settlement, over-excavation and backfill will be considered at the top of the sidewalls to create a transition zone, as shown as tie-in zones in Figure 14.

Filling will increase the load on the buried drums and thus create the potential for collapse of any intact drums that may be in the trenches. Short-term protection monitoring will commence when the trench backfilling begins, and will continue throughout the trench backfilling and cap construction (estimated duration 16-20 weeks). Biweekly monitoring will continue for a period of one month of monitoring after completion of backfill in order to address the possibility of intact drum collapse leading to significant release of chemicals to groundwater. Details on the short-term (protection) groundwater monitoring program may be found in Table A-2 of the Compliance Monitoring Plan (Exhibit D, Part A).

5.5.2 Grading and Surface Water Management

The area to be backfilled and capped (see Figure 15) will be graded to provide proper stormwater drainage. At the present time, some runoff from the area surrounding the subsidence trenches flows into the trenches. Thus, trench backfill, grading, and stormwater diversion will decrease the stormwater flow into the northern trenches, thereby decreasing infiltration with or without a cap in place. However, stormwater runoff will be allowed to continue to flow into the southern trenches to maintain the southern groundwater divide.

As part of backfilled trenches, drainage ditches will be constructed at the margins of the cap to intercept surface runoff and convey it away from the capped trenches. Final ditch configurations, locations, and details will be determined using standard hydraulic design methods as part of final design.

5.5.3 Contingent Groundwater Infrastructure Components

Based upon available data gathered from the existing monitoring wells, groundwater currently meets cleanup levels at the designated points of compliance. Therefore, no groundwater containment or treatment is necessary. In the event that mine waste contaminants are detected in groundwater at or above trigger levels (one-half of the applicable MTCA cleanup level at the compliance boundary), a contingency groundwater treatment system will be activated to withdraw groundwater at a rate that will prevent the off-site migration of contaminants and to treat (as necessary) the groundwater prior to discharge to an existing Metro sewer. With this contingency for future groundwater treatment available if needed, institutional controls on groundwater use, and long-term groundwater monitoring, the risks from groundwater to public health and the environment are avoided. The contingency groundwater treatment system is presented in the Contingent Groundwater Extraction and Treatment Plan (Exhibit D, Part C). Contingency groundwater extraction and treatment, if required, will continue until groundwater remains below one-half of the applicable MTCA cleanup level at the points of compliance and extraction well for an entire year. If the Contingent Groundwater Extraction and Treatment System is triggered and implemented, as discussed in Section 4.0 of the Contingency Groundwater Treatment Plan (Exhibit D, Part C), the compliance monitoring frequency of treatment system inflow and outflow will be determined by the Metro discharge permit.

5.5.3.1 North Portal Infrastructure

To expedite installation of a contingent treatment system, some of the infrastructure was installed in 2008 near the north portal (Golder 2009b). The infrastructure that was selected for pre-emptive installation included the items that have a long lead or permitting phase that might slow the installation process. For example, a fenced gravel pad to support the extraction/treatment equipment was installed north of Portal #2. A discharge pipeline was installed from the treatment pad extending to the west end of the PCC property to be tied into the local Metro Publically Owned Treatment Works (POTW) sewer, if the system is ever needed. Additionally, an electrical transformer and control box for equipment hook-up has been installed. The area has lighting and is fenced for security. If mine waste contaminants at or above MTCA Cleanup Levels are detected in groundwater from the north sentinel wells upon confirmation, the groundwater extraction well, performance wells, necessary pumps, piping, and storage (surge tanks) will be installed. However, groundwater extraction will not begin unless concentrations at or above 50 percent of the MTCA cleanup levels are detected at a compliance well. If that occurs, the groundwater will either be directly discharged to the Metro POTW sewer (if groundwater COC concentrations meet POTW discharge limitations), or a groundwater treatment system will be installed that treats groundwater for the specific detected contaminants to levels acceptable as required for discharge to the Metro POTW sewer. The treated groundwater effluent will be temporarily trucked to the nearest Metro POTW sewer intake, until the existing buried pipeline can be connected directly to the Metro POTW sewer.

5.5.3.2 South Portal Infrastructure

Similar to the north portal, infrastructure to support a contingent groundwater extraction and treatment system will be installed during the remedial action near the south portal. The infrastructure that will be installed at the south portal will include a gravel pad to support a future groundwater extraction well, pumps and groundwater storage (surge) tanks, an electrical transformer, an equipment control panel, gates, and fencing. The existing gravel roads at the south portal will be improved as needed for truck access. The groundwater extraction well, pumps and groundwater storage tanks will only be installed if and when Site groundwater exceeds a confirmed concentration at or above MTCA cleanup levels at the south sentinel well. Groundwater extraction will not begin until concentrations at or above 50 percent of the MTCA cleanup levels are detected at a compliance well. At such a time, a temporary pipeline leading from the south portal to the treatment system at the north portal will be used to transport contaminated groundwater to the north portal for treatment and disposal. The temporary pipeline could eventually be replaced with a buried permanent pipeline.

5.5.4 Sentinel Wells

Four additional sentinel wells will be installed before construction of the cap in order to get water level readings before the cap is installed. Two will be in the north and two in the south. Installation of these additional sentinel wells and collection of water level readings prior to construction of the cap will be completed to address WDOH recommendations provided in their consultation report. These additional sentinel wells will supplement existing sentinel wells. Figures 12 and 13 illustrate the locations and approximate depth of the proposed additional sentinel wells.

5.5.4.1 South Sentinel Well System

Two additional sentinel wells will be added to the existing monitoring wells in the south (LMW-9 and LMW-11) for a total of four sentinel wells that will be used for the early detection of waste constituents. Both of these new sentinel wells will be installed to monitor the surface of the water table within the mine because the two flow paths with the highest potential for contaminants to migrate toward the south are along the surface of the water table and near the bottom of the mine. One of these new sentinel wells will be located near LMW-11 (estimated to be about 150 feet deep). The other new sentinel well will be placed just south of the capped waste disposal trenches (estimated depth of about 170 feet). This additional sentinel well, placed just south of the capped waste disposal trenches, will serve two purposes:

1. Early detection of any waste constituent migrating toward the south beyond the waste disposal area.
2. Effectiveness monitoring of groundwater level changes resulting from remedial actions.

This “dual purpose” sentinel and effectiveness monitoring well will be a sufficient distance from the south monitoring wells so as to determine whether future groundwater is able to flow toward the south from the waste disposal area. The sentinel wells will be installed before the remedial action construction at the trench area begins.

5.5.4.2 North Sentinel Well System

The north compliance boundary currently lacks early detection sentinel monitoring wells with the possible exception of LMW-10, which is about 150 feet south of the north compliance monitoring wells (LMW-2 and LMW-4). Figures 12 and 13 also show the location and approximate depth of the two additional north sentinel wells, which will be located adjacent to the north portal (Portal #2). These sentinel wells will be installed before remedial action construction begins at the trench area. One sentinel well will monitor the shallow groundwater table (at less than 30 feet bgs) and the other sentinel well will monitor the groundwater at approximately the 150-foot depth within the mine. The monitoring intervals for these sentinel wells were selected in consideration of WDOH recommendations provided in their consultation report. These two additional sentinel wells, together with monitoring of LMW-10 as a sentinel well, provide good vertical coverage of groundwater flowing within and away from the mine before reaching the north compliance boundary.

If logistically possible, the shallow and deeper northern sentinel wells will be moved within the former location of the main slope/decline for Rogers No. 2 (north portal). However, if that is not possible, they will be moved as close as possible to that location.

5.5.5 Monitoring

Separate groundwater monitoring programs will be used for protection during the remedial action and over the long term for confirmation following completion of remediation. Detailed monitoring plans have been developed for the selected remedy and are presented in the Compliance Monitoring Plan (Exhibit D, Part A). In addition, the Contingent Groundwater Extraction and Treatment Plan (Exhibit D, Part C of the Consent Decree) discusses procedures for capture and treatment of groundwater in the event that groundwater contamination is detected at the Site.

A Remedial Action Health and Safety Plan (HASP) will be submitted to Ecology before construction activities begin at the Site. This HASP is also for protection monitoring during construction and will include air monitoring requirements for ensuring that the workers and off-site public are not exposed to potential Site contaminants.

Performance Monitoring will include CQA monitoring of the backfill and cap installation and surface diversion systems during remedial actions. A CQA plan will be established and submitted to Ecology before construction activities begin at the Site.

5.5.5.1 Protection Monitoring

Protection monitoring is conducted during remediation to ensure that there are no adverse effects to human health or the environment from remediation activities. Health and safety monitoring will also be performed to ensure that Site workers are not exposed to undue or unexpected risks. Protection monitoring includes short-term groundwater monitoring, as discussed in the Compliance Monitoring Plan (Exhibit D, Part A of the Consent Decree), specifically in the Health and Safety Plan.

5.5.5.2 Performance Monitoring

Performance monitoring is conducted to confirm that the cleanup action has attained cleanup standards, remediation levels, or other performance standards such as construction quality control, or to demonstrate compliance with permits. Performance monitoring for the Site will involve CQA that the cleanup action design is achieved by the materials used and the construction methods are in accordance with acceptable standards of care. Performance monitoring will demonstrate that the constructed remedy is in compliance with any required permits or with the substantive requirements of MTCA exempted permits. The CQA plan will be prepared with the EDR, since its details are dependent on the final design of the remedy.

5.5.5.3 Confirmational Monitoring

Confirmational monitoring will be conducted for the following purposes: 1) to verify that the remedy performs as expected over time, and 2) to allow timely maintenance of a cap and other physical components of the selected alternative. Periodic Site inspections and surveys will be sufficient for determining maintenance needs and monitoring cap performance. Cap performance is also evaluated by groundwater monitoring. Long-term confirmational groundwater monitoring, Site inspections, and maintenance will continue until residual hazardous substance concentrations no longer exceed cleanup or remediation levels as described in the CAP resulting from either (1) the application of new remediation technologies currently unavailable or (2) other circumstances or conditions that affect residual concentrations such that they no longer pose a risk to human health or the environment.

Cap Monitoring: Cap monitoring will consist primarily of visual inspections for damage and subsidence. The cap will be periodically examined for the presence of offsets, scarps, low-points, ponded water, odd changes in grade, excessive erosion, and the condition of the vegetative layer. For the first year, such inspections will be performed on a quarterly basis and will eventually be reduced to once a year for the post-closure period. It is expected that the vegetated cover will be maintained including, as-needed mowing to prevent the establishment of deep rooted trees or bushes.

In the event of an earthquake of Intensity IV or greater (Modified Mercalli Intensity Scale) in the area, the cap will be inspected for damage and repaired accordingly. The north and south portal areas will be inspected for ground ruptures, fractures, earth displacements, or similar damage to original (pre-earthquake) landscape. If portal water surfaces due to the earthquake event, it will be inspected for signs of anomalous water quality (color, turbidity, odor, etc.). Ecology will be notified of site conditions within seven (7) days and a decision will be made between the property owner and Ecology on taking groundwater samples from on-site wells in accordance with the sampling network, protocols, and analytical methods of the Compliance Monitoring Plan. Contingency actions will be implemented as necessary in accordance with the procedures described in this CAP.

Groundwater Monitoring: Groundwater monitoring will include periodic groundwater sampling and analysis as described in the CMP at selected key locations throughout the Site to confirm that concentrations of constituents of concern from prior waste disposal activities do not exceed acceptable limits at the conditional points of compliance. In accordance with WDOH’s recommendation, private well surveys will be conducted near the Site (within the RI/FS Study Area) during the five year periodic review. Active private wells closest to the north and south portals whose owners consent to testing of their wells will also be tested annually for five years for the same suite of chemicals as the monitoring wells at the Site. Ecology and the PLPs will re-evaluate the need for further private well testing during the five year review. Based on available data, site groundwater emanating from the mine currently meets remediation goals, so the monitoring program will be designed for early detection of a release to Site groundwater of potential contaminants attributable to the disposal of waste in the trenches, should it occur. Because groundwater from the trenches is channeled by the sidewalls with near vertically sloping rock strata, which provide a natural containment structure, monitoring where the groundwater exits the trenches (i.e., the north and south portals) is considered sufficient to detect any potential release. Groundwater monitoring will focus on detecting potential releases at the northern end (i.e., LMW-2, LMW-4, and LMW-10), at the southern end (i.e., LMW-3, LMW-5, and LMW-8), and within the Frasier and Landsburg Seams (i.e., LMW- 6 and LMW-7, respectively). The groundwater located at the bottom of the mine will also be monitored (i.e., LMW-11). Additionally, four sentinel wells will be installed before the remedial action covering the wastes is started, which will also be included in the long-term monitoring program. In the event that a release is detected, the migration of impacted groundwater would be evaluated, groundwater monitoring would be increased, and additional wells would be sampled and analyzed as necessary to determine the fate and transport of the contaminants and to evaluate associated risk. Groundwater monitoring reports will include an evaluation of the water level data collected in order to assess the water level configuration within the mine, including the groundwater divide located near the south portal.

5.5.5.4 Groundwater Monitoring Program Summary

If a release were to occur, it is more likely to occur during or immediately after the trenches are backfilled. Based upon the reported handling of drums during placement in the trenches, and given the length of time since placement, most drums are probably already breached. The additional load of the backfill, however, may further collapse the drums, increasing the potential for a release. Impacted soil could also be compressed, potentially leading to migration of contaminants. After backfilling and compaction of the trenches, the stresses will equilibrate and the potential for a release will be lessened. Considering the travel time of a release to existing monitoring wells, frequent monitoring of existing wells is appropriate during and after backfill placement. Therefore, the groundwater sampling program will have two components: 1) Protection Monitoring; [WAC 173-340-410 (1)(a)] during backfilling of the trenches; and 2) Confirmational Monitoring for the post-closure care period [WAC 173-340-410 (1)(c)].

Details of the groundwater monitoring are presented in the Compliance Monitoring Plan (Exhibit D, Part A). The groundwater monitoring program will include the following elements:

- Confirmational monitoring will be performed using the following monitoring wells:
  - Existing monitoring wells at the north and south portals (LMW-2, LMW-3, LMW-4, LMW-5, LMW-8, LMW-9, LMW-10, and LMW-11)
  - Existing monitoring wells within the Frasier and Landsburg Seams (LMW-6 and LMW-7, respectively)
  - Four new sentinel wells (Deep North Sentinel Well, Shallow North Sentinel Well, South Shallow Sentinel Well, and Dual South Sentinel/Cap Effectiveness Well).
  - Active private wells located closest to the north and south portals whose owners consent to testing of their wells will also be tested annually for five years

Because the hydraulic conductivity within the mine is much greater than it is laterally through the adjacent bedrock, monitoring these locations would detect a release of contaminants directly attributable to disposal of waste in the trenches.

The new sentinel wells will also be sampled for contaminants during the long-term compliance monitoring phase (after remedial construction, see Table A-2 in the Compliance Monitoring Plan).

- Limited surface water testing will be conducted at the north and south portals prior to remedial construction. Limited surface water sampling will also be conducted at the south portal during remedial construction performance monitoring (see Exhibit D, Table A-2). The north portal will be backfilled with clean soil prior to remedial construction to allow installation of the north sentinel wells.
- Frequent monitoring of these 10 existing monitoring wells and the new sentinel wells will be performed during the backfilling of the trenches and cap construction, which is estimated to take approximately 16 to 20 weeks. Samples will be obtained every two weeks from these wells and analyzed for pH, specific conductance (as an indicator for metals and other inorganic compounds), and dissolved oxygen. If there is a dramatic change in any of these groundwater parameters, we will consider analyzing samples for potential contaminants. On a monthly basis, the samples would also be screened for TPH using NWTPH-HCID analysis and analyzed for VOCs. A VOC analysis (EPA Method 8260) would be capable of detecting a wide range of potential VOCs that are mobile. Any detections or anomalies in the screening analyses would be subject to more laboratory analysis for confirmation of the detection. If the detection is confirmed, then samples from the affected well(s) would also be analyzed for priority pollutant metals and organic compounds using EPA methods 8270 and 8081. At the completion of the remedial action construction, sampling will extend for an additional month following the same sampling program.
- Confirmational monitoring would initially (after remedial construction is completed) consist of annual and screening-level monitoring. Annual monitoring would provide comprehensive monitoring for specific contaminants of potential concern, and would include VOCs, SVOCs, TPH, PCBs, pesticides, and trace metals. Selected general water quality parameters (pH, specific conductance, dissolved oxygen, turbidity, and total dissolved solids) would also be included. Screening-level monitoring would be conducted when the monitoring is more frequent than annual (i.e., quarterly or semi-annually), and would include analysis for VOCs (EPA Method 8260), trace metals, pH, specific conductivity, dissolved oxygen, and turbidity. More in-depth analysis would then be performed if screening analysis indicated that constituents may be present in the groundwater at levels of concern (at or above 0.25 of the applicable MTCA cleanup level.

  Sentinel wells will also be included in the confirmational monitoring program. Sentinel wells will be used as an early warning for impacted groundwater migration. Four new sentinel wells will be installed prior to the completion of the remedial action. LMW-9 and LMW-11 are also considered sentinel wells.

  Confirmational monitoring would start at the completion of the remedial action in sentinel and compliance wells. The confirmational monitoring frequency would be quarterly for the first year, semi-annual for the next four years, and annual for the next five years. After 10 years, the frequency of confirmational monitoring will be analyte- and well location dependent, as follows:

  - LMW-2, LMW-4, LMW-10, Deep North Sentinel Well (yet to be installed), Shallow North Sentinel Well (yet to be installed), LMW-6, and LMW-7 will have a monitoring frequency of 2.5 years for VOCs and TPH; and every 5 years for metals, SVOCs, PCBs, and chlorinated pesticides.
  - LMW-3, LMW-5, LMW-8, LMW-9, MWL-11, South Shallow Sentinel Well (yet to be installed), Dual South Sentinel/Cap Effectiveness Well (yet to be installed) will have a monitoring frequency of 5 years for VOCs, TPH, metals, SVOCs, PCBs, and chlorinated pesticides.

  These frequencies were based on the evaluation of BIOSCREEN modeling, the results of which were summarized by Golder in a report (2009a) and approved by Ecology in a letter dated January 21, 2010. The sampling frequency for the southern monitoring wells was revised from a ten year to a five year schedule based on comments from the

2013 public comment period. The long-term groundwater monitoring frequency is summarized in Table A-2 of the Compliance Monitoring Plan.

- During each five year periodic site review, a survey of private wells located near the site will be conducted. Under WAC 173-340-420, periodic reviews occur at least every five years after remedial construction is completed of the cleanup action.
- Based on the above survey of private wells located near the north and south portals, active private wells closest to the north and south portals, whose owners consent to testing of their wells, will be tested annually for five years for the same chemicals as the monitoring well at the Site. The targeted wells will be the specific group of wells located closest to the north and south portals and will not be in a location beyond the major hydrologic boundaries like Cedar River or Rock Creek. Ecology and the PLPs will re-evaluate the need for further private well testing during each five year review. The private wells to be tested will be selected according to their location in areas most susceptible to impacts if contaminants were to discharge from the mine's north and south portals. To be selected for sampling during a periodic review, a private well must meet the following criteria:
  - The well selected for sampling must be located hydraulically downgradient and closest to either Portal #2 (north portal) or Portal #3 (south portal). Wells located on the north side of the Cedar River or South side of Rock Creek (i.e., opposite side from the mine) will not be included;
  - The well must be an active groundwater supply well for the resident or tenant;
  - The owner(s) of the private well must enter into an access agreement with the PLP Group and/or Ecology. Ecology will assist the PLP Group in obtaining access agreements with private well owners. The access agreement will memorialize the private well owner's consent to provide the PLPs, Golder, and/or Ecology with reasonable entry and access to the property for the purpose of water quality sampling, subject to certain terms and conditions. The access agreement will, to the degree practicable, include the following terms: enable the PLP Group and/or Ecology to request subsequent inspection and follow-up sampling of the private well by the King County Department of Health (DOH) to evaluate potential sources of contamination; provide that the PLP Group would be required to pay for such subsequent investigation and testing; and provided that deficiencies noted during the King County DOH Water Systems Condition Report could be used to exclude the well from additional monitoring until the deficiencies are corrected by the private well owner. In addition, the private well owner(s) would agree to indemnify the PLP Group, Golder, and Ecology in the event that contamination is detected in the private well that is not attributable to the mine.
  - No well testing will be conducted if the private well has chemicals or other suspected sources of contamination on the property.
  - Wells will be sampled for the same list of analytes as used at Site wells: chlorinated solvents, benzene cadmium, arsenic, total chromium. Very immobile contaminants (such as phthalates, lead, and pesticides) are possible Site contaminants that could be detected in private wells in the future. It is recognized, however, that the Site may not be the only possible source of these contaminants. For example, lead pipes found in homes are a common source of lead in drinking water; plastic piping and plastic pump components (e.g., PVC, electric wire insulation, piping solder) could be a source of phthalates; and pesticides applied at a property could possibly affect groundwater that supplies a well. However, very few of these contaminants were detected in private wells during the four quarters of testing during the RI or during Ecology's 2014 private well testing and when detected, were found at very low levels below MTCA cleanup levels and drinking water standards and not considered a concern at the time.
  - Although very few of these contaminants were found in the private wells in the past, Ecology recognizes that this could change in the future and that the site may not be the only possible source of contamination. To address that possibility, Ecology and

the PLP Group will assess any detected lead, phthalates and pesticides found in private wells to determine the possible source. The primary considerations will be (1) the private well construction materials (e.g., PVC, electric wire coverings, piping solder); (2) where the sample was collected relative to the wellhead; and (3) whether any Site monitoring and sentinel wells contain any of these contaminants. If the sampling port is some distance from the wellhead, the type of piping between the wellhead and the sampling port would also be considered. Other factors might also need to be considered on a "case-by-case basis."

5.5.5.5 Response If Remediation Levels Are Exceeded

A response action will depend on information obtained from groundwater monitoring and cap inspections. In the event that a contaminant (that could be directly attributable to the disposal of waste in the trenches through an "alternative source evaluation") is detected and confirmed within groundwater from a sentinel well or compliance well at specific concentrations, contingent remedial actions will be triggered. Contingent remedial actions are summarized below, and additional details are provided in Exhibit D – Part A (Compliance Monitoring Plan).

Sentinel Well Detections at or above 0.25 MTCA Cleanup Levels:

- Following validation of the laboratory data (quality assurance/quality control [QA/QC]), if the detection at a sentinel well is at or above 0.25 of the MTCA cleanup level, the PLP Group will inform Ecology within seven (7) days and then confirm the detection by re-sampling the sentinel well. The sample will be analyzed for the analyte that was detected at or above 0.25 of the MTCA cleanup level. The PLPs will also notify the City of Kent Public Works by email or phone if and when it is confirmed that contamination has been detected at the Site
- If the analytical validation and confirmation re-sampling results confirm that the analyte is present within groundwater from the sentinel well at a concentration that is at or above 0.25 of the MTCA cleanup level, the PLP Group will notify Ecology within seven (7) days and then conduct an "alternative source evaluation" to evaluate if the detection is caused by a source other than the waste disposed in the Roger's mine trenches. Results will be presented for Ecology review and approval. A final decision will be made by Ecology and the PLP Group as to whether the detection or detections were caused by a source unrelated to the Site.
- If an alternative source of the detected analyte is not identified, the PLP Group will then commit to increasing the monitoring frequency as per Table A-3. The increased monitoring will only be for groundwater at the particular sentinel well and for the particular analyte having a validated and confirmed detection above 0.25 of the MTCA cleanup level. This sequence of steps for detections at sentinel wells is shown in Figure A-8 in Exhibit D – Part A.

Sentinel Well Detections at or above 0.5 MTCA Cleanup Level:

- Following validation of the laboratory data (QA/QC), if the detection is determined valid and the detected concentration is at or above 0.5 of the MTCA cleanup level at a sentinel well, the PLP Group will inform Ecology of the detection within seven (7) days and then confirm the detection by re-sampling the sentinel well and analyzing for the analyte that was detected at or above 0.5 MTCA cleanup level.
- If confirmation re-sampling does not confirm the presence of the contaminant at a concentration at or above 0.5 of the MTCA cleanup level, then the confirmational monitoring cycle will continue without the implementation of corrective remedial action to install the Contingent Groundwater Extraction and Treatment System (see Figure A-8 in Exhibit D – Part A).

- If the confirmation re-sampling confirms the concentration of the contaminant at or above 0.5 of the MTCA cleanup level in a sentinel well, Ecology will be informed within seven (7) days. The design, and permitting requirements associated with the Contingent Groundwater Extraction and Treatment System (presented in Exhibit D - Part C) will be submitted to Ecology for approval within two to four weeks of the re-confirmation of results, no later than 30 days.

Sentinel Well Detections at MTCA Cleanup Levels or above:

- If the confirmational re-sampling of the sentinel well shows concentrations at or above MTCA cleanup levels, then the Contingent Groundwater Extraction and Treatment System (as described in Exhibit D - Part C) will be installed as the corrective remedial action for containment and treatment of impacted groundwater. The anticipated time frames for the installation of the Contingent Groundwater Extraction and Treatment System are presented in Exhibit D Part C.
- Groundwater sampling will be expanded to the compliance wells located downgradient of the sentinel wells that had the detection and will be conducted at the same increased frequency as the sentinel wells (see Exhibit D Part A Table A-3).

Compliance Well Detections at 0.5 MTCA Cleanup Levels or above:

- Groundwater containment (pumping and treatment) will not be initiated unless groundwater concentrations of contaminants meet or exceed 0.5 of the MTCA cleanup levels at a compliance boundary well(s). Treated groundwater will be discharged to the local POTW sewer (see Exhibit D – Part C for more details).
- System startup, optimization, and operation (including pumping) is estimated to be completed in two weeks. See Exhibit D Part C for details on the pumping optimization for contaminant capture.

If a detection at a sentinel well does not increase to exceed the MTCA cleanup level, the increased frequency of groundwater monitoring at specific sentinel well(s) (as specified in Table A-3 in Exhibit D, Part A) can end and return to the regular long-term monitoring schedule in accordance with Table A-2 (in Exhibit D – Part A) under any of the following conditions:

- If the validated and confirmed detection becomes non-detect at the same laboratory MDL for three consecutive monitoring periods;
- If the trend analysis (using a minimum of eight monitoring events for statistical representativeness) shows a steady or decreasing trend; or
- If the trend analysis indicates that a rate of increase would not result in concentrations exceeding the MTCA cleanup level in a time period that is less than the routine long-term monitoring specified in the CMP (Table A-2 in Exhibit D – Part A).

Groundwater Monitoring During Operation of the Contingent Groundwater Treatment System:

- During the contingent groundwater treatment system operation, compliance wells at the compliance boundary where the exceedance of 0.5 MTCA cleanup levels occurred will be monitored quarterly only for the analytes that were in exceedance. All other wells will be monitored as per the long-term monitoring program.
- Contingency groundwater extraction and treatment will continue until groundwater at the points of compliance and the pumped effluent are below 0.5 MTCA cleanup levels for four consecutive monitoring periods or a minimum of one year. An additional four quarters or one year of groundwater sampling will be conducted at the compliance wells after pumping is stopped. When the contingency groundwater extraction and treatment system is implemented, the compliance monitoring frequency of treatment system inflow and outflow must also be in accordance with the Metro discharge permit.

- As an added means to monitor contingent groundwater extraction system performance and compliance, a performance well or wells will be installed between the extraction well and compliance well to confirm contaminant capture is hydraulically effective and contaminants do not migrate past the Site boundaries by monitoring groundwater quality at the downgradient compliance wells. In response to WDOH's recommendation, the Contingent Groundwater Extraction and Treatment System Plan (Exhibit D, Part C) contains an expanded description of how the performance wells and variable pumping rates would be used to optimize the groundwater extraction system to establish hydraulic capture and ensure that contaminants do not migrate past the Site boundaries.

5.5.6 Institutional Controls

Under the selected remedy, any contaminated material (i.e., subsurface waste, including drums) will remain on-site and, as such, institutional controls are required [WAC 173-340-440(1)(a)] for the disposal areas. Institutional controls are a key component of the remedial alternatives for maintaining long-term effectiveness.

An environmental covenant will be recorded at the Site to ensure that Site use restrictions remain in force regardless of the property owner, and to notify any prospective purchasers of the Site of the presence of subsurface waste. Site use restrictions will prohibit using the Site for purposes that are incompatible with a waste Site. For the selected remedy, these restrictions will prohibit penetrating the cap and any Site use that could damage the cap or significantly reduce its effectiveness. Any structures or buildings (such as maintenance equipment sheds) will not be allowed in the cap area, unless they are part of the remedial action. The Site environmental covenant will apply to the waste-filled subsidence trenches and a buffer zone around the installed remedial system cap and components. Such use restrictions shall also include limitations on development in specified areas located near Portals #2 and #3 which have been designated for installation of the Contingency Groundwater Treatment Systems, should such systems become necessary and to the extent that such development would be inconsistent with the installation and operation of such systems. Site use restrictions will remain in force indefinitely. In addition, warning signs will be posted to provide notice of the presence of a waste site to trespassers and recreational visitors.

A locked fence surrounds the northern portion of the Site (see Figure 4) that contains waste materials, to prevent people from coming in contact with waste materials during allowed recreational uses around the Site. This locked fence will remain in place for a period of five years following the remedial action to ensure that the cap is secured and ground cover is well established. Fencing may not be needed after five years because the trench backfill will provide an effective barrier from the waste material, such that incidental trespass (which fencing is designed to prevent) or limited utilization of the Site would not present a health risk or jeopardize the cap integrity. After five years, the fencing may be removed with Ecology's approval.

During construction of the remedial action, means of restricting access to the waters discharging from Portals #2 and #3 will be engineered, in a manner acceptable to Ecology, to prevent exposure to those waters by humans. The engineered restriction will keep Portals #2 and #3 groundwater discharge from surfacing, thereby eliminating access and direct contact by humans. These access restrictions shall remain in force indefinitely.

Groundwater use restrictions and engineered access restrictions on the use of and exposure to surface waters from Portals #2 and #3 will be implemented to prevent exposure to groundwater and portal surface water near the Site and within the compliance boundary shown in Figure 11. After these restrictions are employed at the Site, exposure of humans to potentially contaminated groundwater from the Site could happen only if off-site migration occurred. Routine, periodic monitoring of groundwater will be used to detect contaminants on-site specifically attributable to the disposal of waste in the trenches before off-site migration can occur.

Periodic Site inspections and maintenance of the cap, fencing, warning signs, and any other physical components of the institutional controls will be included in the deed restrictions. Financial assurances have been established, as appropriate, in the Consent Decree to cover all costs associated with the operation and maintenance of the remedial action at the Site, including institutional controls, compliance monitoring, and corrective measures.

Groundwater at the Site's conditional points of compliance currently meets remediation goals. Therefore, no groundwater containment or treatment is currently necessary. In the event that groundwater were to become impacted by contaminants specifically attributable to the disposal of waste in the trenches, groundwater containment treatment (if necessary) and discharge to the Metro POTW sewer would be readily implemented.

5.6 Evaluation of Cleanup Action With Respect to MTCA Criteria

Alternative 5 meets all threshold criteria specified in WAC 173-340-360(2) (protection of human health and the environment, compliance with cleanup standards, compliance with ARARs, and provision for compliance monitoring). It provides the best combination of long-term effectiveness and reliability, short-term effectiveness, implementability, and reduction of toxicity, mobility, and volume. In addition, this alternative is cost-effective [WAC 173-340-360(3)(e)].

Alternative 5 relies on containment of hazardous substances, which has a low preference under MTCA. Site conditions at the Landsburg Mine make higher preference remedial actions less desirable. Remedial actions involving in-situ treatment are less reliable and would be unverifiable. Remedial actions involving ex-situ treatment or off-site disposal would require excavation of the waste materials, which represents a significant potential safety concern with the Site conditions and is considered impracticable. In addition, waste materials could be below the water table within the mine workings and waste removal effectiveness is uncertain.

WAC 173-340-380(1)(a)(ix) requires specification of the types, levels, and amounts of hazardous substances remaining on Site for containment alternatives. Based on available information, the northern trenches (areas 7, 8, and 9 in Figure 15) were used in the late 1960s to the late 1970s for disposal of various industrial waste materials, construction materials, and land-clearing debris. Materials were disposed of in those trenches from the access road shown in Figure 4 of the CAP, attached as Exhibit B. Industrial wastes were contained in drums or dumped directly from tanker trucks. Based on invoice and dumping records from PCC, an estimated 4,500 drums of waste and about 200,000 gallons of oily wastewater and sludge were disposed into the trenches. Available documented interviews with waste haulers and truck drivers indicate that wastes included paint wastes, solvents, metal sludges, and oily water and sludge (Ecology 1990). It is expected that many of the drums were only partially full. The amount of waste remaining at the Site is unknown, but a portion may have been burnt during historical fires, which occurred during placement.

Although the amount of waste remaining at the Site within the Roger Seam trenches is uncertain, Alternative 5 provides a substantial surficial physical barrier (backfilling the trenches where waste was disposed in the northern trenches (areas 7, 8, and 9 in Figure 15) and reduces surface water infiltration, which will reduce the potential for mobilization of waste to the water table. Institutional controls will limit land uses at the Site and, therefore, reduce the risk associated with both mine subsidence and contaminant exposure.

Compliance monitoring will ensure that waste materials remain contained and that the integrity of the Alternative 5 cap is maintained. The conditional points of compliance for groundwater and surface water will be where waters discharge from the Site boundaries, as shown in Figure 11. Cleanup levels for groundwater, if needed, will be MCTA Method B cleanup levels or applicable Method A as described in Section 4.2. Method A and Method B cleanup levels, based on residential exposure, are appropriate for the highest beneficial use of groundwater as a potential drinking water source.

In order to protect groundwater, the point of compliance for soils is throughout the Site, as provided in WAC 173-340-740(6)(b). Ecology recognizes that the cleanup action involves containment of hazardous substances. This cleanup action, once implemented, will comply with cleanup standards so long as: (1) all hazardous substances remain contained in the subsidence trenches of the Rogers Seam and covered by the trench backfill and the low-permeability soil cap, (2) the compliance monitoring program ensures the long-term integrity of the containment system by providing for soil cap maintenance and repair and for groundwater monitoring, and (3) requirements for containment technologies in WAC 173-340-740(6)(f) are met, which are:

1. The remedy is permanent to the maximum extent practicable as evaluated in the Feasibility Study and summarized in Section 5.34 of this CAP.
2. The remedy is protective of human health from direct contact exposures to hazardous substances, since all wastes will be buried deeper than 15 feet with clean backfill material.
3. The remedy is protective of terrestrial ecological receptors from direct contact exposures to hazardous substances, since all wastes will be buried deeper than 15 feet with clean backfill material.

4. Institutional controls will be in place. Recorded covenants will include land use restrictions that prohibit activities that could interfere with long-term integrity of the containment system.
5. Long-term compliance maintenance monitoring will be conducted for the foreseeable future, which will evaluate and maintain the long-term integrity of the containment system.
6. The long-term groundwater confirmational monitoring will be used to evaluate the potential for hazardous substances to migrate from the Site, and the contingent groundwater treatment system, if required, will ensure that contamination remains on-site and prevents contact with contaminated groundwater.

Ecology is establishing a point of compliance for ambient air throughout the Site. Ambient air impacts were low and only observed within trench within area 9 (Figure 15) above exposed wastes. Since the trenches that had wastes disposed (northern subsidence trenches in areas 7, 8, and 9 shown in Figure 15) will be backfilled with the implementation of Alternative 5, Ecology does not believe ambient air impacts to be of concern for the Site after remedial actions are completed. Confirmational ambient air monitoring will not be necessary for the Site unless the additional Site safety monitoring information during cleanup actions warrants a concern.

Ecology is establishing the point of compliance for surface water as the point or points at which hazardous substances are released to surface waters of the State of Washington, pursuant to WAC 173-340-730(6). Since the discharge of hazardous substances from the Site to surface waters can only occur where groundwater discharges to surface water, such as at the portals, groundwater compliance monitoring at the designated confirmational groundwater monitoring wells will be appropriate for confirmation and attainment of surface water compliance at the portals. In the event of an exceedance of surface water standards is identified during the compliance monitoring program, confirmation sampling of groundwater at a point of groundwater discharge to surface water (the portals) will be undertaken to verify the exceedance of surface water standards.

6.0 IMPLEMENTATION SCHEDULE

The CAP implementation schedule is set forth in Exhibit C to the Consent Decree.

7.0 REFERENCES

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TABLE

TABLE 1

SUMMARY OF REMEDIATION ALTERNATIVE EVALUATION

Criteria [a]			Alternative Scores [c]			
	Relative Value of Criterion [b]	Calculated Criteria Weights	5 Low-P Cap	6 FML Cap	7 FML/GCL Cap	9 Excavate
Long-Term Effectiveness and Reliability						
Effectiveness (50% of criterion)		50%	8.3	9	9.5	10
Reliability (50% of criterion)		50%	9.5	9	8.5	4
Overall criterion score	1	53%	8.9	9	9	7
Short-Term Effectiveness	0.4	21%	6.8	6.6	6.4	0
Reduction in Toxicity, Mobility, and Volume	0.1	5%	2	2	2	5
Implementability	0.4	21%	6.8	6.4	6	0
Net Benefit		100%	**7.7**	7.6	7.5	3.9
Cost (present value, millions)			$1.00	$1.18	$1.34	$24
Benefit : Cost (i.e., cost-effectiveness)			7.6	6.4	5.6	0.2

Notes:

[A] See text 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 text for score basis.

FIGURES

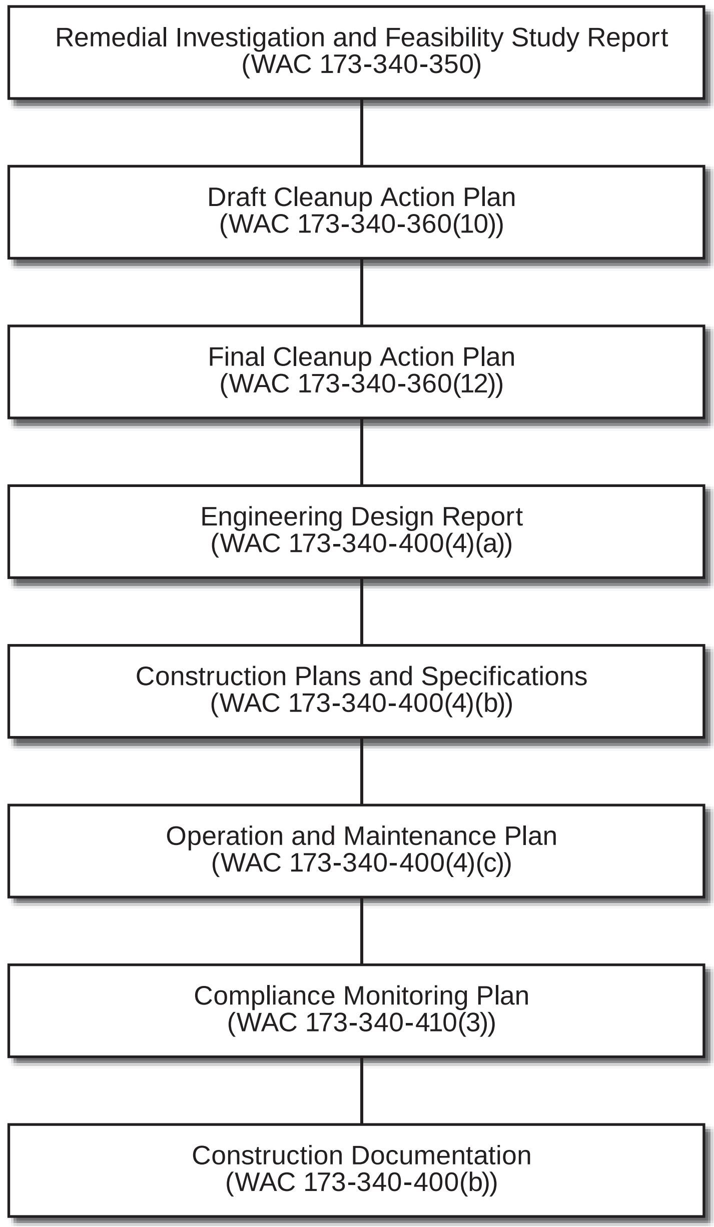
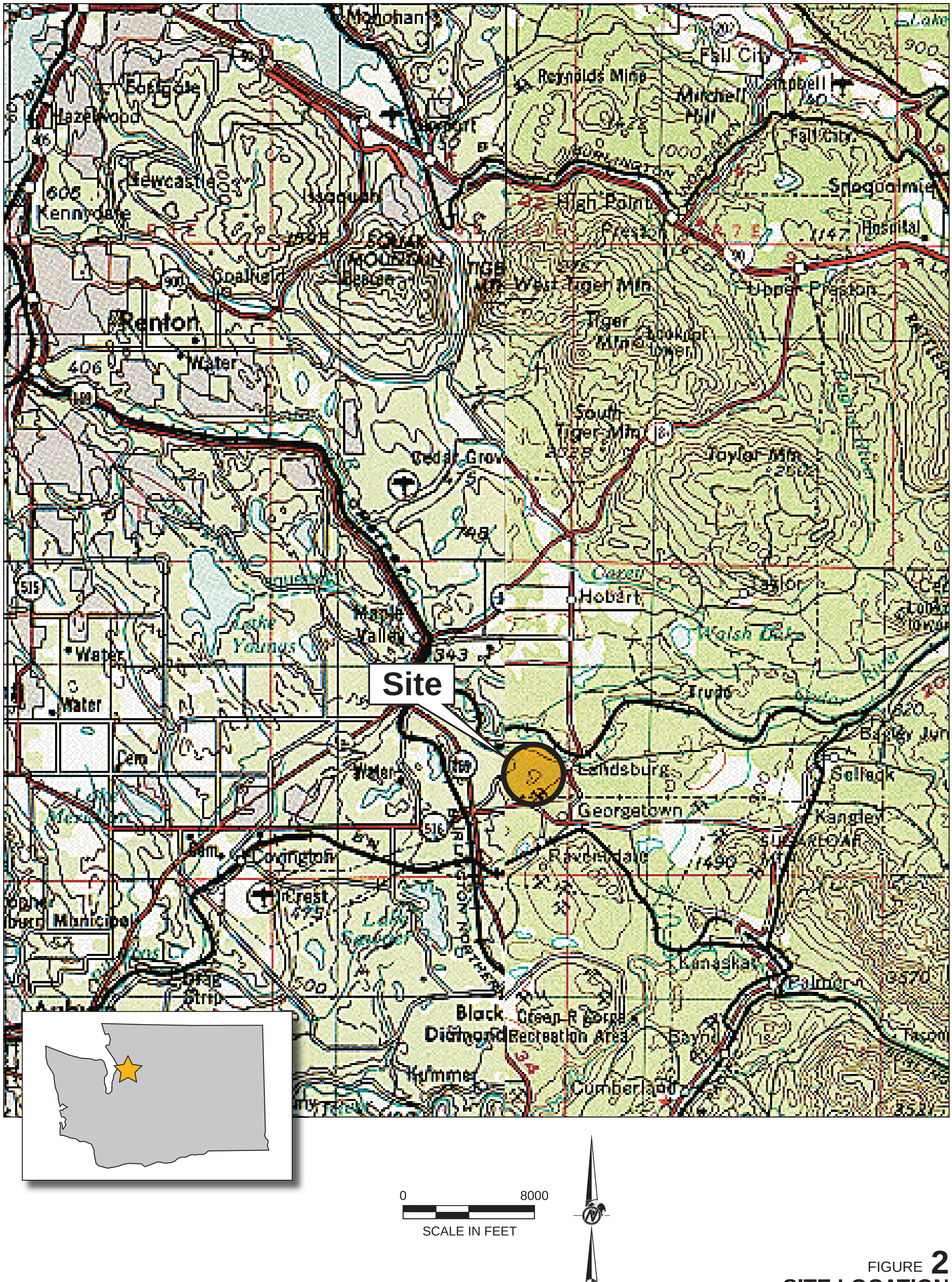


FIGURE 1
DOCUMENTS REQUIRED UNDER MTCA (CHAPTER 173-340 WAC)
PALMER/LANDSBURG MINE/WA



Source: *USGS 1:250,000 Sheets,Seattle and Wenatchee*

FIGURE **2**

SITE LOCATION

PALMER/LANDSBURG MINE/WA

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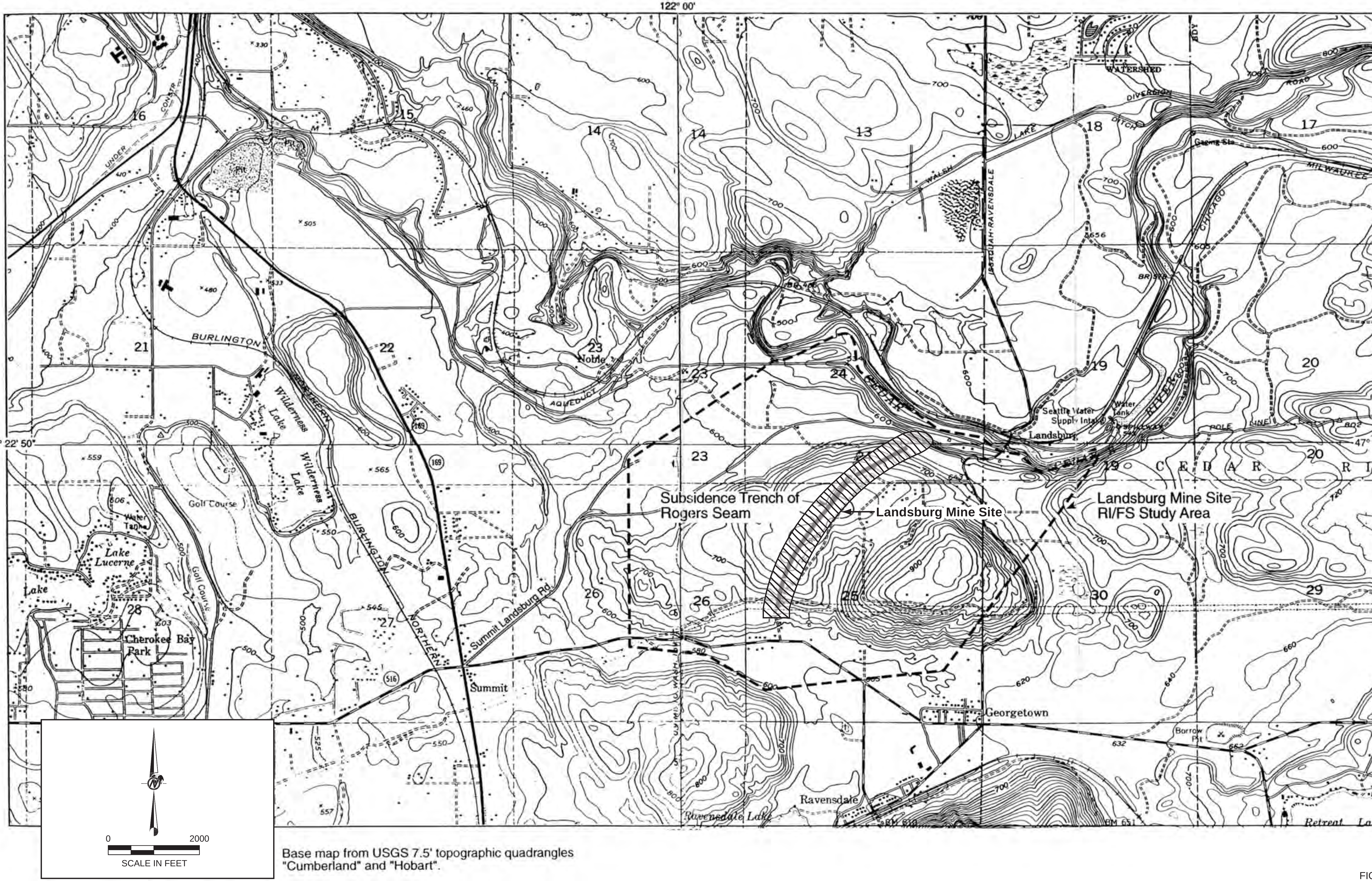
Golder Associates



Base map from USGS 7.5' topographic quadrangles "Cumberland" and "Hobart".

FIGURE 3
STUDY AREA BOUNDARY
PALMER/LANDSBURG MINE/WA

Golder Associates

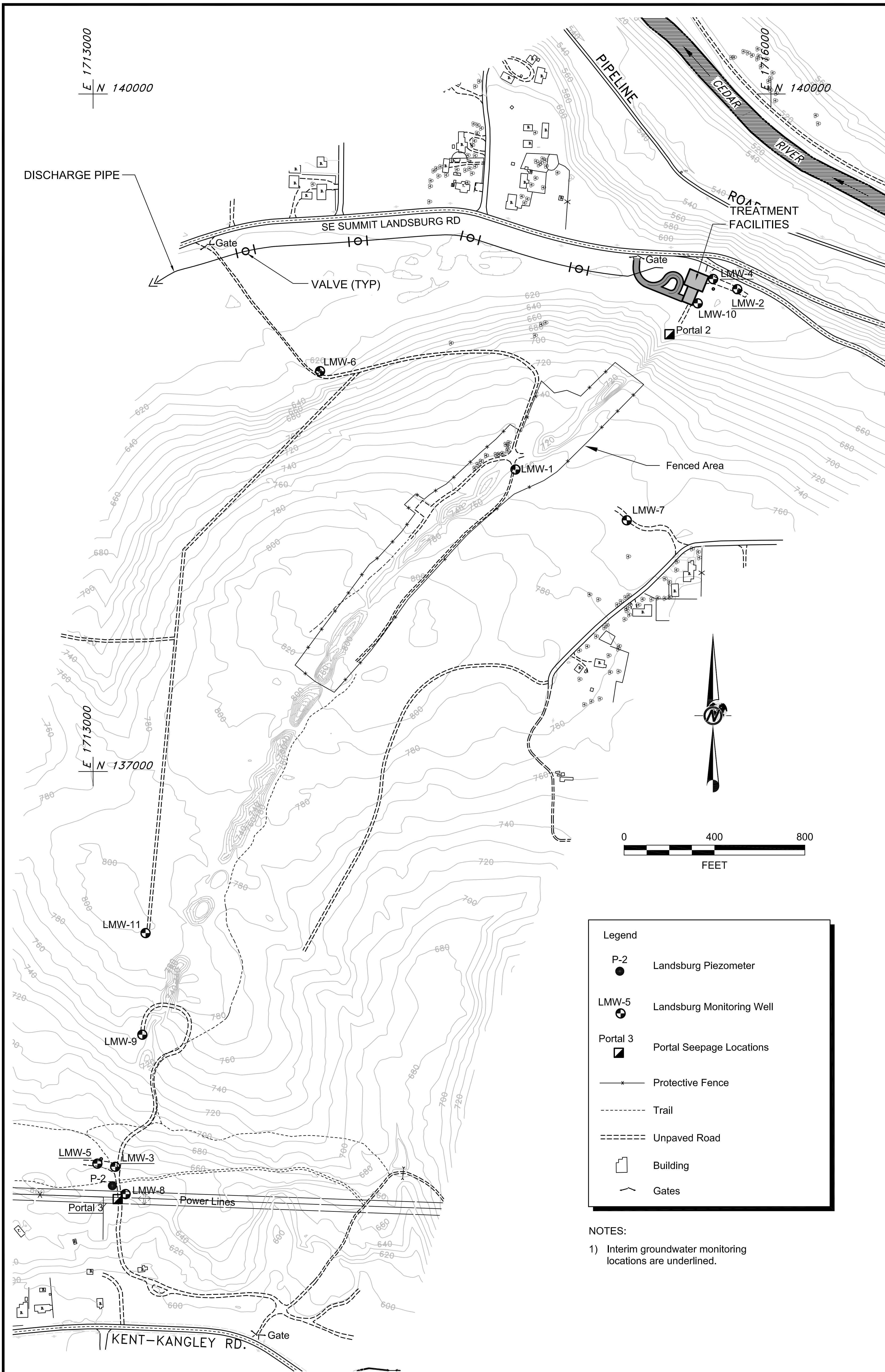
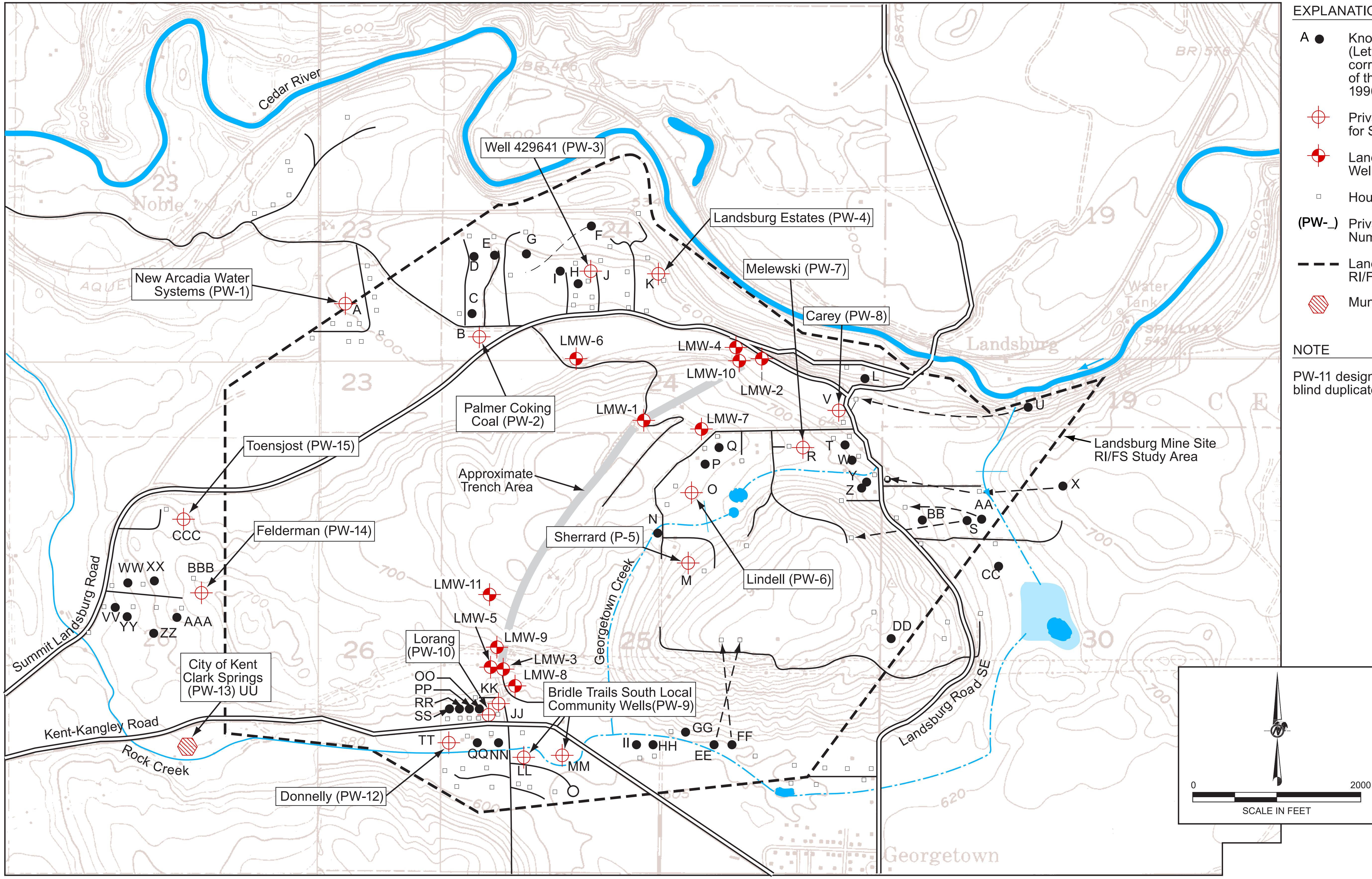


FIGURE **4**

SITE FEATURES AND TOPOGRAPHY

PALMER/LANDSBURG MINE/WA



EXPLANATION

A ● Known Private Wells (Letter designations correspond to Table 2-1 of the RI/FS [Golder 1996])

Private Well Chosen for Sampling

Landsburg Monitoring Wells (LMW-_)

Houses

(PW-_) Private Well Sample Number

Landsburg Mine Site RI/FS Study Area

Municipal Supply Well

NOTE

PW-11 designation used for blind duplicate QC samples

FIGURE 5
WELL LOCATIONS
PALMER/LANDSBURG MINE/WA

Golder Associates

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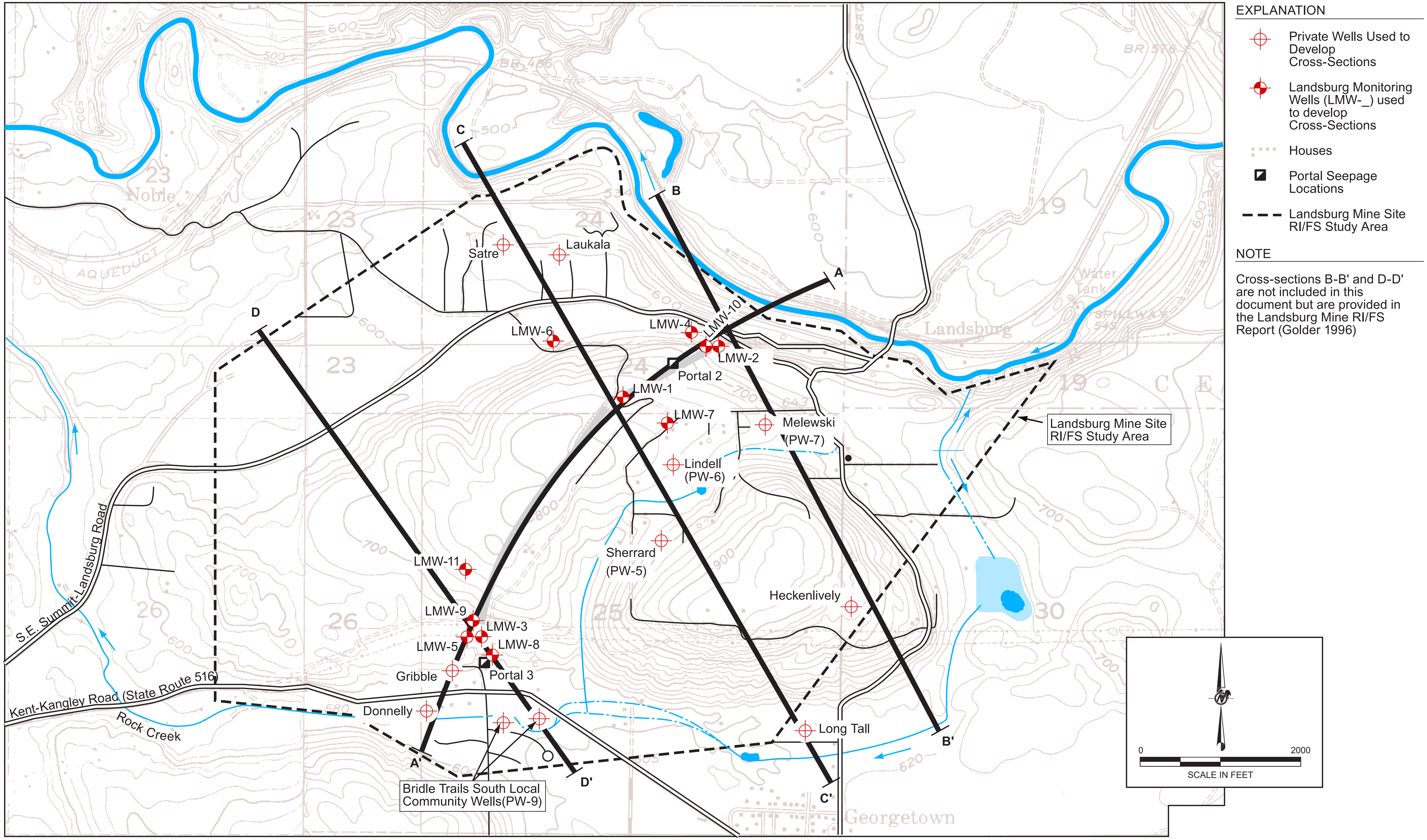

Base map from USGS 7.5' topographic quadrangles "Cumberland" and "Hobart".

FIGURE 6
MAP VIEW FOR LANDSBURG CROSS-SECTIONS
PALMER/LANDSBURG MINE/WA

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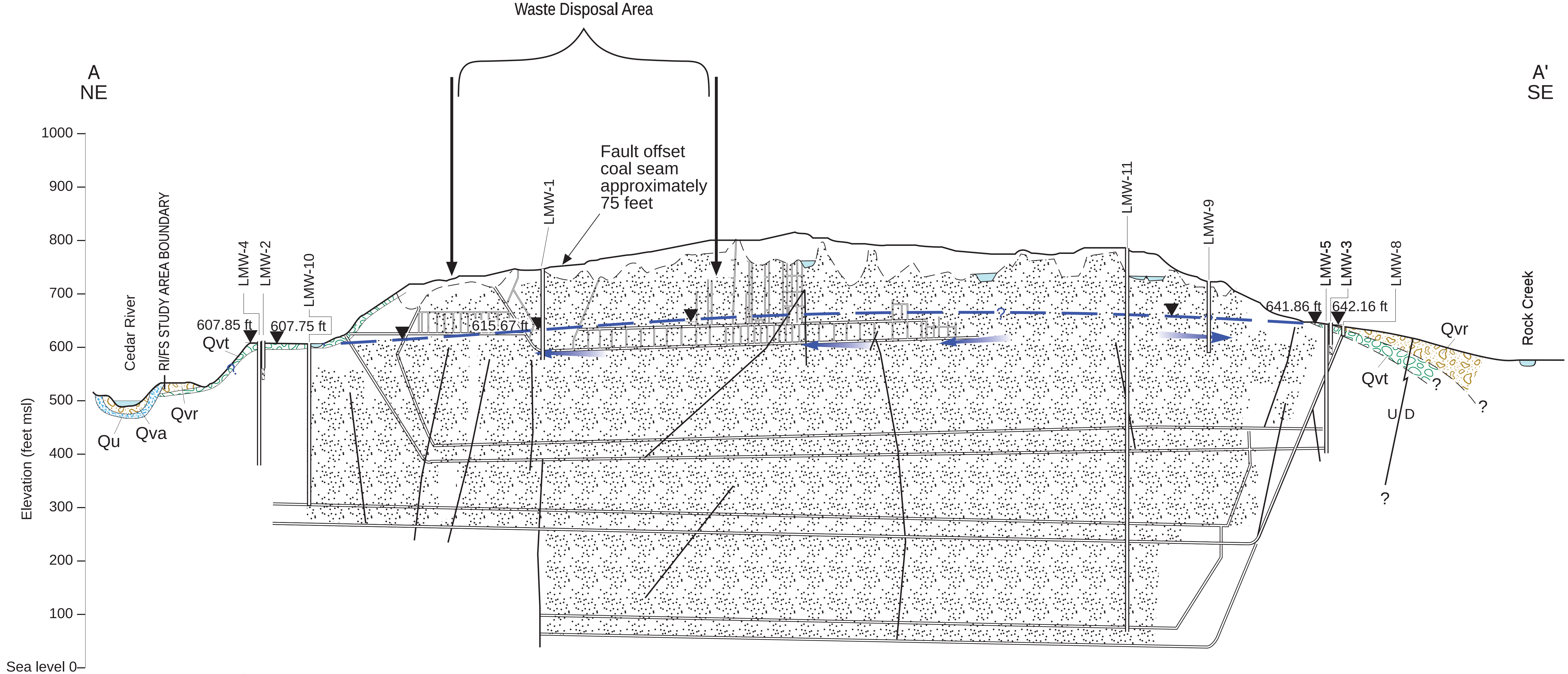
Golder Associates



EXPLANATION

Potentiometric surface

Outline of trench bottom

Water Level (ft. amsl) 2/23/94

Qvt Till, compact mixture of gravel occasional boulders in clayey silty sand matrix

Sandstone

Surface water feature

Anticipated collapsed zone within mine

Qu Drift, till, fluvial sand and gravel, lacustrine sand, silt, clay and peat

Qvr Recessional outwash, well sorted sand and pebble-cobble

Qva Advanced outwash pebble-cobble gravel may include very fine sand

Monitoring Interval

Groundwater Flow Direction

Sources for the Geology and Mine Information:
J.E. Luzier 1969; surficial geology
State of Washington, Water Well reports
Mine Superintendant's Records
Landsburg Well Logs

NOTE: Vertical to horizontal scale ratio is 2.5:1
Wells are project normal into the strike of the Cross-Section A-A'

Assuming groundwater discharge at the north and south end of mine.

0 500
FEET

FIGURE 7
CROSS-SECTION ALONG STRIKE AT COAL SEAM
CROSS-SECTION A-A`
PALMER/LANDSBURG MINE/WA

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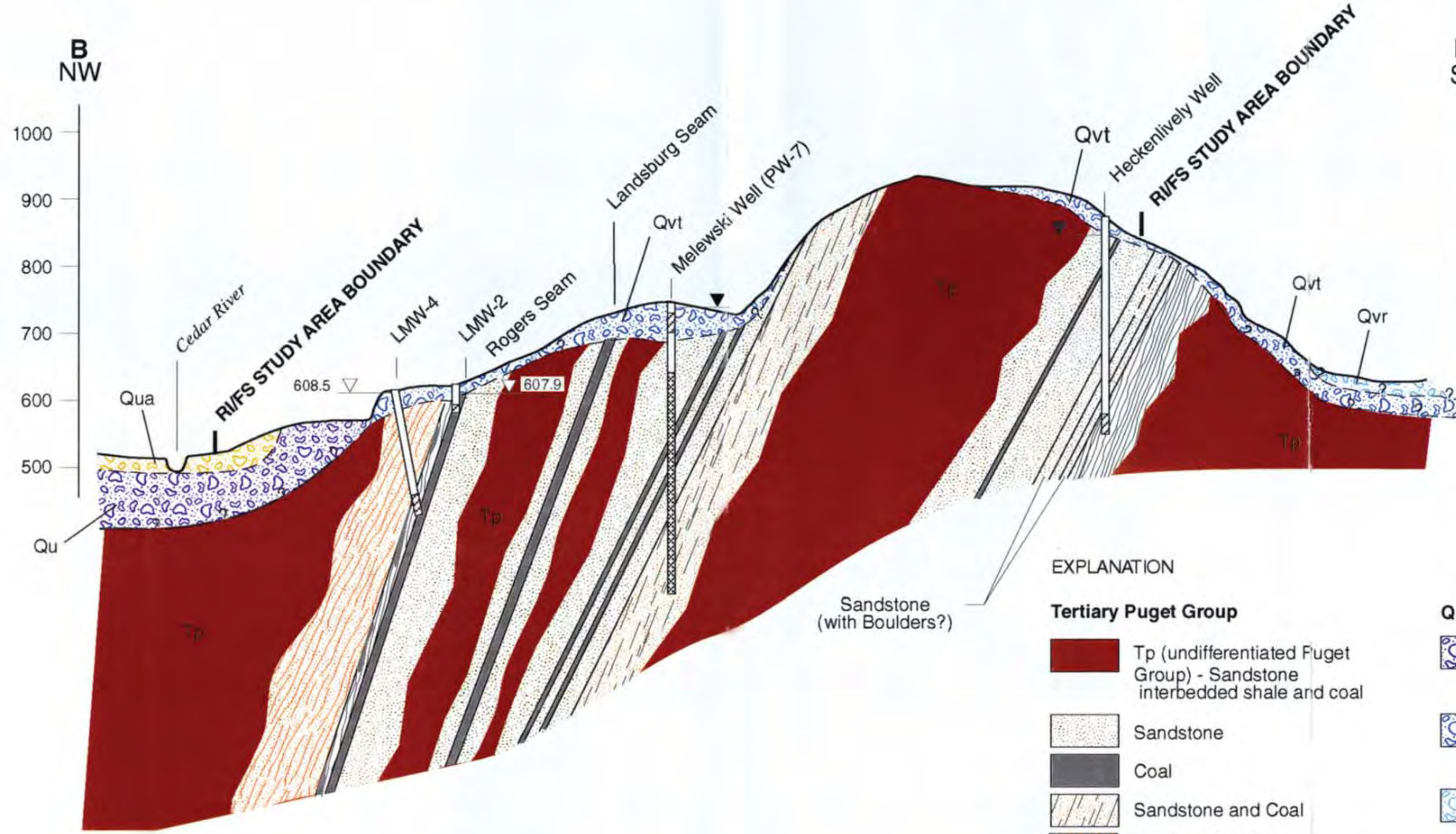
Golder Associates



EXPLANATION

Tertiary Puget Group

- Tp (undifferentiated Puget Group) - Sandstone interbedded shale and coal
- Sandstone
- Coal
- Sandstone and Coal
- Sandy SILTSTONE
- Shale
- Shaley Coal and Shale

- Grouted Closed
- Monitoring Interval
- Approximate Water Level
- 608.5 Water Level (ft amsl) 2/23/94

Quaternary Deposits

- Qu (Pre-Vashon Drift) - till, fluvial sand and gravel, lacustrine sand, silt, clay and peat
- Qvt (Till) - compact mixture of gravel, occasional boulders in clayey silty sand matrix
- Qvr (Recessional outwash) - well sorted sand and pebble-cobble
- Qua (Undifferentiated alluvium) - pebble-cobble gravel and sand

Sources for the Geology and Mine Information:

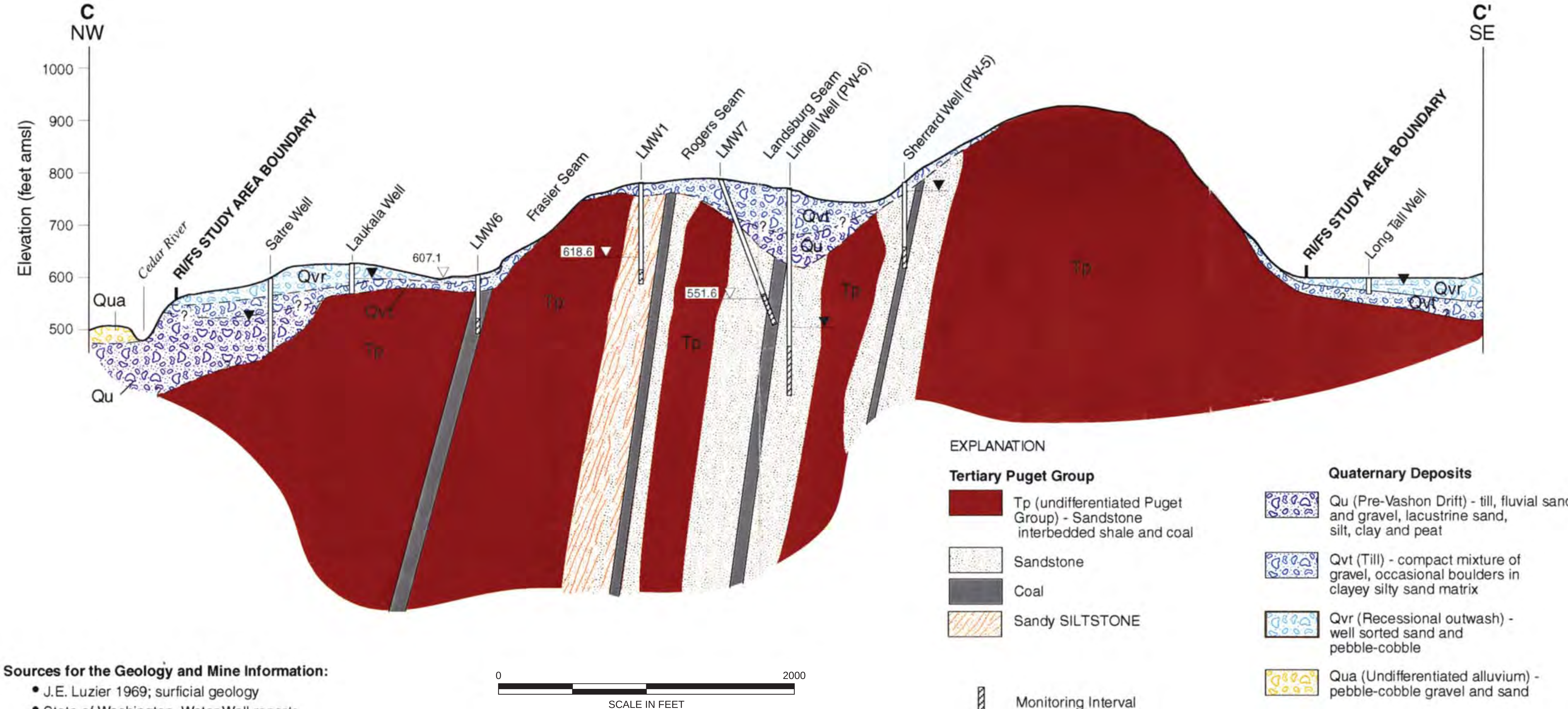
- J.E. Luzier 1969; surficial geology
- State of Washington, Water Well reports
- Mine Superintendant's Records
- Landsburg Well Logs

0 2000
SCALE IN FEET

NOTE: Vertical to Horizontal scale ratio is 3.6:1.
Wells are projected normal into the strike of the Cross-Section B-B'.
Cross-sections are inferred from limited data and should be considered approximate.

FIGURE 8
CROSS SECTION B-B`
PALMER/LANDSBURG MINE/WA

Golder Associates



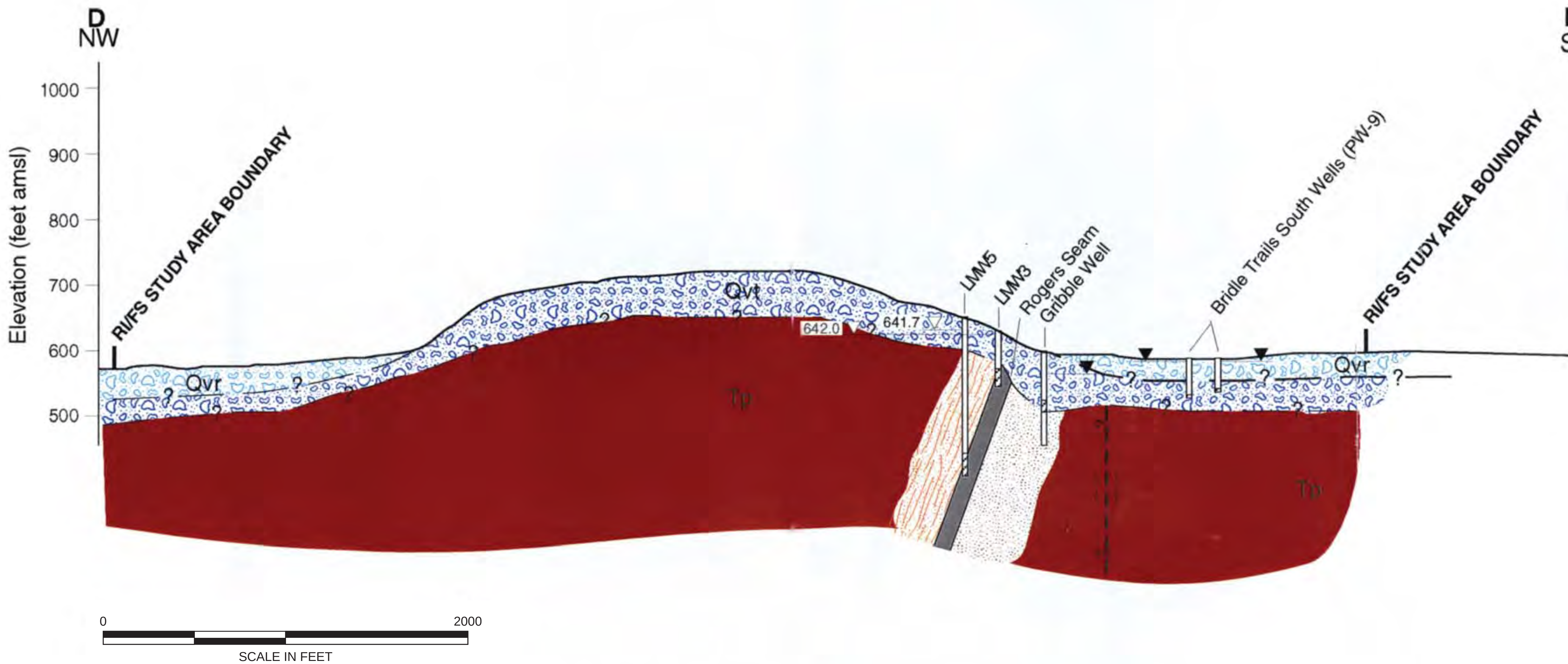
Sources for the Geology and Mine Information:

- J.E. Luzier 1969; surficial geology
- State of Washington, Water Well reports
- Mine Superintendant's Records
- Landsburg Well Logs

NOTE: Vertical to Horizontal scale ratio is 3.6:1.
Wells are projected normal into the strike of the Cross-Section C-C'.
Cross-sections are inferred from limited data and should be considered approximate.

FIGURE 9
CROSS SECTION C-C`
PALMER/LANDSBURG MINE/WA

Golder Associates



EXPLANATION

Tertiary Puget Group

Tp (undifferentiated Puget Group) - Sandstone interbedded shale and coal

Sandstone

Coal

Sandy SILTSTONE

Quaternary Deposits

Qvt (Till) - compact mixture of gravel, occasional boulders in clayey silty sand matrix

Qvr (Recessional outwash) - well sorted sand and pebble-cobble

Monitoring Interval

Approximate Water Level

608.5 Water Level (ft amsl) 2/23/94

Fault, dashed where inferred, queried where uncertain

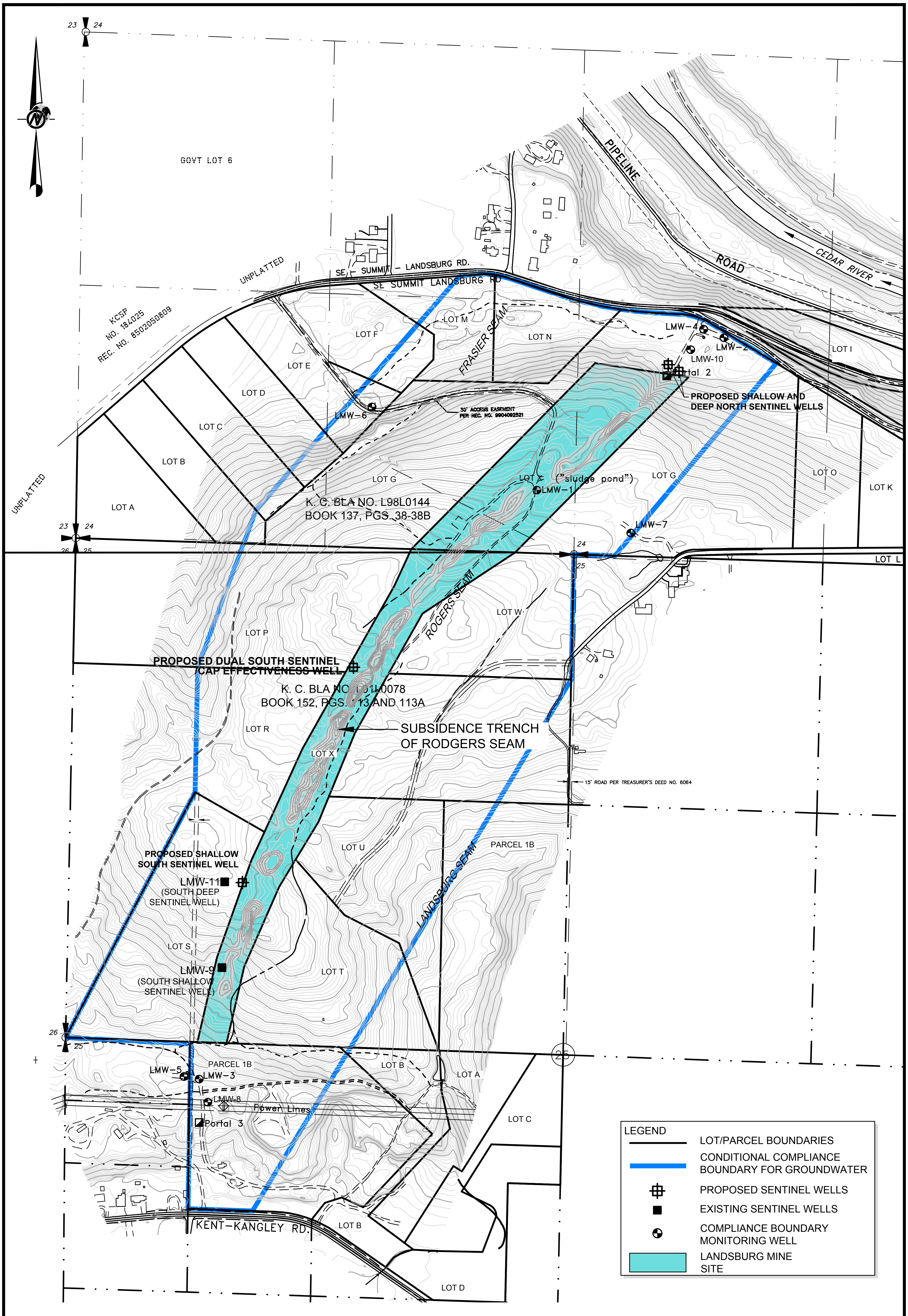
Sources for the Geology and Mine Information:

- J.E. Luzier 1969; surficial geology
- State of Washington, Water Well reports
- Mine Superintendant's Records
- Landsburg Well Logs

NOTE: Vertical to Horizontal scale ratio is 3.6:1.
Wells are projected normal into the strike of the Cross-Section D-D'.
Cross-sections are inferred from limited data and should be considered approximate.

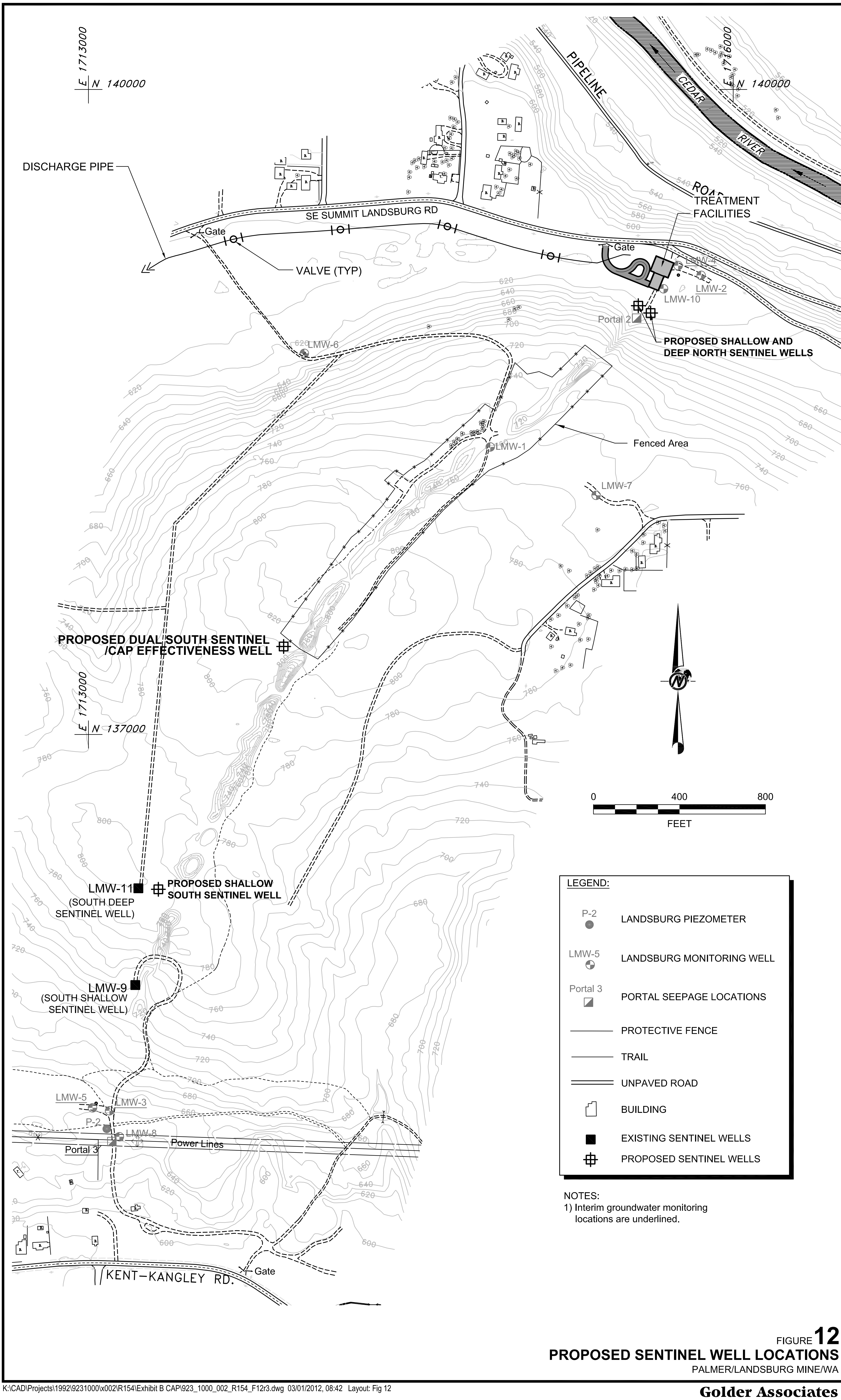
FIGURE 10
CROSS SECTION D-D`
PALMER/LANDSBURG MINE/WA

Golder Associates



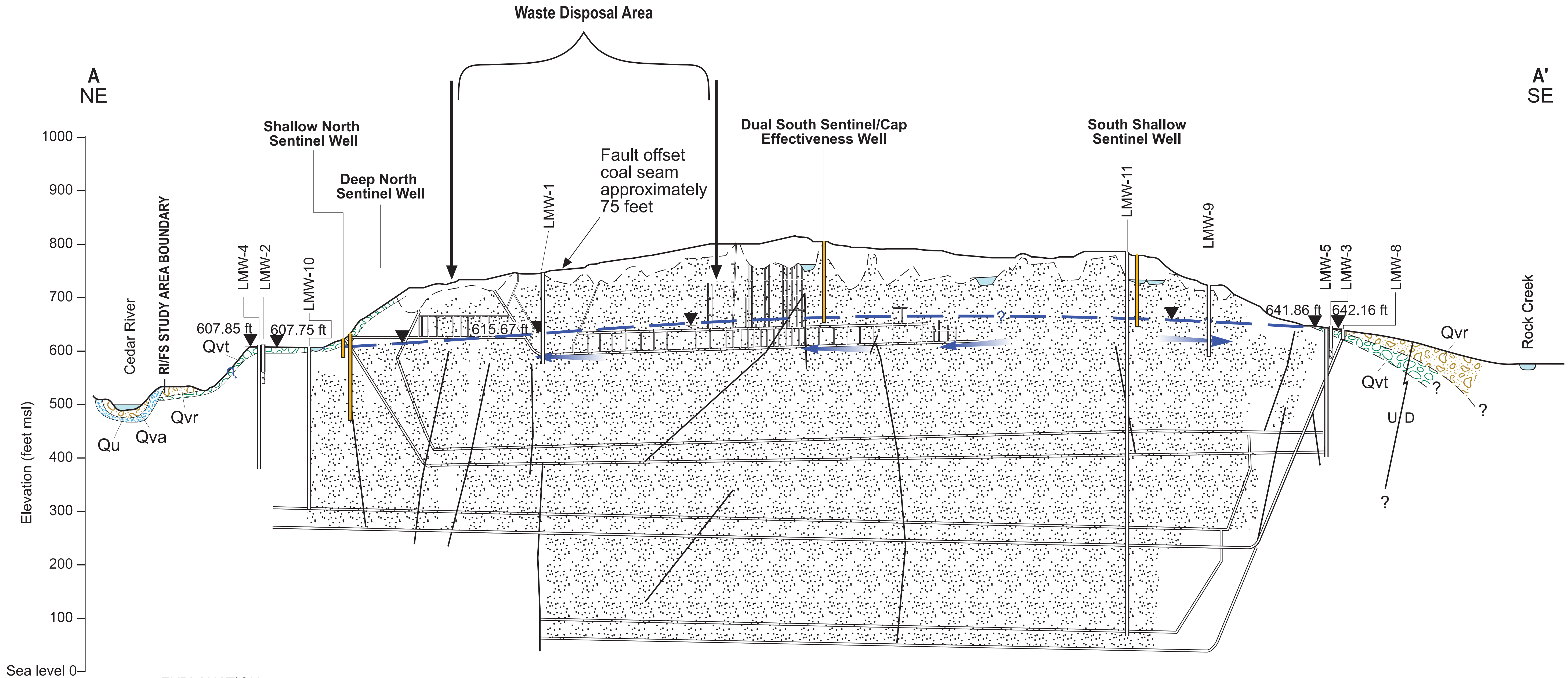
NOTE:
1. LETTERS AT LOT X PROPERTY CORNERS CORRESPOND TO THE COORDINATES IN TABLE 1

FIGURE 11
LOCATION FOR CONDITIONAL POINTS OF COMPLIANCE FOR GROUNDWATER
PALMER/LANDSBURG MINE/WA



NOTES:
1) Interim groundwater monitoring locations are underlined.

FIGURE **12**
PROPOSED SENTINEL WELL LOCATIONS
PALMER/LANDSBURG MINE/WA



EXPLANATION

Potentiometric surface

Outline of trench bottom

Water Level (ft. amsl) 2/23/94

Qvt Till, compact mixture of gravel occasional boulders in clayey silty sand matrix

Sandstone

Surface water feature

Anticipated collapsed zone within mine

Qu Drift, till, fluvial sand and gravel, lacustrine sand, silt, clay and peat

Qvr Recessional outwash, well sorted sand and pebble-cobble

Qva Advanced outwash pebble-cobble gravel may include very fine sand

Monitoring Interval

Groundwater Flow Direction

Sources for the Geology and Mine Information:
J.E. Luzier 1969; surficial geology
State of Washington, Water Well reports
Mine Superintendant's Records
Landsburg Well Logs

NOTE: Vertical to horizontal scale ratio is 2.5:1
Wells are project normal into the strike of the Cross-Section A-A'

Assuming groundwater discharge at the north and south end of mine.

0 500
FEET

FIGURE 13
CROSS-SECTION ALONG STRIKE AT COAL SEAM
CROSS-SECTION A-A`
PALMER/LANDSBURG MINE/WA

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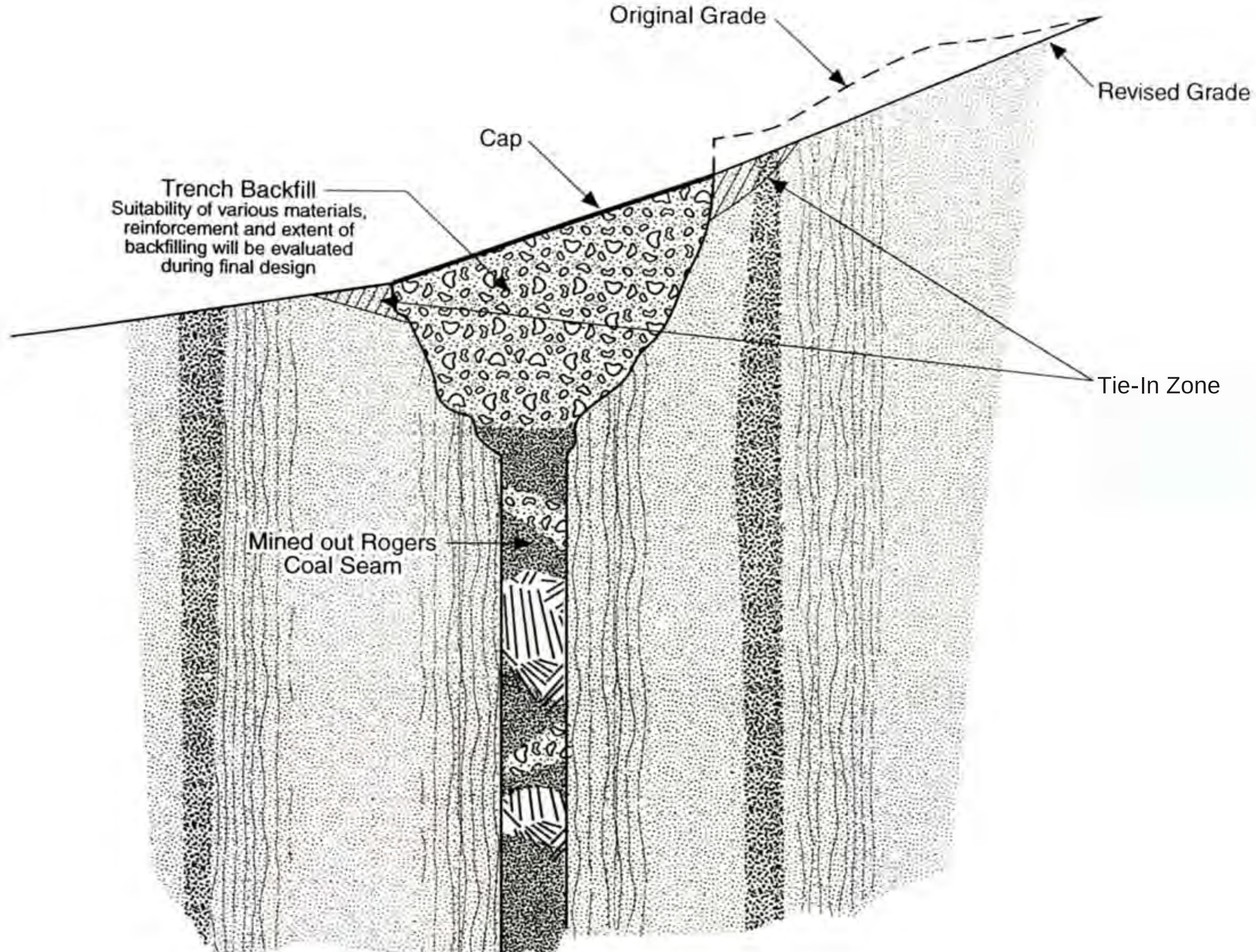
Golder Associates

Conceptual Cross-Section
(not to scale)



Cap Design Options

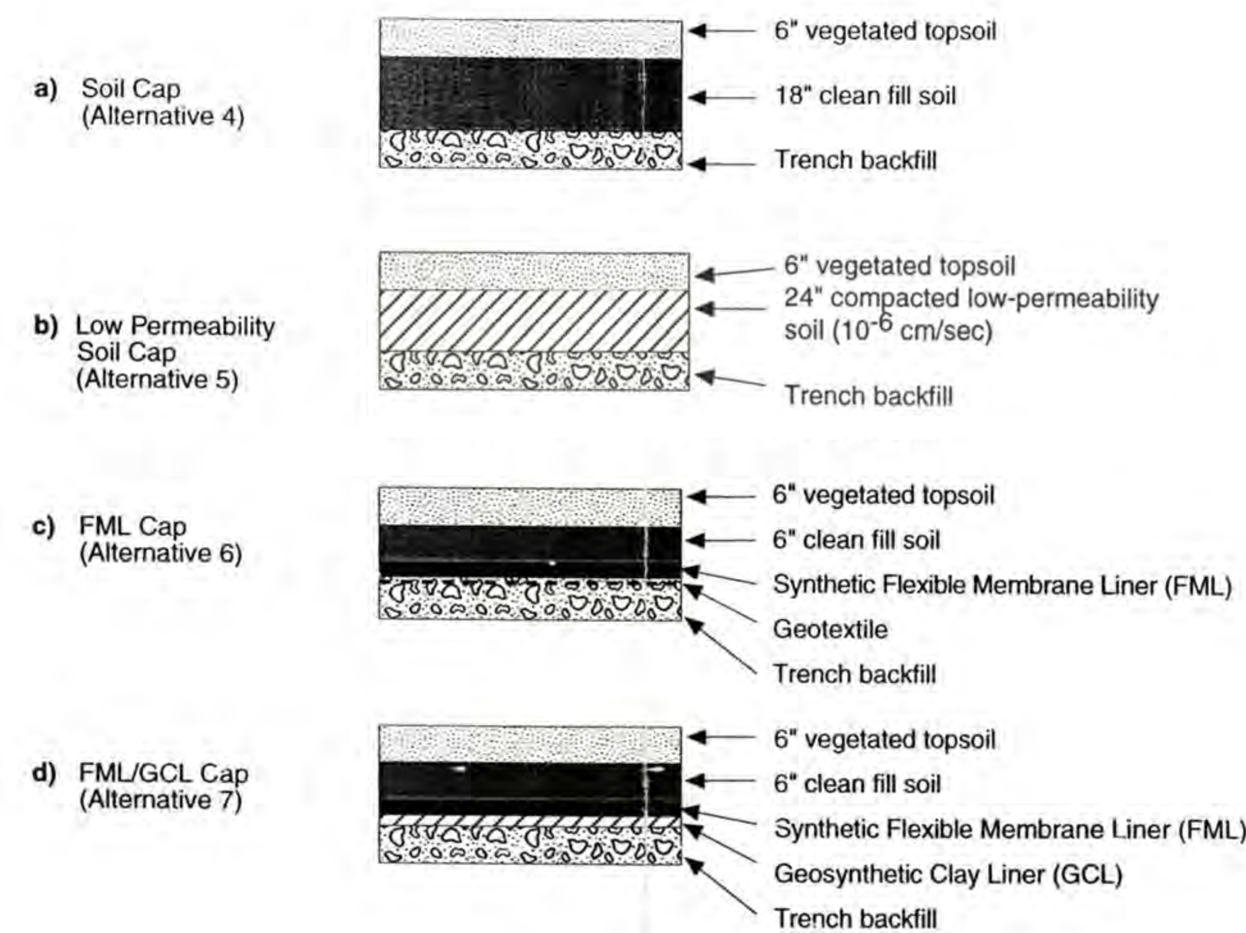
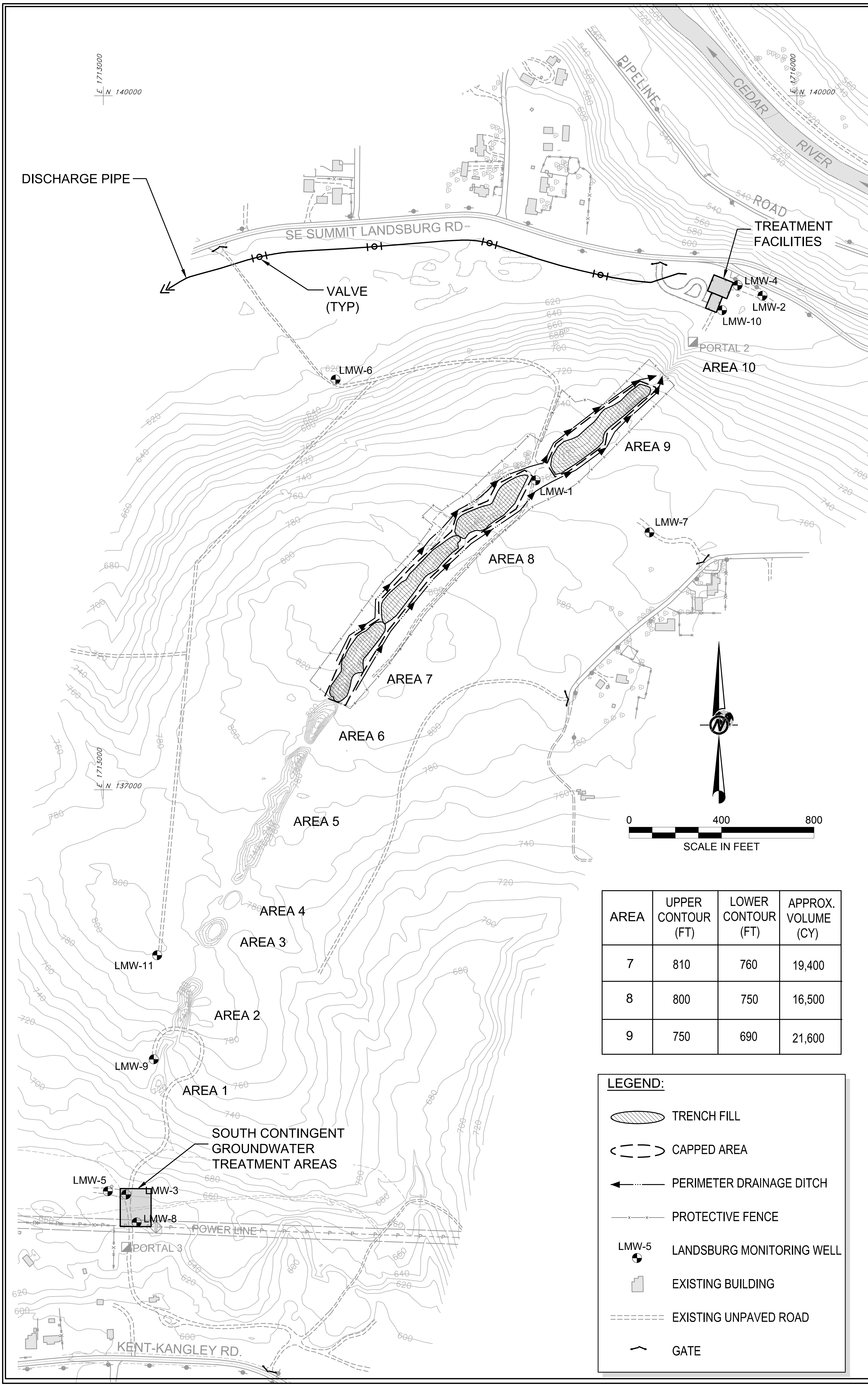


FIGURE 14
CAP DESIGNS
PALMER/LANDSBURG MINE/WA

Golder Associates



AREA	UPPER CONTOUR (FT)	LOWER CONTOUR (FT)	APPROX. VOLUME (CY)
7	810	760	19,400
8	800	750	16,500
9	750	690	21,600

NOTES:

1. TOPOGRAPHY IN VICINITY OF TRENCHES WILL BE MODIFIED AS NECESSARY TO ACCOMMODATE CAP AND DITCHES.
2. ONLY TRENCH AREAS 7,8, AND 9 WILL BE BACKFILLED AND CAPPED.

FIGURE **15**

CAPPED AREA AND DRAINAGE DITCHES

PALMER/LANDSBURG MINE/WA

APPENDIX A

LANDSBURG MINE SITE ARARS

Requirements	Applicable or Relevant & Appropriate	Comment (informal and not legal opinion)
Archeological and Historic Preservation Act Title 16 USC 469a	Applicable	This act requires that actions conducted at the site must not cause the loss of any archeological and historic data. This act mandates preservation of the data and does not require protection of the actual facility. The requirements of this Act are potentially applicable based on a determination of whether such archaeological data occur on site.
Clean Air Act of 1977, as amended Title 42 USC 7401 et seq.	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. The Clean Air Act is implemented in the State of Washington through the Washington Clean Air Act. Washington Clean Air Act criteria which are potentially ARAR for the Landsburg Mine site are presented in Table 4-2 under the State ARAR discussions.
Clean Water Act of 1977 Title 33 USC 1251, as amended		The Clean Water Act establishes the guidelines and standards to control discharge of pollutants to waters of the U.S. Selected sections are discussed below.
Water Quality Standards 40 CFR 131	Applicable	40 CFR 131 establishes the requirements and procedures for states to develop and adopt water quality standards based on federal water quality criteria that are at least as stringent as the federal standards. Washington State has received EPA approval and has adopted more stringent water quality criteria under WAC 173-201A. These criteria are presented in detail as state ARARs, and are listed in Table 4-4.
Section 404 40 CFR 230.10	Applicable	These sections of the Clean Water Act and associated regulations prohibit discharge of dredge or fill material to wetlands as defined by the U.S. Army Corps of Engineers. The Section 404 requirements are potentially applicable based on a determination of the occurrence of wetlands on the Mine site.
National Pollutant Discharge Elimination System (NPDES) 40 CFR 122 to 125	Applicable	The NPDES program controls release of toxic pollutants through monitoring requirements and implementation of a best management practices program. The substantive requirements of the program would be required if discharge of treated waste water were to occur as part of remediation; however, a permit would not be required due to a MTCA exemption.
Endangered Species Act of 1973 Title 16 USC 1531 et seq.	Applicable	The Endangered Species Act of 1973 establishes requirements for the protection of threatened and endangered species. The requirements of this act are potentially applicable based on a determination of whether such species occur on the Mine site or could be impacted by site remedial activities.

Requirements	Applicable or Relevant & Appropriate	Comment (informal and not legal opinion)
Executive Order 11990	Applicable	Executive Order 11990 requires the protection of wetlands from destruction and specifies that construction activities in the area of wetlands be minimized. The federal agencies are to implement these considerations through existing federal requirements, such as the National Environmental Policy Act. The Executive Order is potentially applicable based on a determination of the whether wetlands are present on the Mine site or could be affected by site remedial activities.
Hazardous Materials Transportation Act 49 USC 1801, et seq		
Hazardous Materials Regulation 49 CFR 171	Applicable	No person may offer to accept hazardous material for transportation in commerce unless the material is properly classed, described, packaged, marked, labeled, and in condition for shipment. These requirements are applicable to hazardous material generated during remedial activities that would be sent offsite for disposal.
Hazardous Materials Tables, Hazardous Materials Communications Requirements, and Emergency Response Information Requirements 49 CFR 172	Applicable	These requirements are applicable if hazardous waste is generated during remediation and is transported offsite. Tables are used to identify requirements for labeling, packaging, and transportation based on categories of waste types. Specific performance requirements are established for packages used for shipping and transport of hazardous materials.
National Historic Preservation Act of 1966 Title 16 USC 470	Applicable	The National Historic Preservation Act requires that historically significant properties be protected. The National Register of Historic Places is a list of sites, buildings or other resources identified as significant to United States history. An eligibility determination provides a site the same level of protection as a site listed on the National Register of Historic Places. The requirements of this federal law are potentially applicable based on a determination of whether such properties occur on the Mine site.
National Oil and Hazardous Substances Contingency Plan (NCP) 40 CFR 300	Relevant & Appropriate	Since the Landsburg Mine site is not on the NPL, the NCP is not applicable to this RI/FS. Sections of the NCP may be relevant and appropriate, however, depending on site conditions.
Resource Conservation and Recovery Act Title 42 USC 6901 et seq	Portions Applicable	The Resource Conservation and Recovery Act (RCRA) consists of standards and criteria controlling the treatment, storage and disposal of hazardous wastes. 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). Therefore, to avoid redundancy, RCRA criteria which are potentially ARAR for the Landsburg Mine site are not detailed here. The State of Washington equivalent criteria are presented in the state ARAR discussions and in Table 4-2.

Requirements	Applicable or Relevant & Appropriate	Comment (informal and not legal opinion)
Safe Drinking Water Act of 1974 Title 42 USC 300, et seq.		
National Primary and Secondary Drinking Water Standards 40 CFR 141, 143	Applicable	MTCA requires that groundwater cleanup levels be at least as stringent as maximum contaminant levels (MCLs), and non-carcinogen maximum contaminant level goals (MCLGs) established under the Safe Drinking Water Act where groundwater is a current or potential future source of drinking water.
Surface Mining, Control and Reclamation Act of 1977 30 USC 1201 et seq.		
Underground Mining General Performance Standards 30 CFR 717	Not ARAR	This regulation provides general operational performance standards for underground mines, including reclamation activities. Since the Mine activities had ceased prior to the effective date of this law, these regulations are not applicable.
Abandoned Mine Land Reclamation-General Reclamation Requirements 30 CFR 874	Applicable	These rules describe the eligibility of coal lands for reclamation with money from the Abandoned Mine Reclamation Fund. Coal lands are eligible for reclamation activities if they were mined for coal prior to August 3, 1977, and were left or abandoned in either an unreclaimed or inadequately reclaimed condition. Potentially, this may be applicable to the mine site remedial activities. Funds could be available from the fund to remediate physical hazards posed by the mine and not for any hazards posed by chemical contamination being addressed by Ecology.
Toxic Substance Control Act (TSCA) Title 15 USC 2601 et seq.		
Regulation of PCBs 40 CFR 761	Applicable	TSCA requires that material contaminated with PCBs at concentrations of 50 ppm or greater be disposed of in an incinerator or by an alternate method that achieves an equivalent level of performance. Liquids at concentrations between 50 and 500 ppm and soils above 50 ppm may also be disposed in a chemical waste landfill. TSCA requirements do not apply, however, to PCBs at concentrations less than 50 ppm. TSCA requirements are potentially applicable to remedial actions at the site if PCBs are detected above this level in excavated soils. To date, however, PCBs have not been detected above this concentration at the site.

Requirements	Applicable or Relevant & Appropriate	Comment (informal and not legal opinion)
STATE ARARs		
Model Toxics Control Act Ch. 70.105D RCW	Applicable	MTCA is the key governmental regulation governing the conduct of the overall investigation and cleanup process for the site and is therefore applicable. MTCA describes the requirements for selecting cleanup actions, preferred technologies, policies for use of permanent solutions, the time frame for cleanup, and the process for making decisions. The regulation specifies that all cleanup actions be protective of human health, comply with all applicable state and federal regulations, and provide for appropriate compliance monitoring. Specific criteria for the various cleanup methods are presented in the MTCA regulations. The MTCA regulations specify that cleanup actions utilize permanent solutions to the maximum extent practicable. Although MTCA identifies a hierarchy of preferred technologies that should be evaluated for use in the cleanup action, cost may also be a factor in determining points of compliance and selection of cleanup actions. For example, if the cost of cleanup action is substantial and disproportionate to the incremental increase in protection compared to a lesser preferred cleanup action, the less preferred action may be selected. Generally, technologies that recycle or re-use materials are preferred most, followed by methods that destroy or detoxify hazardous substances, and cleanup methods that may leave contaminants on-site. 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 several state laws. These include the State Clean Air Act (RCW 70.94), Solid Waste Management - Reduction and Recycling Act (RCW 70.95), Hazardous Waste Management Act (RCW 70.105), Water Pollution Control Law (RCW 90.48), Shoreline Management Act (RCW 90.58), and Construction Projects in State Waters (RCW 75.20). In addition, the exemption also applies to the procedural requirements of any laws requiring or authorizing local governmental permits or approval for the remedial action. Therefore, while substantive compliance is necessary, permits and approvals are not required for remedial actions at the site.
Model Toxics Control Act Cleanup Regulations WAC 173-340	**Applicable**	WAC 173-340, which implement the requirements of MTCA, contains the primary regulations under which the Landsburg Mine site RI/FS process is being conducted and are therefore applicable. These regulations establish administrative processes and standards to identify, investigate and cleanup facilities where hazardous substances have been released.
Department of Natural Resources WAC Forest Practices Permit WAC 222	Applicable	The State Department of Natural Resources (DNR) requires a Forest Practices Permit whenever more than 5,000 board feet of marketable timber is harvested from an area or property. If remedial actions at the Landsburg Mine site will remove trees having greater than 5,000 board feet of marketable timber, the substantive requirements of this rule would be applicable. Remedial actions under a Consent Decree are exempt from procedural and permitting requirements under MTCA; however a Forest Practices Permit is still required in this case.

Requirements	Applicable or Relevant & Appropriate	Comment (informal and not legal opinion)
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. This standard specifically exempts CERCLA and MTCA cleanup actions, and provides for groundwater cleanup standards at such sites to be developed under WAC 173-340-720. Therefore, WAC 173-200 is neither applicable nor relevant and appropriate to the Landsburg Mine site.
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. 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 4-3.
Department of Game Procedures WAC 212-12	Applicable	This standard defines the requirements that the Department of Game must take to protect endangered or threatened wildlife. These requirements may be applicable if endangered or threatened wildlife are identified at the site or within Department of Natural Resources records searches.
Shoreline Management Act Guidelines WAC 173-16	Applicable	The act provides guidelines for the development of master programs regulating the use of shorelines. The substantive requirements of the Act are potentially applicable to the Landsburg Mine site if remedial activities occur within 200 ft of the Cedar River shoreline area.

Requirements	Applicable or Relevant & Appropriate	Comment (informal and not legal opinion)
State Environmental Policy Act (SEPA) Ch. 43-21C RCW SEPA Rules WAC 197-11 SEPA Procedures WAC 173-802	Applicable	SEPA is applicable to remedial actions at the Landsburg Mine 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. The SEPA process is triggered when a governmental action is taken on a public or private proposal. According to WAC 197-11-784, a proposal includes both regulatory decisions of agencies and actions proposed by applicants. If the proposal is not "exempt", Ecology will require the submission of a SEPA checklist which solicits information regarding how the proposal will affect elements of the environment, such as air, water, etc. If the proposal is determined by Ecology to have a "probable significant adverse environmental impact", an environmental impact statement (EIS) will be 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) will be issued and the SEPA process is completed without preparation of an EIS. Any public comment period required under SEPA must be combined with any comment period associated with the MTCA process 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, the DNS can be issued with the draft Cleanup Action Plan prepared pursuant to MTCA.
Hazardous Waste Management Act 70.105 RCW	Portions Applicable	Recent amendments to MTCA (RCW 70.105D.090) exempt cleanup actions conducted pursuant to a Consent Decree or Agreed Order from the procedural requirements of this law, but still requires substantive compliance with MTCA. The exemption does not apply to the substantive provisions, however, which still may apply depending on site conditions. Also, recent amendments to RCW 70.105 provide a conditional exemption to state-only dangerous wastes generated during a cleanup action conducted under a Consent Decree. Therefore, substantive provisions of this Act may be applicable if non-exempt dangerous wastes are generated during cleanup.

Requirements	Applicable or Relevant & Appropriate	Comment (informal and not legal opinion)
Dangerous Waste Regulations WAC 173-303		A partial list of potentially applicable sections of the Dangerous Waste Regulations are included below.
Designation of Waste WAC 173-303-070	Applicable	These requirements establish the methods and procedures to determine if solid waste requires management as dangerous waste. The substantive requirements of this section may be applicable if remedial activities involve the generation of waste.
Requirements for Generators of Dangerous Waste WAC 173-303-170	Applicable	Substantive requirements for generators of dangerous waste established under this chapter may be applicable to remedial actions performed at the site if dangerous waste is generated.
Closure and Post Closure WAC 173-303-610	Potentially relevant and appropriate	This section describes closure and postclosure performance standards for dangerous waste units, including requirements for plan preparation, maintenance and monitoring of waste containment systems, groundwater monitoring, deed notices, etc. Because the Landsburg Mine site stopped receiving waste materials prior to the effective date of this regulation and does not meet the definition of a regulated facility, these requirements of WAC 173-303 are not legally applicable to the site. Most of the requirements of this section are procedural, and not relevant because of the MTCA exemption for procedural requirements. Subsection 610(2), “Closure performance standard”, corresponds to threshold requirements under MTCA. Therefore, the remedy selected by Ecology will satisfy this closure performance standard by definition. Some of these regulations may be relevant and appropriate, however. The most relevant portion of Section 610 is subsection (7), “Postclosure care and use of property”. This subsection addresses post-closure maintenance and monitoring, including groundwater monitoring. Section (10) requires a notice in the property deed. The relevant requirements of Section 610(7) and (10) may be appropriate for the Landsburg Mine site.
Releases from Regulated Units WAC 173-303-645	Potentially relevant and appropriate	WAC 173-303-645 regulates releases from regulated units. Although the Landsburg Mine site does not meet the definition of a regulated dangerous waste unit, the requirements of this section are relevant. Portions of this section may be appropriate, such as: Groundwater protection standard, 645(3) Compliance period, 645(7) General groundwater monitoring requirements, 645(8) Detection monitoring program, 645(9) Compliance monitoring program, 645(10). The relevance and appropriateness of these sections will be considered in the preparation and review of the Compliance Monitoring Program required under MTCA.

Requirements	Applicable or Relevant & Appropriate	Comment (informal and not legal opinion)
Landfills WAC 173-303-665	Potentially relevant and appropriate	Design standards specific to dangerous waste landfills are found in WAC 173-303-665. Of these, liner and operating standards are not relevant to closure of the Landsburg Mine site. Potential leachate will be addressed by groundwater monitoring pursuant to the approved MTCA Compliance Monitoring Program. Section 665(6) addresses closure and post-closure care, which is relevant to this site. The design standard for the final cover, which may or may not be appropriate for this site, consists of the following [WAC 173-303-665(6)(a)]: "(i) Provide for long-term minimization of migration of liquids through the closed landfill (ii) Function with minimum maintenance; (iii) Promote drainage and minimize erosion or abrasion of the cover; (iv) Accommodate settling and subsidence so that the cover's integrity is maintained; and (v) Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present."
Solid Waste Management, Recovery, and Recycling Act Ch. 70.95 RCW Minimum Functional Standards (MFS) for Solid Waste Handling WAC 173-304	Applicable	Recent amendments to MTCA (RCW 70.105D.090) exempt cleanup actions conducted pursuant to a Consent Decree or Agreed Order from the procedural requirements of this law. The exemption does not apply to the substantive provisions, however, which still may apply depending on site conditions. MTCA regulations [WAC 173-340-710(b)(c)] specify that WAC 173-304 contains the "minimum requirements" for landfill closure conducted as a MTCA cleanup action.
General Closure and Post-Closure Requirements, Landfilling Standards WAC 173-304-407, -460 Criteria for Municipal Solid Waste Landfills(MSWLF) WAC 173-351	Applicable Not ARAR	WAC 173-304-460 capping requirements include a minimum 2 ft. thick clay layer having a permeability of 1 x 10^{-6} or lower. Alternately, a synthetic liner material may be substituted for the soil layer. The MFS represent the primary capping criteria to consider in this FS. The purpose of the regulation is to establish minimum state-wide standards for all municipal solid waste landfill (MSWLF) units. This regulation implements rulemaking by the EPA under the authority of Subtitle D of RCRA, as amended in 1984. The criteria apply only to new and existing MSWLF. MSWLF units that stopped receiving waste prior to October 9, 1991 are subject to closure and post-closure rules under chapter 173-304. Because the Landsburg Mine site is not a MSWLF and stopped receiving waste prior to the applicable date, these rules are not ARAR to the site. All other solid waste disposal facilities that are not regulated under Subtitle C of RCRA (and the State of Washington equivalent – WAC 173-303) are subject to the criteria under WAC 173-304 "Minimum Functional Standards for Solid Waste Handling."

Requirements	Applicable or Relevant & Appropriate	Comment (informal and not legal opinion)
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.
Water Pollution Control/Water Resources Act Ch. 90.48 RCW/Ch. 90.54 RCW Surface Water Quality Standards WAC 173-201A	Applicable	Recent amendments to MTCA (RCW 70.105D.090) exempt cleanup actions conducted pursuant to a Consent Decree or Agreed Order from the procedural requirements of this law. The exemption does not apply to the substantive provisions, however, which still may apply depending on site conditions. 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. Groundwater beneath the site may discharge to the Cedar River, therefore surface water quality criteria established under this chapter may potentially be applicable to the groundwater at the point of discharge to the river. Ecology has announced anticipated rule development for the purpose of adopting risk-based numeric limits for protection of public health as required by the federal CWA (WSR-18-095). Other proposed changes to the standard were also announced in WSR-94-16-056. Table 4-4 lists criteria for selected compounds.
State Waste Discharge Program WAC 173-216 National Pollution Discharge Elimination System Permit Program WAC 173-220	Applicable Applicable	Requirements of this program may be applicable to remedial actions that include discharges to the ground. The chapter implements a permit system applicable to industrial and commercial operations that discharge to the groundwater, surface waters, or municipal sewerage systems. Specific discharges prohibited under the program are identified. Cleanup actions conducted under a Consent Decree or Agreed Order are exempt, however, from procedural requirement (permits). Establishes a state permit program pursuant to the national NPDES system. Substantive sections of the regulation may be applicable to remedial alternatives that involves discharges to surface waters. Discharges may include site run-off, spillage, leaks, sludge, or treated waste disposal.
Washington Clean Air Act Ch. 70.94 RCW and Ch. 43.21A RCW		Recent amendments to MTCA (RCW 70.105D.090) exempt cleanup actions conducted pursuant to a Consent Decree or Agreed Order from the procedural requirements of this law. The exemption does not apply to the substantive provisions, however, which still may apply depending on site conditions.

Requirements	Applicable or Relevant & Appropriate	Comment (informal and not legal opinion)
General Regulations for Air Pollution Sources WAC 173-400	Applicable	Substantive standards established for the control and prevention of air pollution under this regulation may be applicable to remedial actions proposed for the operable unit. The regulation requires that all sources of air contaminants meet emission standards for visible, particulate, fugitive, odors, and hazardous air emissions. The Puget Sound Clean Air Agency (PSCAA) enforces and administers these requirements in the greater Puget Sound Area. Refer to discussion under PSCAA.
Controls for New Sources of Air Pollution WAC 173-460	Applicable	This standard requires that new sources of air emissions provide emission estimates for toxic air contaminants listed in the regulation. The standard requires that emissions be quantified and used in risk modeling to evaluate ambient impacts and establish acceptable source impact levels. These standards are applicable since the regulation specifically lists sites subject to MTCA actions.
Puget Sound Clean Air Agency (PSCAA)		PSCAA, activated under the Washington State Clean Air Act (RCW 70.94) 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 the King, Pierce, Snohomish and Kitsap county areas.
Regulatio n 1	Applicable	Regulation 1 establishes the general requirements and programs the agency uses to administer its regulatory program. Substantive aspects of this regulation may be applicable to the mine site if remediation activities may result in the emission of air contaminants regulated by the agency. Specific requirements of the program concern: registration of sources, new source review, emission standards and ambient air quality standards and control methods required.
Regulation 2	Not ARAR	Regulation 2 provides for the control of photochemically reactive volatile organic compounds (VOCs), precursors to low atmospheric ozone formation, in order to meet National Ambient Air Quality Standards (NAAQS) for Ozone. The regulation identifies specific source categories regulated under the standard. Regulation 2 is not ARAR since the Landsburg Mine site does not meet the definition of any of the sources regulated nor are VOCs anticipated to be released in quantities significant for the standard to be considered relevant and appropriate.
Regulation 3	Applicable	Regulation 3 controls the emission of toxic air contaminants, sources of, and development of strategies to protect public health and the environment from impacts of toxic air contaminants and may be applicable if toxic air contaminants are emitted. Ambient air concentrations for toxic air contaminants are established by PSCAA for the Puget Sound Region. Best Available Control Technology (BACT) is required for sources that emit toxic air contaminants. Toxic air contaminants are listed in Appendix A of Regulation 3 or listed in Subpart D, 40 CFR 372. Appendix A also identifies Acceptable Source Impact Levels (ASILs) for toxic air contaminants. Specific procedures for asbestos emission control are also addressed under Regulation 3.

Requirements	Applicable or Relevant & Appropriate	Comment (informal and not legal opinion)
Surface Mined-Land Reclamation Act Ch. 78.44 RCW Surface Mined-Land Reclamation WAC 332-18	Not ARAR	These regulations specify reclamation requirements for surface mines in the State of Washington. However, since the Landsburg Mine is an underground Mine, and involved coal mining, which is specifically exempted in the Act, the requirements of these regulations are not applicable or relevant and appropriate to closure activities conducted at the site. Primacy for regulation of coal mining in the State of Washington rests with the federal Office of Surface Mining.
LOCAL ARARs[a]		
King Co. Zoning Code Title 21 KCC	Applicable	Substantive requirements of the County zoning ordinance are applicable to remedial actions at the Landsburg Mine site. However, remedial actions are exempt from permitting and procedural requirements under MTCA.
Special Control Areas and Flood Hazard Areas Ch. 21.54 KCC Sensitive Areas Ordinance and Rules Ordinance 9614	Applicable	Sensitive Areas in King County are defined and regulated by the Sensitive Areas Ordinance, King County Code Chapter 21.54, and its administrative rules. The locations of sensitive areas are identified in the Sensitive Areas Map folio for wetlands, streams, flood hazards, erosion hazards, landslide hazards, seismic hazards, and coal mine hazards. The Sensitive Areas Rules set forth procedures and standards to be followed when a development proposal involves a sensitive area. The main portion of the Mine site is identified in the folio as a coal mine hazard area. Other portions of the site are mapped as erosion hazard areas. Since the Mine site is included in a sensitive area, the substantive requirements of the Sensitive Areas Ordinance are applicable to remedial action at this site. However, remedial actions are exempt from procedural and permitting requirements under MTCA.
Isolated Wetland Disturbance and Mitigation King County 21A.24.330 KCC	Applicable	King County Wetland ordinance sets forth standards and procedures to be followed when a proposed project will impact a wetland. The MTCA Consent Decree will require the filling of two wetlands, totaling approximately 0.09 acres. Substantive requirements of the County ordinance are applicable at the Landsburg Mine site; however, remedial actions under a Consent Decree are exempt from the procedural and permitting requirements under MTCA. These wetlands are isolated and are not hydrologically connected to any navigable waterway. In regards to the isolated wetlands, alteration of these systems is permitted as follows: “on sites twenty acres or greater in size, up to three isolated wetlands may be altered by combining their functions into one or more replacement wetlands on the site pursuant to an approved mitigation plan; and whenever an isolated wetland is altered pursuant to this subsection, the replacement wetland shall include enhancement for wildlife.” Therefore, a mitigation site with a wildlife component will be required on-site or as close to

Requirements	Applicable or Relevant & Appropriate	Comment (informal and not legal opinion)
		Therefore, a mitigation site with a wildlife component will be required on-site or as close to the site as possible. The required mitigation of Class 3 wetlands is 1:1, with an additional 25-footbuffer to surround the mitigation site. Additional acreage will most likely be considered as part of wildlife enhancement, although activities such as the installation of waterfowl nesting boxes or bat roosting boxes is also appropriate.
Clearing and Grading	Applicable	A Clearing Permit is required for any removal of trees and vegetation in a sensitive area or special district area. A grading Permit is required for any amount of grading around a sensitive area, or for a proposed project that will disturb 100 cubic yards or greater. Substantive requirements of the County ordinance are applicable at the Landsburg Mine site; however, remedial actions under a Consent Decree are exempt from the procedural and permitting requirements under MTCA.

[a]Under RCW 70.105D.090, cleanup actions conducted under Consent Decrees or Agreed Orders are exempt from the procedural requirements of any laws requiring or authorizing local government permits or approvals for the remedial action, but must meet the substantive requirements of the permits.

APPENDIX B

SEPA DETERMINATION OF NONSIGNIFICANCE

WAC 197-11-970 Determination of nonsignificance (DNS).

DETERMINATION OF NONSIGNIFICANCE

Description of proposal: The Landsburg Mine site is a former underground coal mine located approximately 1.5 miles northwest of Ravensdale in southeast King County. During the late 1960s and early 1970s, a portion of a trench at the top of the mine was used as a disposal site for a variety of industrial wastes. The industrial wastes are confined within a limited portion of the trench located atop the former mine. A major risk to human health and the environment is through the groundwater pathway. However, environmental investigations and groundwater monitoring have shown no groundwater contamination at the site so far. The proposed project is to clean up the site under the regulatory authority of the Model Toxics Control Act (MTCA). The proposed remediation will consist of the following tasks:

- Filling in the northern portion of the mine trenches where the wastes are located.
- Capping the northern portion with a low permeability soil cap and landscaping it to divert surface water and reduce rainfall infiltration.
- Applying institutional controls on land and groundwater use and preventing access to the former mine portal areas where most of the groundwater from within the mine flows out.
- Installing infrastructure for contingent groundwater capture and treatment should contamination be detected at site wells.
- Monitoring groundwater indefinitely.
- Having a contingency plan and infrastructure facilities to contain, safely treat, and dispose of contaminated groundwater should there be a detection at the site.

The proposed cleanup is described in more detail in a Draft Cleanup Action Plan (DCAP), which is one of the exhibits to the MTCA consent decree (legal agreement) being proposed to clean up this site. The SEPA checklist describing the remedial construction activities is part of the DCAP. The SEPA and MTCA documents will undergo a combined 30 day public comment period before Ecology approves the proposed work.

Proponent: Landsburg Mine Site PLP Group

Location of proposal, including street address, if any: The site is approximately 1.5 miles northwest of Ravensdale in rural southeast King County, Washington. It is situated south and east of the S.E. Summit-Landsburg Road and north of the Kent-Kangley Rd (State Highway 516). It is located within sections 24 and 25, Township 22 N., Range 6 E., in the northwest corner of the Cumberland 7.5 minute quadrangle along the boundary with the Hobart quadrangle.

Lead agency: Washington State Department of Ecology

The lead agency for this proposal has determined that it does not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030 (2)(c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public on request.

☐ There is no comment period for this DNS.

☐ This DNS is issued after using the optional DNS process in WAC 197-11-355. There is no further comment period on the DNS.

☑ This DNS is issued under WAC 197-11-340(2); the lead agency will not act on this proposal for 30 days from the date below. Comments must be submitted by November 11, 2013 to Jerome Cruz, 3190 - 160th SE Bellevue, WA 98008, Tel. 425-649-7094.

Responsible official: Robert W. Warren

Position/title: Northwest Regional Office Section Manager, Toxics Cleanup Program **Phone:** (425)649-7054

Address: 3190 - 160th SE Bellevue, WA 98008

Date: October 11, 2013 **Signature:** ____________________

APPENDIX C

RESPONSIVENESS SUMMARY

RESPONSIVENESS SUMMARY

for

Landsburg Mine Site
October 11 – December 12, 2013 Public Comment Period

Cleanup Consent Decree including Draft Cleanup Action Plan and SEPA Determination

Prepared by
Washington State Department of Ecology
Northwest Regional Office
Toxics Cleanup Program
Bellevue, Washington

March 2017

Location: Ravensdale, King County, Washington
CS ID: 60
FS ID 2139
Site Manager: Jerome B. Cruz
Public Involvement Coordinators: Nancy Lui, Thea Levkovitz

Contacts

Jerome B. Cruz, Cleanup Site Manager
Washington State Department of Ecology
Toxics Cleanup Program
3190 160th Ave SE Bellevue, WA 98008
Phone: (425) 649-7094
E-mail: jerome.cruz@ecy.wa.gov

More Information

The Consent Decree, Consent Decree exhibits (including cleanup action plan), SEPA Checklist and Determination of Non-Significance are available at:

Washington State Department of Ecology
Northwest Regional Office Central Records
3190 160th Ave SE Bellevue, WA 98008

Call for an appointment: Sally Perkins
Phone: (425) 649-7190
Fax: (425) 649-4450
E-mail: sally.perkins@ecy.wa.gov
Hours: Tuesday – Thursday
8:00 a.m. – 12:00 p.m.
1:00 p.m. – 4:30 p.m.

The above documents and Responsiveness Summary including all original comments are also available electronically on the web at Ecology's Landsburg Mine site web page: https://fortress.wa.gov/ecy/gsp/Sitepage.aspx?csid=60

Accommodation Requests:
To request ADA accommodation including materials in a format for the visually impaired, call Ecology at 425-649-7286 or visit http://www.ecy.wa.gov/accessibility.html. Persons with impaired hearing may call Washington Relay Service at 711. Persons with speech disability may call TTY at 877-833-6341.

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LIST OF ACRONYMS

ARAR	Applicable, Relevant and Appropriate Requirements
APA	Administrative Procedure Act
BIOSCREEN	BIOSCREEN Natural Attenuation Decision Support System
CAP	Cleanup Action Plan
CUL	Cleanup Level
CRC	Cedar River Council
CGTS	Contingent Groundwater Treatment System
DCAP	Draft Cleanup Action Plan
DNS	Determination of Nonsignificance
DOH	Department of Health
GMVUAC	Great Maple Valley Unincorporated Area Council
MTCA	Model Toxics Control Act
O&M	Operation & Maintenance
PLP	Potentially Liable Persons
POTW	Publicly Owned Treatment Works
RCW	Revised Code of Washington
RI/FS	Remedial Investigation/Feasibility Study
SEPA	State Environmental Policy Act
TCP	Toxics Cleanup Program
WAC	Washington Administrative Code

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Executive Summary

The Washington State Department of Ecology (Ecology) held a comment period from October 11 through December 12, 2013 on the proposed environmental cleanup of the Landsburg Mine Site in Ravensdale, Washington. Ecology reviewed all the comments to the Draft Cleanup Action Plan. This response to comments (Responsiveness Summary) contains Ecology's answers and changes to the cleanup plan in response to input from the public, stakeholder groups, the City of Kent, and the Washington Department of Health (DOH).

The 2013 Draft Cleanup Action Plan (DCAP) proposed the following cleanup actions:

- Cover and contain the waste disposal area at the Site and cap it with soil that reduces infiltration by rainwater.
- Install early warning monitoring wells to find out if contamination is moving in groundwater and to be able to respond quickly to prevent it from moving off-site .
- Monitor groundwater coming from the Site for contamination.
- If contamination is detected in Site groundwater at certain trigger levels, PLPs will pump, contain, and treat any contaminated groundwater as described in the contingency plan. The treated water will be safely discharged to the sewer.
- Install infrastructure (cement pad, electrical connections, fencing, pipeline, and improved road access) to speed up the time needed to implement the contingency plan.
- Apply legal restrictions that restrict future land use, groundwater use, and any activities that could affect the cleanup remedy to protect human health and the environment.

In response to comments received, the final cleanup plan will be changed to:

- Increase how often the monitoring wells are tested to ensure that groundwater is protected over the long-term.
- Test groundwater for 1,4-dioxane in addition to existing list of chemicals that will be routinely monitored.
- Revise the triggers for the contingency plan, so that the PLPs will take the actions in the contingency plan sooner.
- Install additional performance monitoring wells to verify that contaminated groundwater is not leaving the Site.
- Ecology has agreed to incorporate the actions suggested by the Washington State Department of Health. These include the following:
    - Perform targeted private well surveys and test nearby private water wells annually for five years and re-evaluate if necessary.
    - Describe in the cleanup plan the public water systems that are near the site.
    - Collect water table data to better understand flow directions in the former mine.
    - Conduct additional testing of soils just outside the edge of the proposed cap.
    - Perform surface water testing at the former mine portals.
    - Change the depth of the proposed deep sentinel well at the north end of the site to provide better vertical coverage of the groundwater.

- Explain how the contingent treatment system will operate to prevent contaminated groundwater, if ever detected, from existing the Site.

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I. Introduction

This document summarizes and responds to public comments received on the proposed Consent Decree and State Environmental Policy Act (SEPA) determination for the environmental cleanup of the Landsburg Mine Site located in Ravensdale, Washington (Site). The Consent Decree includes a cleanup plan describing the proposed remediation of this Site following the requirements of the Model Toxics Control Act (MTCA).

The Washington State Department of Ecology (Ecology) and the Potentially Liable Persons (PLPs) will enter into a legal agreement called a Consent Decree. The PLP Group includes Browning-Ferris Industries of Illinois, Inc., BNSF Railway Company, PACCAR Inc, Weyerhaeuser Company, TOC Holdings Co., and Palmer Coking Coal Company. Burlington Environmental Inc., a subsidiary of Philip Services Corporation or PSC, settled its liability under a 2003 bankruptcy settlement. Under the Consent Decree, the PLPs will agree to and will become legally obligated to clean up the Site in accordance with the Final Cleanup Action Plan (CAP). The CAP has been finalized after Ecology made minor revisions in response to public comments, as discussed below. The Final CAP will be an exhibit to the Consent Decree, which will be filed in King County Superior Court.

In 2013, the public was invited to review and comment on the draft Consent Decree and its exhibits.

Ecology made available the following documents for public review and comment:

- Consent Decree and exhibits, including the Draft Cleanup Action Plan (DCAP).
- SEPA Checklist.
- SEPA Determination of Non-Significance (DNS).

The initial comment period ran from October 11 through November 11, 2013. In response to a request from the City of Kent, the comment period was extended through December 12, 2013.

Ecology held a public meeting at the Tahoma Junior High School on October 24, 2013 to provide information and take comments. Twenty-one people attended this meeting. The public meeting included an open question and answer session. The question and answer session was designed to provide immediate responses to the public's questions and concerns.

In December 2013, the City of Kent asked the Washington State Department of Health (DOH) to evaluate the site characterization work. DOH completed their evaluation in November 2016, and recommended that Ecology conduct some additional work (add link to the health consultation report). Ecology and the PLPs have agreed on appropriate responses to many of DOH's recommendations.

This responsiveness summary provides Ecology's responses to all of the written comments received from interested parties during the comment period.

This document is organized into seven parts:

1) Site background
2) Cleanup Action Plan description
3) Summary of Public Involvement for Consent Decree
4) Comments received and Ecology's responses
5) Summary of DOH Consultation and Ecology's responses
6) Summary of changes to be made to the Final CAP
7) Compilation of all written comments and documents (Appendix A). The complete comment document from the City of Kent is also provided in an accompanying compact disc in Appendix A

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II. Site Background

The Landsburg Mine Site is a former underground coal mine located approximately 1.5 miles northwest of Ravensdale in southeast King County (Figure 1). Due to the mining operations, the ground above the mined coal seam subsided, forming a long, narrow trench above the former mine (Figure 2). The northern half of this trench was used to dispose of a variety of industrial wastes during the late 1960s and late 1970s. Detailed records indicate that approximately 4,500 drums and 200,000 gallons of oily wastes were disposed of in the trench. Contaminants of concern, based on limited sampling of the northern trench area, include chromium, lead, PCBs (polychlorinated biphenyls), bis(2-ethylhexyl)phthalate, methylene chloride, TCE (trichloroethene), and petroleum hydrocarbons.

Environmental investigations began in 1990. In 1991, a number of accessible drums were removed from the site. The environmental investigations and groundwater testing conducted over the last 25 years indicate that groundwater discharging from the former mine is not contaminated. The surrounding geology and the results of remedial investigations beginning in 1994 indicate the wastes are confined to the northern trench and possibly within the mine workings beneath this area of the former mine. However, contamination from the wastes could still be released from the Site and transported off-site via groundwater, despite the fact that to date, no groundwater contamination has been detected coming from the former mine. The potential for any off-site migration of contamination is a concern because water from the mine discharges towards Cedar River and Rock Creek and because groundwater in the area outside of the Site is a source of drinking water.

Groundwater movement away from the Site generally occurs in all directions. However, it appears to be highly directional, i.e. flow is chiefly along the mine workings to the former mine entrances or "portals" located at the north and south ends of the subsidence trench. As a result, if contaminants were released, it would likely be to the north and/or south of the Site.

The focus of the investigative and cleanup approach has been to monitor the discharge points of the groundwater flow system. As a precaution, it is assumed that the wastes or their leachates could migrate out of the former coal mine from these points at some time in the future. This cautionary approach, while conservative, was adopted due to several factors including:

- the lack of groundwater impacts outside of the mined coal seam,

- high hydraulic conductivity within the mined-out seam,
- known discharge points for groundwater from the mine workings at the portal areas, and
- the geometry of the mined out seam with respect to surrounding geology.

The Site has been under a MTCA Agreed Order since 1993. The Remedial Investigation/Feasibility Study (RI/FS) report was completed in 1996 after undergoing a public comment period. Ongoing semi-annual groundwater monitoring has continued through the present under the requirements of the 1993 Agreed Order. A public review version of the Draft CAP was completed in 2013. Following the MTCA process, the Consent Decree, including the Draft CAP, underwent a public comment period that began on October 11, 2013 and ended on December 12, 2013.
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III. Cleanup Action Plan (CAP)

In order to protect human health and the environment, as required by MTCA, the following objectives will be met by implementing the remedial action as described in the 2017 Final CAP (which reflects changes to the 2013 DCAP as described in Sections VI and VII below):

- Isolate and contain the wastes in the northern trench,
- Prevent or reduce leaching of the wastes by rain and groundwater,
- Reduce the amount of groundwater emanating from the mine, and
- Implement the contingency plan in the event contaminants are detected at a certain level in groundwater discharging from the former mine.

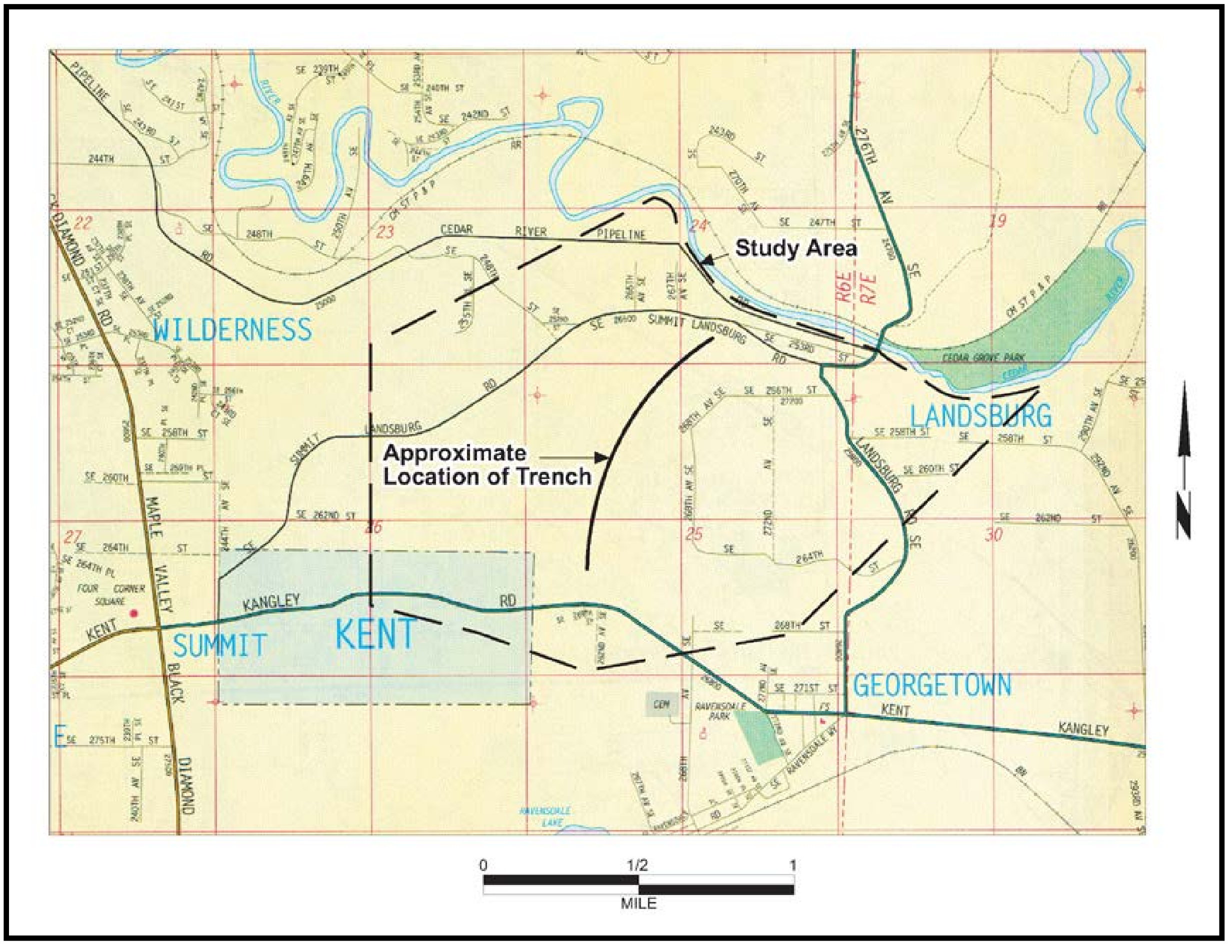

Figure 1. Location of Landsburg Mine site

Based on Site work, previous investigations, and limited physical surveys, it appears that the wastes are confined to the northern trench. Groundwater is the most likely pathway for any contaminants to migrate. To date, there have been no impacts to groundwater emanating from the mine at the Site. No contaminants associated with the historic waste disposal have been detected in over 25 years of groundwater testing. This cleanup action will:

- Cover the areas of known waste deposits,
- Monitor groundwater at the Site indefinitely
- Implement the contingency plan and detection system if certain triggering events occur, and
- Establish financial assurance for Operation & Maintenance and corrective measures.

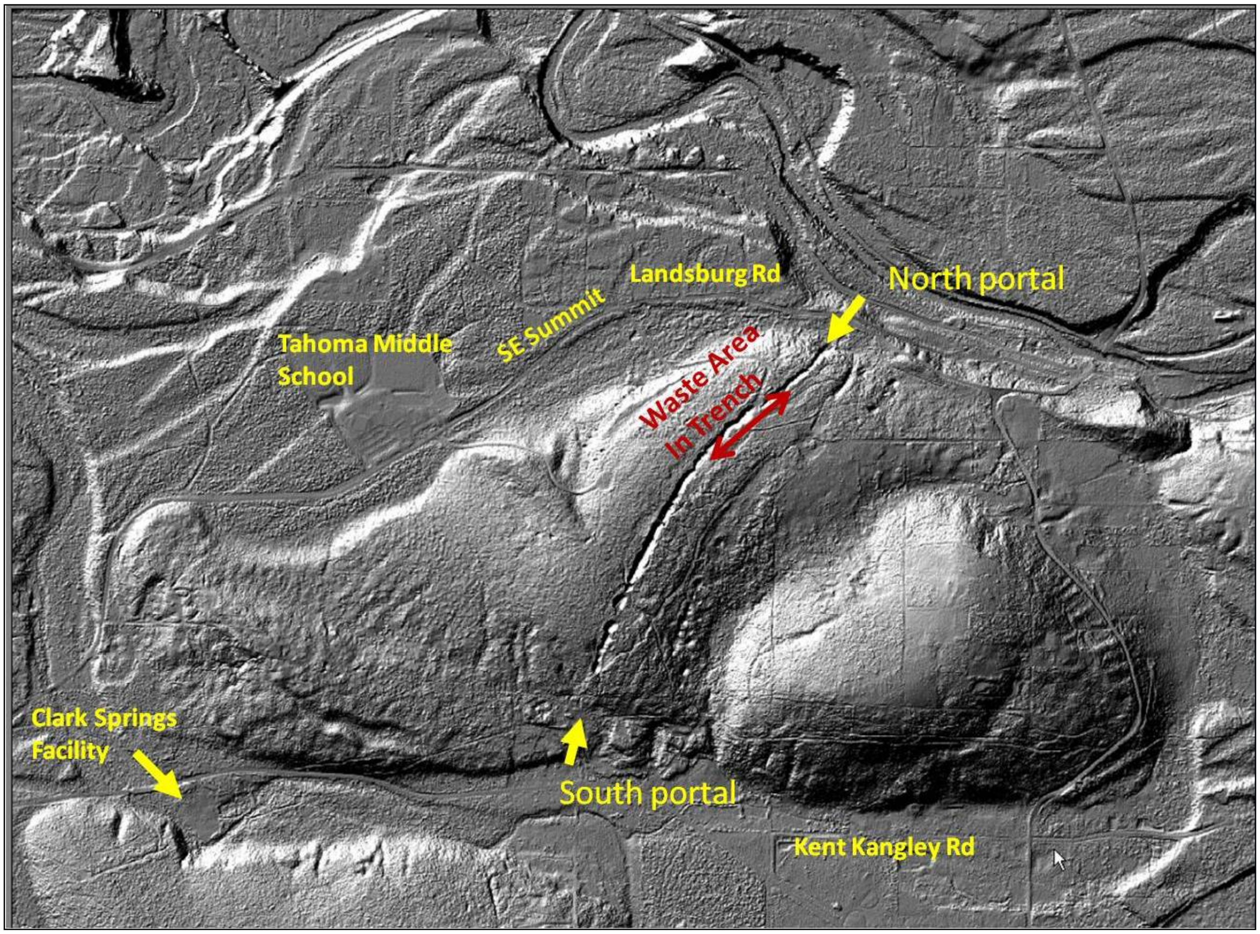

Figure 2. Lidar (Light radar) image showing the "bare earth" surface without trees or vegetation. Trench that formed above the former coal mine is linear feature between north and south portals.

The Final CAP calls for covering the waste deposit areas in the northern portion of the trench with clean fill to bring the grade to the surface. A low-permeability soil cap, with vegetation, will be placed as the final surface of the trench to minimize water infiltration. This final surface will be graded to direct surface water away from the trenches. Long-term groundwater monitoring will be performed indefinitely to test for any contamination from the former mine.

The Final CAP also includes a Contingent Groundwater and Extraction Treatment System Plan that will be installed if the concentration of a Site-related contaminant is detected in any of the sentinel wells at or above the cleanup levels. The treatment system will be activated and operated if the contaminant concentrations reach or exceed one-half the cleanup levels at a compliance well. These more protective trigger levels were included in the Final CAP in direct response to public comments received on the DCAP. The system will include groundwater pumping to contain and prevent contaminated groundwater from leaving the Site.

The Final CAP also requires monitoring groundwater at the Site indefinitely and establishing financial assurance for Operation & Maintenance and corrective measures. The documents containing these additional requirements will be referenced throughout this document as follows:

- Compliance Monitoring Plan: Part A of Exhibit D to the draft Consent Decree
- Operation and Maintenance (O&M) Plan: Part B of Exhibit D to the draft Consent Decree
- Contingent Groundwater Extraction and Treatment System Plan (Groundwater Contingency Plan): Part C of Exhibit D to the draft Consent Decree

In those instances where changes to the 2013 DCAP were made in the 2017 Final CAP, whether in response to the DOH Consultation or public comments, the changes are described in the appropriate portions of Section V below.

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IV. Summary of Public Involvement for Consent Decree

Public Involvement activities at this Site have included the following:

- Publication of paid display ads in *King County Journal* on October 20, 2005 and February 2, 2006.
- Publication of notice in the Washington State Site Register, October 3, 2013.
- Distribution of a fact sheet describing the Site and the proposed cleanup through a mailing to approximately 4,715 addresses, including the Ravensdale community and other interested parties (mailed October 4, 2013).
- Dissemination of Press Releases announcing the proposed plan, comment period and public meeting. These press releases were sent to daily newspapers and broadcasters in King County, Kent/Renton/Auburn reporters, Voice of the Valley, Puget Sound Business Journal, King 5 television, and to subscribers who receive all of Ecology's news releases.
- Interview with the King 5 News Reporter Gary Chittim during a Site visit. Subsequently, King 5 broadcast its news piece on October 14, 2013 (see https://fortress.wa.gov/ecy/gsp/DocViewer.ashx?did=61936 for video of newscast).
- Attending the monthly meetings of the Greater Maple Valley Area Council on October 7, 2013 and Cedar River Council on October 22, 2013 to announce the proposed cleanup and answer questions.
- Posting of the documents on the Washington State Department of Ecology (Ecology) website (https://fortress.wa.gov/ecy/gsp/Sitepage.aspx?csid=60) and announcements on social media
- Public meeting held on October 24, 2013 to present the cleanup and answer questions. "Flyover" video presentation that provides background and graphics of the site, made available during the public meeting and via Ecology's website.
- Providing copies of the above documents through information repositories at Ecology and at the Maple Valley Library.

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V. Public Comments Received and Ecology's Responses

Ecology received sixteen (16) written comments on the 2013 DCAP from individuals and interested parties during the comment period. The submissions were from residents, area councils, and the City of Kent. Ecology reviewed all comments received. In this document, the written comments are summarized or quoted directly where appropriate.

Table 1. List of Commenters

Name	Date submitted:	Submitted as:
Gary Habenicht	10-24-2013	Email
Gordy & Leah George	10-24-2013	Sign-up sheet from 10-24-2013 public meeting
Jim Lee	10-24-2013	Comment from 10-24-2013 public meeting
Bill & Jane Nation	10-24-2013	Comment from 10-24-2013 public meeting
Gretchen Gibbs	10-27-2013	Email
Jon Parkinson	10-28-2013	Email
Craig Weinstein	10-28-2013	Email
John McTighe	10-24-2013	Comment from 10-24-2013 public meeting
	11-2-2013	Email
Sam R. Gallant	11-4-2013	Mailed comment form
Jason Howell	11-12-2013	Email
Brad and Becky Lake	12-5-2013	Email
Steve Hiester, on behalf of the Greater Maple Valley Unincorporated Area Council	12-11-2013	Email letter attachments
Larry Phillips and Reagan Dunn co-chairmen on behalf of the Cedar River Council	12-12-2013	Email letter attachment
Timothy LaPorte, on behalf of the City of Kent	12-12-2013	Email and hardcopy

A copy of the complete comment document by the City of Kent may be found in the accompanying compact disc in Appendix A, or may be viewed at Ecology Northwest Regional Office at the address listed on page 4.

Ecology grouped all the comments into related topics, as shown in Table 2. Ecology's response follows each comment.

Table 2. Public Comments by Topic

This responsiveness summary does not include requests for information by contractors on potential contracting opportunities in connection with the proposed cleanup, requests for contact information, or requests to be included in mailing lists, since those requests were not directly related to the contents of the DCAP and proposed remedial action.
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A. Private Well Testing

(Gordy & Leah George, Jim Lee, Bill & Jane Nation, John McTighe, Brad and Becky Lake, Cedar River Council)

Gordy & Leah George, Jim Lee, Bill & Jane Nation, John McTighe, Brad and Becky Lake and the Cedar River Council requested that private drinking water wells be tested for contaminants.

Ecology's Response

The requests for testing appear to be based on a concern that contamination from the Site has impacted surrounding groundwater, including private drinking water wells near the Site. Private well testing was done in 1992 by the Department of Health (DOH) and in 1994-95 for the remedial investigation (RI). No contamination was detected in private wells during either of these investigations. In addition, interim groundwater testing has been conducted at the Site since 2000, and continues to show no negative impacts to groundwater at the Site.

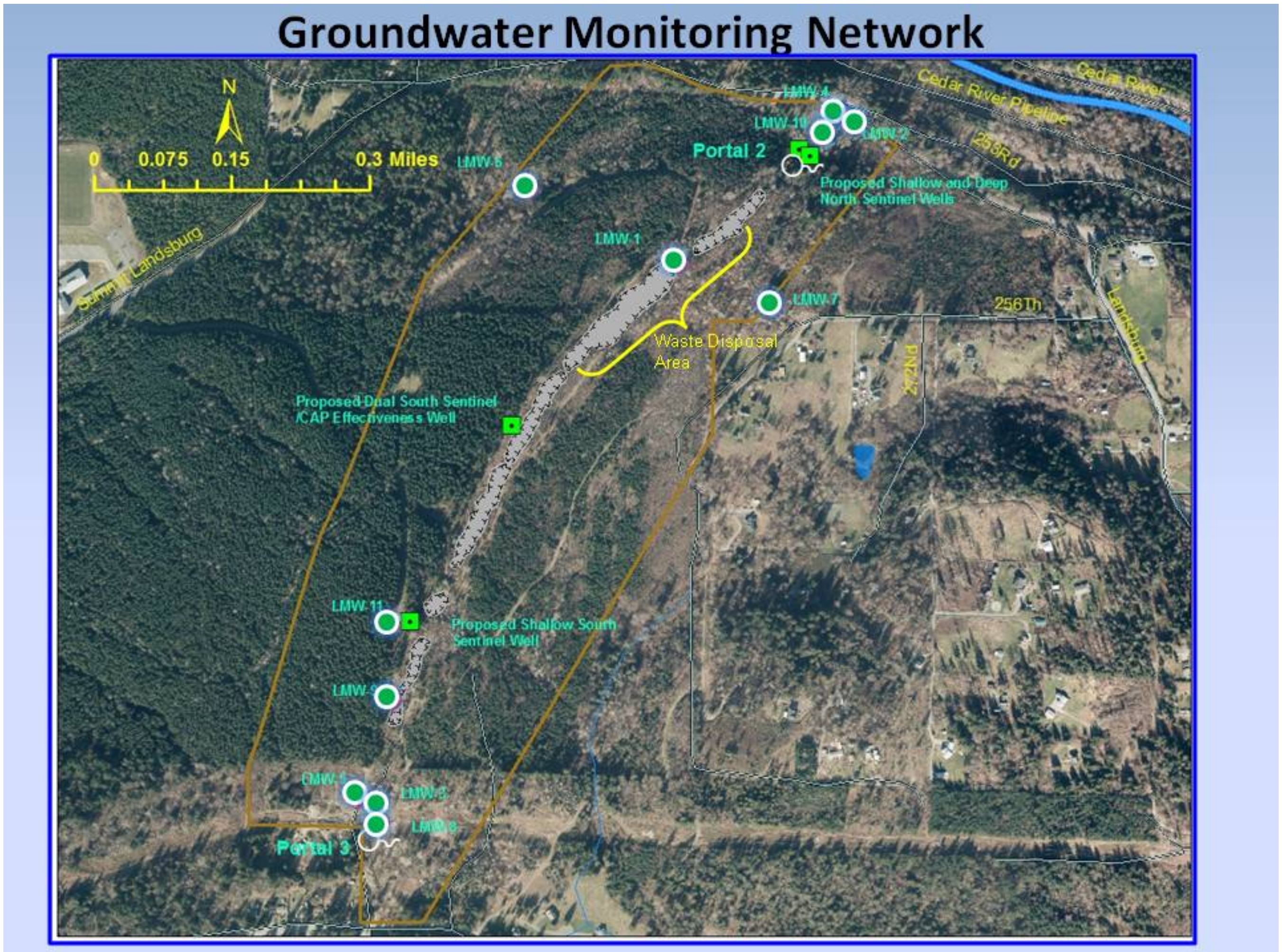

Figure 3. Location of existing and proposed monitoring wells at the site.

In 2014, Ecology responded to this concern by offering to test nine nearby private wells for the full suite of contaminants analyzed at the Site. Two owners agreed. In the fall of 2014, Ecology tested water in these wells for the same contaminants as those being tested for at the Site. Although the samples contained a few detections of common trace metals and in one well, substances called phthalates, no contaminants related to the Landsburg Mine Site were detected.

Furthermore, the detected contaminants were below state cleanup levels and EPA's maximum contaminant levels (MCLs) for drinking water. These substances are commonly found in drinking water and natural water. For the chemicals tested, Ecology considers the well water from those two wells to be as good or better than other public drinking water systems.

The on-site monitoring wells are also closer to the former mine than any of the surrounding private wells (see Figure 3). The Site wells are located in the immediate path where potentially contaminated groundwater could flow from the waste area. These wells will detect any contamination before it reaches the private wells.

In addition, in response to the recommendations made by DOH, the Final CAP has been modified to require testing of active private wells nearest the north and south portals annually for five years, for the same chemicals as the on-site monitoring wells. Ecology and the PLPs will re-evaluate the need for further private well testing during each five year periodic review.
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B. Wildlife

(Gary Habenicht, Bill & Jane Nation)

Concerns were raised about the fate of wildlife (such as bears) that might live in the trench area. Mr. Habenicht contends that bears den there for the winter.

Ecology's Response

The industrial wastes deposited in the northern mine trench contain hazardous substances or toxins that can threaten human health and the environment. This would include a risk to the health of wildlife through direct contact (exposure to soil and surface water in the waste area). By filling in the northern trench with clean fill and capping it with a low permeability cap, the remedial action will isolate the wastes (encapsulate it), prevent direct contact, and minimize the amount of water that could leach through the wastes. Over the long-term, this will protect wildlife that could otherwise be exposed to the hazardous substances.

Before infilling, there will be clearing and grubbing that may be expected to drive off wildlife that may be in the trench area. The Engineering Design Report (EDR) for the cleanup will address the appropriate measures such as using air horns to drive off wildlife during tree clearing and grubbing to avoid unnecessary impacts to wildlife.
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C. Property Values

Bill & Jane Nation asked, "What happens to our property value?"

Ecology's Response:

Ecology has no knowledge of whether the property values near the Site have been impacted by proximity to Landsburg Mine Site. However, if property values have been impacted, property values typically recover after cleanup and Site improvements.
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D. Noise and Pollution

Bill & Jane Nation expressed a concern about the noise level and an increase in pollution caused by the cleanup process.

Ecology's Response:

There will be a temporary increase in truck traffic and machinery operations at the Site and in the surrounding area during cleanup construction. Appendix B in the DCAP contains the SEPA checklist, which addresses these types of environmental health concerns.

Construction activities for the cleanup are not anticipated to occur for a period exceeding 6 to 8 months. The construction activities will be conducted during daylight hours. If on-Site sources of backfill are used, only minimal impact to public traffic is anticipated due to the majority of truck traffic being primarily confined to the Site. If off-Site material is used for backfill during the first construction phase, it is estimated that approximately 50 to 60 trucks will be hauling fill to the Site per day on public roads for 100 to 120 days over approximately 20 to 25 weeks during the first phase of construction. The amount of truck traffic during the second construction phase would be much less and should not pose a significant impact on public traffic.

The cleanup will be carried out under a Health and Safety Plan by workers properly trained for hazardous waste work. Standard engineering and operational practices will be used as needed to control fugitive dust from source material, excavation, hauling the clean backfill and cap materials, and placement of the materials within the trenches. The Health and Safety Plan will require protection monitoring during construction and will include air monitoring requirements for ensuring that the workers and off-site public are not exposed to potential Site contaminants. The Health and Safety Plan will be submitted for Ecology's review and approval before construction activities begin at the Site.
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E. Site Characterization and Investigation

(Gretchen Gibbs, Jon Parkinson, Craig Weinstein, Jason Howell, Brad and Becky Lake and the City of Kent)

1. The City of Kent commented that there has been little characterization of the Site and no waste characterization. Gretchen Gibbs, Jon Parkinson, Craig Weinstein, Jason Howell, Brad and Becky Lake stated that they did not believe that the characterization work conducted at the Site was sufficient for Ecology to accurately assess the potential risk to local schools, residents, and watersheds.

Ecology's Response:
Ecology concluded that the Site investigation and characterization were adequate based on the results of the following investigations and technical assessments using empirically collected data and reliable data sources:

- 1990: Surface Water Sampling (Geraghty and Miller, 1990)
- 1990: Soil Gas Survey (Applied Geotechnology, 1990)
- 1991: Site Hazard Assessment (Ecology and the Environment, Inc. 1991)
- 1991: Emergency Drum Removal (Burlington Environmental, 1991)
- 1992: Interviews with mine personnel with firsthand experience during the period of disposal (Golder Associates Inc., January 1992)
- 1992: Private Well and Surface Water Sampling (State of Washington Department of Health, 1992)
- 1994-1996: Remedial Investigation and Feasibility Study (Golder Associates Inc., 1996)
- 2000 to Present: Interim Groundwater Monitoring (17 volumes of Landsburg Mine Site Interim Groundwater Monitoring Results) (Golder Associates Inc.)
    - 2004: South Portal Hydrogeologic Study: Installed and monitored three new wells (LMW-8, LMW-9 and P-2) at the southern end of the former mine to better understand hydrogeology.
    - 2004: Installed a deep well (LMW-10) (at approximately 300 feet depth) at the north portal area to monitor potential deep contamination migrating to the north.
    - 2005: Installed another deep well (LMW-11) (at approximately 700 feet depth) at the south mine interior to monitor potential deep contamination migrating to the south.
- 2005: Landsburg Mine—Formal Coal Mine Hazard Assessment (SubTerra, May 2005)
- 2006: Rogers Mine Groundwater Geochemistry Testing for Natural Attenuation Evaluation (Golder Associates Inc., April 27, 2006])
- 2009: Landsburg Potential Contaminant Adsorption Testing (assorted documents, Golder Associates Inc., 2009)
- 2008: BIOSCREEN Modeling for Determination of Protective Groundwater Monitoring Frequency (Golder Associates Inc., October 13, 2008)
- 2016 : Health consultation by DOH on site characterization. Ecology and the PLP Group made minor modifications to the DCAP in response to DOH's recommendations.

The above investigations and technical studies obtained sufficient information about the wastes and Site characteristics to allow Ecology to make a decision regarding the remedial action. For example, sampling and analyses of the soil and drum contents conducted during the 1991 Site Hazard Assessment (SHA) and Emergency Drum Removal established that wastes, waste area soils, and water in the trench contained hazardous substances in concentrations exceeding

MTCA cleanup levels. The SHA included the collection of 14 surface and subsurface soil samples from within the northern trench, surface water samples from two ponds, and liquid samples from three exposed drums.

In addition, sufficient investigation of the Site was carried out in the 1996 RI/FS to adequately characterize the Site for purposes of development and evaluation of cleanup action alternatives. The 1996 RI/FS included the following investigative activities:

- Phase I Site assessment
- Mine history and hazard assessment
- Air monitoring
- Source identification/location characterization in Rogers trench (geophysical surveys)
- Private well survey and sampling (including the Clark Springs water supply) for four quarters
- Monitoring well installation, including hydraulic tests and water level monitoring
- Quarterly surface and groundwater monitoring (sampling and chemical analysis)
- Surface soil sampling of trench rim and portal areas with bedrock fracture characterization
- Topographic survey and geologic reconnaissance

The soil sampling for the 1996 RI/FS was limited to the portal areas and trench rim because the interior trench area was previously sampled during the SHA and Drum Removal project in 1991. Undisturbed soil samples collected on the trench rim and in the portal areas showed no chemicals above natural background levels. Therefore, there was no need to expand the soil sampling program. The record of soil testing and analysis is presented in the final RI/FS report. Based on a recommendation by DOH, the Final CAP has been revised to require that additional soil samples be collected at the edge of the proposed cap and tested for volatile chemicals will be conducted.

The approach taken during the 1996 RI was to focus environmental sampling efforts on potential pathways of contaminants leaving the former mine and not on wastes present within the former mine itself. The presence of wastes in the trench is sufficiently known based on extensive review of disposal records, manifests, and interviews. This was in addition to in-trench sampling completed during the 1991 SHA. Further invasive investigations in the former mine were limited due to physical constraints and dangers. Record and Site investigation results indicated that the following wastes are isolated in the northern portion of the trench:

- An estimated 4,500 drums of waste
- Approximately 200,000 gallons of oily waste and sludge
- Wastes included paint wastes, solvents, and metal sludges

Site characterization must include hydrogeology to characterize aquifers, aquitards, groundwater flow directions, and for this Site, potential contaminant transport pathways. Detailed hydrogeologic investigations have concluded the following:

- Preferential flowpaths are to the north and south portals
- Vertically dipping bedrock layers on either side of the former mine greatly limit lateral or side flow

- Upward vertical gradients exist at the portal wells
- Precipitation is the primary source of groundwater recharge in the former mine

Subsequent to the 1996 RI/FS, other subsurface remedial actions were carried out that included the following:

- 2004: hydrogeologic investigation of the south portal
- 2005: installation of a 700-foot deep well in order to sample groundwater from the southern interior of the former mine

Results from periodic monitoring (conducted since 1996) continue to show no detection of contaminants in existing and new wells.

Based on the above work, Ecology concluded that sufficient characterization work was performed at the Site. Consistent with WAC 173-340-130(5) ("Scope of Information") and WAC 173-340-350(7)(a), adequate information was gathered at the Site to determine a preferred cleanup alternative for the protection of human health and the environment.

2. Gretchen Gibbs, Jon Parkinson, Craig Weinstein, and Jason Howell suggested that Ecology consult with an independent third party to improve the groundwater monitoring plan for the Site and that the monitoring network use automated sensors for continuous sampling."

Ecology's Response:

Ecology experts, which include professional engineers, hydrogeologists, and chemists, have reviewed the Site investigation results and concluded that the Site is adequately characterized. Therefore, Ecology does not believe there is a need for an independent third party to review the information. The CAP is compliant with MTCA and is the best alternative for this Site. Please see Section I (below) for a discussion on the use of automated sensors.

Based on a request from the public, DOH completed a health consultation in 2016 which focused on site characterization work. DOH provided recommendations for the site characterization and cleanup plan, many of which Ecology has incorporated into the Final CAP. This consultation was carried out by DOH itself (a separate agency) and was a methodical technical review of the site characterization and cleanup plan.

3. Jason Howell commented that there is a lack of knowledge about the hydrodynamics of the Site and the surrounding area.

Ecology's Response:

The groundwater flow system is well understood, as discussed above in Section E (1).

Furthermore, the Final CAP has been revised to require that additional sentinel wells be installed, which will provide a better understanding of the water level configuration within the mine, including the location of the groundwater divide located close to the south portal area. An effort will be made to install the sentinel wells before the waste area in the trench is filled in and capped in order to collect baseline water level measurements.

4. Brad and Becky Lake requested that Ecology modify the assumption that the trench sidewalls are unlikely pathways for migration of contamination from the mine. They commented that crevices and seams in the surrounding sandstone formation transport a substantial volume of groundwater. In support, they noted that there are a number of wells in the area that can produce up to30 gallons/minute from a depth of 300 feet or more.

Ecology's Response:

Detailed Site investigations indicated that the sidewalls consist of vertically layered sandstones, shales, and siltstones, which have low permeability across bedding planes and therefore would not convey significant quantities of groundwater in this direction compared to what discharges at the portal areas. See section 3.6.3.2 in the 1996 RI/FS report[1].

The reported higher groundwater production may be due to groundwater storage in the well casing rather than a sustainable yield from a hydraulically connected aquifer(s). High yields from wells in the area may also be due to other factors such as long well screen that taps into multiple aquifers or a local aquifer layer or seam interbedded with the lower permeability units further away from the Site. The latter may be the crevices and seams referred to in this comment.

The mine records and data do not indicate significant groundwater flow paths through the adjacent bedrock walls. The mine history, records, and data were gathered and compiled in a comprehensive study by SubTerra, Inc. (Landsburg Mine-Coal Mine Hazard Assessment, May 2005). The mine records contain detailed documentation of water infiltration into the mine and show that the amount of groundwater entering the mine from faults and fractures was minimal.

Furthermore, monitoring wells LMW-6 and LMW-7, located west and east of the disposal trench respectively, would detect any contaminants migrating across the bedding planes. To date, no contaminants have been detected in these wells, nor in any of the other Site wells.
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F. Installing a Well in the Center of the Wastes/Disposal Area

Brad and Becky Lake suggested that additional wells be installed within and on the edges of the former waste disposal area in order to better characterize the waste and its associated contamination. They proposed that the wells should be drilled "to the full depth of the mine" and should include "casing perforations at 10-20 foot intervals."

Ecology's Response:

[1] The 1996 RI/FS report can be downloaded at: https://fortress.wa.gov/ecy/gsp/DocViewer.ashx?did=4382

The requested well (containing casing perforations or well screens at multiple intervals along its length) may be interpreted as a nested well, which is prohibited under WAC 173-160-420(3). What follows below is a more thorough explanation as to why more intrusive investigations of the mine and the waste area were not carried out.

In 2004, Ecology held discussions with the City of Kent on site characterization and installation of deep wells in the former mine interior including through the waste area. In the same year, Ecology instructed the PLPs to install a 700 foot well within the southern deepest interior of the mine workings. The 700 foot well was installed because of the City of Kent's concerns over possible deep-seated contamination, which if released could impact the Clark Springs Water Supply (located west of the south portal of the Site). The volume of wastes estimated in the trench (4,500 55-gallon drums) and the amount of time that had passed since disposal of the wastes could allow for water to mix and circulate in the mine interior. Therefore, Ecology found it reasonable to expect that residual contamination would have been detected in groundwater within the mine if contamination was escaping the waste trench and infiltrating the deeper southern mine workings.

No contaminants have been detected in the 700-foot well. By installing this well in the mine interior, more reassurance on the water quality and level of risk at deeper levels of the Site was achieved. The deep well provided better characterization and a better perspective of the degree of risk from possible deep-seated contamination at the Site.

Ecology decided that installing an additional deep well in the waste disposal area was not essential for several reasons. No groundwater contamination is coming from the Site and the approach for the preferred remedial alternative, determined after the RI/FS, is to monitor the outputs of the former mine. Furthermore, given the results from the 700-foot well in the former mine's deep southern interior, drilling another well beneath the wastes would not provide additional value to the cleanup solution in this case. Hypothetically, even if such a well detected contaminants within the former waste disposal area, it is well established that the contaminants are not exiting the mine (possibly due to low contaminant source flux, attenuation, dilution/adsorption, and dispersion processes). Such a result would not change the preferred cleanup alternative in the DCAP.

Moreover, drilling through the wastes could create a new pathway for contaminants to migrate away from the Site. Please refer to Section K. "Monitoring Well Installation for Cap Performance Monitoring" for an explanation of risks associated with drilling into the wastes and with installing additional wells at the edges of the waste area.
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G. Covering Wastes (Containment Remedy)

(Gary Habenicht, Sam R. Gallant, Jason Howell, City of Kent)

1. Gary Habenicht, Sam R. Gallant, and Jason Howell questioned the decision to cover and cap the wastes at the Site and whether a containment remedy constitutes a "true" cleanup given that hazardous wastes will remain on-Site. The City of Kent commented that "Ecology has failed to make, and cannot make, the determinations required by MTCA to

approve a containment remedy that leaves all hazardous waste in place at the Site forever."

Ecology's Response:

Ecology concluded that the waste containment by cover is the most appropriate remedy for the Site. Cleanup remedies like waste removal/retrieval are not feasible because it is physically dangerous at the Site, as described further in the next Comment/Response. Additionally, waste removal/retrieval at the Site fails the disproportionate cost analysis criteria under WAC 173-340-360. Ecology further concluded that it has sufficient information about the Site to select a cleanup remedy, in accordance with WAC 173-340-350(7). This allowed Ecology to determine that the most appropriate remedy is containment with long-term monitoring to confirm that the waste remains isolated in accordance with WAC 173-340-350(8) and -360.

The proposed remedy to backfill the areas where the wastes are located and capped with a low permeability cover is known as a containment remedy (an "engineered control") and is a well-established cleanup alternative under MTCA. The RI/FS report details the data collection, rationale, and procedural determinations for choosing this as the preferred alternative for cleanup under MTCA. WAC 173-340-200 defines "Engineered Controls" as:

> "containment and/or treatment systems that are designed and constructed to prevent or limit the movement of, or the exposure to, hazardous substances. Examples of engineered controls include a layer of clean soil, asphalt or concrete paving or other materials placed over contaminated soils to limit contact with contamination; a groundwater flow barrier such as a bentonite slurry trench; groundwater gradient control systems such as French drains or pump and treat systems; and vapor control systems."

The Site's containment remedy is designed to:

- isolate and contain the wastes to prevent direct contact,
- prevent or reduce leaching of the wastes by channeling runoff from the trench and minimizing rainfall infiltration into the trenches containing waste; and
- reduce the amount of groundwater emanating from the mine

2. The City of Kent asked Ecology to amend the DCAP to require the removal of chlorinated solvent sludge which they believe is "easily" accessible on the surface.

Ecology's Response:

Ecology decided not to have the sludge removed for a number of reasons:

1. Physical hazards to the workers, such as sinkholes or mine collapse
2. The sludge area is not easily accessible since it is located at the base of the subsidence trench, which is between 20 to 60 feet deep and heavily vegetated.
3. A recent Site visit shows that the sludge area has been filled in with wood debris, vegetation, and soil.

4. Removal of the sludge could disturb the waste area and cause contamination to spread into the water table within the mine and subsequently to the outside environment.
5. The incremental environmental benefit of removing contaminants from the trench is outweighed by the costs and risks to the workers.

For these reasons, Ecology decided that the sludge should be part of the wastes being addressed by the containment remedy.
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H. Dewatering the Former Mine

Brad and Becky Lake suggested that the CAP require continuous dewatering of the mine via a new well located within the former waste disposal area, for the duration of the Consent Decree. They commented that dewatering from the center of the former waste disposal area would prevent groundwater contamination from flowing out of the mine and into area groundwater. They also commented that dewatering would have the added benefit of requiring the "construction and operation of a waste treatment facility," the lack of which is an "ongoing concern" of nearby residents and businesses.

Ecology's Response:

There is no substantial benefit to dewatering the former mine given the lack of contamination detected in groundwater discharging from the mine portals and the impracticality of pumping (and maintaining pumping) the large amount of water already contained within the mine workings (estimated at 75 million gallons). Pumping and disposing of 75 million gallons of potentially clean water and later maintaining pumping to keep the mine interior dry would be technically difficult to achieve with no added value over the proposed remedy. In addition, such an extent of groundwater withdrawal would have a negative effect on nearby water resources, which some neighbors expressed concern about. This would constitute a disproportionately extreme action with little to no incremental environmental benefit when compared to the selected remedy, especially given the lack of groundwater contamination discharging at the Site.
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I. Automated Groundwater Contaminant Monitoring

(Gretchen Gibbs, Jon Parkinson, Craig Weinstein, Jason Howell, and the Cedar River Council)

Comments from several citizens and the Cedar River Council proposed the installation of automated instruments, which would provide continuous, 24-hour monitoring of pH, conductivity, total dissolved solids (TDS), and groundwater levels at the Site. According to the commenters, this would provide an early warning system in the event that contamination is detected at the Site.

Ecology's Response:

While in concept it appears to be a good idea, existing automated real-time technology does not have the monitoring sensitivity to detect the set of contaminants at the concentrations required under MTCA and in the CAP.

Accurate and reliable measurements of chemical contaminant concentrations are needed to monitor groundwater at this Site. The existing method of groundwater monitoring at the Site detects chemicals in the parts per billion to parts per million concentration range. Use of pH, conductivity, TDS and groundwater levels would be misleading due to their natural variability in the groundwater. This natural variability would not be a reliable indicator of chemical contaminant concentrations.

Ecology is not aware of current technology available today that can monitor a wide range of specific contaminants in real time to parts per billion concentrations. Therefore, the installation of automated sensors will not be required in the CAP.
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J. Protectiveness of Long Term Monitoring Frequency

(Jason Howell, Cedar River Council, City of Kent)

1. Jason Howell, Cedar River Council, and the City of Kent expressed concerns about whether the frequency of long-term groundwater monitoring (or time interval between testing) was protective; that the time between sampling was too long; and that contamination would not be detected and addressed prior to it reaching the nearby water resources.

Ecology's Response:
There are two phases to the groundwater monitoring plan, short-term and long-term (See Table 3 below showing the original proposed monitoring frequency in the 2013 DCAP). Short term refers to the timeframe from start of construction to ten years after construction completion, with frequencies ranging from bi-weekly to yearly. Long-term monitoring refers to groundwater monitoring that will be conducted thereafter, with a frequency ranging from every 2.5 to 10 years.

Table 3. Groundwater Monitoring Frequency in DCAP (July 31, 2013 Version)

Period	When	What
CONSTRUCTION	Every two weeks	General parameters (pH, turbidity, dissolved oxygen, etc.
	Every month	General & Volatile organics
POST-CONSTRUCTION		
Year 1	Every three months	Full suite (1st round)
		Partial suite (rest of year)
Years 2 to 5	Twice a year	Full (1st round)
		Partial (rest of year)
Years 6 to 10	Once a year	Full suite
Years 11 and beyond	Once every 2 ½ years	Partial suite (North)
	Once every 5 years	Full suite (North) Partial suite (South)
	Once every 10 years	Full suite (South)

The monitoring plan in the Final CAP is protective for the following reasons:

- During remedy construction, groundwater monitoring is more frequent. At years 11 and beyond (see Table 3), monitoring is less frequent because of the large amount of time it would take for contamination to travel between the sentinel wells (located closer to the areas of waste disposal) and the compliance wells—a minimum of 2.5 years. Thus, by using both sentinel and compliance wells, more time between sampling rounds assures that any contaminants will be detected in time for the Contingency Plan to be implemented effectively.
- The results of BIOSCREEN modeling (a computer model for contaminant travel) indicated that, depending on the direction of flow, sampling at frequencies ranging from approximately every 2.5 years to every 10 years would detect a possible contaminant release in time to initiate the Contingency Plan before contamination leaves the Site.
- The BIOSCREEN modeling was highly conservative in order to ensure protectiveness. It used the most mobile organic compounds and metals, assumed no natural degradation that would otherwise attenuate contaminants during transport, and used high source concentrations. The BIOSCREEN travel time modeling indicated that the frequency for full testing was protective, for the full suite of analytes, in detecting potential groundwater contamination that could come from the waste area. As shown in Table 3, the Final CAP also includes partial testing of the more mobile analytes more frequently,

as an added safeguard in the long-term monitoring program.

- The Site has not had any detections of contaminants or their residue in groundwater emanating from the mine for over twenty-five years. In such a case, model calibration should take into account this absence of detections or incorporate this as a minimum time of potential arrival for the mobile constituents used in the BIOSCREEN model at particular well locations. For instance, if contaminated groundwater were escaping the mine, modeling results indicated that all the modeled constituents should have been detected in the north compliance wells, while methylene chloride, vinyl chloride, and 1,4-dioxane should have been detected in the southern Site wells. Therefore, the travel times estimated by the BIOSCREEN modeling may be unrealistically short, resulting in overly frequent groundwater monitoring frequencies. By adopting this conservative approach to modeling and using early warning sentinel wells, Ecology believes this adds additional safeguards into the monitoring plan.

Figure 4 illustrates the concept of sampling frequency using both “early warning” sentinel wells and compliance wells. Please see Ecology’s response in “2.” below for a more detailed description of the method/model used to determine monitoring frequencies.

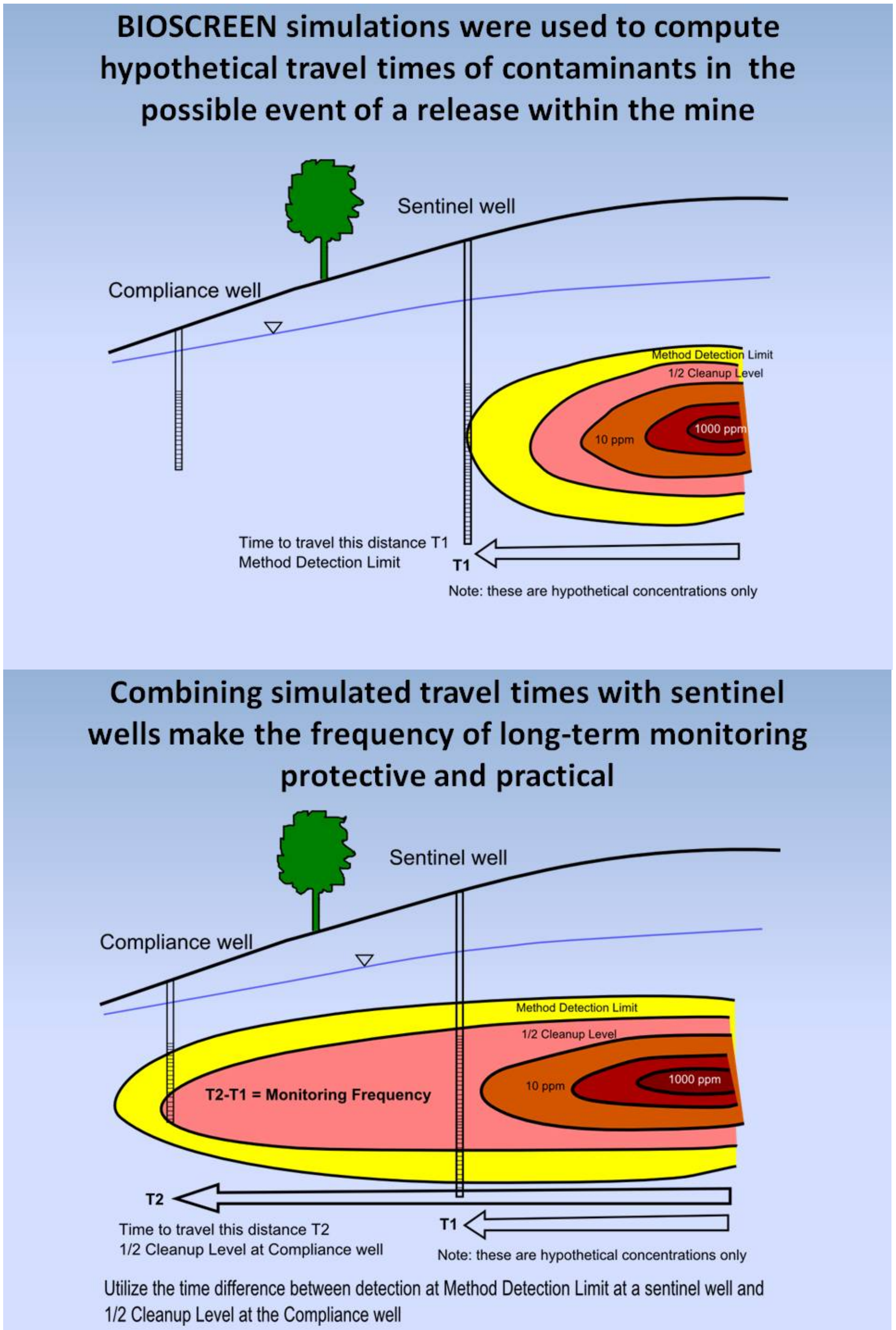

Figure 4. Schematic showing how monitoring frequencies were derived using travel times at sentinel wells and compliance wells. The time difference between T2 and T1 allows for early detection and response should a release occur.

Despite Ecology's confidence in the existing level of protection of the monitoring frequency, Ecology understands the public's desire to conduct long-term monitoring more frequently. Ecology also believes that more frequent monitoring at the south sentinel and compliance wells will support more robust 5-year periodic reviews under MTCA and the Consent Decree. Ecology therefore revised the Final CAP to have all analyte parameters monitored at a frequency of once every five years at the south sentinel and compliance wells, instead of once every 10 years, during long-term groundwater compliance monitoring. Ecology also revised the Final CAP to trigger increased monitoring frequency requirements whenever confirmed sample results at a sentinel well exceed ¼ of the cleanup level (as opposed to confirmed samples at a compliance well). The following Table 4 illustrates Ecology's revisions to the monitoring frequency that was in the DCAP (see Table 3 above) for monitoring after the first 10 years and in the possible event of a detection at a sentinel well.

Table 4. Additional Revisions to the Monitoring Frequency in DCAP are added to Final CAP (2017)

Period	When	What
Years 11 and beyond (long term monitoring)	Once every 2 ½ years	Partial suite (North)
	Once every 5 years	Full suite (North) Full suite (South)
If at any time a sentinel well detects contaminants above ¼ cleanup level	**Increased frequency (Table A-3 in compliance monitoring plan)**	**Detected contaminant(s)**

2. <u>Jason Howell questioned the use of BIOSCREEN modeling software to determine the frequency of sampling events and suggested conducting an "empirical" study such as a dye-based study.</u>

   <u>The City of Kent commented that the required frequency of sampling events is based on speculative assumptions and is not sufficiently protective.</u>

<u>Ecology's Response:</u>

Dye studies were considered early in the investigation, but were not pursued due to unreliability issues when used in a subsurface environment with a substrate containing highly adsorptive capacities (coal and clay), and dilution effects due to the high permeability and water content in the mine workings.

The BIOSCREEN model is a well-established model for contaminant transport and is an appropriate method for determining monitoring frequency. The BIOSCREEN program is a widely used screening and predictive modeling tool with simple, rapid operation and fairly accurate results that allow for multiple transport simulations. The contaminant travel modeling (using BIOSCREEN) carried out in 2009 used protective (conservative) parameters that simulated worst-case scenarios for potential transport of contaminants in the groundwater. This included using the most mobile (fastest) contaminant chemicals, fast-moving groundwater speeds and rock permeabilities, no degradation (natural attenuation) of these compounds (which normally occurs during transport), and high contaminant source concentrations (which would provide a continuous source of contamination rather than a finite one as would occur in real life). The resulting monitoring frequencies are protective based on these modeling results.

In the Final CAP, sentinel wells will be part of the monitoring network. Sentinel wells are located closer to the wastes than compliance wells in order to provide early detection of any potential contaminant release. BIOSCREEN modeling results indicate that it will take years before a cleanup level is reached at the compliance wells for even the most mobile contaminants. The amount of time ranges from a minimum of three years to 142 years using ultra-conservative parameters. The modeling results provided the framework for a very protective monitoring frequency, which will ensure that potential groundwater contamination is detected before cleanup levels are exceeded at the points of compliance. This was accomplished by using the difference between the time it takes a potential contaminant to reach the sentinel well at Method Detection Limits (MDL) and the time it takes to reach the compliance well at ½ of the Cleanup Level (CUL). See Figure 4 schematic.

Using this approach, any release of contaminants at the waste area at any unknown time in the future will be detected before cleanup levels are reached at the point of compliance. This will give the PLP Group the time needed to verify results, finalize the design, and install and operate the Groundwater Extraction and Treatment System to prevent contaminant migration from the Site.

The City of Kent participated in the BIOSCREEN modeling effort. The City of Kent and the PLP Group provided model input parameters based on each party's conceptualization of the hydrogeology of the Site. Ecology chose the model input parameters from each party's submittal and focused on those parameters which were more conservative and practical. The results of the modeling effort represent a very conservative prediction of contaminant migration from the mine disposal area to the compliance boundaries. Based on the modeling results, Ecology concluded that the long-term monitoring frequencies in the DCAP were protective.

For more details, please refer to the BIOSCREEN report ("Bioscreen Modeling Results and Long-Term Groundwater Monitoring Frequency") by Golder dated October 13, 2008 and Ecology's January 21, 2009 decision letter on long term monitoring frequency (available at Ecology's northwest regional office Central Records and at Ecology's website for Landsburg Mine site at: https://fortress.wa.gov/ecy/gsp/CleanupSiteDocuments.aspx?csid=60).

While Ecology concludes that the results of the modeling are sound and justify the DCAP's long-term monitoring plan, we understand the public's concerns about the frequency of long-term monitoring. Therefore, to be more protective of human health and the environment, Ecology has updated the Final CAP to require that all analyte parameters will be monitored at a frequency of once every five years at the south sentinel and compliance wells, instead of once every 10 years during long-term groundwater compliance monitoring. This increased frequency will also provide Ecology with a full suite of analysis for the five-year periodic review. Ecology will also require increased monitoring frequency whenever confirmed sample results at a sentinel well exceed ¼ of the cleanup level (see Table 4).

3. Jason Howell and the CRC questioned whether the design of the current and proposed monitoring well network and the requirements for sampling "types" and frequencies are sufficient to protect public health.

Ecology's Response:

Ecology concluded that the number and placement of monitoring wells is sufficient and effective at detecting potential contaminated groundwater at the Site for the following reasons:

- Site monitoring wells are located in the highly permeable mine workings beneath the subsidence trench. Permeability is much higher in the mine workings of the Rogers seam compared to the flow across the vertically dipping bedrock on the west and east sides of the seam.
- The five monitoring wells are located at the discharge points at the north and south portals.
- There is a deep well within the southern interior of the mine workings to detect any potential contaminant migration southward.
- There are also two wells, one to the west and one to the east of the trench that monitor lateral groundwater flow across bedrock bedding planes, which flank the Rogers seam trench where the wastes are located (see Figure 3).

Ecology also finds the proposed frequencies of monitoring to be effective in protecting human health and the environment. Please refer to Ecology's responses in Sections J(1) and J(2).

The Compliance Monitoring Plan provides for long-term groundwater monitoring frequencies that will detect contaminants at sentinel wells within the Site boundaries before they exceed cleanup levels at the point of compliance.

Based on the 2016 health consultation, the Final CAP will situate the deeper sentinel well at the north end of the mine at a higher elevation to allow better overall vertical groundwater monitoring coverage. If logistically possible, the shallow and deeper sentinel wells will be moved within the inclined northern mine shaft location. However, if that is logistically impossible, they will be moved as close as possible. The changes in locations will be addressed in the CAP and engineering design report. The Final CAP has also been modified to require considering additional monitoring wells in the southern portion of the mine if the groundwater divide is found to be located beneath any portion of the former waste disposal area.
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K. Monitoring Well Installation for Cap Performance Monitoring

The City of Kent suggested that two additional performance monitoring wells be installed within the capped area in order to gather sufficient data to evaluate the performance and effectiveness of the cap once installed.

The City also suggested that “the new monitoring wells be installed before the trenches are backfilled in order to gather baseline data.

Ecology’s Response:

Additional wells beneath the proposed cap are not needed for several reasons. First, the installation of additional wells may disturb the wastes and cause the spread of contamination from the waste area. Second, drilling additional wells may create preferential pathways for rainwater infiltration and leaching through the wastes, defeating the purpose of the cap. Finally, while some additional data may be gained from such wells, they would not provide significant added benefits to the selected remedy, including the long-term monitoring program. See also Ecology response in Section F (“Installing a Well in the Center of the Wastes/Disposal Area”).

Ecology finds the proposed number and locations of the sentinel wells (north and south) to be adequate and appropriate. The “Dual South Sentinel/Cap Effectiveness Well” well is a combination well serving two functions: (1) a performance well for evaluating cap performance; and (2) a sentinel well for detection of potential contaminant migrating to the south. This combination well will be monitored in conjunction with existing wells LMW-1 and LMW-1A to establish baseline measurements for hydraulic performance of the cap. LMW-1/1A, located within the rock bridge, is situated at the northern half of the proposed cap.

The Final CAP will require the sentinel wells to be installed before construction of the cap. Please note that the short-term (construction phase) monitoring plan will still apply to the original wells as described in the CAP, but not the sentinel wells. However, water levels will be measured in the sentinel wells before and during construction. After the construction phase, the monitoring plan will apply to the sentinel wells in accordance with the long-term sampling program as described in the Compliance Monitoring Plan schedule (see Table A-2 in the Compliance Monitoring Plan).
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L. New Monitoring Well Design and Placement

The City of Kent expressed concern about the locations of new groundwater monitoring wells north of the mine, stating that they will not be able to intercept groundwater flowing towards the Cedar River watershed.

Ecology’s Response:

The proposed sentinel wells are appropriately located within the mine workings to intercept groundwater flowing northward and southward through the mine workings. Groundwater emanating from the former coal mine flows most rapidly through the mine workings where collapsed coal and gravel rubble and rock tunnels create a high transmissive flow path to the north.

For the northward groundwater flow, two new sentinel wells (for early detection) will be screened in the upper portion of the water table in the mine workings/rubble and at the mid-level of the mine workings/rubble near Portal #2. If logistically possible, the shallow and deeper northern sentinel wells will be moved within the inclined northern mine shaft location. However, if that is logistically impossible, they will be moved as close as possible. Sentinel wells in these locations will be able to detect potential contamination emanating from the waste disposal trenches before it migrates to the compliance boundary, which will be monitored by LMW-2, LMW-4 and LMW-10 (which were all installed in the mine workings).

In its original comments provided to the City about well placement at the north end, the City's consultant Aspect Consulting suggested installing a well in the gravel trench at the north portal. The gravel trench is in the portion of the mine workings extending from the portal area to SE Summit Landsburg Road, which was filled-in to level off the ground after coal was extracted from the surface in this area. In response to Aspect Consulting's suggestion, Ecology verified that the proposed sentinel well locations are already in the mine workings and trench and thus are in the primary groundwater pathways from within the former mine.
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M. Omission of 1,4-Dioxane from Analytical Suite

The City of Kent suggested that because the former waste disposal area contains chlorinated solvent wastes, the chemical 1,4-dioxane should be added to the suite of analytes to be tested for under the groundwater monitoring program.

Ecology's Response:

Ecology has revised the CAP to add the analyte 1,4-dioxane to the list of analytes which will be analyzed using EPA Method 8270 when this method is required during compliance monitoring.
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N. Notification in Event of Contaminant Detection

The City of Kent commented that under the CAP, "interested parties" should be notified if and when groundwater monitoring detects contamination migrating from the former mine and that "all Site data" should be made available to the public on a website.

Ecology's Response:

Ecology's practice has been to notify the public, other agencies, and local governments such as the City of Kent about Site activities and status in a timely manner by email and outreach tools such as the Site Register, Ecology's website, Fact Sheets, and Display Ads. Ecology's data submittal policy (Policy 840) and Environmental Information Management System (EIM) requires posting of environmental data online. See also Section X of the Consent Decree.

These tools have always been available for data and information exchange.

Under WAC 173-340-130(7)(a), "If the department is conducting remedial actions or requiring remedial actions under an order or decree, the department shall ensure appropriate local, state, and federal agencies and tribal governments are kept informed and, as appropriate, involved in the development and implementation of remedial actions. The department may require a potentially liable person to undertake this responsibility." Therefore, Ecology will require the PLP Group to also notify the City of Kent Public Works by email or phone if and when it is confirmed that contamination has been detected at the Site. Ecology will include this in Section 5.5.5.5 of the CAP ("Response if Remediation levels Are Exceeded") and Section 1.7.2 of the Compliance Monitoring Plan ("Response If Remediation Levels Are Exceeded").
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O. Recognition of Other Water Resources Surrounding Site

The City of Kent commented that the Consent Decree failed to reference other nearby water resources, including the Cedar River, Rock Creek, and the Clark Springs facility.

Ecology's Response:

Ecology has added the following language to Section V of the Consent Decree:

"The Site is situated between two surface water bodies (river/streams): Rock Creek to the south and Cedar River to the north. An infiltration gallery adjacent to Rock Creek, referred to as the Clark Springs facility, has been used by the City of Kent since 1957 as a supplement to its municipal water sources. The infiltration gallery is located adjacent to Kent-Kangley Road and is located approximately 4,100 feet west-southwest of the Site's south portal."

In addition, Ecology has updated the CAP to include information about the City of Kent's Clark Springs' municipal drinking water system, the Covington Water District system, and the Cedar Valley Sole Source Aquifer (used by the City of Renton). This was done because of concerns about the local water systems and the Site's potential effect on the water supply.
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P. Plan Approval and Ecology Assurance of Protection of Water Resources

The City of Kent expressed concern that the selected remedy will undermine Ecology's obligation to protect "irreplaceable water resources."

Ecology's Response:

Despite the lack of data indicating impacts to groundwater or nearby water resources for almost 40 years since waste disposal took place, Ecology has taken a precautionary approach by assuming that contaminants may migrate from the former waste disposal area in the future. By implementing the selected remedy, Ecology seeks to further ensure the safety of nearby water resources. Implementation of the FinalCAP will remediate the Site by:

- filling in the northern portion of the trench where the wastes are located
- capping it with a low permeability soil cap (Figure 3)
- applying institutional controls on land and groundwater use
- installing infrastructure for contingent groundwater capture and treatment should contamination be detected at Site wells, and
- monitoring groundwater until residual hazardous substance concentrations no longer exceed cleanup or remediation levels as described in the CAP resulting from either (1) the application of new remediation technologies currently unavailable or (2) other circumstances or conditions that affect residual concentrations such that they no longer pose a risk to human health or the environment.

This remedy is protective because it is designed to:

- contain and isolate the wastes from direct contact,
- prevent or reduce leaching of the wastes by rain and groundwater,
- reduce the amount of groundwater emanating from the mine,
- secure the site from activities that may interfere with the cleanup remedy,
- maintain long-term groundwater monitoring for timely detection of a possible contaminant release from the Site, and
- implement a contingency plan to prevent contaminants from leaving the Site, if detected, in a timely manner.

The selected remedy is protective of human health and the environment and provides assurance that nearby water resources, such as the Cedar River and Rock Creek, are safeguarded from a potential release from the Site.

Presently, the waste disposal area is still a fenced-off open trench. The waste remains vulnerable to leaching by rainfall and there is potential direct contact exposure if someone climbs over the fence and potential exposure to wildlife that enters the trench. Ecology concludes that the proposed cleanup remedy will improve the current situation by eliminating or reducing the risk of direct exposure and leaching of precipitation.
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Q. State of Washington's Duty to Protect Water Resources and Public Health

The City of Kent commented that implementation of the selected remedy would be inconsistent with the State's authority and duty to prevent harm to water resources, public health, and local economies.

Ecology's Response:

Ecology has been and continues to follow its mandate to implement environmental cleanup to protect human health and the environment in accordance with MTCA. For the past 20 years, Site investigations and groundwater monitoring have demonstrated that there have been no impacts to groundwater emanating from the mine. Ecology chose the selected remedy in order to safeguard area water resources and to protect human health and the environment should a release occur in the future.

Ecology designed the CAP to protect water resources – please refer to Ecology's response in Section P ("Plan Approval and Ecology Assurance of Protection of Water Resources").
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R. Concerns about Financial Assurance

(Greater Maple Valley Unincorporated Area Council, Cedar River Council, City of Kent)

Many commenters voiced concerns about the funds and funding arrangements for maintaining the remedial action, specifically for long-term groundwater monitoring, contingency actions, and soil cap maintenance. There was a concern that the money would be used up, and that all of the PLPs funding the cleanup would either declare bankruptcy or drop out of their obligations to fund the cleanup.

Specifically, the Greater Maple Valley Unincorporated Area Council (GMVUAC) suggested that the Consent Decree require PLPs to contribute additional financial assurances over time in order to safeguard against the possibility of PLPs escaping liability without ensuring the long-term effectiveness of the cleanup.

Ecology's Response:

The PLPs are required to pay for the cleanup, all on-going operation and maintenance costs, and implementation of the contingency plan, if required. Once the Consent Decree is finalized and filed in King County Superior Court, each PLP within the PLP Group will be jointly and severally liable for the full cost of cleanup as well as all operation and maintenance costs. This means that if one PLP becomes insolvent (goes bankrupt), then the remaining PLPs are still liable for funding the full cost of cleanup, all operation and maintenance costs, and any future required implementation of the contingency plan.

WAC 173-340-440(11) regarding financial assurance, states:

> (11) Financial assurances. The department shall, as appropriate, require financial assurance mechanisms at sites where the cleanup action selected includes engineered and/or institutional controls. It is presumed that financial assurance mechanisms will be required unless the PLP can demonstrate that sufficient financial resources are available and in place to provide for the long-term effectiveness of engineered and institutional controls adopted. Financial assurances shall be of sufficient amount to cover all costs associated with the operation and maintenance of the cleanup action, including institutional controls, compliance monitoring, and corrective measures.

Pursuant to WAC 173-340-440(11), financial assurance is required for activities involved in the long-term operation and maintenance of the cleanup action, including institutional controls, compliance monitoring, and corrective measures. There are a number of different forms that financial assurance can take. The PLP Group could choose any of the following to prove financial capacity: a trust fund, letter of credit, third party liability insurance, financial test, corporate guarantee, payment bond, or performance bond. The Consent Decree does not require a specific type of financial assurance. That decision is left up to the PLP Group; however, the amount of money (or the amount of financial assurance coverage) must be reviewed and approved by Ecology within 60 days of the effective date of the Consent Decree.

Section XXI of the Consent Decree states that Ecology has approved the initial financial assurance estimate of $775,000. The financial assurance vehicle for the Landsburg Mine Site is likely going to be a trust fund; however, the PLP Group may select another form of financial assurance before the deadline to provide proof of financial assurances sufficient to cover the initial estimate of $775,000 (within 60 days of the effective date of the Consent Decree).

Ecology has extensive experience managing financial assurances for both MTCA sites and for dangerous waste facilities regulated under RCW 70.105. Based on the analysis of the cost estimates and anticipated financial assurance mechanisms by Ecology's Toxics Cleanup Program and Ecology's Hazardous Waste & Toxics Reduction Financial Assurances Office, the amounts estimated are sufficient for the operation and maintenance of the cleanup action and protects public welfare in the process.

In addition, there are certain protections built into the financial assurance section of the Consent Decree. First, the Consent Decree requires an annual review, which obligates the PLP Group to provide documentation to Ecology regarding the status and account balance of the financial assurance in place to fund the long-term O&M of the cleanup action, including groundwater monitoring. Second, Ecology may require additional money to supplement the financial assurances if it becomes necessary (i.e. if the annual review identifies that there are insufficient funds, or if the costs of the O&M are higher than anticipated). In the event that the Groundwater Contingency Plan is implemented, Ecology would require additional financial assurance for the ongoing operation and maintenance of the groundwater treatment system.

Ecology's yearly review of the financial assurance mechanism for the Landsburg Mine Site will ensure that there are sufficient funds to carry out the ongoing operation and maintenance and monitoring until Ecology determines that it is no longer required.
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S. "In Perpetuity" vs. "Indefinitely"

(GMVUAC, City of Kent)

Several commenters expressed concern that the use of the word "indefinitely" is not the same as "in perpetuity," which was the terminology used by Ecology in previous outreach events and communications.

The City of Kent requested that the text be revised to indicate that soil cap maintenance will be required "in perpetuity."

GMVUAC commented that the courts have interpreted *"indefinite"* to mean *"temporary,* thereby causing them concern that there are not enough protections in the financial assurance mechanisms for the long-term nature of this cleanup.

<u>Ecology's Response</u>:

"In perpetuity" generally means "eternal" or "forever," while "indefinitely" means for an undesignated amount of time. GMVUAC is partially correct that the word "indefinitely" does not necessarily mean "permanently." The long-term groundwater monitoring at the Landsburg Mine Site will continue indefinitely in that it will only stop if and when Ecology grants its approval.

With respect to GMVUAC's concern that the courts have interpreted *"indefinite"* to mean *"temporary"* [*U.S. v. Pieter van den Berg*, 5 F.3d 439 (9th Cir. 1993)], Ecology respectfully disagrees with the application of that case to this situation. The Ninth circuit in *U.S. v. Pieter* was discussing the meaning of a "temporary statute"—a legal term of art used in the context of analyzing the retroactive application of penalties under a repealed or expired statute. One party argued that the statute at issue was "indefinite" rather than "temporary" because its expiration was conditioned upon a certain event occurring rather than a certain end date. The court reasoned that "indefinite" is more like "temporary" than it is "permanent" since there is a presumed end date, although that end date may be unknown. The court concluded that, "to the extent that such labels are useful," an "indefinite" statute is a subset of a "temporary" one.

Ecology understands the public's concerns about the use of the terms "in perpetuity" versus "indefinitely." Ecology used the term "in perpetuity" early on in describing the proposed cleanup actions at the Site, including the long-term groundwater monitoring plan. During preparation of the DCAP, the term "indefinitely" was substituted for "in perpetuity" because Ecology wants to keep open the possibility that in the future, a technology might exist that would more permanently remediate the wastes contained within the Site. Ecology did not intend to change the overall meaning or intent of the long-term nature of the cleanup action plan, which includes monitoring and containment.

For the cleanup, Ecology believes that the terms "indefinitely" and "in perpetuity" are operationally equivalent. Ecology interprets these words to mean continuous monitoring with no timetable to terminate the long-term requirements. As long as the wastes remain at the Site (to be buried under clean fill and a soil cap), the cleanup remedy and its measures (groundwater monitoring, institutional controls, contingency plans) will continue to be carried out indefinitely ("in perpetuity") until such time as Ecology determines otherwise.

Ecology has revised the CAP to clearly define the term "indefinitely" for purposes of the cleanup. The following sentence will be inserted as the last paragraph of section 1.3 of the CAP ("The CAP and the Cleanup Process"):

"For this cleanup action plan and other exhibits to the Consent Decree, the use of the word 'indefinitely' will mean with no timetable to terminate the long-term requirements of cleanup, and continuously until such time Ecology says otherwise (i.e. approval of a new remedial technology that permanently remediates the wastes to below MTCA cleanup levels and/or existence of other conditions that affect concentrations such that they no longer pose a risk, present or future, to human health and the environment)."

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T. Provisions for Termination of O&M and Institutional Controls

(Jason Howell, City of Kent)

1. Jason Howell commented on

- Section 5.5.5.3 of the DCAP (Confirmational Monitoring), which states:

  "Long-term confirmational groundwater monitoring and Site inspections and maintenance will continue until residual hazardous substance concentrations no longer exceed cleanup or remediation levels as described in the CAP resulting from either (1) the application of new remediation technologies currently unavailable or (2) other circumstances or conditions that affect residual concentrations such that they no longer pose risk to human health or environment."

- Jason Howell commented that this language could be exploited as an "escape clause" that the PLP Group could use to circumvent long-term monitoring and notification requirements.

Ecology's Response:

The Consent Decree, including the CAP, does not provide for termination of the remedy or any remedy components unless and until Ecology determines that hazardous substances are no longer present at the Site above MTCA cleanup levels. This would have to result from either (1) the application of new remediation technologies currently unavailable or (2) other circumstances or conditions that affect residual concentrations such that they no longer pose a risk to human health or the environment.

The language the commenter cites addresses the possibility that in the future, a new technology might exist that would more permanently remediate the wastes at the Site, achieve MTCA cleanup standards and requirements, and eliminate attendant risks (including potential future releases). The quoted language still ensures that the cleanup remedy (including confirmational monitoring) will continue indefinitely, or until the wastes can be remediated permanently at or below MTCA cleanup standards. Consequently, the PLP Group would have to demonstrate to Ecology that the Site no longer poses a threat to human health and the environment, based on evidence that the Site had been fully remediated in accordance with MTCA requirements, including elimination of potential future risks as identified in the RI/FS report and the CAP. In such a case, Ecology may determine that there is no need to continue implementing the original cleanup plan (containment remedy) as described in the Consent Decree; however, the process for public involvement, compliance monitoring for the more permanent remedy, and delisting of the Site will still apply.

Operationally, as long as the wastes are at the Site (to be buried under approximately 20 to 70 feet of clean fill and a soil cap), the cleanup remedy and its measures (groundwater monitoring, institutional controls, contingency plans) will continue to be carried out indefinitely. Any significant change of such activities would require an amendment to the Consent Decree, which would not occur without public notice, an opportunity for comment, and Ecology's approval.

Please also see Ecology's response in Section S ("In Perpetuity" vs. "Indefinitely").

2. <u>The City of Kent expressed concern that the CAP does not require groundwater monitoring to continue "in perpetuity." The City commented that the CAP contains provisions that contemplate future termination of long-term monitoring, O&M requirements, and institutional controls.</u>

<u>Ecology's Response:</u>

Ecology is not abandoning its conservative approach to remedy selection. The original approach, including the conceptual elements of the remedy chosen in the 1996 RI/FS report, is still the same conservative approach and remedy in the Final CAP.

"In perpetuity" monitoring has not been abandoned in the Final CAP; the term was merely changed to "indefinitely" to allow for the future possibility that a technology may exist to permanently remediate the Site, which would be more protective of human health and the environment. O&M activities and institutional controls will continue indefinitely, unless and until Ecology determines otherwise—which would trigger an additional public comment period.

See also Ecology's response in section S ("In Perpetuity" vs. "Indefinitely").
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U. Regulatory Compliance and Alleged Violations

The City of Kent wrote that it believes the CAP fails to comply with MTCA requirements and that "Ecology's conduct has been arbitrary, capricious, and unlawful," in violation of Washington's Administrative Procedure Action (APA). In particular, the City of Kent commented that Ecology made "misrepresentations to the public" and "arbitrarily and capriciously abandoned the 'Black Box Approach' relied upon for the past 20 years of Site decisions and activities." The City also wrote that the selected remedy is based upon "speculation and unproven assumptions" and "fails to comply with MTCA's requirements to provide a reasonable assurance of protectiveness of human health and the environment."

<u>Ecology's Response:</u>

Ecology believes that both the DCAP and the Final CAP fully comply with MTCA- and that the agency's actions have been neither arbitrary and capricious nor unlawful.

The DCAP went out for public comment as required under WAC 173-340-600. Ecology has been diligent in its outreach and public communication activities (see section IV, "Summary of Public Involvement"). Ecology has kept the City of Kent Public Works informed of Site activities and has provided them with copies of interim groundwater monitoring in a timely manner.

In accordance with MTCA, the Site underwent the following activities or milestones:

- Initial Investigation completed in 1989
- Site Hazard Assessment completed in 1991
- Added to the Hazardous Sites List in 1991
- Agreed Order for RI/FS executed in 1993
- RI/FS completed in 1996. The RI/FS report included a determination of cleanup standards including ARARS and a disproportional cost analysis
- Twenty years of groundwater monitoring at the Site
- Interim actions in 1990 and 2008
- Publication of the draft Consent Decree, including the DCAP, for public comment in 2013
- Health consultation with DOH completed in 2016

The investigative and cleanup approach taken in the 1996 RI/FS was to monitor the outputs to the groundwater flow system in the former mine and assume as a precaution that the wastes or their leachates could migrate out in the future. The preferred remedial alternative from the 1996 FS is the same approach as that taken in the DCAP, although Ecology has now incorporated additional precautionary safeguards based on additional data and a better understanding of the risks. Accumulated data, such as results from deep well LMW-11, have provided additional confirmation of the absence of deep groundwater contamination and therefore confirmed the reduced degree of risk to the south where the Rock Creek watershed and the Clark Springs Water Supply are located.

The Final CAP has been refined to the point that it is highly protective and precautionary in nature. It still involves the assumption that the wastes in the northern trench may impact groundwater within the former mine and possibly migrate out in the future. The CAP proposes to cover the waste area with clean fill and a low permeability cap. The CAP requires indefinite monitoring at the discharge points (or outputs) of the former mine and a portion of the interior. The discharge points are located at the former mine portals to the north and south and are the primary pathways for groundwater to flow at the Site. The CAP also requires the PLP Group to implement a Contingent Groundwater Extraction and Treatment Plan with treatment infrastructure and institutional controls on groundwater use, Site access, and cap maintenance. There is also no evidence of a danger to state water resources. Even if this were to change, the PLP Group would be required to implement the contingency plan, which will be triggered if the sentinel wells indicate contamination at one-half of the cleanup level.

While Ecology believes that the work done at the Site has been diligent, protective of human health and the environment, responsive, and transparent to the public and local government in accordance with MTCA and APA, additional site characterization work, as recommended by DOH, will be done to confirm those findings. See Ecology's response in Section E ("Site Characterization and Investigation").
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V. Alleged False/Misleading Statements in the Fact Sheet

1. The City of Kent commented that the following statements about the RI/FS contained in Ecology's October 2013 Fact Sheet were false or misleading:
    a. "The RI/FS investigated the nature and extent of contamination…at the Site."
    b. The RI/FS report presented "results of investigations into…the nature and extent of contamination."
    c. The RI/FS "consisted of a comprehensive investigation of site environmental conditions.'

Ecology's Response:

Ecology does not believe that the Fact Sheet was false or misleading. An RI/FS was conducted at the Site and the remedial decisions were based on adequate information.

Fact sheets are a high-level summary of available information, and do not contain complete technical detail regarding the Site and the DCAP. The Fact Sheet is meant to give the public an overview of the Site, including the history of the Site, the contaminants of concern, and the proposed remedial action. During the public comment period, the public then has an opportunity to review the complete record and provide its comments to Ecology.

Please also see Ecology's response in Section E ("Site Characterization and Investigation").

2. The City of Kent commented that the following statement about soil sampling contained in the Fact Sheet was false: "[S]oil sampling conducted in…the northern areas of the trench showed no contamination." The City further commented that, "to the contrary, no soil sampling ever occurred in the trench (anywhere)."

Ecology's Response:

The October 2013 fact sheet erroneously stated that soil sampling conducted in the northern areas of the trench showed no contamination; however, in the same sentence, it correctly stated that soil sampling conducted outside of this area and at the portal areas showed no contamination. Furthermore, the City's comment that "no soil sampling ever occurred in the trench (anywhere)" is not correct.

Section 3.2.21 of the 1996 RI/FS report describes soil sampling conducted within the trench. The 1991 Site Hazard Assessment (SHA) included the collection of 14 surface and subsurface soil samples from within the northern trench area, surface water samples from two ponds, and liquids sampled from three exposed drums. Figure 3-4 in the RI/FS report shows the locations of those samples. Soil chemical data from the SHA were incorporated into the overall data evaluation in the 1996 RI/FS.

In addition, in 1991, the PLP Group removed accessible drums from the trenches north and south of the rock bridge in the northern area of the Site where disposal occurred. As part of this removal action, the PLP Group inspected and tested the residual materials in the drums and conducted some additional sampling and analyses of sludges observed in the trench soils. The results (Site Hazard Assessment by Ecology and Environment, 1991; and Emergency Drum Removal by Burlington Environmental, 1991) were reported and are located in Ecology's Central Records.

3. <u>The City of Kent commented that the following statement about the local water supply contained in the Fact Sheet was false: "There is no known threat to the Clark Springs water supply from the Site based on over 20 years of investigations and monitoring." The City also commented that this statement evidences abandonment of Ecology's conservative approach to the cleanup.</u>

<u>Ecology's Response:</u>

The Fact Sheet correctly states that there is no known (or actual) threat to Clark Springs, such as a contaminated groundwater plume, because no groundwater contamination has been detected leaving the Site. Furthermore, results from monitoring at the southern deep interior of the former mine indicate a reduced future risk to the City of Kent's water supply.

There are no wastes in the southern subsidence trench area above the former mine. However, contaminated water inside the southern half of the former mine (if it existed) could potentially flow towards the south portal and into Rock Creek and downstream to the area of Clark Springs. To date, the deep (700 foot) well and other wells in the southern portion of the former mine have shown no contamination. The wastes are located at the northern area of the subsidence trench, and the groundwater within the mine beneath the waste area flows to the north portal. The flow directions in relationship to the location of the wastes, and the lack of any groundwater contaminant detections in the southern half of the Site is indicative of a lesser risk compared to the risk of future contaminant migration from the north portal (Cedar River and areas around the north portal).

The CAP has not abandoned Ecology's initial assumptions about the presence of wastes and its precautionary approach to the cleanup plan for the Site. Furthermore, the CAP still incorporates long-term monitoring and contingency plans at the south portal and in fact improves upon previous versions of the DCAP. Improvements include (1) infrastructure for a contingent treatment system at the south portal, (2) institutional controls at the south as well as the north portal areas, and (3) more groundwater monitoring wells. Another improvement is designing the cap to cover the former waste disposal area at the northern half while leaving the southern portion of the subsidence trench open. This allows precipitation to enter into the southern half of the former mine and thus maintain the groundwater divide near the south portal. Thus, water flowing out to Rock Creek from the former mine will not be derived from water beneath the waste area to the north half of the former mine.

These improvements are enhancements of the original preferred Site remedy proposed in the 1996 RI/FS report.

4. The City of Kent commented that the Fact Sheet contained misleading information about the CAP's groundwater monitoring plan because the Fact Sheet did not set forth the details of how the frequency of sampling events will change over time during the long-term monitoring phase. The City commented that these details were "buried" in complex and confusing documents.

Ecology's Response:

The passage in question (page 10 of the Fact Sheet) reads:

> Q: How often are the monitoring wells at the Site tested?
> A: Presently, the wells are being sampled twice a year - in the spring (typically high groundwater levels) and fall (typically low groundwater levels).

This specific question-and-answer was only intended to address the current monitoring frequency. It was not intended to describe the entire proposed monitoring plan. The monitoring frequency in the DCAP provides for short-term to long-term durations (see Tables 3 and 4 of this document). This information was available to the public in the DCAP at the document repositories and website during the comment period, and Ecology presented the proposed monitoring program and frequency to the public during its public meeting.

Moreover, in response to the public's concerns about the frequency of sampling events during long-term monitoring, Ecology has updated the Final CAP to increase the frequency of testing for all analyte parameters at the south sentinel and compliance wells. Ecology will also require increased monitoring frequency whenever confirmed sample results at a sentinel well exceed ¼ of the cleanup level. See Ecology's response to Section J ("Protectiveness of Long-Term Monitoring Frequency").

5. The City of Kent added in their above comment that the proposed monitoring requirements have no seasonal basis."

Ecology's Response:

The proposed long-term monitoring program in the CAP is based on sampling over seasonal variations or at seasonal lows, where any potential contamination would be less diluted and present at the highest potential concentrations. The proposed monitoring plan, depending on time following remedy construction, is designed to account for seasonal variations in groundwater level. Please refer to Table A-2 in the Compliance Monitoring Plan for the detailed program.

6. The City of Kent commented that the Fact Sheet was misleading because it stated that the CAP requires "Applying institutional controls on land and groundwater use" and "Monitoring groundwater indefinitely" and because it did not describe the CAP's "termination provisions for monitoring, maintenance, and institutional controls."

Ecology's Response:

The Fact Sheet appropriately describes the terms and duration of the institutional controls, groundwater monitoring, and other long-term components of the DCAP. Fact sheets are a high-level summary of available information, and do not contain complete technical detail regarding the Site and the DCAP. The Fact Sheet is meant to give the public an overview of the Site, including the history of the Site, the contaminants of concern and the proposed remedial action.

Also, please see Ecology's response in Section I ("Provisions for Termination of O&M and Institutional Controls") with regard to the comments on alleged termination provisions.

The City of Kent commented that the Fact Sheet contained a number of speculative statements, including assumptions about "Hazardous Waste Dumping Locations," "the 'Unlikely' Detection of Contaminated Groundwater," "Why Groundwater Contamination Has Not Been Detected (Yet) At The Site,"

"Trench Voids, Instability, and Safety," and "fires consuming wastes."

Ecology's Response:

Ecology's response in Section E ("Site Characterization and Investigation") describes the investigations and data used to determine the location of the wastes in the trench and to choose the preferred cleanup alternative. The 1996 RI/FS report established the existence and location of the waste area. Since the late 1970s when the disposals occurred, groundwater emanating from the mine has not been affected by contamination coming from the wastes, nor was there any evidence of any impacts shortly after the disposals. The proposed cleanup plan still conservatively assumes that contamination to groundwater coming out of the former mine may occur in the future.

Ecology does not find the language that explains the possible reasons why groundwater contamination has not been detected at the Site to be misleading. The Fact Sheet (as well as other documents discussing groundwater contamination) clearly states that these are possible explanations and were based on information gathered during the RI/FS, including information from records collected on the disposals and documented history where available. The 1996 Remedial Investigation presented the following reasons:

1) Wastes disposed in the trench are no longer present, either because they were consumed in the fires that were known to have occurred, or they already discharged to Cedar River through the mined-out Rogers Seam.
2) The chemicals from the wastes were absorbed in place by the leftover coal in the abandoned mine, effectively immobilizing them.
3) Some of the drums were either empty when disposed of or filled with relatively non-reactive or harmless substances. Much of the 200,000 gallons of oily wastewater would have had very low concentrations of chemicals, based on the description from invoice records.
4) Wastes are still contained within intact drums and have not yet been released.

Ecology's Fact Sheet does contain a statement regarding fires consuming wastes. Ecology concurs with the original RI/FS conclusion that fires <u>may</u> have burned off a portion of the wastes, but at the same time recognizes that the amount that may have burned off is unknown. This does not constitute reliance on speculation to justify the CAP; it simply states one theory that "A portion of the waste may have been burned during fires in the early 1970s."

In a January 2012 draft version of the Fact Sheet, the sentence read: "a *significant* portion of the waste may have been burned during fires in the early 1970s." However, in its editorial comments on the draft document, Ecology struck out the word "significant," since Ecology could find no investigation or data to support the contention that a "significant" portion of the waste had been burned off (see draft CAP January 16, 2012 version cited on page 787 of the City's comment document).

In response to the comment alleging "Speculation About Trench Voids, Instability, and Safety," the "Landsburg Mine – Coal Mine Hazard Assessment" (SubTerra, 2005) evaluated potential remaining mine voids and potential continued subsidence. Collapse of rubble from bedrock sidewalls and leftover coal occurred after coal extraction. The material left behind would not be as compacted as the original intact coal seam and would have void spaces between pieces of rock. Evidence of voids is found in the well logs in the RI/FS report and in mine records. Based on this information, Ecology believes that there are real potential hazards (such as bottom and sidewall collapse from voids or rubble displacement) in and around the trench that should be taken into consideration when developing the remedial action for the Site.

Please also see Ecology's response in Section G ("Covering Wastes (Containment Remedy)") for the technical and regulatory basis for capping the wastes after considering other cleanup alternative such as removal of the wastes.
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W. Ability to Submit Supplemental Comments

The City of Kent commented that it intended to reserve the right to supplement" its comments upon discovery of additional information to be produced by Ecology.

<u>Ecology's Response</u>:

The comment period for the cleanup Consent Decree for the Site is closed.

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X. Factors such as Earthquakes that Potentially Cause Contaminant Movement

(Jason Howell, Cedar River Council, City of Kent)

1. Jason Howell, the CRC, and the City of Kent expressed concern about the selected remedy's ability to protect human health and the environment in the event of "a catastrophic event" such as an earthquake.

   The CRC and the City of Kent suggested that the CAP include an additional contingency plan for events such as earthquakes, cavern collapse within the former mine, and major changes in groundwater levels and/or precipitation.

   The City noted that a fault line "runs right through the Site" and that "a strong seismic event" could cause contamination to migrate away from the former waste disposal area. The City suggested that an emergency contingency plan require initiation of groundwater monitoring "within two (2) weeks, and monthly for one (1) year after" the event. The City also suggested that the Final CAP include an express provision describing Ecology's authority and discretion to require additional remedial action in the event of an emergency or "any appropriate circumstances."

Ecology's Response:

The 1996 RI/FS report recognized that the wastes may impact groundwater in the future, which is why the CAP takes a precautionary approach, minimizes the potential for leaching of the wastes, maintains a protective groundwater monitoring program, and establishes infrastructure and contingency plans to contain and treat contaminated groundwater if it were to be detected at the Site. It was recognized that a natural event, such as an earthquake, may cause possible collapse or rupture of buried drums or drum remnants, thereby potentially releasing liquid contaminants into the mine workings. Potentially contaminated groundwater could subsequently migrate from the Site. Thus, it becomes important to monitor groundwater after such an event. Also, an earthquake could damage Site wells and the integrity of the soil cap.

To address the potential risk from earthquakes, the CAP calls for inspection of the Site after an intensity IV or greater earthquake (see page 38 of the CAP and page B-4 in the Operation and Maintenance Plan). Section 5.5.5.3 of the DCAP states, in pertinent part:

> In the event of an earthquake of Intensity IV or greater (Modified Mercalli Intensity Scale) in the area, the cap will be inspected for damage and repaired accordingly. The north and south portal areas will be inspected for ground ruptures, fractures, earth displacements, or similar damage to original (pre-earthquake) landscape. If portal water surfaces due to the earthquake event, it will be inspected for signs of anomalous water quality (color, turbidity, odor, etc.). Ecology will be notified of site conditions within seven (7) days and a decision will be made between the property owner and Ecology on taking groundwater samples from site wells in accordance with the sampling network,

protocols, and analytical methods of the Compliance Monitoring Plan in the Consent Decree (Exhibit D).

In order to arrive at the decision to sample Site monitoring wells, the wells will have to be inspected for damage as part of the post-earthquake Site inspection. The timeliness of monitoring of the wells will be based on the results of the inspection report. If warranted by the extent of earthquake effects, Ecology may require that additional investigations be conducted to assess changes to the Site caused by the earthquake.

“Groundwater flow” is a risk exposure pathway recognized in the 1996 RI/FS report wherein contaminated water could potentially migrate out of the former mine and degrade drinking water resources surrounding the Site. All of the data gathered to date indicates that the groundwater emanating from the mine is not contaminated. However, if contaminated groundwater is detected at the site (for whatever cause), the contingency plan in the CAP is designed to prevent contamination from migrating from the Site by pumping the water, treating it, and disposing of it safely. See the Groundwater Contingency Plan for more details.

Fractures and faults do exist at the Site; however, the RI/FS report referenced mine records documenting that fractures and faults did not transmit significant amounts of groundwater. Furthermore, if fractures do exist that run across the Rogers seam, the two monitoring wells that are installed within the Frasier and Landsburg coal seams on either side of the Site (LMW-6 and LMW-7) would detect cross bedding flow or preferential pathway (fracture) flow of contaminants if it were to occur.

With regard to Ecology’s power and discretion to require more work in light of a new development or emergency event that affects cleanup, please also see the reopener provisions in Section XVIII.B of the Consent Decree (“Covenant Not to Sue—Reopeners”).
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Y. Concerns on Contingency Plan

(Greater Maple Valley Unincorporated Area Council, Cedar River Council, City of Kent)

1. GMVUAC expressed concern about the volume of drums and waste that remain at the Site and the potential for off-Site migration of contamination.

   In particular, GMVUAC commented that the CAP’s reliance on “industry-standard methods” to remediate contaminated groundwater in the event of detection at a sentinel well is insufficient to protect public health and safety.

Ecology’s Response:

The concern expressed by GMVUAC appears to be directed at the second stage of the contingency plan, which is to treat the groundwater and dispose of it safely and reliably. First, if contingency actions are triggered, groundwater will be pumped to prevent contaminated groundwater from leaving the Site in order to protect human health and the environment. This water, whether it requires pretreatment or not, will not be released into the surrounding environment. The CAP requires the PLP Group to dispose of this water safely into the sanitary sewer system, at which point it will be treated by METRO.

Secondly, as stated in the Groundwater Contingency Plan, because the groundwater emanating from the mine is not yet contaminated, Ecology does not know the specific mine waste contaminants that will be encountered. The treatment processes in the Contingency Plan cannot be identified until we know what the contaminants are. Using industry-standards and methods of treating the water as part of the overall response provides high levels of quality control, and target standards will ensure that treatment and disposal is protective of human health and the environment. Using non-industry standards for treatment could put the safety of the disposal of the water at risk. Once contamination is detected and remediation actions are triggered, the PLP Group must submit to Ecology for review and approval a design of the Contingent Groundwater Extraction and Treatment System along with a system-specific Operation and Maintenance (O&M) Plan. The groundwater treatment system design and O&M Plan will be prepared and submitted to Ecology in a timely manner after confirmation of the remediation level exceedance. See Table 5 below for details.

Furthermore, when the treatment system is connected to the publicly-owned treatment works (POTW) sewer, groundwater will be pumped to prevent any spread of contamination from the Site, and the treated water will be conveyed directly to the sewer system for secondary treatment and will not pose a threat to public health and safety.

If the infrastructure cannot be installed despite the county's written approval to connect to the sewer system (see Appendix A of the Groundwater Contingency Plan), other options will be available that insure that extracted, treated groundwater will not be released into the environment (for example, storing in Baker tanks, trucking water into sewer, or recirculation into trench). Accordingly, Ecology believes the proposed plan for water disposal is the most protective option available and does not rely solely on treatment methods to clean up potentially contaminated groundwater if detected at the Site. Please also see Section T ("Provisions for Termination of O&M and Institutional Controls") with regard to indefinite monitoring.

2. <u>GMVUAC expressed concern about the Contingent Groundwater Extraction and Treatment System's ability to capture all contamination migrating from the mine. In particular, GMVUAC commented that contamination could "escape the seam" and impact nearby water resources, including private wells, the Cedar River, and Rock Creek.</u>

<u>Ecology's Response:</u>

The RI/FS report and CAP do not assume that all contamination will always be contained at the Site. The RI/FS report concluded that groundwater from the former mine chiefly flows out of the portal areas and through recessional glacial deposits that discharge into Cedar River and Rock Creek. Therefore, the water does flow into Cedar River and Rock Creek. This water has remained free of contaminants that could be attributed to the wastes. The approach at the Site has been such that if a release does occur in the future, then contingencies will be implemented. That is why the cleanup plan was written with its proposed remedial actions: trench infilling, covering with low permeability soil cap, surface water diversion, contingent groundwater extraction and treatment infrastructure and plan, and long-term (indefinite) groundwater monitoring of sentinel and compliance monitoring wells.

3. GMVUAC expressed concern about "the lack of specific plans" to implement in the event of a "major leakage of contaminants" from the former mine.

Ecology's Response:

Should groundwater monitoring indicate that groundwater is contaminated, there are specific requirements that must be met by the PLP Group for finalizing the design, implementing, and installing a groundwater extraction and treatment system. See Section 5.5.5.5 of the CAP, the Compliance Monitoring Plan, and the Groundwater Contingency Plan. Please also refer to Ecology's other responses in this section.

4. The CRC commented that the Final CAP should include "conceptual level contingency plans" that set forth "general treatment systems for classes of contaminants." The CRC questioned whether the PLP Group will be able to coordinate and take action fast enough in the event of a contaminant release. The CRC noted that it has been 17 years since the RI/FS was completed in 1996.

Ecology's Response:

Ecology believes the level of detail in the Groundwater Contingency Plan is sufficient under MTCA. However, in response to public comments, Ecology is accelerating the time period for design, review, and permitting of the contingent groundwater treatment system. Ecology has made changes to the Final CAP in response to these concerns. Please see Section Y(5) and Table 5 below.

5. The City of Kent expressed concern that the Groundwater Contingency Plan does not require "immediate" installation and operation in the event of off-Site contaminant migration.
   The City suggested that the "trigger" level of contamination should be set more conservatively.

Ecology's Response:

The Groundwater Contingency Plan is designed to capture a potential contaminant plume by pumping or extracting groundwater (also referred to as groundwater containment) in order to treat and safely dispose of the water before contamination exceeding cleanup levels migrates from the Site.

In 2009, the infrastructure components of the Contingent Groundwater Extraction and Treatment System' that could delay construction were identified, designed, and constructed as an Interim Remedial Action to shorten the time needed to implement the entire extraction and treatment system.

Although Ecology believes that the design, installation, and operation of the Contingent Groundwater Extraction and Treatment System can be carried out in an appropriate and timely manner to prevent off-Site migration, Ecology has made changes to the Final CAP in response to public comments. Specifically, Ecology is accelerating the schedule for triggering implementation of the Contingent Groundwater Extraction and Treatment System as follows:

- Ecology review and approval, and permitting of the Contingent Groundwater Extraction and Treatment system, will be initiated if and when collected samples detect and confirm that the groundwater contaminant concentration is at or above one-half of the MTCA cleanup level[2] at designated sentinel wells (Portal #2 sentinel wells, LMW-11, LMW-9, and the proposed sentinel well adjacent to LMW-11).
- The final design submittal will be due within 30 days of a confirmed exceedance as described above.
- Installation of the Contingent Groundwater Extraction and Treatment System will begin if and when the confirmed groundwater contaminant concentrations reach MTCA cleanup levels at the above designated sentinel wells.
- The system will be turned on and operated if and when the groundwater is confirmed to be contaminated and concentrations meet or exceed one-half of the MTCA cleanup levels at a compliance well.
- The system will continue to be operated until concentrations at the compliance wells and in the pumped effluent remain below one-half of the MTCA cleanup levels for four consecutive monitoring periods or a minimum of one year.

These revised requirements in the Final CAP enable implementation of the Groundwater Contingency Plan in a more timely manner, with added protection to the public health and the environment.

In addition, if a sentinel well detects contamination at 1/4 of MTCA cleanup levels, Ecology will require more frequent Site monitoring to ensure prompt operation of the extraction and treatment system (where the trigger for operating the system is 1/2 MTCA cleanup level at the compliance wells).

As a precaution, Ecology will require the installation of additional performance wells between the contingent extraction wells and the compliance wells for determining containment of the contaminant plume during groundwater extraction when the system becomes operational. The compliance wells will be used to confirm that contaminated groundwater does not migrate off-Site.

The following table summarizes the original and revised set of triggers.

[2] Cleanup level means the concentration of a hazardous substance in soil, water, air, or sediment that is determined to be protective of human health and the environment under specified exposure conditions.

Table 5. Revised Contingency Plan Triggers

Contingency Plan Phase of Work	Triggering Event				Estimated completion time[2]
	July 2013 DCAP		Final CAP		
	Sentinel well[1]	Compliance well	Sentinel well[1]	Compliance well	
Increased frequency of groundwater monitoring		**1/4 cleanup levels**	**1/4 cleanup levels**		
Design, Ecology approvals, and permitting requirements		**1/2 cleanup levels**	**1/2 cleanup levels**		**Design submittal: Within 30 days** **Approvals and permitting: 2 – 4 weeks**
System installation		**1/2 cleanup levels**	**Reaches cleanup levels**		**2 – 4 weeks**
System startup, optimization, and operation (including pumping)		**Reaches cleanup levels**		**1/2 cleanup levels**	**2 weeks**
System shutdown		**Compliance well and pumped effluent below cleanup levels for 4 monitoring events (minimum 1 year)**		**Compliance well and pumped effluent below ½ cleanup levels for 4 monitoring events (minimum 1 year)**	

[1] Sentinel wells are closer to the wastes than compliance wells to provide early detection of any contaminant release. Modeling of contaminant travel times indicate it will take from months to years before a cleanup level is reached at the compliance wells.
[2] Pre-treatment before disposal to sewer will likely increase the time to complete each phase of the Contingency Plan; however, timely completion of each phase is still expected based on modeling results and technical evaluation. Temporary storage and trucking of waste effluent could be conducted if needed.
NOTE: Iron, manganese, and arsenic are analytes associated with the coal mine water and monitored levels are not associated with Landsburg Mine Waste and will not be used as a trigger, unless a significant increase in concentrations occurs and an alternative source is not identified.

Under these conditions, groundwater capture will occur while contaminant concentrations remain within the Site boundaries. The Final CAP requires groundwater extraction and treatment to continue until contaminant concentrations in groundwater (at the points of compliance) and in the pumped effluent are below one-half of MTCA Cleanup Levels for four consecutive monitoring periods or a minimum of one year. Monitoring groundwater will continue indefinitely after the extraction and treatment system has been turned off.

The Final CAP has been revised to reflect the changes identified in Table 5.

6. <u>The City of Kent commented that there is a lack of performance standards for achieving and demonstrating groundwater containment:</u>
   <u>The City noted that the Groundwater Contingency Plan assumes a pumping rate of 40 gallons-per-minute but does not mandate "any specific rate of extraction."</u>

<u>Ecology's Response:</u>

The Groundwater Contingency Plan contains standards of performance based on achieving cleanup levels at the conditional points of compliance. By doing so, it ensures that human health and the environment are protected by preventing the migration of contaminants off-Site. The chief performance standard is that "contingency groundwater extraction and treatment would continue until groundwater at the points of compliance meets MTCA Method B cleanup levels" (see page C-7 of the Groundwater Contingency Plan). In addition, as noted above, the Final CAP has been revised to require that groundwater extraction and treatment continue until groundwater at the points of compliance and the pumped effluent are below one-half of MTCA Cleanup Levels for four consecutive monitoring periods or a minimum of one year.

Please also see Section Y(5), Ecology's response to City of Kent's comments on hydraulic triggers. Additional performance wells will be installed between the contingent extraction wells and the compliance wells in order to monitor containment as needed.

The estimated extraction rate of 40 gallons/minute was derived from mine records, interviews, and information on the mine dewatering system (Golder, 1996 and SubTerra, 2005). The estimated mine inflow and outflow rates are consistent with the total amount of precipitation occurring at the Site. Hydraulic containment of contaminants leaving the former mine is straightforward and bounded by the geologic structure of the mine.

Please also see Golder's Response to Aspect Specific Comment #11 in Appendix C.

There is some uncertainty regarding the optimal (or minimal) groundwater extraction rate required for containment after the low permeability cap and surface water diversion is installed, but the pumping rates can be optimized during initial operation of the system. The Groundwater Contingency Plan has been revised to require installation of additional performance monitoring wells between the contingent extraction wells and compliance wells, which will be used in conjunction with sentinel and compliance wells to establish containment and to optimize extraction rates.

The City of Kent commented that Ecology must establish enforceable deadlines for implementation of the remedial action.

The City of Kent suggested that initial operation of the Contingent Groundwater Extraction and Treatment System should be required within one week of the "trigger" (confirmation of contaminant concentrations at or above 1/2 of the cleanup level at the point of compliance) and that hydraulic containment be complete within one month of the "trigger."

Ecology's Response:

Time tables specific to the installation and operation of the Contingent Groundwater Extraction and Treatment System will be included in the final design and O&M Plan, which will require Ecology's approval. See also Section Y(5) and Table 5: Ecology's responses to hydraulic triggers and response times.

Ecology's actions are compliant with MTCA, and Exhibit C to the Consent Decree (Schedule) lays out an enforceable overall schedule for the entire remedial action. If implementation of the Groundwater Contingency Plan is required, a detailed schedule for the design, installation, and operation of the extraction and treatment system will be included in the design submittal. Due to the unknown nature (chemical composition) and depths of a potential detection of contaminants at the Site, the degree of detail on timelines and deadlines must be limited to those stated in the Groundwater Contingency Plan and in Table 5 above, identifying the revised triggers for design approval, permitting, system installation, and operation.

7. The City of Kent expressed concern about the lack of requirements to design, approve, construct, and test the Contingent Groundwater Containment System before any groundwater contamination is detected. The City suggested that Ecology require an "up-front" demonstration of the system's ability to pump and contain contaminated groundwater

Ecology's Response:

Up-front installation of the Contingent Groundwater Extraction and Treatment System is not necessary.

Pump tests at the ends of the seam and the Baker Tank Discharge conducted during the 1996 RI/FS established the hydraulic communication with water from the portal areas and water in the coal seam beneath the subsidence trench.

Due to the higher permeability of the mine workings at the portal areas compared to the adjacent sidewalls made up of Puget Group bedrock, and the comparatively narrow width of the seam (measured at about 16 feet when the coal was boomed and extracted), pumping at this zone is expected to be highly effective. This geologic structure provides a boundary for groundwater containment. The maximum rate of groundwater extraction for containment of contaminants flowing out of the former mine would be the amount of water entering the former mine.

Furthermore, since the amount of water entering the former mine will be changed by placing a low permeability cap and diverting surface waters from entering the north mine subsidence trenches, the value of any containment study conducted before those remedial actions are implemented would be questionable after the remedial actions are constructed.

The installed system will be capable of handling the maximum amount of groundwater emanating from the former mine and will contain the contamination. Groundwater extraction rates for containment can be determined and optimized during the initial operation of the extraction system (with adequate performance/observation well monitoring). Please also see Section Y(5) (hydraulic containment triggers).

8. The City of Kent commented that the DCAP's assumptions about groundwater disposal facilities were speculative. The City questioned whether the sanitary sewer system has the capacity to simultaneously serve both the local school district and the Site's contingent groundwater system. The City noted that Tahoma School District No. 409 has expressed concern that the Site's use of the sewer system will impact the planned construction of a new school next to the existing junior high school and that the district would seek compensation for the Site's use of the sewer line, which could delay implementation of the Groundwater Contingency Plan.

Ecology's Response:

The design of infrastructure for the Contingent Groundwater Extraction and Treatment System was based on engineering analysis and designs for disposing of pre-treated water from the Site, should groundwater extraction and disposal be needed. In 2006, Ecology amended the Agreed Order to require the installation of this infrastructure after undergoing a public comment period and issuing a responsiveness summary that addressed the comments above. King County reviewed and approved of the infrastructure plan, provided that the pipeline remains unconnected until such time that it is needed (see letter from Karen Wolf to Jerome Cruz in Appendix A of the Groundwater Contingency Plan).

Subsequently, Golder Associates (technical consultants to the PLP Group) confirmed that there is sufficient capacity to handle the combined discharges of the school and the Contingent Groundwater Extraction and Treatment System. Additionally, the treated groundwater can be temporarily stored during school hours for later disposal.

Other options (trucking, recirculation) will be explored if substantial unforeseen hurdles are raised with regard to connection of the infrastructure to the Soos Creek Water and Sewer District's sanitary sewer line.

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Z. Determination of Compliance Boundary for Groundwater Protection Area

1. The City of Kent commented that the points of compliance for groundwater are "arbitrarily aligned" with the property boundary and that a "carved out" area near the south portal should be included within the Groundwater Protection Area.

Ecology's Response:

The compliance boundary for the Groundwater Protection Area is an important component for maintaining long-term protectiveness at the Site. Coupled with the Groundwater Contingency Plan and infrastructure, institutional controls on groundwater and portal water use, and long-term groundwater monitoring, risks from groundwater to public health and the environment are avoided by preventing human exposure to Site groundwater if Site groundwater were to become contaminated by waste constituents.

The Groundwater Protection Area is the area of land where institutional controls will be placed prohibiting the withdrawal and use of groundwater, in order to minimize risks of potential contamination flowing into these areas from the waste area (either as porous flow across bedding planes or through fractures). The protection area serves as a safeguard by prohibiting groundwater use in the areas that extend orthogonally along the length of Rogers seam mine workings.

The Groundwater Protection Area encompasses the Site as well as areas west and east of the Roger's seam (which is where the wastes are located in the northern trench at the top of the hill). First, the Groundwater Protection Area extends westward and eastward and is bounded by the Frasier and Landsburg coal seams, respectively. The Frasier and Landsburg seams are also former coal mines, and they form hydrogeologic line sinks to which laterally flowing groundwater in the bedrock drains to and discharges via the portals. These hydrogeologic sinks, for the most part, comprise the west and east hydraulic boundaries for groundwater to the west and east, respectively, of the Rogers seam (where the wastes are located). Any risks to groundwater further away from the Site along this west-east direction are reduced to nonexistent, due to groundwater flow toward these hydrologic line sinks. The compliance boundary for the Groundwater Protection Area was established based on technical reasons.

Second, this compliance boundary for the Groundwater Protection Area is based on the conceptual site model of groundwater flow and potential contaminant transport at the Site. In combination with other components of the CAP, it ensures future conservative protection at the Site from potential exposure should a release of contamination from the wastes occur.

The "carved out" section the City of Kent refers to is a small parcel on the southwest edge, which was sold to a private landowner (the small parcel is described in Exhibit E-2). There is an access agreement between the private landowner and the PLP Group to sample the monitoring well that is located on the small parcel (LMW-5). Ecology determined that with respect to institutional controls on properties not owned by a PLP, MTCA requires a "good faith effort to obtain" a restrictive covenant and does not unconditionally mandate that environmental covenants be recorded on such properties (see WAC 173-340-440(8)(c)). If the "good faith effort" fails to secure a covenant on the property, "other legal or administrative mechanisms" may be employed as institutional controls (see WAC 173-340-440(8)(c)). The PLPs will conduct a "good faith effort to obtain" an environmental covenant for the privately-owned small parcel (Exhibit E-2) when the Consent Decree is filed. The PLP Group will also record the environmental covenant for the Site within 10 days of Ecology's written approval of the as-built drawings for the low permeability soil cap.

2. <u>The City of Kent expressed concern about the DCAP's distinction between sentinel wells and compliance wells, as well as the location of each.</u>

   <u>The City commented that the DCAP fails to establish the requirements of WAC 173-340-720(8)(b) for using a conditional point of compliance, and suggested that the standard point of compliance be used for both sentinel and compliance wells.</u>"

<u>**Ecology's response**</u>:

The City of Kent cites WAC 173-340-720(8)(b) for how MTCA sets conditional points of compliance:

> **"Conditional point of compliance.** Where it can be demonstrated under WAC 173-340-350 through 173-340-390 that it is not practicable to meet the cleanup level throughout the site within a reasonable restoration time frame, the department may approve a conditional point of compliance that shall be as close as practicable to the source of hazardous substances, and except as provided under (d) of this subsection, not to exceed the property boundary. Where a conditional point of compliance is proposed, the person responsible for undertaking the cleanup action shall demonstrate that all practicable methods of treatment are to be used in the site cleanup."

To date, Site investigations and groundwater monitoring have found no contamination of groundwater emanating from the mine or other impacts to water quality, making it technically difficult and impracticable to set a standard point of compliance at this Site as is typically done under MTCA.

The requirements under WAC 173-340-350 through 173-340-390, regarding impracticability to meet cleanup levels throughout the Site, were sufficiently met by completion of the RI/FS report in 1996, public comment on the RI/FS report, completion of the DCAP, and public comment on the DCAP. The selected remedy is appropriate given the conceptual site model, the presence of wastes, and the conservative assumption that groundwater contamination coming from within the former mine could occur in the future. The Site conditions and remedial design concepts in the CAP necessitate conditional points of compliance for groundwater.

Under MTCA, a conditional point of compliance must be located "as close as practicable" to the source of contamination. WAC 173-340-720(8)(b). MTCA defines "practicable" as "capable of

being designed, constructed and implemented in a reliable and effective manner including consideration of cost." WAC 173-340-200. The sentinel wells are "early warning" wells, which trigger active remediation at the Site to prevent the potential migration of contaminated groundwater past Site boundaries, making them an important component of the monitoring program and the overall remedy. Based on contaminant travel modeling and the time it takes to implement the engineered remediation system in the Groundwater Contingency Plan, it would not be practicable to designate the sentinel wells as conditional point of compliance wells. Rather, the compliance wells, as specified in the DCAP, constitute conditional points of compliance located as close as practicable to the source of hazardous substances (i.e., trench wastes), because they must be located at an optimum distance to implement groundwater containment and treatment in a timely manner while preventing migration into the environment in order to be implemented in a reliable and effective manner. The sentinel wells cannot practicably achieve such compliance under these specific Site conditions.
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AA. Covenant Not to Sue and Contribution Protection

The City of Kent commented that unless and until the Groundwater Contingency Plan is triggered, the remedial action requirements imposed on the PLP Group by the Consent Decree are insufficient to justify the scope of the decree's covenant not to sue and contribution protection provision. The City expressed concern that the PLP Group will not provide sufficient financial assurance for potential remedial actions beyond installation of the low-permeability cap. The City suggested that the decree's covenant not to sue and contribution protection provision should be conditioned on the PLP Group's future implementation of the Groundwater Contingency Plan. The City also expressed concern that a containment remedy cannot achieve remediation within a reasonable restoration time.

Ecology's Response:

The CAP takes a precautionary approach in its remedial design. Ecology believes that the Consent Decree's covenant not to sue and contribution protection provisions are suitable for this cleanup based on the appropriate level of remedial activities and design for the whole Site, including the Cap Protection Area and the surrounding Groundwater Protection Area. Applying institutional controls to the Groundwater Protection Area was included as an added safety factor for possible groundwater contamination in bedrock west and east of the waste area. The level of response and design was achieved by recognizing the lower permeability of surrounding bedrock in the Groundwater Protection Area, and conversely, the higher permeability and hydraulic responsiveness within the former mine, including the points of compliance at the north and south portals of the former mine. Additionally, the Frasier and Landsburg seams (which are located at the west and east ends of the Groundwater Protection Area) will continue to be part of the long-term monitoring network for the Site.

Given the lack of current impacts to groundwater discharging from the mine and the Site's geologic/hydrogeologic conditions, institutional controls are appropriate for the Groundwater Protection Area. The Contingent Groundwater Extraction and Treatment System (including pumping) and other remedial activities in the Groundwater Contingency Plan are appropriate (based on the conceptual site model and Site conditions) and ensure the protectiveness of the cleanup.

Please also refer to Ecology's response in Section Z ("Determination of Compliance Boundary for Groundwater Protection Area") with regard to determining the boundaries for the Groundwater Protection Area.

Because no impacts to mine discharging groundwater have been detected at the Site, an estimate of groundwater restoration time is not achievable until such time that groundwater contamination actually is observed at the Site. Accordingly, Ecology believes the covenant's reopener provisions (B.3 and B.4) based on the reasonable restoration timeframe set forth in the CAP remain valid and appropriate.

It should be noted that the reopener provision in the Consent Decree authorizes Ecology to require additional remedial action from the PLPs if Ecology determines that such actions are necessary to abate an imminent and substantial endangerment to human health and the environment. If new information on groundwater, hazardous substances, or Site information relating to the implementation of the Groundwater Contingency Plan comes to light that would trigger a reopener, Ecology will reopen the Consent Decree.

Similarly, Ecology may need to reopen or amend the Consent Decree if and when the Groundwater Contingency Plan is triggered, since at that point Ecology will have the information regarding the types and quantities of hazardous substances in the groundwater necessary to design and implement the Contingent Groundwater Extraction and Treatment System.
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BB. Land Use Restrictions

The City of Kent expressed concern about the scope of the environmental (restrictive) covenants attached as Exhibits F-1 and F-2 to the draft Consent Decree and their adequacy as institutional controls for the Site. The City suggested that the covenants should be modified to (1) eliminate provisions that allow for termination of the covenant, and (2) add a provision that would trigger "expansion" of the area to which institutional controls apply in the event that groundwater contamination migrates off-Site.

Ecology's Response:

The environmental covenant will be recorded on the Site property and immediately surrounding properties, which will substantially limit land uses and prohibit groundwater use in an effort to minimize any risk that wastes in the mine could be disturbed. Additionally, if any inconsistent land use is proposed on a property encumbered by the covenant, such use must first be approved by Ecology. Finally, the covenants cannot be removed without Ecology's approval.

See Ecology's response in Section Z ("Determination of Compliance Boundary for Groundwater Protection Area") regarding the boundaries of the Groundwater Protection Area. The compliance boundary for the Groundwater Protection Area was scaled as appropriate to the hydraulic boundaries, cross flow directions, and ownership constraints explained previously. The CAP provides a scope of work that extends beyond the Cap Protection Area, including long-term monitoring, institutional controls, installation of the Contingent Groundwater Extraction and Treatment System, and O&M.

Due to the geology and hydrology of the Site and the lack of groundwater contamination migrating from the waste disposal area, Ecology does not see a need for additional provisions to expand the institutional controls or the "Groundwater Protection Area" beyond their present extents at this time. The southwestern extent of the "Groundwater Protection Area" extends to property boundaries in order to provide as much buffer as practicable and controllable by the PLPs. Technically, the bedrock adjacent to the western side of the Rogers mine workings appears to be currently discharging groundwater into the Rogers mine interior, rather than from the mine interior to adjacent western bedrock, as evidenced by the groundwater levels observed during the drilling of LMW-11 (installed through bedrock on the southern portion of the Rogers mine).

Although impacted groundwater should not migrate westerly through the adjacent bedrock beyond the proposed southwestern "Groundwater Protection Area" boundary, any potential groundwater contamination migrating south within the Rogers mine toward the south portal (Portal #3) will be detected by the array of sentinel wells, which would trigger additional remedial actions including containment of contaminated groundwater. Ecology believes that the "Groundwater Protection Area" is sufficiently protective; if contamination migrates toward the south portal, it will be detected and contained before any contamination can migrate beyond the "Groundwater Protection Area" along the southwestern and southern boundaries. These conditions reduce the concern about including the southwest parcel within the compliance boundary.
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CC. Five Year Periodic Reviews

1. <u>The CRC suggested that the Consent Decree should include provisions that address (1) how periodic reviews will involve adaptive management for O&M requirements, and (2) how the public will be involved in those reviews.</u>"

<u>Ecology's Response:</u>

The five-year periodic review process required under MTCA and incorporated in the Consent Decree (see Section XXVI) embodies the adaptive management approach to the cleanup by (1) requiring periodic assessment of the progress of the cleanup to confirm continued protection of human health and the environment, and (2) establishing Ecology's right to require further remedial actions at the Site under certain circumstances. For example, Ecology is authorized under Section XVIII.B of the Consent Decree to require additional remedial action if Ecology determines that such action is necessary to abate an imminent and substantial endangerment to human health or the environment.

WAC 173-340-420(4) establishes the criteria by which Ecology evaluates whether human health and the environment are being protected through the review of post-cleanup Site conditions and monitoring data. If Ecology determines that substantial changes to the CAP are necessary to protect human health and the environment in light of its evaluation under the criteria in WAC 173-340-420(4), a revised CAP shall be prepared, which would be subject to public notice and comment. In addition, Ecology's periodic review will be published in the Site Register and is subject to the public notice and comment provisions of WAC 173-340-600. The Site Register is typically published every two weeks. If you would like to be placed on the Site Register's e-mailing list, complete the electronic form at:

https://listserv.wa.gov/cgi-bin/wa?SUBED1=siteregister&A=1.

The periodic review report will also be announced and made available for download at Ecology's website for the Landsburg Mine Site (see link on page 4).

Based on the above, Ecology believes that these sections of the Consent Decree, coupled with MTCA requirements for periodic reviews, provide for adaptive management and administrative flexibility in the event of changing Site conditions, changing maintenance and monitoring requirements, or need for further remedial action.
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VI. Health Consultation by the Washington Department of Health

During the 2013 public comment period, the City of Kent submitted to Ecology a letter dated December 12, 2013, to the Washington State Department of Health's Office of Environmental Public Health Sciences requesting that it "undertake appropriate site investigation, consultation, and reporting actions" regarding the Site. In response to the City's request, the Department of Health (DOH) completed a Health Consultation report on November 16, 2016, entitled "Site Characterization Evaluation Landsburg Mine Site King County, Washington."

DOH concluded that:

- The Site poses a potential chemical health hazard. The extent of the potential hazard is unknown.
- Except for arsenic, none of the chemicals found in groundwater at the Site in May and November 2013 and June 2014 are a public health hazard. Although the maximum level of arsenic found in the groundwater presents some risk of causing long-term health effects, the levels are below state and federal drinking water standards.
- The Site poses a physical hazard.

DOH provided the following recommendations:

- Before placing the soil cap, install and measure water levels in an appropriate number of monitoring wells to determine the location of the groundwater divide within the former mine.
- Before placing the soil cap, install and sample additional monitoring wells at the north end of the mine to better assess whether contaminants are being released from the mine.

- Provide information about the City of Kent's Clark Springs' municipal drinking water system, Covington Water District system, and Cedar Valley Sole Source Aquifer (used by the City of Renton).
- Conduct a well survey to identify private wells installed in the area and include language in the final CAP requiring additional well surveys in the future.
- Test private wells closest to the north and south portals annually for five years for the same chemicals as the monitoring wells. Re-evaluate the need for further private well testing as part of the five-year Site review.
- Test private wells east and west of the waste disposal area annually for five years and re-evaluate the need for further testing at the five-year review unless it can be confirmed the groundwater from the surrounding bedrock discharges into the mine rather than flowing away from the mine.
- Sample and analyze trench rim samples for volatile organic compounds (VOCs).
- Test surface water at portals #2 and #3.
- Modify the CAP to explain why pumping tests are not feasible and explain what steps will be taken to ensure that the contaminants do not migrate beyond the Site boundaries.
- Maintain the existing fencing around the waste disposal area and add warning signs explaining why the area is fenced.

Ecology will carry out the following tasks in response to the recommendations from DOH:

- Modify the CAP to require collection of water level data from Site wells (including the additional sentinel wells) to better define the location of the groundwater divide.
- Modify the CAP to set the proposed deeper northern sentinel well at a mid-level depth that would give better vertical groundwater coverage for possible contamination that could come from the mine. If logistically possible, the shallow and deeper northern sentinel wells will be moved within the inclined northern mine shaft location or as close as possible.
- Modify the CAP to require consideration of additional monitoring wells in the southern portion of the mine if the groundwater divide is found to be located beneath any portion of the former waste disposal area.
- Modify the CAP to include information about the City of Kent's Clark Springs' municipal drinking water system, Covington Water District system, and Cedar Valley Sole Source Aquifer.
- Modify the CAP to require the PLPs to conduct private well surveys near the Site during the five-year periodic Site reviews.
- Modify the CAP to require the PLPs to test active private wells closest to the north and south portals annually for five years for the same chemicals as the monitoring wells.
- Modify the CAP to require the PLPs test the soil just outside of the proposed cap edge for volatiles.
- Modify the CAP to require the PLPs conduct limited surface water testing at the north and south portals prior to remedial construction and performance monitoring (see Compliance Monitoring Plan, Table A-2).
- Modify the CAP to explain why pumping tests are not feasible and explain (or highlight) what steps will be taken to ensure that the contaminants do not migrate beyond the Site.
- Notify the PLP Group that existing and future fencing around the waste area must be

properly maintained and that signage must be posted that explains why it is being fenced.

The full health consultation can be viewed at www.doh.wa.gov/consults.
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VII. Summary of Changes made to Final CAP and Consent Decree

In response to public comments, and as described more fully throughout these responses, Ecology has made the following changes to the Final CAP, which the PLPs will be obligated to implement under the Consent Decree:

- Require that the sentinel wells be installed before construction of the cap (see response in section K).

- Increase the frequency of long-term monitoring (after 10 years) at the southern sentinel and compliance wells. For long-term (continuous) groundwater monitoring, all analyte parameters will be monitored at a frequency of once every five years at the south sentinel and compliance wells, instead of once every 10 years (see Table 4 of this document). This increased frequency will also provide Ecology with a full suite of analysis for every five-year review.

- Add the chemical 1,4-dioxane to the suite of analytes to be tested during compliance monitoring when required to use EPA Method 8270.

- Clearly define the use of the word "indefinitely" for the cleanup (see response in section S).

- Revise triggers for implementing the Groundwater Contingency Plan. An accelerated schedule for implementing the extraction and treatment system will be achieved according to this revised set of triggers (see Table 5 of this document). These revised triggers allow implementation of the system much earlier than the previous plan and thus provides added protection to public health and the environment.

- As a precautionary measure, require additional performance wells for determining containment of the contaminant plume during groundwater extraction if the system becomes operational. The compliance wells will be used for confirmation that contaminated groundwater does not migrate off-Site.

- Incorporate the public health actions that Ecology has agreed to take in response to DOH's health consultation recommendations.

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-END OF PUBLIC COMMENTS RECEIVED AND RESPONSES-

APPENDICES

Appendix A: Copies of Written Comments (including CD containing City of Kent comment document)
Timothy LaPorte, City of Kent Public Works

KENT
WASHINGTON

PUBLIC WORKS DEPARTMENT
Timothy J. LaPorte
Public Works Director
400 West Gowe
Kent, WA 98032
Fax: 253-856-6500

PHONE: 253-856-5500

October 9, 2013

VIA EMAIL and U.S. MAIL

Robert W. Warren (rwar461@ecy.wa.gov)
Section Manager
Toxics Cleanup Program, NWRO
Washington Department of Ecology
3190 – 160th Avenue SE
Bellevue, Washington 98008-5452

RE: Landsburg Mine Site—Request to Extend Public Comment Period

Dear Mr. Warren:

I write on behalf of the City of Kent ("City") to request that Washington's Department of Ecology ("Ecology") extend by thirty (30) days (to December 11, 2013) the public comment period for the proposed Landsburg Mine Site consent decree and draft cleanup action plan. Per the most recent Ecology Site Register, Ecology has established the comment period to run from October 11 to November 11, 2013. The City believes that additional time is necessary for the City and the public to adequately review, assess, and prepare comments on the complex materials at issue. The materials comprise over 550 pages of detailed technical and legal requirements. Ecology and the Landsburg PLP Group have worked on the preparation of the materials for many years—that fact alone demonstrates the complexity of the issues presented, and the inadequacy of the announced 30-day comment period.

We will appreciate your consideration of this request, and your response as soon as possible. Thank you.

Sincerely,

Tim LaPorte

Timothy LaPorte
Public Works Director

cc: Dori Jaffe, Assistant Attorney General
Jerome Cruz, Ecology Site Manager

www.ci.kent.wa.us

MAYOR SUZETTE COOKE

City of Kent Public Works Department

Gary Habenicht

-----Original Message-----
From: Gary Habenicht [mailto:gbhabenicht@gmail.com]
Sent: Thursday, October 24, 2013 8:25 PM
To: Cruz, Jerome (ECY)
Subject: Landsburg Mine Site

Jerome:

My name is Gary Habenicht and I have lived close to the area in question for many years as I am fourth generation to the Landsburg / Ravensdale area.

I had planned to be at the public meeting but other commitments prevented my presence. The question I would have asked is why cover the site? I suspect that it is part of an already agreement, but still why cover it, why spend that kind of money, money that could be used elsewhere or not at all?

The northern half of the cave in or fill site is remarkable habitat and sanctuary for the black bear. I have had three sightings this summer already. It is my contention that the cave in location is where bear(s) den up for the winter.

Anyway just a little more input to the project.. I can be reached by e-mail or by phone at 206-571-2802.

Sincerely

Gary Habenicht

Jim Lee

DEPARTMENT OF ECOLOGY
State of Washington

Landsburg Mine Cleanup Site
Comment Period: October 11 – December 12, 2013

Ecology would like to hear from you regarding the Landsburg Mine Site. You may mail this form to: Department of Ecology, ATTN: Jerome Cruz, Site Manager, 3190 160th Ave SE, Bellevue, WA 98008 or email your comments to jerome.cruz@ecy.wa.gov Please indicate Landsburg Mine Site in your subject line.

Please print clearly

Name: Jim Lee

Organization/Neighborhood: Landsberg estates

Mailing Address: 24916 267 th Ave SE

City: Ravensdale State: WA Zip: 98051

Email: Leejh4@earthlink.net

Phone Number: 425 432-8257

Comments (if you need more space, please use the backside.):

Our well is 500 feet from the mine's north end. It should be tested for contaminents at least once a year. It has not been tested since 1993 except our own testing for E-coli.

Bill & Jane Nation

DEPARTMENT OF ECOLOGY
State of Washington

Landsburg Mine Cleanup Site
Comment Period: October 11 – December 12, 2013

Ecology would like to hear from you regarding the Landsburg Mine Site. You may mail this form to: Department of Ecology, ATTN: Jerome Cruz, Site Manager, 3190 160th Ave SE, Bellevue, WA 98008 or email your comments to jerome.cruz@ecy.wa.gov Please indicate Landsburg Mine Site in your subject line.

Please print clearly

Name: Bill & Jane Nation

Organization/Neighborhood:

Mailing Address: 25113-265TH AVE. SE.

City: Ravensdale State: Wa. Zip: 98051

Email: JANESDOLLS@VIRCOM.NET

Phone Number: (425)432-4031

Comments (if you need more space, please use the backside.):

(1.) Wild life lives on this land. What happens to them?

(2.) What happens to our property value?

(3.) Monitoring our personal Wells for 4 home owners.

(4.) Noise & pollution when we're across the road.

Gretchen Gibbs

-----Original Message-----
From: Gretchen [mailto:gretch751@yahoo.com]
Sent: Sunday, October 27, 2013 9:18 AM
To: Cruz, Jerome (ECY)
Subject: Landsburg Mine Site

Hello Department of Ecology, Jerome Cruz,

We have reviewed information shown at your Landsburg Mine Site Public Comment Period Extension meeting on 10/24/2013. We do not see evidence of even the bare minimum due diligence needed to correctly assess what danger the vast quantity of Toxic, Hazardous Waste poses to Our local School, Residents, OR the Cedar River and Green River Watersheds. There are Material flaws in the current approach and plan. We need to have a proactive and independent third party involved with a much more rigorous design for monitoring the site, including an approach that uses automated sensors and sampling as a core component of the monitoring protocol.

Gretchen Gibbs

Jon Parkinson

From: Jon Parkinson [mailto:parkinson343@gmail.com]
Sent: Monday, October 28, 2013 10:49 AM
To: Cruz, Jerome (ECY)
Subject: Landsburg Mine Site

Hello Department of Ecology, Jerome Cruz,

We have reviewed information shown at your Landsburg Mine Site Public Comment Period Extension meeting on 10/24/2013. We do not see evidence of even the bare minimum due diligence needed to correctly assess what danger the vast quantity of Toxic, Hazardous Waste poses to Our local School, Residents, OR the Cedar River and Green River Watersheds. There are Material flaws in the current approach and plan. We need to have a proactive and independent third party involved with a much more rigorous design for monitoring the site, including an approach that uses automated sensors and sampling as a core component of the monitoring protocol.

Thank You,

Jon Parkinson
27548 247th Ct SE
Maple Valley, WA 98038
425-736-6111

Craig Weinstein

-----Original Message-----
From: Craig Weinstein [mailto:caweinstein4@gmail.com]
Sent: Monday, October 28, 2013 4:43 PM
To: Cruz, Jerome (ECY)
Cc: A Weinstein
Subject: Landsburg Mine Site

Hello Department of Ecology, Jerome Cruz,
We have reviewed information shown at your Landsburg Mine Site Public Comment Period Extension meeting on 10/24/2013. We do not see evidence of even the bare minimum due diligence needed to correctly assess what danger the vast quantity of Toxic, Hazardous Waste poses to Our local School, Residents, OR the Cedar River and Green River Watersheds. There are Material flaws in the current approach and plan. We need to have a proactive and independent third party involved with a much more rigorous design for monitoring the site, including an approach that uses automated sensors and sampling as a core component of the monitoring protocol.

Respectfully,

Craig Weinstein
Maple Ridge Resident

John McTighe

DEPARTMENT OF ECOLOGY
State of Washington

Landsburg Mine Cleanup Site
Comment Period: October 11 – December 12, 2013

Ecology would like to hear from you regarding the Landsburg Mine Site. You may mail this form to: Department of Ecology, ATTN: Jerome Cruz, Site Manager, 3190 160th Ave SE, Bellevue, WA 98008 or email your comments to jerome.cruz@ecy.wa.gov Please indicate Landsburg Mine Site in your subject line.

Please print clearly

Name: JOHN MCTIGHE

Organization/Neighborhood: LANDSBURG ESTATES WATER DIST.

Mailing Address: 24929-267 AVE. SE

City: RAVENSDALE State: WA. Zip: 98051

Email: RATTLER 100 @ MSN.COM

Phone Number: 206-660-0308

Comments (if you need more space, please use the backside.):

I WOULD LIKE OUR COMMUNITY WELL SERVING 267th AVE. SE IN RAVENSDALE OFF SUMMIT LANDSBURG ROAD TESTED FOR CONTAMINANTS & ORGANIC MATERIAL AS WAS DONE ONLY A COUPLE TIMES IN THE 1980's. THE WELL IS LOCATED PROBABLY 300 FT. NORTHWEST OF THE NORTH PORTAL OF THE ROGERS SEAM. I WOULD ALSO LIKE AN EMAIL ADDRESS AND WEBSITE TO ENABLE ME TO SUBMIT MORE COMMENTS ON THIS SUBJECT POTENTIALLY AFFECTING MINE & MY NEIGHBORS DRINKING WATER.

From: John McTighe [mailto:rattler100@msn.com]
Sent: Saturday, November 02, 2013 11:39 PM
To: Cruz, Jerome (ECY)
Subject: Landsburg Mine Site

Hello Jerome,
I was at the public meeting at Tahoma Junior High School that was held at the end of October. I submitted a comment
by writing at that time but I want to go on record by email also.
I live on 267th Ave. SE which is slightly northwest of the North Portal of the mine. We have a well that serves the
eight separate residences on 267th Ave. SE Ravensdale, Wa. 98051. My address is
24929 267th Ave. SE Ravensdale, Wa.
98051. I believe it has been over 20 years or more since our well was checked for organic contaminants and I would like
to have our well put on any future testing that is done. I know the wells that are near the Clark Springs area where the City of Kent has a major source of water has been monitored with testing and would like the same done for our well on 267th Ave. SE in Ravensdale, Wa.
It would alleviate much worry about the state of the water source that provides drinking water and other water
use for the eight residences located here on 267th Ave. SE
Sincerely, John McTighe

206-660-0308 cell
425-432-3836 home

Sam R. Gallant

DEPARTMENT OF ECOLOGY
State of Washington

RECEIVED
NOV 05 2013
DEPT OF ECOLOGY
TCP - NWRO

Landsburg Mine Cleanup Site
Comment Period: October 11 – December 12, 2013

Ecology would like to hear from you regarding the Landsburg Mine Site. You may mail this form to: Department of Ecology, ATTN: Jerome Cruz, Site Manager, 3190 160th Ave SE, Bellevue, WA 98008 or email your comments to jerome.cruz@ecy.wa.gov Please indicate Landsburg Mine Site in your subject line.

Please print clearly

Name: Sam R. Gallant

Organization/Neighborhood:

Mailing Address: 27515 SE 253 St

City: Ravensdale State: Wa Zip: 98051

Email: sam101gltt@yahoo.com

Phone Number: 425-584-7040

Comments (if you need more space, please use the backside.): Landsburg Mine

I think covering over this site is just a band-aid to a much more potential catastrophe in the future. You think all of these drums of hazardous materials have alredy leaked out but you don't know that for a fact. If they do leak in the future they could potentially effect millions of water users through out King County. You say you have monitored lots of neighborhood wells for years but no one has ever monitored or checked my well and I am downhill and probably closer to the Cedar River than anyone in the vicinity. I know that tons of Hydrocarbons were dumped here for years from talking with the owner of the SuperFund Site in Kent Valley he bragged about it. This is not the answer although would be very beneficial to your clients paying for this. This should have been addressed 20 years ago and now you just want to do something to show that you are taking it seriously if it had been in Seattle or Bellevue this would have been addressed 25 years ago or know one would have ever allowed anyone to dump this crap there in the FIRST PLACE!!! Sam R. Gallant

City of Kent Mayor Suzette Cooke

KENT
WASHINGTON

OFFICE OF THE MAYOR
Suzette Cooke, Mayor
220 4th Avenue South
Kent, WA 98032
Fax: 253-856-6700

PHONE: 253-856-5700

November 7, 2013

Maia D. Bellon, Esq., Director
Washington State Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Re: Landsburg Mine Site -- Draft Clean-up Action Plan
Request for Meeting to Discuss City of Kent's Concerns

Dear Ms. Bellon:

I write on behalf of the City of Kent (Kent) to request a meeting with you to discuss our very significant concerns about the Landsburg Mine Site and the recently issued Draft Cleanup Action Plan (DCAP).

From 1959-1975, nearly 450,000 gallons of liquid industrial waste (among other known and unknown hazardous materials) were dumped into the Landsburg Mine located between Maple Valley and Ravensdale. This poses a serious water quality and public health concern to Kent, as the now-abandoned mine is located within 1,000 feet of the Clark Springs property, the source of our community's primary water supply. The DCAP provides that the hazardous wastes will not be removed and will remain in the mine — meaning that a serious threat to the Kent water supply, as well as to the Cedar River and many nearby residential drinking wells, will remain in the ground forever.

Ecology recently issued the DCAP and a draft consent decree for public review (the ongoing public comment period ends Dec. 12, 2013). Kent has worked on this matter with Ecology for many years, and while we appreciate the efforts of your principal staff, we continue to have numerous concerns about the proposed approach to dealing with this site.

Given that it is still fairly early in your tenure as Director and you have not had an opportunity to hear directly from us, we request a face-to-face meeting with you to discuss the serious concerns we have. We recognize you will want your staff in attendance as well.

Kent will submit detailed written comments to Ecology in opposition to the DCAP and draft consent decree. These concerns include:

1) Lack of site investigation (no waste characterization);
2) Incomplete understanding of site hydrology;
3) Unknown waste migration since disposal;
4) Speculation and unproven assumptions used to justify the DCAP;
5) No removal of any waste proposed;
6) Inadequate monitoring plan may be terminated in the future;
7) Unproven "contingency plan" assumes contaminated groundwater can be contained quickly after it is detected before polluting/stigmatizing the surrounding water resources; and
8) Financial assurance fails to ensure that PLPs will be solvent when required to address the site's conditions, even as provided by the DCAP.

In short, we are very concerned the DCAP fails to satisfy MTCA's requirements. The proposal is a minimalist approach to site investigation and remediation, contrary to Ecology's duty to protect and preserve precious water resources.

We request a meeting with you as soon as possible to discuss the Landsburg Mine Site. It is the City's goal to protect the environment and our municipal water supplies now and for future generations.

I would ask that your staff contact my Executive Assistant Patrick Briggs pbriggs@kentwa.gov to schedule this meeting.

Thank you for your consideration.

Sincerely,

Suzette Cooke

Suzette Cooke
Mayor

Jason Howell

From: jason.howell@h2observe.com [mailto:jason.howell@h2observe.com]
Sent: Wednesday, November 13, 2013 8:28 PM
To: Cruz, Jerome (ECY); Warren, Bob (ECY); Altose, Larry (ECY)
Cc: kpeterson@ci.kent.wa.us; karen.smith@covingtonwater.com; kevin.scott@H2Observe.com; Eric.Knudsen@H2Observe.com
Subject: ACTION REQUIRED: Landsburg Mine Site Public Comment Period Extension meeting on 10/24/2013

Hello Department of Ecology, Jerome Cruz, Robert Warren, Larry Altose,

I have, speaking on behalf of our community, reviewed information shown at your Landsburg Mine Site Public Comment Period Extension meeting on 10/24/2013. We do not see evidence of even the bare minimum due diligence needed to correctly assess what danger the vast quantity of Toxic, Hazardous Waste poses to Our local School, Residents, OR the Cedar River and Rock Creek Watersheds. There are Material flaws in the current approach and plan. We need to have a proactive and independent third party involved with a much more rigorous design for monitoring the site, including an approach that uses automated sensors and sampling as a core component of the monitoring protocol.

For next steps, please contact me at: http://www.H2Observe.mobi or jason.howell@H2Observe.com

See detail below.

Thank You - Jason Howell

Summary of materially ineffectual, probable non-compliance or conformance items:

- No actual, empirical (e.g., Travel time-, Dye-based) studies have ever been performed at the site; leaving BIOSCREEN modeling software as the main mechanism for setting frequency of monitoring
- The hydrodynamics surrounding the site remain effectively unknown, even to all the experts involved
- No contaminates have ever been found leaking at the site
- Current and planned well count and positioning, sampling type and frequency are simply not adequate or reasonable for the nature and volume of toxic compounds soaked into the Cedar and Rock Creek watersheds
- The proposed monitoring regimen is simply not effective day-to-day, nor in the event of a catastrophic event (e.g., earthquake)
- Although it is legal to use the word 'cleanup' to describe the plan; it does not in fact constitute a true cleanup; rather, the 'Cleanup Consent Decree' describes a literal

coverup of an unplanned, unregulated hazardous waste dump – directly adjacent to, and in, the Cedar River and Rock Creek watersheds. It also sits directly adjacent to Tahoma Junior High School, a facility that was planned and constructed very recently, with no effectual controls in proximity to the school.

Documented references that illustrate the major, material shortcomings within the Cleanup Consent Decree and Draft Cleanup Action Plan:

- **Page #38, Section 5.5.5.3 Confirmational Monitoring**:
  *"…Long-term confirmational groundwater monitoring and Site inspections and maintenance will continue **until** residual hazardous substance concentrations no longer exceed cleanup or remediation levels as described in the CAP resulting from either (1) the application of new remediation technologies currently unavailable or (2) other circumstances or conditions that affect residual concentrations such that they no longer pose risk to human health or environment."*

  ➔ Legally, this likely functions as a boilerplate escape clause for the PLP group
  ➔ Effectively, this likely functions as a mechanism to bypass or override timely identification of legitimate public health impacts, originating directly from the hazardous dumping site

- **Page #40, Section 5.5.5.4**:
  "…Confirmational monitoring would start at the completion of the remedial action in sentinel and compliance wells. The confirmational frequency would be quarterly for the first year, semi-annual for the next four years, and annual for the next five years. After ten years, the confirmational monitoring will decrease in frequency again, but the frequency will be analyte- and well location dependent, as follows:
  - *{NORTH} LMW-2, LMW-4, LMW-10, Deep North Sentinel Well (yet to be installed), Shallow North Sentinel Well (yet to be installed), LMW-6, and LMW-7 will have a monitored frequency of **2.5** years for VOCs and TPH; and every **5** years for metals, SVOCs, PCBs, and chlorinated pesticides.*
  - *{SOUTH} LMW-3, LMW-5, LMW-8, LMW-9, LMW-11, South Shallow Sentinel Well (yet to be installed), Dual South Sentinel/Cap Effectiveness Well (yet to be installed) will have a monitoring frequency of **5** years for VOCs and TPH; and every **10** years for metals, SVOCs, PCBs, and chlorinated pesticides.*

  ***These frequencies were based on the evaluation of BIOSCREEN modeling**, the results of which were summarized by Golder in a report (2009a) and **approved by Ecology** in their letter dated January 21, 2010."*

  ➔ Initial and subsequent monitoring frequencies and locations are partially or wholly ineffectual in protecting public health

➔ Technologies now exist to enable much higher frequency of monitoring, when leveraging a comprehensive (effective) well count and placement, for <u>any</u> affected wells or groundwater.

Brad and Becky Lake

From: B Lake [mailto:lakex3@hotmail.com]
Sent: Thursday, December 05, 2013 5:49 PM
To: Cruz, Jerome (ECY); Warren, Bob (ECY); Altose, Larry (ECY)
Cc: jason.howell@h2observe.com; Bradley Lake
Subject: RE: ACTION REQUIRED: Landsburg Mine Site Public Comment Period Extension meeting on 10/24/2013

Dear Mr. Cruz/Department of Ecology,

As local residents who are concerned about the potential for contamination of the groundwater and soils in the area, we are providing comments on your proposed cleanup action plan for the Landsberg Mine. Our requests for additions to the cleanup action plan (CAP)are as follows:

1) We ask that the CAP include drilling 1 pumping/sampling well in the center of the waste disposal area to the full depth of the mine (with casing perforations at 10-20 foot intervals), and also include drilling 2 additional wells on the north and south edges of the waste disposal area to the full depth of the mine (with casing perforations at 10-20 foot intervals). This would allow a more thorough characterization of the mine contaminants and their movements, which is an ongoing concern of the residents and businesses in the area.

2) We ask that the CAP include dewatering the mine down to the very bottom of the trench via the well drilled in the center of the waste disposal area (700+ feet), and that the mine be continuously dewatered for the life of the agreement. This will allow for further investigation of the contaminants which are believed to be in the mine, and cause contaminants to be pulled/flow towards the center of the area believed to have the greatest contamination rather than flowing away from it. The proposed cap of a portion of the mine trench would be more effective if the mine was dewatered via the well at the center of the contaminant area. This dewatering action would also remove the liquid/water that could convey the contaminants to other areas of the mine and also help to prevent the flow of contaminants into the aquifers of the surrounding areas, creating health hazards for the local residents and businesses.

This action would likely create a need for the construction and operation of a waste treatment facility to treat the contaminated waters as they are removed, prior to disposal. This action would address another ongoing concern of the residents and businesses in the area concerning the lack of treatment facilities due to the unknown nature of the contaminants.

3) We ask for modification of the assumption that the sidewalls of the trench, being sandstone,

are unlikely pathways for movement of contaminants from the mine. There are crevices and seams in the sandstone layers of the hill surrounding the mine, which convey significant quantities of water. This is evidenced by the existence of several wells in the area capable of producing 25 to 30 gallons per minute from a depth of 300+ feet. Additional monitoring and characterization of any additional/potential contaminant pathways will need to be developed and monitored.

4) We request that scheduled monitoring (or continuous monitoring) of 12 to 15 adjacent drinking water wells on a more frequent basis be scheduled to address the concerns of the neighboring users. This monitoring should be yearly for the life of the agreement, for the suspected contaminants and a suite of priority pollutants, to assure nearby users that their well water is safe for them and their children/families to drink. As you heard in the public forum there is a high level of concern about the uncertainty of the potential pathway and composition of contaminants which may leave the mine.

There has not been enough characterization of the contaminants and exit pathways for contaminants to provide a reasonable level of certainty or protection for the surrounding users of the aquifers, and the proposed CAP does not do enough to address those concerns for protecting public health.

We appreciate you including these requests in the cleanup action plan for the Landsberg Mine.

Brad and Becky Lake/Concerned Residents of the Rock Creek Area
26031 276th Ave. S.E.
Ravensdale, Wash. 98051

Greater Maple Valley Unincorporated Area Council (GMVUAC)

Greater Maple Valley Unincorporated Area Council
P.O. Box 101
Maple Valley, WA 98038

December 11, 2013

To: Jerome Cruz
Washington State Department of Ecology
3190 160th Ave SE
Bellevue, WA 98008
jerome.cruz@ecy.wa.gov

Subject: Landsburg Mine Cleanup Action Plan October 11, 2013, Consent Decree

Mr. Cruz,

We have reviewed the subject Decree and its Exhibits and offer the comments herein. While we find the plan has merit in the short term, there remain several long-term concerns.

Given the history of the site, we remain concerned with the degree of contamination resulting from up to 5,000 drums (~450,000 gal) of toxic waste which were dumped into the partially mined seam, then overfilled with construction debris fill.

Although DOE considers its monitoring wells as “early warning” systems, it has no specific treatment system in place should specific toxic materials be detected. Solely relying on industry-standard methods to cleanup such materials does not constitute a sufficient plan. Monitoring groundwater indefinitely is not the same as a commitment to ensuring eventual public health and safety.

The contingency plan includes groundwater treatment with infrastructure facilities at the north and south portal areas to contain, treat, and dispose of contaminated groundwater should it be detected at the Site. However, DOE and the Potentially Liable Parties (PLPs) are assuming a “bathtub” containment, i.e., nothing should escape the seam and migrate to private wells, the water table, the Cedar River, or Rock Creek.

The long-term liability of the responsible PLPs is questionable. The subject Decree specifies *“indefinite”* funding, which the courts have interpreted as *“temporary” [U.S. v. Pieter van den Berg*, 5 F.3d 439 (9th Cir. 1993)]. Because the in-ground contamination is potentially a very long-term problem, such language does not guarantee sufficient cleanup and remedial funding will be there when needed. Consequently, we request the subject Decree expressly address increase in or refunding of the PLP source of such funds (i.e., bond or other guarantee) over time to continue with the long-term effectiveness of the proposed employed measures. In fact, what mechanisms are being put in place to ensure “replenishment” of funds as they are exhausted? Without such mechanisms and their enforcement, what is the subject Decree buying the State and the Public?

Finally, the lack of specific plans, should monitoring show major leakage of contaminants, leaves the Public without clear recourse.

We request the subject decree be modified to address these issues of concern. Thank you.

Sincerely,

Steve Hiester (hies_skel@hotmail.com)
Chairman, Greater Maple Valley Unincorporated Area Council

cc: King County Executive Dow Constantine: Dow.Constantine@kingcounty.gov
King County Council: council@kingcounty.gov; rod.dembowski@kingcounty.gov; larry.gossett@kingcounty.gov; kathy.lambert@kingcounty.gov; larry.phillips@kingcounty.gov; julia.patterson@kingcounty.gov; jane.hague@kingcounty.gov; pete.vonreichbauer@kingcounty.gov; joe.mcdermott@kingcounty.gov; reagan.dunn@kingcounty.gov
King County Executive’s Land-Use Policy Advisor: Lauren.Smith@kingcounty.gov
King County Community Service Area Manager: alan.painter@kingcounty.gov
KC/Seattle Public Health: david.fleming@kingcounty.gov
District 5 State Legislative Representatives: jay.rodne@leg.wa.gov; mark.mullet@leg.wa.gov; chad.magendanz@leg.wa.gov
State DOE Public Involvement Coordinator: nancy.lui@ecy.wa.gov

Cedar River Council

C E D A R   R I V E R   C O U N C I L

Co-chair, Larry Phillips, King County Council
Co-chair, Reagan Dunn, King County Council

Staff, Nathan Brown III
201 South Jackson Street, Suite 600
Seattle, Washington 98104
206 263-6181
206 296-0192 fax

December 5, 2013

Dear Dr. Cruz:

RE: Landsburg Mine Cleanup Action Plan / Consent Decree

Thank you for your presentation to the Cedar River Council, (CRC) on October 22, 2013. This comment letter is on behalf of the Cedar River Council. Our comments are based on your presentation to the CRC, the project administrative record and the public meeting at the Tahoma Middle School on October 24th, 2013.

The CRC is primarily focused on issues surrounding the health of the Cedar River. We also take an interest in issues that could impact the welfare of basin residents. The Cleanup Action Plan, (CAP) is based on substantial information developed over the last two decades and is consistent with Model Toxics Control Act, (MTCA) requirements. This toxics cleanup site is up gradient of two major public resources, the Cedar River and the City of Kent Water System facility at Clark Springs. It is also surrounded by private water supply wells.

The "Cap, Cover and Perimeter Fence Plan," along with surface water diversion on the north end of the mine appears to do no harm and may reduce or slow contaminant transport to groundwater, but the expected results are not certain and these actions alone should not relieve the Potentially Liable Parties, (PLP's) of their long-term responsibilities under MTCA.

Our specific comments are:

1. Water supply wells surrounding the site have only been sampled one time in 1990. The subject "Cleanup Action Plan" is heavily based upon an assumption that there will be no groundwater impacts that will not be seen first at the two portals, the validity of this assumption is by no means proven. Therefore, it seems prudent and protective of human health to repeat this effort at least one time and at the routine five year review cycle. Since the sampling event in 1990 lab procedures and detection limits have improved significantly, health based cleanup levels have dropped and new water supply wells have likely been installed. At the public meeting many nearby neighbors had similar concerns and deserve to benefit from the full protection and peace of mind intended by the Model Toxics Control Act.

2. We urge you to consider requiring continuous monitoring with alarm telemetry at the North and South portal monitoring wells. While current technology may not allow for remote monitoring of some chemicals, simple analyses such as ph, conductivity, and groundwater levels are routinely monitored by remote systems that relay an alarm in the event of an out of range condition. Further, consideration of sensors and telemetry used in industrial and laboratory operations should be considered, given the critical public resources relatively close to the mine discharges. A continuous monitoring system with alarms makes good sense for the public.

3. Five year reviews will be performed at this site. Please include language in the Consent Decree that spells out how adaptive management on maintenance and monitoring requirements will occur during reviews and what the expectation for public involvement for these reviews is.

4. The current contingency plans are inadequate. Please incorporate conceptual level contingency plans, agreed to by all parties in the event contaminants are detected at either portal. Although treatment systems can't be totally designed until the contaminants and concentrations are known, general treatment systems for classes of contaminants such as metals or volatile organics are commonly designed. We are concerned that the length of time required for a large PLP group to take action is not fast enough in the event that changing conditions require remedial action. This comment is largely based on the past project performance. The RI/FS was completed in 1996 and 17 years later we are still contemplating the remedy. In addition please address the following points within the CAP:

- Describe a robust catastrophic event contingency plan, which reckons with the effects of periodic earthquakes, shifts in groundwater tables and major changes in precipitation.
- Clearly demonstrate that the well monitoring plan is sufficiently frequent to preclude contaminants leaking into surrounding public and private drinking water supply systems before additional remedial actions can be completed.
- Include an adaptive management plan to respond to changing conditions.

5. The long-term funding requirements for the PLP's are not clear. The plan needs to include a simple substantive financial plan that is understandable to the general public.

The Cedar River Council supports implementation of the "Cap, Cover and Perimeter Fence Plan," along with surface water diversion on the north end of the mine portion of the Landsburg Mine Cleanup Action Plan without further delay, but we also believe that the additional monitoring and contingency plans must be completed to protect the public.

Sincerely,

Larry Phillips, Co-Chair
Metropolitan King County Council, Dist. 4

Reagan Dunn, Co-Chair
Metropolitan King County Council, Dist. 8

The Cedar River Council promotes the health of the Cedar River Basin, focusing on lower basin issues.
The Council is comprised of basin residents and representatives of community groups, businesses, local, state, federal, and tribal governments.

PUBLIC WORKS ADMINISTRATION
Timothy J. LaPorte, P.E.
Public Works Director
400 West Gowe
Kent, WA 98032
Fax: 253-856-6500

PHONE: 253-856-5500

December 12, 2013

VIA HAND DELIVERY

Jerome B. Cruz
Site Manager
Toxics Cleanup Program
Northwest Regional Office
Washington Department of Ecology
3190 – 160th Avenue SE
Bellevue, Washington 98008

RE: Landsburg Mine Site - Comments in Opposition to the Proposed Draft Consent Decree, Draft Cleanup Action Plan, and Related Exhibits

Dear Dr. Cruz:

Enclosed please find for the Washington State Department of Ecology's consideration the City of Kent's Comments in Opposition to the Proposed Draft Consent Decree, Draft Cleanup Action Plan, Draft Compliance Monitoring Plan, and Related Exhibits for the Landsburg Mine Site—both in paper format (two duplicate copies) and in electronic format on disk (two duplicate disks).

As we have indicated in the past, the City of Kent is prepared to meet with Ecology at any time to discuss the Landsburg Mine Site. If such a meeting would assist Ecology in understanding the issues raised in the City's comments, please contact us.

We will appreciate your consideration of the City's comments.

Sincerely,

Tim LaPorte

Timothy Laporte
Public Works Director

Enclosures—Kent's Comments (two paper copies; two disks)

City of Kent (complete document in accompanying CD)

PUBLIC WORKS ADMINISTRATION
Timothy J. LaPorte, P.E.
Public Works Director
400 West Gowe
Kent, WA 98032
Fax: 253-856-6500

PHONE: 253-856-5500

KENT
WASHINGTON

December 12, 2013

VIA CERTIFIED MAIL; RETURN RECEIPT REQUESTED

Washington State Department of Health
Office of Environmental Health, Safety,
and Toxicology
P.O. Box 47825
Olympia, Washington 98504-7825

RE: Landsburg Mine Site
Request for Department of Health Activities

Dear Sir or Madam:

I write on behalf of the City of Kent ("City") to request that the Washington State Department of Health's Office of Environmental Health, Safety and Toxicology undertake appropriate site investigation, consultation, and reporting actions regarding the Landsburg Mine Site (the "Site") located in Ravensdale, Washington as described in detail below.

The Site is currently the subject of activities under the oversight of the Washington State Department of Ecology ("Ecology") pursuant to Washington's Model Toxics Control Act ("MTCA") because enormous volumes of hazardous wastes historically were dumped into the former coal mine at the Site. Ecology recently sought public comments on a Proposed Draft Consent Decree for the Site, including a Draft Cleanup Action Plan, Draft Compliance Monitoring Plan, and Related Exhibits (the "Proposed Plan").

The City is very concerned about the Site and the Site's threat to nearby water resources. The Site is located immediately north and upgradient of the Rock Creek drainage, a tributary of the Cedar River, and less than one-half mile from the City's primary source of municipal water at Clark Springs. The Site also is just 500 feet south of the Cedar River, and many private wells or small community water supply systems are located in the immediate vicinity of the Site. We understand that the Department of Health has had some involvement with the Site in the past.

Enclosed please find the City of Kent's Comments in Opposition to the Proposed Draft Consent Decree, Draft Cleanup Action Plan, Draft Compliance Monitoring Plan, and Related Exhibits for the Landsburg Mine Site ("Kent's Comments")—both in paper format (two duplicate copies) and in electronic format on disk (two duplicate disks). These materials also have been submitted to Ecology, for Ecology's consideration as part of the MTCA process for the Site. Additional information about the Site and the Proposed Draft Consent Decree can be obtained from Ecology's website (at https://fortress.wa.gov/ecy/gsp/Sitepage.aspx?csid=60) and from Ecology's Site Manager (Jerome Cruz, 425-649-7094).

Pursuant to the role and responsibilities of the Office of Environmental Health, Safety and Toxicology, the City requests that the Department of Health consider the Proposed Plan, consider Kent's Comments, and engage in the following activities: (1) engage in a health consultation with the Agency for Toxic Substance and Disease Registry ("ATSDR") to review the Proposed Plan to determine if the Proposed Plan is sufficient to prevent or sufficiently mitigate the exposure to, or threat of exposure to, hazardous substances (including a leak or discharge of chemical or hazardous materials) that may pose a risk to public health and safety, and the compromise of vital water resources (including but not limited to the City's municipal water supply source and water system); (2) conduct a Site investigation of a threat of exposure to hazardous substances (including a leak or discharge of chemical or hazardous materials) that may pose a risk to public health and safety, and the compromise of vital water resources (including but not limited to the City's municipal water supply source and water system); (3) formally communicate in writing to Ecology the results of the Department of Health activities described above in items #1 and #2, for Ecology's consideration in the MTCA process for the Site; and (4) provide the results of these Department of Health activities to the City.

We will appreciate your efforts regarding this matter and look forward to your timely response.

Sincerely,

Tim LaPorte

Timothy Laporte
Public Works Director

Enclosure—Kent's Comments (two paper copies; two disks)
cc: Jerome Cruz, Washington State Department of Ecology

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Appendix B. Letter from Ecology Extending Comment Period

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Northwest Regional Office • 3190 160th Ave SE • Bellevue, WA 98008-5452 • 425-649-7000
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

October 16, 2013

Mr. Timothy LaPorte
Public Works Director
City of Kent Public Works
400 West Gowe
Kent, WA 98032

Re: Landsburg Mine Site – Request to Extend Public Comment Period

Dear Mr. LaPorte:

This is in response to your letter of October 9, 2013, to Robert Warren, Section Manager, Department of Ecology's (Ecology) Toxics Cleanup Program Northwest Regional Office, wherein on behalf of the City of Kent, you requested for a thirty (30) day extension to the public comment period for the Landsburg Mine Site. The comment period is originally scheduled to end on November 12, 2013.

Ecology will extend the comment period for the requested amount of time. Ecology will end the comment period for the cleanup consent decree on December 12, 2013.

Please do not hesitate to contact me if you have further questions. My telephone number is (425) 649-7094. My email address is jcru461@ecy.wa.gov.

Sincerely,

Jerome Cruz
Site Manager

cc: Dori Jaffe, AAG, Ecology Division
Robert Warren, Ecology

[Back to Table of Contents]

Appendix C. Golder Associates Responses to City of Kent Attachment F (Aspect Consulting's Comments to Proposed Plan)

TECHNICAL MEMORANDUM

Date:	March 21, 2017	**Project No.:**	923-1000-002.R154
To:	Jerome Cruz, Ecology Site Manager	**Company:**	Washington Department of Ecology
From:	Douglas Morell, PhD, L.HG.		
cc:	Landsburg Mine Site PLP Group	**Email:**	dmorell@golder.com
RE:	**Golder Associates Responses to Aspect Consulting Memorandum dated December 11, 2013**		

At Ecology's request, and on behalf of the Landsburg Mine Site PLP Group, Golder Associates Inc. (Golder) submits the following responses to comments on the proposed Consent Decree and Cleanup Action Plan for the Landsburg Mine Site submitted on behalf of the City of Kent by Aspect Consulting dated December 11, 2013.

1.0 GENERAL COMMENTS (GC)

A. The Remedy Must Include The Ability To Respond Immediately With An Installed, Tested, And Robust Groundwater Containment System If Contaminated Groundwater Threatens To Migrate From The Site. The Proposed Plan Must Be Revised To Define Timelines And Deadlines For Ecology's Oversight and Enforcement Activities.[1]

Response: A number of the City's comments relate to concerns about the time required to design, obtain Ecology approval for, permit, construct and optimize operation of the Contingent Groundwater Extraction and Treatment System in the event that contaminant migration from the mine workings were to occur. In 2009, treatment system infrastructure components that required long lead times were identified, were designed, and were constructed as an Interim Remedial Action to shorten the time needed to implement the entire system if needed.

We believe that the timelines in the Draft Cleanup Action Plan (DCAP) for taking necessary additional actions to bring the Contingent Groundwater Extraction and Treatment System on line were reasonable and sufficiently protective of human health and the environment. Nevertheless, in consultation with Ecology, we will include a number of changes to the Final CAP (FCAP) to accelerate the time frame for initiating various actions. These changes will increase the amount of time available for system review, permitting and construction, thereby increasing the protectiveness of the remedy. They will also result in earlier operation of the system to prevent exceedance of MTCA cleanup levels at the compliance wells. Finally, we propose including an enforceable deadline for submittal of an Engineering and Design Report (EDR) for the Contingent Groundwater Extraction and Treatment System. The EDR will include deadlines for subsequent activities relating to system review, permitting, and, as appropriate, installation, operation and optimization. Once approved by Ecology, the EDR, including its deadlines, will become an enforceable part of the CAP and Consent Decree. Exhibit D, Part C of the FCAP, has also been revised to describe the optimization testing that would be conducted if the system ever required activation.

The revised triggers and schedules for implementation of the Contingent Groundwater Extraction and Treatment System, should it become necessary, are summarized in Table 1 below, and are discussed more fully in Ecology's response to City of Kent comment (Responsiveness Summary [RS] Section Y.5, Concerns on Contingency Plan). The FCAP will also be revised as requested by Aspect Consulting to require

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[1] In the general comment section, each comment heading is taken verbatim from Aspect's comments.

Golder Associates Inc.
500 Century Plaza Drive, Suite 190
Houston, TX 77073 USA
Tel: (281) 821-6868 Fax: (281) 821-6870 www.golder.com

continued operation of the system until levels at the compliance wells and pumping well remain below 0.5 MTCA for four consecutive monitoring periods or a minimum of 1 year.

Table 1: Summary of revised triggers and schedules for contingent groundwater extraction and treatment system activities in response to public comments

Activity	**Draft CAP Trigger / Schedule**	**Final CAP Trigger / Schedule**
Increase monitoring frequency and conduct an Alternative Source Evaluation.	Begins when confirmed compliance well sample results are >0.25 MTCA	Begins when confirmed sentinel well sample results are > 0.25 MTCA
Submit contingent groundwater extraction and treatment system Engineering and Design Report (EDR), including schedule for all subsequent activities (e.g., review and permitting, construction and operation)	Approximately 30 days after confirmed compliance well sample results are > 0.5 MTCA	No later than [30] days after confirmed sentinel well sample results are > 0.5 MTCA
Ecology review and permitting of system	According to schedule in Ecology-approved EDR	According to schedule in Ecology-approved EDR (estimated 2 to 4 weeks)
Construct system	When confirmed compliance well sample results are > 0.5 MTCA and according to schedule in Ecology-approved EDR	When confirmed sentinel well sample results are > 1.0 MTCA and according to schedule in Ecology-approved EDR (estimated 2 to 4 weeks)
Begin operation of system	When confirmed compliance well sample results are > 1.0 MTCA and according to schedule in Ecology-approved EDR	When confirmed compliance well sample results are > 0.5 MTCA and according to schedule in Ecology-approved EDR (estimated 2 weeks)
Stop operation of system	When compliance well sample results are < 1.0 MTCA for four consecutive monitoring periods or a minimum of 1 year	When compliance wells and pumping well sample results are < 0.5 MTCA for four consecutive monitoring periods or a minimum of 1 year

(changed parameters are underlined)

Note: Iron, manganese, and arsenic are analytes associated with the coal mine water and monitored levels are not associated with Landsburg Mine Waste and will not be used as a trigger, unless a significant increase in concentrations occur and an alternative source is not identified.

B. The Remedy Must Define Enforceable Deadlines for the Contingent Groundwater Containment System's Installation, Operation, and Achievement of Hydraulic Containment.

Response: As described in response to Aspect General Comment #GC-A and presented in Table 1 above, the FCAP will be revised to include enforceable deadlines for the design, review, permitting, and, as appropriate, installation, operation and optimization of the Contingent Groundwater Extraction and Treatment System.

C. The Proposed Plan's "Trigger" For Initiating Operation Of The Contingent Groundwater Containment System Is Not Sufficiently Protective Because The Proposed Plan Could Allow Contaminated Groundwater To Migrate From The Site And Degrade Adjacent Water Resources.

Response: As described in response to Aspect General Comment #GC-A above, the FCAP will be revised to accelerate the time at which operation and optimization of the Contingent Groundwater Extraction and Treatment System would begin in order to prevent exceedances of MTCA cleanup levels at the compliance wells. The revised trigger for operation of the system will be the trigger that Aspect Consulting requested (0.5 MTCA cleanup levels at wells near the portals – i.e., at the compliance wells). Please also see Ecology's response to City of Kent Comment (RS Section Y.5, Concerns on Contingency Plan).

D. The Remedy Must Include Defined And Enforceable Hydraulic Performance Standards For Achieving Groundwater Containment.

Response: The most effective performance standards are the MTCA CULs and conditional point of compliance upon which the FCAP is based. The Contingent Groundwater Extraction and Treatment System, if necessary, will be designed to prevent groundwater above MTCA CULs from leaving the Site. The EDR will include appropriate performance criteria including: installing and monitoring of extraction performance wells, as needed, and groundwater quality monitoring from sentinel and compliance wells. Any groundwater extraction system tested and designed before construction of the remedial cap and surface water diversion would need to be revised for the change in groundwater recharge and flow resulting from the cap. Monitoring wells for the extraction system, including existing compliance and sentinel wells, and any necessary additional performance wells as determined in the EDR, will be used to monitor hydraulic performance if the extraction system becomes operational. Although it is implicit in the DCAP, the Contingent Groundwater Extraction and Treatment Plan (Exhibit D – Part C) included with the FCAP will explicitly state that additional performance wells will be added, as necessary, to ensure effective monitoring of hydraulic performance.

E. The Proposed Plan Anticipates That Monitoring, Maintenance, And Institutional Controls Will Terminate In The Future, Contrary To Many Past Promises Made By Ecology And The PLP Group. For This Site, MTCA Requires Monitoring, Maintenance, And Institutional Controls In Perpetuity.

Response: As discussed in Ecology's responses to the City of Kent Comments (RS Section T.2, Provision for Termination of O&M and Institutional Controls), the remedy, including monitoring, maintenance, and institutional controls, will continue unless and until residual wastes are remediated using new, currently unavailable technologies to below applicable MTCA levels. Any such change to the remedy would require either an amendment to the Consent Decree or a new Consent Decree, both of which would require Ecology approval and trigger additional opportunities for public review and comment. The referenced language does not signal a shift in the long-term strategy for the Site.

F. The Remedy Must Include More Protective Monitoring Frequencies.

Response: As discussed in Ecology's response to City of Kent (RS Sections J.1 and J.2, Protectiveness of Long Term Monitoring Frequency, Golder conducted the BIOSCREEN modeling with input from Aspect Consulting. Ecology selected the most conservative input parameters from those submitted by Golder and Aspect to determine appropriate monitoring frequency. Accordingly, the monitoring frequencies in the DCAP are appropriate and protective. Nevertheless, the FCAP will be revised to increase the frequency of monitoring at the South sentinel and compliance wells to once every 5 years for all analytes, in part to support more robust 5-year reviews by Ecology.

G. The Proposed Plan Undermines The "Black Box Approach" By Relying Upon Speculation And Unproven Assumptions.

Response: The comment is a generalized criticism of the Remedial Investigation/Feasibility Study (RI/FS) and the selected cleanup alternative and approach taken for the Site. The comment largely restates issues raised and addressed elsewhere in responses to Aspect's comments, including, specifically, responses to Aspect Comments #GC-A, -D, -E and -F, which are provided above.

H. If the "Black Box Approach" Is To Be Used For Remedy Selection, MTCA Requires More Conservative (Protective) Remedy Components Than Those Provided By The Proposed Plan.

Response: The comment identifies four recommended changes to the DCAP that Aspect asserts would make the remedy more conservative (protective). Golder's response to each numbered recommendation is given below:

1. Sludge Removal Recommendation: As discussed in Ecology's response to City of Kent comment (RS, Section G.2, Covering Wastes [Containment Remedy]), there is no incrementally higher benefit under existing conditions to remove sludge compared to containing it under clean fill.

2. Additional Monitoring Wells: Hydraulic monitoring will be conducted during trench backfilling. The FCAP plans to install a combination sentinel / hydraulic monitoring well just south of the southern-most backfilled trench. The existing monitoring wells LMW-1 and LMW-1A located on the rock bridge will be used for hydraulic monitoring during trench backfilling. The proposed array of hydraulic monitoring wells for trench backfilling will provide useful data on the effects of trench backfill to groundwater levels. There is no need to add other new wells for this purpose. Please also see Ecology response to City of Kent comment (RS, Section K, Monitoring Well Installation for Cap Performance Monitoring).

3. Immediate Earthquake Response: Ecology and the PLP Group first recognized the potential risk from earthquakes in earlier drafts of the Consent Decree. For this reason, the CAP calls for inspection of the site after an intensity IV or greater earthquake (see section 5.5.5.3 of the FCAP, and section 1.5 in Part B Operation and Maintenance Plan, Exhibit D of the Consent Decree). Section 5.5.5.3 of the DCAP states:

   > "Ecology will be notified of site conditions within seven (7) days and a decision will be made between the property owner and Ecology on taking groundwater samples from site wells in accordance with the sampling network, protocols, and analytical methods of the Compliance Monitoring Plan in the Consent Decree (Exhibit D)."

   In order to arrive at the decision to sample wells, site wells will have to be inspected for damage as part of the post-earthquake site inspection. Additional monitoring will be based on the decision by Ecology and property owner once the results of the inspection are reported. If warranted, Ecology may require additional investigations be conducted to assess changes caused by the earthquake. We do not agree that "triggers" other than occurrence of an intensity IV earthquake should be defined nor that more specific monitoring or investigation requirements be identified in the CAP because earthquake affects cannot be defined before occurrence.

4. Increased Financial Assurance: As discussed in Ecology's response to City of Kent comment (RS, Section R, Concerns about Financial Assurance), the Financial Assurances requirements of the Consent Decree are adequate, consistent with MTCA, and allow Ecology to require additional financial assurances if determined necessary during the annual review process.

I. The Proposed Plan to Leave Chlorinated Solvents Sludge ("Free Product") In Place at the Surface Violates MTCA's Requirements. The Sludge Must Be Removed From the Trench Surface.

Response: Please see response to Aspect Comment #GC-H.1 above and review Ecology's response to City of Kent comment (RS, Section G.2, Covering Wastes (Containment Remedy).

J. Other Deficiencies of The Proposed Plan Are Discussed In The "Specific Comments" Below.

Response: This is a generalized comment about uncertainties at the site relative to the planned cleanup. Specific comments are repeated elsewhere in Aspect's comments and are addressed below. All MTCA and CERCLA sites have uncertainties. In fact The U.S. Environmental Protection Agency (EPA/540/G-89/004 OSWER Directive 9355.3-01) states: "The objective of the RI/FS process is not the unobtainable goal of removing all uncertainty, but rather to gather information sufficient to support an informed risk management decision regarding which remedy appears to be most appropriate for a given site." MTCA (WAC 173-340-350(1) states: "The purpose of a RI/FS is to collect, develop, and evaluate sufficient information regarding a site to select a cleanup action." Both the Federal and State agencies recognize that all uncertainties do not need to be removed in an RI. The proposed remedial action has not changed materially from the initial 1996 RI/FS even after additional investigations have been conducted, mainly in response to the City of Kent recommendations when deemed technically appropriate.

K. The Proposed Consent Decree's Financial Assurance Cost Estimate Violates WAC 173-340-440(11)'s Requirement to Require Financial Assurance Mechanisms to Cover All Costs Associated With the Operation And Maintenance Of The Remedial Action, Including Corrective Measures.

Response: Please see response to Aspect Comment #GC-H 4 above and review Ecology's response to City of Kent comment (RS, Section R, Concerns about Financial Assurance).

We will respond to the following specific comments from Aspect where and to the extent they include comments or issues different from any of Aspect Comments #GC-A through -K.

2.0 SPECIFIC COMMENTS:

1. The RI/FS did not misrepresent source characterization. Section 3.2 of the 1996 RI/FS identifies the activities that were completed and the use of data available from previous investigations and interim removal actions. Section 2.2 of the DCAP describes source sampling as "limited."

2. We will remove the word "unlikely" from the sentence.

3. Because groundwater discharges from both the south and north portal areas from the mine, there must be a divide within the permeable mine workings. The data indicate that the divide is very near the south end of the mine based on groundwater elevations (hydraulic heads) in P-2, LMW-3, LMW-5, LMW-9, and LMW-11. Review of the monitored elevation heads in these southern wells during interim groundwater monitoring indicates that the groundwater elevations are very nearly the same within the southern 600 feet of the overall 4,200 foot long Roger Coal Mine. Furthermore, the waste disposal area is more than 2,200 feet north of this southern 600 feet section of the mine wherein the groundwater divide resides. Groundwater flows from locations having higher groundwater elevations toward locations with lower groundwater elevations. The portal discharge at the southern end of the mine is at an elevation of about 642 feet (LMW-8) while the waste disposal trench discharge elevation at the north tunnel in the rock bridge (LMW-1) averages about 625 feet elevation, or almost 20 feet lower. The monitored groundwater elevations show groundwater flows specifically within the southern 600 feet of the mine (represented by LMW-3, LMW-5, LMW-9, and LMW-11) toward the north at times and at other times toward the south. During some monitoring events, there is no measureable difference in groundwater elevations within the mine's southern wells and; therefore, at such monitoring events, no discernable groundwater flow is occurring between the well locations within the southern 600 feet. This data indicate that in the southern 600 foot portion of the mine, groundwater flow changes direction from being northerly to being southerly with very little measureable difference in elevation over a distance of greater than 600 feet. This data define the groundwater divide to be within the southern portion of the mine workings where seasonal recharge changes to the mine workings shift the groundwater divide and causes a change in groundwater flow direction at the southern end of the mine where the divide exists. Groundwater underneath the disposed waste in the north portions of the mine is flowing northerly and not influenced by slight seasonal shifts in the groundwater divide in the south end of the mine.

   Although the groundwater divide is in the southern portion of the mine, the FCAP, like the DCAP, assumes a conservative position that the divide may be under the waste disposal area and groundwater under the northern trenches may be able to migrate to the south portal. If the divide is always located south of waste disposal trenches, there would be no reason to monitor and sample the south portal monitoring wells in the future. The installation of the combination sentinel/cap performance monitoring well located just south of the capped trenches should provide information that helps further define and confirm the location of the groundwater divide in the mine.

4. This comment makes a judgment statement. We believe that the proposed remedy, including the revisions discussed in response to Aspect Comment #GC A above, is sufficiently protective and addresses uncertainties at the Site. Many MTCA sites and most MTCA landfill sites have containment as the remedy with long-term compliance monitoring, contingencies, and institutional controls. The proposed remedy is consistent with MTCA.

5. The term "infrastructure components" was used early in the proposed Interim Measures to Ecology and the public to define components of the Contingent Groundwater Extraction and Treatment System that potentially have long-lead times to obtain approvals and to install. This included: electrical connections, access roadway and parking, security fencing, area lighting, and the effluent discharge pipeline (extended to private property boundary). The interim action was proposed and a SEPA Checklist for the project was submitted to Ecology (Golder November 2005 and September 2005, respectively). The proposed infrastructure project was approved by Ecology (Ecology March 20, 2006 signed SEPA DNS; and Ecology May 30, 2006 Approval for the installation of North Infrastructure Components). The term "infrastructure components" was never intended to, or presented to the public in a manner that might, represent the entire Groundwater Extraction and Treatment System. The pipeline will not be connected to the Metro sanitary sewer until needed and a request for connection is made to King County. Temporary trucking to Four-Corners has always been planned until the discharge line can be connected. Issues regarding Soos Creek and Tahoma School expansions have been addressed. The sanitary sewer line has enough capacity to handle the combined flows (Tahoma School and the Landsburg Mine Site), and discharge from the Landsburg Site system could be done during periods without students present. Additional information of the Contingent Groundwater Extraction and Treatment System will be provided in Exhibit D – Part C that defines the necessary steps for system installation, shows the system components, pumping and potential extraction and performance well locations, and the discharge pipeline connection to Soos Creek sanitary sewer system. Engineering details and designs will be submitted in the EDR for the system within 30 days after the appropriate trigger is confirmed.

6. Please see Ecology's response to City of Kent Comment (RS Section Y.5, Concerns on Contingency Plan) and responses to Aspect Comment #GC-A, -B, and -C.

7. Please see Ecology's response to City of Kent Comment (RS Section Y.5, Concerns on Contingency Plan) and responses to Aspect Comment #GC-A.

8. This was addressed previously in responses to Aspect Comment #SC-1 and City of Kent Comment (RS Section E.1, Site Characterization and Investigation).

9. The comments are criticizing the CAP for providing reasonable interpretations of known information. It is appropriate for the RI/FS and CAP to report this known information and to provide reasonable interpretations in the context of other information. Please see Ecology's response to City of Kent Comment (RS Section E.1, Site Characterization and Investigation). Previous investigations (1990 Soils Gas Survey by Geotechnology; 1991 SHA by Ecology; Interim Drum Removals by the PLPs), the RI investigations, and additional hydrogeologic investigations in the southern portion of the mine indicate that wastes were disposed within the northern trenches, that some of the wastes were in drums, and that there were multiple large historical fires in the waste area.

10. Please see Ecology's response to the City of Kent Comment (RS Section X, Factors such as earthquakes that potentially cause contaminant movement). The possibility of an earthquake is considered and addressed in the CAP.

11. Here, Aspect is again criticizing the CAP for providing reasonable interpretations of known information. As described below, the hydrogeologic conceptual model for the Rogers Mine summarized in Section 3.3.2 is based on sound information from mining records, site-specific investigations, and accepted hydrogeologic principles.

The mine records, based on actual observations underground and developed to address miner safety issues, are key to our understanding of the hydrogeology at the Site. To address miner safety, the three items that are always keenly observed and documented in underground mines are: (1) signs of instability; (2) evidence of water inflow; and (3) air quality and the adequacy of ventilation. Miner observations and mine records are not speculative and in fact provide much information that is useful in developing a Site conceptual model (for example, a road cut provides much more information on the geology along the cut than a few boreholes). Since four miners were killed at the Landsburg seam coal mine due to water intrusion just 4 years before the mining on the Rogers seam commenced, water intrusion would be expected to be closely observed and documented, and it was. In fact, faults and fractures when encountered during mining in the mine were identified in mine records along with groundwater inflow observations. Consistently, the encountered faults / fractures had no or very little groundwater inflow when encountered during active mining. Rogers mine records also indicate that the most likely groundwater inflow (when the mine was completely dewatered) was approximately 40 gallons per minute (gpm) during the wet season and pumped much less during the dryer season. The pumps used to dewater the mine were documented in the mine records and have known maximum pumping rates, which were also used to estimate groundwater withdrawals (SubTerra 2005). Those records are representative of the estimated withdrawal rates as reported in the RI/FS.

During periods that the sump pumps were being maintained or repaired, the resulting groundwater level in the mine was recorded and used to estimate the mine recharge for the period of sump pump down-time. The groundwater inflow to the entire mine (at a dewatered stage that maximizes inflow gradients) was consistent with a recharge to the entire mine of 40 gpm. These records also support conclusions regarding the total amount of groundwater recharge in mine workings and are provided in the Landsburg Mine-Coal Mine Hazard Assessment (SubTerra 2005).

In addition to underground mining observations, there are other methods to estimate the amount of water recharging to and discharging from the Rogers Mine. Mass water balances (total precipitation) along the mine Site indicate that a total precipitation of about 50 gpm occurs during an average year within a footprint 200 feet wide along the 4200 feet length of the mine. This simple calculation assumes all precipitation (~50 inches/year) recharges the mine including within 100 feet east and west of the mine. This is an upper bounding estimate, since evaporation, transpiration, sublimation, and runoff or interflow away from the Rogers mine are not discounted from the estimate. This total Site precipitation rate of about 50 inches per year supports the estimated mine groundwater recharging and discharging rates presented in the 1996 RI/FS, the CAP, and the Landsburg Mine-Coal Mine Hazard Assessment (SubTerra 2005). The total average discharge from the mine cannot be greater than the amount of recharge the mine receives. To extract groundwater from the Rogers Mine at a portal at our estimated 40 gpm is anticipated to stop discharge from either portal area and contain the contaminant plume quickly due to the transmissive nature of the mine workings and due to the geologic geometry and groundwater hydraulic boundaries existing in the mine. The amount may be sufficient to eventually drain the mine of groundwater (especially after the added remedy protection of low permeability cap and surface water diversions is implemented). This Site does not require initial studies to determine pumping rates for hydraulic containment. Initial pumping rates should be about 40 gpm after the low permeability cap is installed with surface water diversions and can be optimized (minimal needed for maintaining containment) during its operation. However, the extraction wells to be installed will be capable of extracting significantly higher volumes if it should become necessary to do so.

The Rogers Mine appears to be a groundwater sink to adjacent bedrock groundwater. During the Drilling of LMW-11 borehole penetrated the adjacent silt/sandstone beds to the west of the mine workings to a depth of about 690 feet before reaching the Rogers mine workings. The initial saturated groundwater in the bedrock was encountered at an elevation above the water table in the mine workings. At the beginning of each drill day, water levels were measured in LMW-11 as the borehole progressed deeper. The water levels in the bedrock borehole keep declining and approached the water table in the mine workings. Once the mine workings were penetrated, the water level became essentially the same as in the mine workings at LMW-9. Although this was only a short period of time at one location, it is a strong indicator that bedrock to the west of the mine discharges groundwater to the mine workings, rather than vise-versa; and therefore, is not a groundwater pathway from the mine. This hydrogeologic model is very typical with underground rock mines having portal discharges.

A basic hydrogeologic concept for sedimentary bedrock is that the hydraulic conductivity (K) is anisotropic to the bedding planes. In the direction parallel to bedding planes, the effective K will be similar to the beds having the highest K values, while the effective K perpendicular to the bedding planes will be similar to the beds having the lowest K value (Freeze and Cherry 1979, page 33). Low-grade shale beds are well documented to exist in the Puget Group and at the Landsburg Mine site and were verified by inspecting surface geology, trenching along the mine rim, and RI borings. These shale beds impede groundwater flow perpendicular to the bedding planes. This hydrogeologic model is supported by the mine records that document mine fractures and faults not yielding significant quantities of groundwater even with the mine dewatered which maximizes the hydraulic gradient from the bedrock to the mine workings. Because the adjacent bedrock has very low hydraulic conductivity perpendicular to cross bedding and has groundwater at higher heads than the groundwater in the Rogers mine workings, contaminated groundwater in the mine cannot migrate laterally to the west through bedrock. This hydrogeologic conceptual model for the Rogers mine is based on sound information in mining records, conducted investigations, and sound hydrogeologic principles.

Again, the hydrogeologic conceptual model for the Rogers mine is well supported by direct observational evidence, Site-specific investigation results, and accepted hydrogeologic principals. For added protectiveness, however, the proposed cleanup action conservatively provides for potential lateral migration of Rogers mine contaminants through the bedrock by institutionally controlling groundwater withdrawal and use between the Frasier and Landsburg coal mines and the Rogers mine. Compliance wells are also placed in each adjacent mine to monitor groundwater quality. The Frasier and the Landsburg mines are hydrologic sinks (barriers for Rogers contaminated groundwater to flow through and further west and east of the Frasier and Landsburg mines, respectively) for local bedrock groundwater with portals controlling groundwater levels in these mines. The CAP conservatively proposes to prohibit groundwater withdrawal and use (groundwater protection area) between the Frasier and Landsburg Coal Mine workings as added protective measures, because as previously mentioned, the bedrock adjacent to the Rogers mine is discharging groundwater into the Rogers mine, not vice-versa.

12. The groundwater divide was addressed previously in responses to Aspect Comment #SC-3. We will remove the word “slight” from the suggested sentence.

13. The comment did not identify any specific “speculative statements” or “unproven assumptions” and therefore, cannot be addressed. Mine stability was evaluated during the RI/FS and in the Landsburg Mine – Coal Mine Hazard Assessment (SubTerra 2005). The RI/FS and CAP are consistent with these evaluations.

14. Aspect takes issue with what it incorrectly perceives to be an inconsistency in assumptions underlying the Proposed Plan: “…. the overall volume of remaining voids was estimated to be less than 10 percent. This total porosity is significantly less than the effective porosity assumed for the BIOSCREEN model analysis,……..” In mine stability assessments, “voids” refer to actual remaining voids that have not been filled by soil or rock during mining. The void space may be very large (i.e., if a slab of high wall rock collapsed and bridged the underlying mine workings that prevented in-filling with soil, or from uncollapsed tunnels). It represents the potential volume of future subsidence that could occur. This differs from soil or rock matrix “porosity,” which instead describes the interstitial space between soil grains or within the rock matrix, which is supported by solid grains in contact with each other and which are not subject to collapse.

15. We will change the referenced paragraph to clearly state no contamination has been detected emanating from the mine.

16. RI sampling and analysis outside the waste disposal trenches were conducted along the top surface of the trenches where waste disposal activities were concentrated and in near surface soils surrounding

the north and south portals. This sampling protocol was intentionally focused on areas outside the trenches where contamination most likely may be present, and one location was selected for soil sampling that was considered to represent background. Contamination was not detected in the areas. We feel that sufficient sampling was conducted given the absence of any contaminant detections in the areas that were most likely to be contaminated. There is no reason to suspect contamination in areas that had no truck access or evidence of waste disposal other than the locations sampled.

17. We will change the reference to MTCA Method B to applicable MTCA CULs.

18. Please see Ecology's response to City of Kent Comment (RS Section E.1, Site Characterization and Investigation).

19. The referenced sentence is well supported but we will change the final referenced sentence to qualify its conclusion as based "current <u>known</u> conditions."

20. We will change the referenced sentence as suggested.

21. The figures identify Kent's watershed. No change is needed.

22. We will identify Kent's Clark Springs well as a large municipal supply well and the Bridle trails wells as local community wells. We do not believe that adding additional private wells is needed for the CAP since they are outside of the Landsburg Site groundwater protection area.

23. We will add the referenced sentence as suggested.

24. We will add the referenced sentence as suggested.

25. We will revise the referenced paragraph to state: "No contaminants attributable to wastes disposed of in the trenches were identified in any groundwater, surface water, or air samples collected during the RI/FS or in groundwater samples collected since completion of the RI/FS."

26. In developing MTCA CULs for groundwater at the Site, we have taken into consideration the protection of surface water beneficial uses in the Cedar River and Rock Creek. However, at this Site, we do not agree that triggers in the sentinel and compliance wells be set at MTCA CULs for surface waters. The Cedar River and Rock Creek are hundreds of feet from the Site compliance boundaries and the applicable point of compliance for surface waters is immediately before groundwater discharges to the surface water body. Detection limits in the Quality Assurance Project Plan (QAPP) are sufficient to detect contaminants in sentinel and compliance wells that may pose a potential future risk to surface waters hundreds of feet away.

27. Ecology approved the conditional point of compliance for this Site based on practicability. It is impractical, probably impossible, and too dangerous to remove all waste from the Site relative to the environmental benefit obtained (see FCAP, Section 5.3.2). Typical closure or cleanup actions at landfills are containment in place with a conditional point of compliance with further protection provided by institutional controls. The entire conditional point of compliance boundaries are within property owned by PCC.

28. The restoration time frame for the Proposed Plan is appropriate for a containment remedy.

29. Please see Ecology's response to Comment (RS, Section G.2, Covering Wastes (Containment Remedy)).

30. Please review Ecology's responses to the City of Kent Comments (RS Section T.2, Provision for Termination of O&M and Institutional Controls).

31. Please see Ecology's response to City of Kent Comment (RS Section E.1, Site Characterization and Investigation) and response to Aspect Comment #SC-9. The referenced section will be revised to reflect that contamination has not been detected in groundwater emanating from the mine. The groundwater in the southern portion of the mine has been investigated; contamination has not been detected in groundwater in the southern portion of the mine.

32. Please see response to Aspect Comment #SC-3.

33. Although the Engineering Design Report has not been started, we expect that tree removals in the trench would be initially cut by personnel using protective gear, such as a harness connected to the top of the trench. The tree could be removed from the top of the trench by cable hoists. We do not anticipate removing any grasses or scrubs from the trench. This is not comparable to any conceivable approach to removing chlorinated solvent sludge from Area 2.

34. Please see Ecology's response to City of Kent Comment (RS Section Y.5, Concerns on Contingency Plan) and responses to Aspect Comments #GC-A, -B, -C, -D, and -F and to Aspect Comment #SC-11.

35. Please see response to Aspect Comment #SC-15. The statement is true that "groundwater currently meets cleanup levels" at the designated points of compliance. We will clarify and add the suggested "Based upon available data" phrase to the beginning of the sentence and add "at the designated points of compliance" to the end of the referenced sentence.

36. Please see Ecology's response to City of Kent Comments (RS Section T.2, Provision for Termination of O&M and Institutional Controls).

37. We do not anticipate that a temporary pipeline will be necessary to connect the south portal extraction system to the north portal system. The south portal permanent pipeline can be installed in three to four months and sufficient time between initial triggers and operation of the system exists at the south portal to install the permanent pipeline. A temporary pipeline is only one possible contingency measure. Another option would be to use temporary baker tanks that would be trucked for disposal.

38. Ecology has reviewed and approved the RI/FS. After review of the RI/FS and subsequent investigations, Ecology has selected a containment remedial action and determined that a conditional point of compliance is appropriate for the Site as described in the FCAP.

39. Please see responses to Aspect Comment #GC-H and to Ecology's response to City of Kent Comment (RS, Section K, Monitoring Well Installation for Cap Performance Monitoring).

40. We will provide more details on the locations and screened intervals for the north sentinel wells in Exhibit D – Part C. The historic and current monitoring data has shown that contaminants have not been missed nor migrated off-Site. Speculation on Portal #2 controlling groundwater when the mine workings have collapsed as evidenced by the subsidence trench is not creditable. Compliance wells at the north portal monitor the mined coal seam (gravel backfilled) that extends north of LMW-2 and LMW-4 from the mine north portal. The north compliance wells monitor groundwater at a shallow depth and at depths of approximately the elevation of the second-level and third-level gangways that represent possible pathways in the event that mine collapse was not complete. Compliance wells at the south portal are monitoring near surface groundwater from the mine, and groundwater at the second-level and fourth-level gangways in addition to monitoring groundwater emanating from Portal #3 that is connected to incline for the #3 and #4 gangways. Please see Ecology response to the City of Kent Comment (RS, Section L, New Monitoring Well Design and Placement).

41. We will revise the referenced sentence as requested.

42. The referenced section only provides the purpose of protective monitoring. We will refer to the Compliance Monitoring Plan (CMP) for details in the referenced FCAP section.

43. We will add the reference to the EDR to the referenced section.

44. Please see Ecology's responses to City of Kent Comments (RS Section T.2, Provision for Termination of O&M and Institutional Controls and Section S, "In Perpetuity" vs. "Indefinitely").

45. Please see Ecology's response to City of Kent Comment (RS Section X, Factors such as earthquakes that potentially cause contaminant movement).

46. a) Please see response to Aspect Comment #SC-35.

    b) In response to DOH recommendations, sentinel wells will be installed before the start of construction activities.

47. a) "Release" refers to a release from the mine.

    b) We do not share the belief that it is confusing, but we will revise the section for clarity and refer to specific CMP sections.

    c) We will mention that four new sentinel wells will be added to compliance monitoring. During compliance we do not agree that additional monitoring wells other than the four proposed sentinel wells are needed for compliance monitoring.

    d) i) We do not agree that additional monitoring wells need to be added to the proposed system for protection monitoring. Please see Ecology's response to the City of Kent Comment (RS, Section K, Monitoring Well Installation for Cap Performance Monitoring) and response to Aspect Comment #SC-63.

    d) ii) We will revise the referenced sentence to say analysis for the VOCs, but we are screening for TPH using NWTPH-HCID.

    d) iii) Please see Ecology comments to City of Kent Comment (RS, Section M, Omission of 1,4-Dioxane from Analytical Suite).

    d) iv) We agree that it is appropriate to drop PCBs from the monitoring program, subject to Ecology's approval.

    e) We proposed to use NWTPH-HCID for screening petroleum hydrocarbons. If petroleum hydrocarbons are detected, then the suggested analytical methods would be appropriate for confirmation.

    f) Please see response to Aspect Comment #GC-A and Ecology response to City of Kent Comments (RS Section Y.5, Concerns on Contingency Plan. and Sections J.1 and J.2, Protectiveness of Long Term Monitoring Frequency).

48. a) Please see response to Aspect Comment #GC-A and Ecology's response to City of Kent Comment (RS Section Y.5, Concerns on Contingency Plan). The time for reporting detections of groundwater contamination at or above triggers are specified in the CMP. All monitoring data will be available to the public on Ecology's web site and through their EIMS database. Whether Ecology separately informs selected stakeholders of a detection will be determined by Ecology protocols.

    b) The PLP Group will notify Ecology within 7 days of a detection at a sentinel well at or over 0.25 MTCA CUL. Whether Ecology informs selected stakeholders of a detection is up to Ecology.

    c) Please see response to Aspect Comment #GC-A and Ecology response to City of Kent Comment (RS Section Y.5, Concerns on Contingency Plan).

d) i) The monitoring location and depth interval where a contaminant initially arrives will be used for evaluating plume migration. Please also see responses to Aspect Comment #GC-A and Ecology response to City of Kent Comment (RS Section Y.5, Concerns on Contingency Plan).

d) ii) The Final CAP will require the Groundwater Extraction and Treatment System to operate until groundwater is below 0.5 MTCA CULs at the compliance wells and the pumped effluent for four consecutive monitoring events (minimum of 1 year), instead of at 1.0 MTCA CULs. Although groundwater is not considered contaminated below MTCA CULs, the revision to discontinue operation of the contingent system will provide additional protection.

49. Please see Ecology comments to City of Kent Comment (RS Section T.2, Provision for Termination of O&M and Institutional Controls).

50. We do not agree that this statement is false or misleading. Currently, groundwater does meet remediation goals at the Site's designated points of compliance.

51. Please see responses to Aspect Comment #SC-5.

52. Any landfill and most MTCA/CERCLA sites cannot accurately estimate the quantity of contaminants present, especially when the wastes are so heterogeneous and separated into individual drums and largely inaccessible. These are among the reasons the wastes were not further characterized at this Site. The referenced language complies with MTCA and is consistent with Ecology practice at landfill and other containment sites. See also response to Aspect Comment #SC-9.

53. Surface water MTCA CULs are not applicable at the portals. See response to Aspect Comment #SC-2.

54. The schedule identifies the relevant milestones required under the Consent Decree. More details on notification and submittal requirements are presented in the FCAP and CMP.

55. The schedule is appropriate, reflecting time anticipated for Ecology approvals and limitations on construction outside the approved construction window.

56. It is Ecology's decision as to whether a specific time period will be required for reporting CMP results if the results do not indicate contaminant detections. The CMP identifies timely notification to Ecology if contamination is detected.

57. This comment is a statement and does not require a response. Exhibit D Introduction will be made consistent with any changes made to Parts A, B, and C.

58. The intent was to have laboratories report the MDL levels and to report detections above MDLs, but below the PQLs, as J qualified values. We will revise the section to clarify laboratory reporting requirements.

59. We will qualify the sentence to state that "no media outside the waste disposal portion of the mine".

60. We will change "designed" to "conceptualized". The design will be started based on revised triggers presented in Ecology's response to City of Kent Comment (RS Section Y.5, Concerns on Contingency Plan) and response to Aspect General Comment #GC-A and presented in Table 1.

61. Please see Ecology's response to City of Kent comment (RS, Section K, Monitoring Well Installation for Cap Performance Monitoring).

62. a) Please see Ecology's response to City of Kent comment (RS, Section K, Monitoring Well Installation for Cap Performance Monitoring).

b) Please see Ecology's response to City of Kent comment (RS, Section M, Omission of 1,4-Dioxane from Analytical Suite). We agree that it is appropriate to drop PCBs from the monitoring program, subject to Ecology's approval.

63. Consistent with the response to Aspect Comment #GC-A, the CMP's protection monitoring section will be revised to provide new triggers for installation and operation of the Contingent Groundwater Treatment and Extraction System. The north Portal #2 water will be used during protection monitoring as the north sentinel monitoring location. The contingent Groundwater Extraction and Treatment System will be designed, submitted for Ecology approval, and permitted upon a confirmed exceedance of 0.5 MTCA CUL at a sentinel well. The system will be installed if the confirmed groundwater concentration exceeds the MTCA CUL at a sentinel well. The system will become operational if the groundwater has a confirmed exceedance of 0.5 MTCA CUL at a compliance well.

64. Please see response to Aspect comment #SC-40.

65. a) NWTPH-HCID is a good screening analysis for TPH. If TPH is detected at a sentinel well, confirmation analysis will be done by NWTPH-Dx or NWTPH-Gx, whichever is applicable based on the screening results.

    b) We will provide specific GC/MS analysis in the referenced section. Regarding 1,4-dioxane, please see Ecology response to City of Kent comment (RS, Section M, Omission of 1,4-Dioxane from Analytical Suite).

    c) Please see Ecology's response to City of Kent comment (RS Section X, Factors such as earthquakes that potentially cause contaminant movement) and response to Aspect Comment #GC-H.3.

66. Please see response to Aspect General comment #GC-A and presented in Table 1 and review Ecology's responses to the City of Kent Comments (RS Section Y.5, Concerns on Contingency Plan, and Sections J.1 and J.2, Protectiveness of Long Term Monitoring Frequency).

67. a) Please see response to Aspect General comment #GC-A and presented in Table 1 and review Ecology's responses to the City of Kent Comments (RS Section Y.5, Concerns on Contingency Plan).

    b) Please review Ecology's responses to the City of Kent comments (RS Section Y, Concerns on Contingency Plan). Also see Responses to Aspect comments #GC-A and SC-11.

    c) As stated in the comment, this subject was commented and responded to previously.

68. Please see responses to Aspect comment #SC-65. The four new sentinel wells will be installed before construction. We will not revise Table A-2 to have the field parameters grouped together with footnotes defining which field parameters are included.

69. Routine inspections will be scheduled as described in the CAP. Inspections will also occur after intensity IV earthquakes (see Exhibit D – Part B). Additional inspections are not needed to maintain the cap.

70. We will provide Ecology with a checklist for Site inspections for their approval with submittal of the draft EDR.

71. Please see Ecology's response to City of Kent comment (RS Section T.2, Provision for Termination of O&M and Institutional Controls).

72. A seed mixture will be identified in the EDR to be the standard WSDOT erosion control seed mixture or equivalent.

73. Comment 73 simply refers to Aspect's prior comments on the Contingency Plan, responses to which are provided above.

74. Please see response to Aspect Comment #SC-26.

75. Please see Ecology's response to City of Kent comment (RS, Section K, Monitoring Well Installation for Cap Performance Monitoring).

76. Please review Ecology's responses to the City of Kent comments (RS Section Y, Concerns on Contingency Plan). Also see responses to Aspect Comments #GC-A and SC 11.

77. Please see response to Aspect Comment #GC-A and -G, and Ecology's response to City of Kent comment (RS Section Y.5, Concerns on Contingency Plan).

78. Please see response to Aspect comment #SC-37.

79. a) Please see Ecology's responses to the City of Kent comments (RS Section Y.5, Concerns on Contingency Plan) and responses to Aspect Comments #GC-A and SC-11.

    b) Please see Response to Aspect comment #SC-5.

80. Please see response to Aspect comment #SC-5. The final approvals and permitting of the contingent treatment system effluent pipeline connection to Soos Creek sanitary sewer is anticipated and will be completed when required. Since the system operation will only be necessary if there is a threat to human health and the environment, Ecology has committed to make the determination that the system is needed for the protection of public health and ensure the final discharge pipeline connection is constructed.

81. Please see response to Aspect Comment #SC-37.

82. a) As discussed in response to Aspect comment #SC 11, we have determined that 40 gpm is the maximum amount of groundwater needed for containment at a portal, but the extraction wells will be capable of pumping higher volumes if needed to achieve containment. A pump test does not need and should not be conducted now, since the remedial actions will change the hydraulics of the system. A pump test can be conducted when and if contaminants are ever detected above trigger levels, prompting construction of the contingent groundwater treatment system. The groundwater extraction system will be installed in the proper location for containment of detected contamination and will be tested, including the installation of performance monitoring wells, to determine the optimal long-term pumping rate. With the revised contaminant concentration triggers, there will be sufficient time for pump test optimization before contaminants reach the compliance well(s) at the MTCA-CULs. More details are presented in Exhibit D – Part C.

    b) The groundwater extraction system will be operated in a manner that will contain contaminated groundwater from migrating off-Site. As needed, performance wells will be included in the system design and installed for determining containment. Uncontaminated groundwater does not need to be extracted and treated by the containment system.

    c) The extraction/containment system will include the monitoring devices suggested by Aspect and additional devices not mentioned in Exhibit D (i.e., water level transducers). We will provide more detail in the referenced section, but the design details will be made and submitted to Ecology with the system design and O&M plan.

83. We will revise the exhibit nomenclature as suggested.

84. The language in Section 6 of the proposed Environmental Covenants is taken without modification from Ecology's standard form Environmental Covenant. Section 6 complies with MTCA by tracking the

language in WAC 173-340-440(12) ("Removal of Restrictions"). That provision states that if the conditions at the site at issue requiring the environmental covenant no longer exist, the owner may submit a request to Ecology to remove the covenant. The covenant cannot be removed, however, without Ecology approval after public notice and an opportunity to comment.

85. The Remedial Design already provides a significant buffer around the "Site" (as depicted in the Site Diagram attached to the Consent Decree in Exhibit A) anywhere from 200' up to 500' at some points except for the SW corner at the LMW-5 parcel. The Consent Decree requires, however, that the PLPs make a good faith effort to obtain an environmental covenant (attached to the Consent Decree as Exhibit E-2) from the owner of the property outside of the SW corner of the Groundwater and Portal Protection Area. Additionally, the DCAP requires a monitoring well system that includes both sentinel and compliance wells along with the contingent groundwater treatment plan as modified in Ecology's Responsiveness Summary. The compliance boundary already provides a robust buffer to encompass the "Site", while it should be clarified that the original dimensions of the physical "Black Box" was defined as the actual mine workings that is even further within the Site boundary shown in blue.

86. The boundary for the environmental covenant does encompass the entire Site as depicted in the Site Diagram attached to the Consent Decree as Exhibit A. The groundwater use restriction boundary is not arbitrary, but is based on the existence of groundwater hydraulic sinks created by the two adjacent mine workings. The Frasier Mine did not extend to the south nearly as far as the Rogers and Landsburg mines extended. The boundary to the southwest (we assume that the commenter meant southwest instead of southeast) was based on property ownership, but provides a protective buffer for potentially impacted groundwater migration. Please see also response to Comment #SC-85 above.

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EXHIBIT C

SCHEDULE

Exhibit C –Schedule

Deliverable	Due Date	Comment
Submit to Ecology Draft Engineering Design Report (EDR), which will include a detailed schedule for construction activities; Construction Plans & Specifications (CPS); Construction Health and Safety Plan (HSP); and Construction Quality Assurance (CQA) Plan	Within 150 Days of the Consent Decree Effective Date	
Submit to Ecology Final EDR, including CPS, HSP and CQA	Within 30 days after receiving Ecology comments on the Draft EDR	
Start construction phase of Cleanup Action Plan (CAP) according to EDR, CPS, HSP and CQA	Within 1.25 years of Ecology approval of the Final EDR, CPS, HSP and CQA, and all in accordance with the detailed schedule contained in Ecology-Approved EDR	Construction of the cleanup action will require two full construction seasons to complete. The construction season runs from approximately May 1 to November 1.
Submit As-built Drawings and Draft Cleanup Action Report to Ecology	Within 120 days of completion of construction, as provided in detailed schedule in EDR.	
Submit Final Cleanup Action Report to Ecology	Within 60 days of receiving Ecology's comments on the Draft Cleanup Action Report.	
Record Environmental Covenant (Exhibit E to the Consent Decree)	Within 10 days of Ecology's approval of As-Built Drawings	
Conduct Confirmational Groundwater Monitoring	To begin within 90 days of Ecology's approval of As-Built Drawings, and to be conducted in accordance with the schedule in the Compliance Monitoring Plan (Exhibit D - Part A to the Consent Decree)	

Exhibit C –Schedule

Deliverable	Due Date	Comment
Conduct Inspection and Maintenance of the Cap and Stormwater Facilities	To begin within 180 days of Ecology's approval of As-Built Drawings, and to be conducted in accordance with the schedule in the Operation and Maintenance Plan (Exhibit D – Part B to the Consent Decree)	
Install and operate Contingent Groundwater Extraction and Treatment System (Exhibit D – Part C to the Consent Decree)	If contingent treatment system is deemed necessary under Compliance Monitoring Plan (Exhibit D – Part A to Consent Decree), then design, installation and operation of contingent treatment system will follow Ecology-approved schedule to be included in contingent treatment system design submittal	Contingent treatment system will only to be installed and or operated if and as required under Compliance Monitoring Plan (Exhibit D – Part A to the Consent Decree)
Progress Reports	As provided in Section XI of Consent Decree (monthly during construction, then as provided in Exhibit D, Part A (Compliance Monitoring Program)	

EXHIBIT D

COMPLIANCE MONITORING PLAN DOCUMENTS

Introduction
Part A – Compliance Monitoring Plan
Part B – Operation and Maintenance Plan
Part C – Contingent Groundwater Extraction and Treatment System Plan

REPORT

INTRODUCTION TO PARTS A, B, AND C

PART A - COMPLIANCE MONITORING PLAN

PART B - OPERATION AND MAINTENANCE PLAN

PART C - CONTINGENT GROUNDWATER EXTRACTION AND TREATMENT SYSTEM PLAN

Landsburg Mine Site
MTCA Remediation Project
Ravensdale, Washington

Submitted To: Washington Department of Ecology
3190 – 160th Avenue SE
Bellevue, WA 98008

Submitted By: Golder Associates Inc.
18300 NE Union Hill Road, Suite 200
Redmond, WA 98052 USA

Submitted On Behalf Of: The Landsburg Mine Site PLP Group

June 7, 2017 **Project No. 923-1000-002.R154**

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Golder Associates

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LIST OF FIGURES

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1.0 INTRODUCTION

1.1 Purpose and Scope

This document presents a set of plans, which provide guidance for routine operation, maintenance, monitoring and for mitigation of emergency situations. This document presents three plans: Part A, the Compliance Monitoring Plan; Part B, the Operation and Maintenance (O&M Plan); and Part C, the Contingent Groundwater Extraction and Treatment System Plan for the Landsburg Mine Site (Site) located near Ravensdale, Washington. The Sampling and Analysis Plan, Quality Assurance Project Plan (QAPP), Data Management Plan (DMP), and the Health and Safety Plan (HASP) are presented as part of the Compliance Monitoring Plan (Part A). These plans are required as part of the Site cleanup and monitoring process under the Model Toxics Control Act (MTCA) as established by the regulations set forth in Chapter 173-340 of the Washington Administrative Code (WAC) and under consultations with the Washington State Department of Ecology (Ecology).

This introduction includes a brief Site description and history, summary of the nature and extent of contamination at the Site, and an overview of the selected remedy.

1.1.1 Compliance Monitoring Plan

The purpose of the Compliance Monitoring Plan (Part A) for the Landsburg Mine Site is to describe the environmental monitoring to be performed during remedial action (protection monitoring and performance monitoring) and following completion of the cleanup action (confirmational monitoring). Protection monitoring includes: human remedial worker health and safety monitoring, and groundwater monitoring during remedial construction activities. Performance monitoring is construction quality assurance (CQA) inspections, monitoring, and testing to verify that the cleanup action has been constructed in accordance with the design and specifications. Confirmational monitoring under the Compliance Monitoring Plan consists of long-term groundwater monitoring and maintenance of the constructed remedy components. Long-term inspections, monitoring and maintenance of the cap and drainage system is described in the O&M Plan (Part B).

1.1.2 Operation and Maintenance Plan

The purpose of the Operation and Maintenance (O&M) Plan (Part B) is to provide technical guidance and procedures to ensure effective long-term operation and maintenance of the completed remediation project under both normal and emergency conditions. For the remedy selected for the Landsburg Mine Site, Low-Permeability Soil Cap (see Section 1.4), O&M will consist primarily of routine inspection of the cap and associated drainage features, along with any necessary repairs. A geodetic database of the cap elevations will also be maintained for detection of settlement or other abnormal conditions. A state licensed surveyor will install benchmarks to be used to measure settlement of the cap for compliance monitoring purposes.

1.1.3 Contingent Groundwater Extraction and Treatment System Plan

In the event that groundwater contamination is detected at the sentinel well at or above the remediation levels and confirmed pursuant to the Compliance Monitoring Program, a contingent groundwater extraction and treatment system will be installed. A Contingent Groundwater Extraction and Treatment System Plan (Part C) has been prepared to facilitate rapid installation of the temporary system for groundwater containment and treatment. If the Contingent Groundwater Treatment System is installed, the existing O&M Plan will be revised to include the O&M requirements for the contingent system that will include inspections, maintenance activities, and effluent monitoring.

1.2 Site Summary

The Landsburg Mine Site contains a former underground coal mine located approximately 1.5 miles northwest of Ravensdale in a rural area of southeast King County, Washington. The Site is situated directly south and east of S.E. Summit-Landsburg Road and north of S.E. Kent-Kangley Road. Downtown Seattle is approximately 20 miles to the northwest. The Cedar River passes within approximately 700 feet of the Site to the north. The location of the Site is shown in Figures 2 and 3. The topography of the Site and general Site features are shown in Figure 4. The mine Site occupies property owned by Palmer Coking Coal Company, LLP (PCC) and is located within Sections 24 and 25, Township 22 N., Range 6 E.

Several gravel roads provide access to the property from public thoroughfares, and walking/horse trails run parallel to the east and west sides of the trench. The primary access road begins near S.E. Summit-Landsburg Road and follows along the northern portion of the trench. A second access road begins near where S.E. 256th Street bends to the south and eventually to the mine trenches where waste was disposed. A third gravel road begins across the street from the Tahoma Junior High School along S.E. Summit-Landsburg Road and provides access to LMW-11. A fourth existing access road begins at Kent-Kangley Road and provides access to neighboring houses and to the Portal #3 mine site area. Locked gates secure the Site at the access road entrances, and the portion of the trench where disposal occurred is currently enclosed by a 6-foot tall chain link security fence. Dense vegetation covers the Site. Electrical transmission lines and a Bonneville Power Administration property easement cross the southern portion of the Site in an east-west direction.

There are approximately 130 residences in the vicinity of the Site. The nearest residences are to the southwest approximately 800 feet from the trench. Drinking water for area residences is supplied by groundwater, either through private wells or small community water supply systems.

The Landsburg Mine consisted of two adjacent coal seams: the Landsburg Seam and the Rogers Seam. The two seams are separated by about 600 feet. In addition to these two seams, mining has also been conducted at the nearby Frasier seam. This seam, located some 800 feet northwest of the Rogers Seam, was mined intermittently from the late 1800s to the mid-1940s. The mined section of the Rogers coal seam has a near vertical dip and consists of coal and interbedded shale approximately 16 feet wide. The mined section is about a mile in length and up to 750 feet deep.

As a result of underground mining of the Rogers Seam, a subsidence trench developed on the land surface above the mine workings. The dimensions of the trench vary, from about 60 to 100 feet wide, between 20 to 60 feet in depth and about 3/4 mile in length. The trench is not continuous along its whole length but is comprised of a series of separate subsided segments. Each trench section is separated by a pillar wall.

Disposal activities were conducted at the Site in the northern portion of the trench in the late 1960s to the late 1970s. Disposed materials included various industrial wastes, construction materials, and land-clearing debris. Industrial wastes were contained in drums or dumped directly from tanker trunks. Wastes apparently included paint wastes, solvents, metal sludges, and oily water and sludge (Ecology 1990). Based on invoice records from PCC, an estimated 4,500 drums and 200,000 gallons of oily wastewater and sludges were disposed in the trench. Disposal of land clearing debris continued until the early 1980's.

In 1991, four of the Potentially Liable Parties (PLPs) implemented an Expedited Response Action (ERA) involving the removal of the most accessible drums from the trench and construction of a fence to restrict access to the Site. The ERA involved the removal of over 100 55-gallon drums (Landsburg PLP Steering Committee 1991).

Following the removal of the drums, Ecology and the PLPs negotiated and entered into an Agreed Order with the Ecology (Ecology 1993) which directed the PLPs to conduct an Remedial Investigation/Feasibility Study (RI/FS) to evaluate the need for remedial action. The PLPs for the Landsburg Site currently consist of Palmer Coking Coal Company, LLP; PACCAR Inc.; Weyerhaeuser Company.; Browning-Ferris Industries of Illinois, Inc.; and BNSF Railway Company. The scope of work for the RI was outlined in the *Landsburg Phase I Remedial Investigation/ Feasibility Study (RI/FS) Work Plan* (Golder 1992), which was incorporated by reference into the 1993 Agreed Order. The RI/FS, which consisted of a comprehensive investigation of environmental conditions at the Site and evaluations of potential remedial action alternatives, was conducted by the PLP Group over the period of mid-1993 to early 1996. Results of the RI/FS were presented in the *Remedial Investigation/ Feasibility Study for the Landsburg Mine Site* (Golder 1996).

1.3 Nature and Extent of Contamination

The conclusions of the Remedial Investigation (Golder 1996) regarding the nature and extent of contamination are summarized in this Section. In general, apart from soils located within the subsidence trench in the area of known prior waste disposal activities, soil, groundwater, and surface water media in the Site area do not exhibit concentrations of chemical constituents above naturally occurring background levels. The only known constituents of concern are seven (7) compounds detected in soils inside the trench, which include chromium, lead, polychlorinated biphenyls (PCBs), bis(2-ethylhexyl)phthalate, methylene chloride, trichloroethene (TCE) and total petroleum hydrocarbons (TPH) that exceeded applicable MTCA cleanup standards (see Section 1.3.4 for additional information).

1.3.1 Air

Throughout the majority of the trench area, volatile organic compounds (VOCs) were not detected above background in air. Detectable levels of volatile organic compounds in air were very low and restricted to only a small area within trench number 9 (see Figure 5) in the vicinity of the sludge pond. Air monitoring conducted during drilling of groundwater monitoring wells did not detect significant levels of VOCs.

1.3.2 Groundwater

The overall conclusion of the RI is that there are no constituents of concern for groundwater emanating from the Landsburg Mine Site. Groundwater has been monitored at the Site for over 24 years and no contaminants have been detected above background levels or above MTCA levels from monitoring wells.

The results of groundwater sampling indicate that no federal primary drinking water standards (Maximum Contaminant Levels [MCL]) are being exceeded at any of the Site wells or amongst any of the private wells sampled in the vicinity of the Site, except for the MCL for arsenic in LMW-11.. Because of the naturally occurring geochemical conditions near the bottom the Rogers seam (700 feet deep at MW-11), arsenic concentrations in MW-11 have occasionally been detected at concentrations slightly above the Washington state drinking water standard and the federal MCL (0.010 milligrams per liter [mg/L]). The maximum concentration of arsenic ever detected in MW-11 was 0.012 mg/L. The MTCA Method A standard for arsenic (0.005 mg/L) was exceeded at LMW-11 and three private wells. Secondary MCLs (SMCLs), which are aesthetic standards only and not health-based standards, were exceeded for aluminum, iron, manganese, total dissolved solids, and pH at a number of wells located throughout the area, including both private wells and monitoring wells. SMCLs were exceeded at every Site monitoring well. Of the 14 private wells sampled, seven of the wells had at least one exceedance of a SMCL over the initial four rounds of sampling. Iron is the most prevalent compound exceeding an SMCL. MTCA Method B standard for manganese (50 micrograms per liter [µg/L]) was exceeded at 5 monitoring wells and 3 private wells. The observed distribution of chemical constituents in groundwater around the Site area indicates that waste disposal activities at the Landsburg Mine are not the source of these compounds. Maximum levels of some compounds occur in wells, which are hydraulically isolated from the Mine, with no apparent pathway for chemical migration. Also, the levels observed at the Mine are consistent with reports in the literature, which indicate that coal is a natural and well-known source for these natural chemical constituents (Hem 1985; Fuste and Mayer 1987). The levels observed are within the range of reported values considered typical for coal mine drainages in the State.

Arsenic, iron, and manganese are naturally occurring and can be elevated in coal bed aquifers. Arsenic was not a contaminant of concern at the Landsburg Mine Site (only the 700 foot deep LMW-11 well has arsenic above MTCA cleanup levels, but detected concentrations are typically below State drinking water standards). Manganese and iron are a common groundwater constituent from coal deposits. Although, these private wells are not penetrating any of the Landsburg site mined coal beds (Rogers, Frasier, or Landsburg coal seams), most of the private wells in the area have penetrated and appear to receive water from or are influenced by other coal beds that are not connected to mined coal beds at the Landsburg site. In the region, the Puget Group bedrock has numerous coal seams, most of which are not currently an economically recoverable resource.

1.3.3 Surface Water

Arsenic in surface water at the Site does not exceed the MTCA Method A standard for water discharging at Portals #2 and #3. No other analytes were detected above MTCA Cleanup Levels. The levels of arsenic observed are consistent with groundwater arsenic concentration levels measured at the mine Site. The occurrence of arsenic in groundwater (and therefore surface water) is a result of natural background conditions. Therefore, there are no Contaminants of Concern for surface water at the Landsburg Mine Site.

1.3.4 Soil

There are no identified contaminants of concern for soils outside of the trench. Within the trench, chromium, lead, PCBs, bis(2-ethylhexyl) phthalate, methylene chloride, TCE, and TPH exceeded applicable MTCA cleanup levels in an area confined to the northern portion of the trench where waste disposal is thought to have occurred in the past. Soil testing confirmed that contamination was not identified outside the northern portion of the trenches. These compounds were designated as constituents of concern for soil inside the trench. However, on the basis of trench sampling conducted to date, and in conjunction with historical information and geophysics, potential contamination is believed to be restricted to the northern portion of the trench.

1.4 Summary of Cleanup Action Plan

The remedy selected for the Landsburg Mine Site is Alternative 5, which will place a low-permeability soil cap over backfill in the northern portion of the trench as shown in Figure 5. This part of the trench has been determined to contain the dumped waste, based on historical information, sampling, and geophysical investigations. The trench would be backfilled to grade prior to capping. A conceptual cross-section of the trench backfill and cap is shown in Figure 6.

The major steps in the remedy are:

1. Backfill the trench as required for capping.
2. Allow the backfill to consolidate.

3. Place a low-permeability soil cap over the trench backfill, including grading and surface water management.
4. Maintain the cap during the long-term confirmational period.
5. Implement and maintain institutional controls, groundwater monitoring, and any instituted contingency plan.

Backfilling the trench will induce settlement, which must be accounted for in the design and installation of a cap. The existing materials in the trench are expected to be moderately compressible due to their loose nature and inclusion of construction debris and organic materials. Backfilling is expected to induce minor compression of these materials, which will result in surface settlement on the order of 6 to 12 inches. Settlement of the new fill depends on the type of fill used and the method of placement. The remainder of the settlement will continue gradually for many years at a decreasing rate.

The lower zone of the trench backfill will not be compacted, because of the unacceptably high safety risk of sudden trench collapse caused by heavy vibrating equipment. Instead, the trench will be backfilled and the material allowed to consolidate at least three months. The upper portion of the backfill will be compacted to reduce the settlement of the cap foundation. The trench will be over-filled to add a small "surcharge." The backfill will then be allowed to settle and consolidate prior to cap placement.

The low-permeability soil cap consists of 24 inches of compacted low-permeability soil beneath 6 inches of vegetated topsoil. The permeability of the low-permeability soil cap will be less than 10^{-6} centimeters per second (cm/sec), meeting Minimum Function Standards (MFS) specifications for landfill caps (WAC 173-304). The topsoil will not be compacted in order to provide a loose medium for establishing the vegetative cover. To establish vegetation, the topsoil will be seeded with grasses suitable for the local climate.

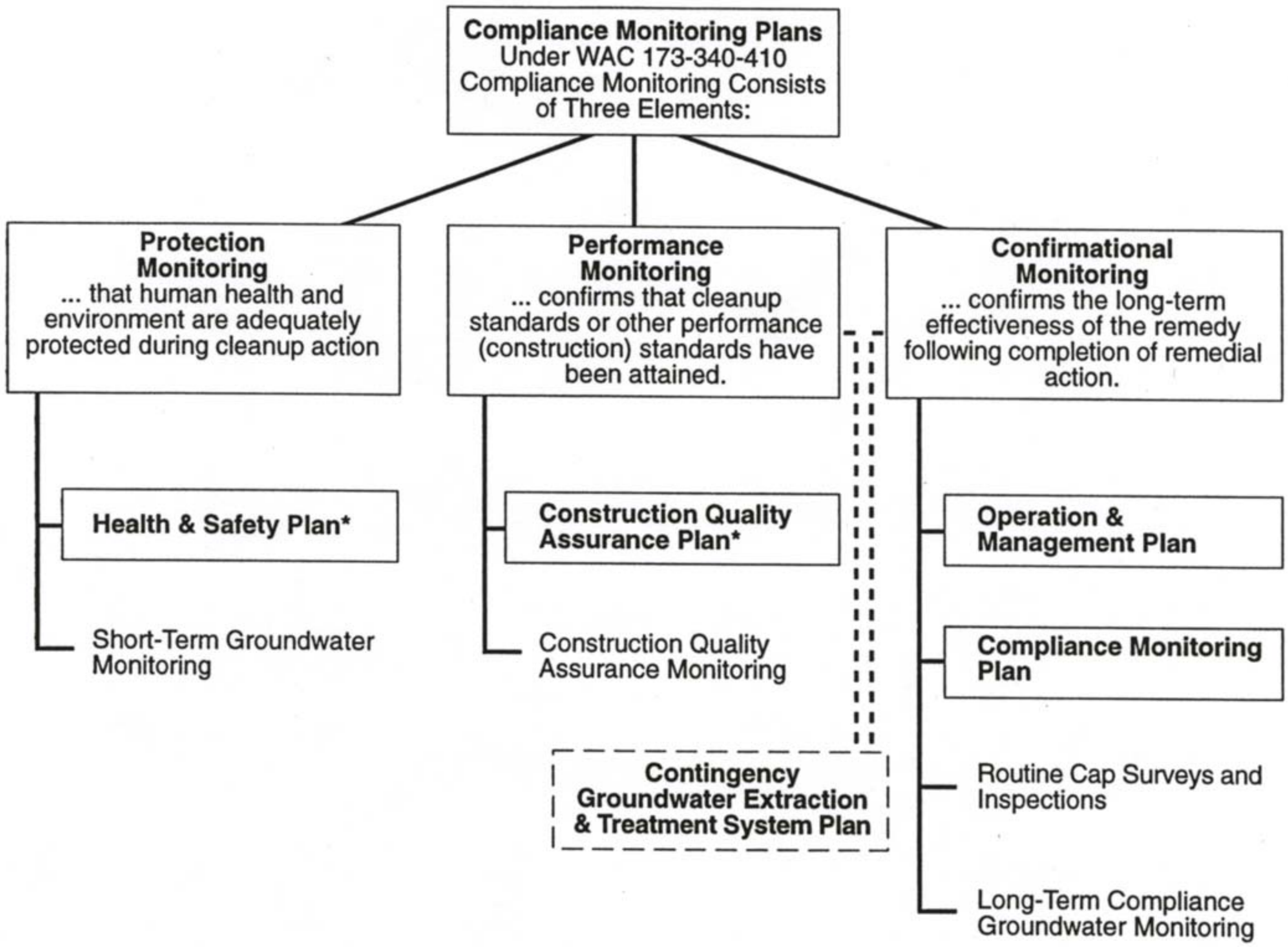
The cap and surrounding area will be graded to provide proper stormwater drainage. Drainage ditches will be constructed at the margins of the cap or along the access roads to intercept surface runoff and convey it away from the backfilled trenches, as shown on Figure 5. Final design of the drainage ditches will be provided in the Engineering Design Report (EDR) and the Construction Plans and Specifications.

Site use restrictions will prohibit using the Site for any purpose incompatible with a waste disposal site. Groundwater use restrictions will be employed to prevent exposure to Site groundwater. Restrictions will prohibit penetrating the cap and any Site use that could damage the cap or significantly reduce its effectiveness. Deed restrictions will be instituted to ensure that Site use restrictions remain in force regardless of the property owner, and to notify any prospective purchasers of the presence of subsurface waste.

Warning signs will provide notice of the presence of a waste Site. A 6-foot tall chain link security fence will be maintained around the low permeability cap (Trenches 7, 8, and 9) for five years after the remedial action. The fence will serve to keep visitors and trespassers off of the cap to ensure that the cap is secured and groundcover is well established. Fencing is not needed for capping alternatives (after five years) because the trench backfill will provide a very thick barrier against contact with any waste material, such that incidental trespass (which fencing is designed to prevent) or limited utilization of the Site would not present a health risk. The fence will also prevent access that might result in damage to the low permeability cap. At the end of five years, when the vegetative cover should have had sufficient time to become established and protect the low permeability cap, the fence may be removed with approval from Ecology.

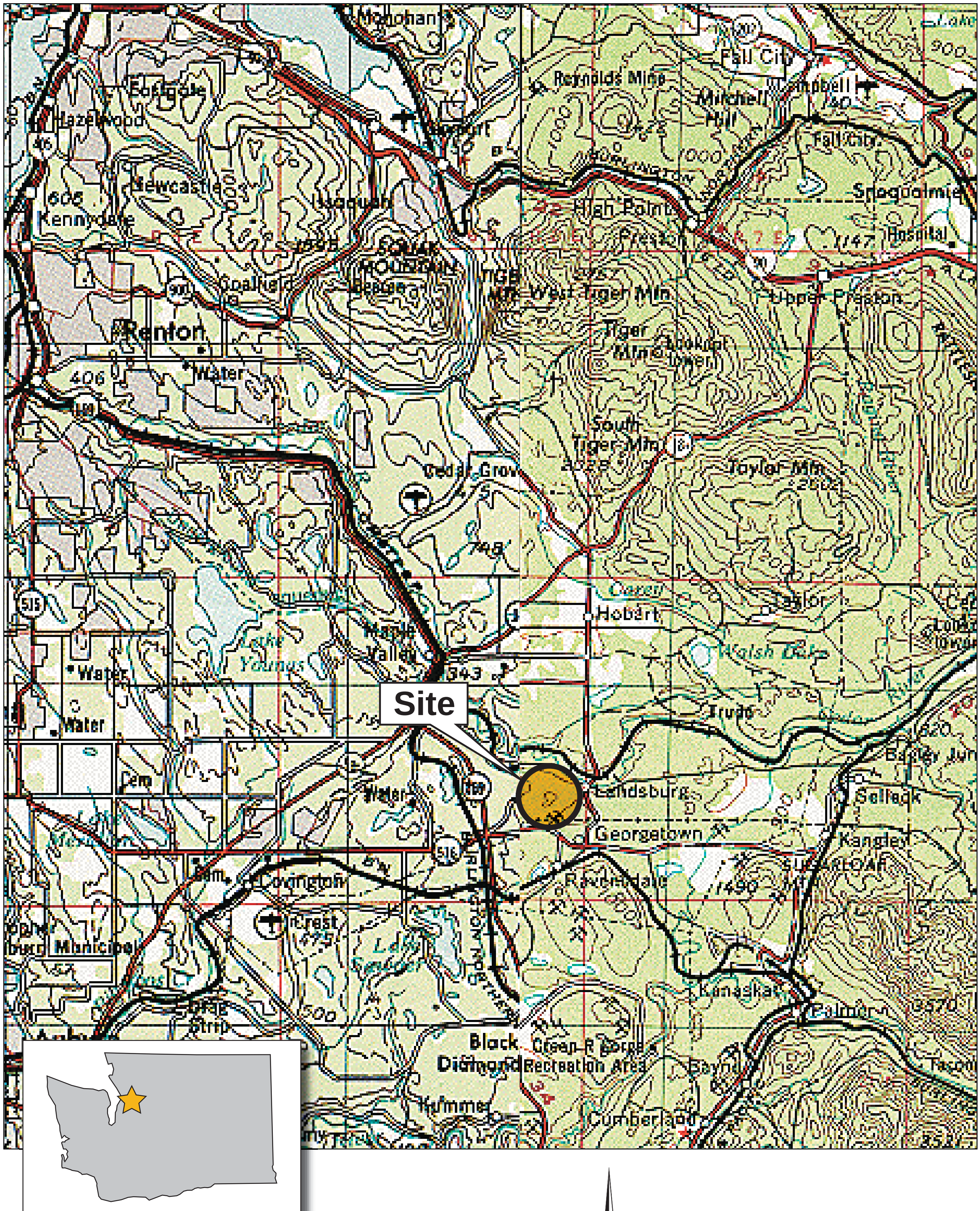
Based upon all available data gathered from sampling and analysis of existing monitoring wells, groundwater at the compliance boundaries currently meets cleanup levels, therefore, no groundwater containment or treatment is necessary. If Site contaminants migrate to the conditional compliance boundaries at concentrations exceeding one half of MTCA cleanup levels, a Contingent Groundwater Extraction and Treatment System will be operated to capture and contain contaminants for the protection of human health and the environment. With this contingency available, institutional controls and monitoring address the possibility of future groundwater concerns. A Contingent Groundwater Extraction and Treatment System Plan has been prepared (see Part C of this document), which could be installed quickly if needed. To expedite installation of a contingent treatment system, some of the infrastructure was installed in 2008. The infrastructure that was selected for pre-emptive installation were the items that have a long lead time or permitting phase that might slow the installation process. For example, a fenced gravel pad area to support the extraction/treatment equipment was installed north of Portal #2 and adjacent to the S.E. Summit-Landsburg Road. A discharge pipeline was installed from the treatment pad extending to the west end of the PCC property where it could be tied into the local Metro Publically Owned Treatment Works (POTW) sewer line serving Tahoma junior high. Additionally, an electrical transformer and control box for equipment hook-up has been installed. The area has lighting and is fenced for security.

FIGURES



*The Health and Safety Plan and the Construction Quality Assurance Plan are both directly related to the final design of the remedial construction activities and will be provided with the Engineering Design and Specifications.

FIGURE 1
ASPECT OF COMPLIANCE MONITORING, REQUIRED PLANS AND ACTIVITIES
PALMER/LANDSBURG MINE/WA



0 8000

SCALE IN FEET

FIGURE **2**

SITE LOCATION

PALMER/LANDSBURG MINE/WA

Source: USGS 1:250,000 Sheets,Seattle and Wenatchee

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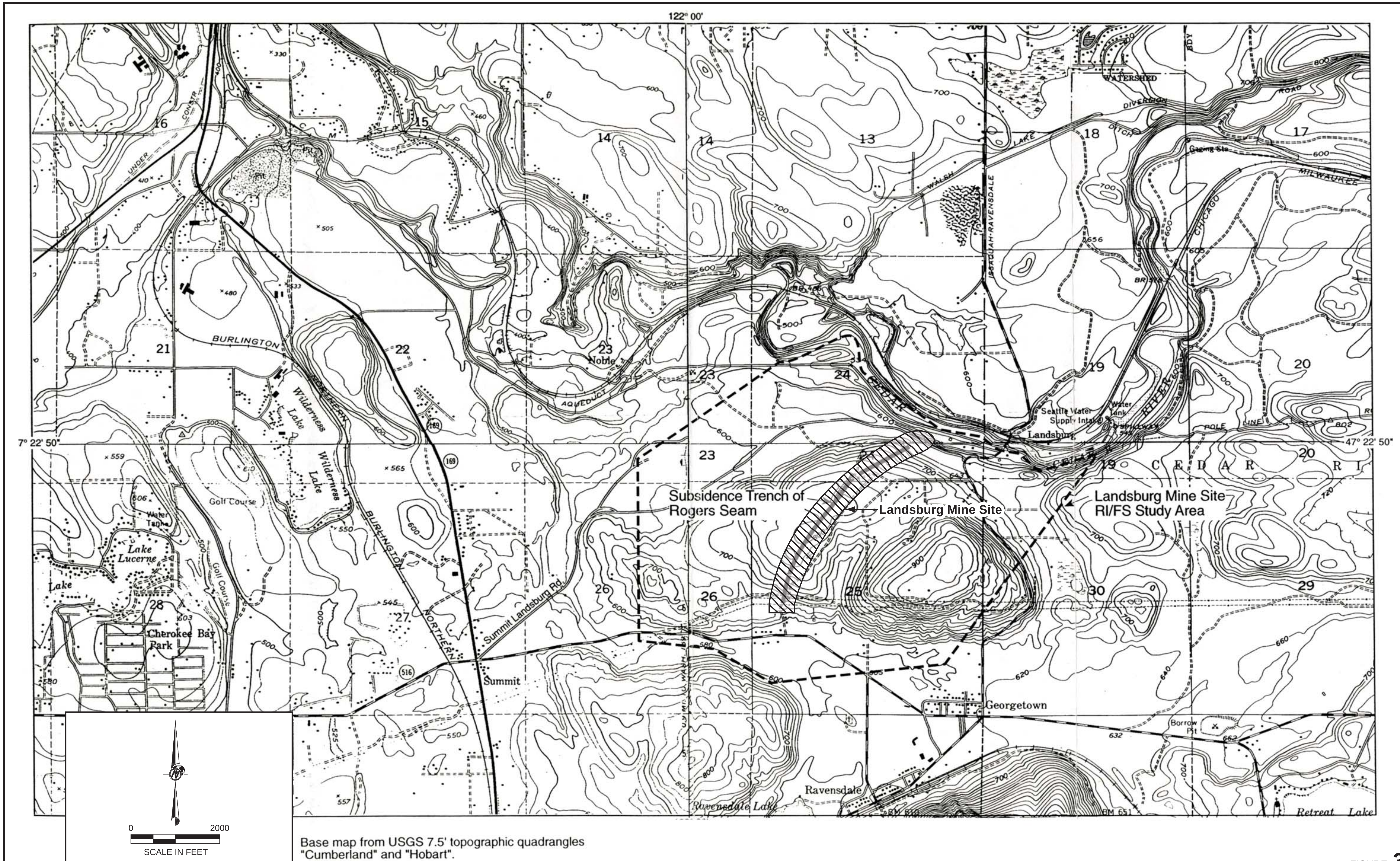
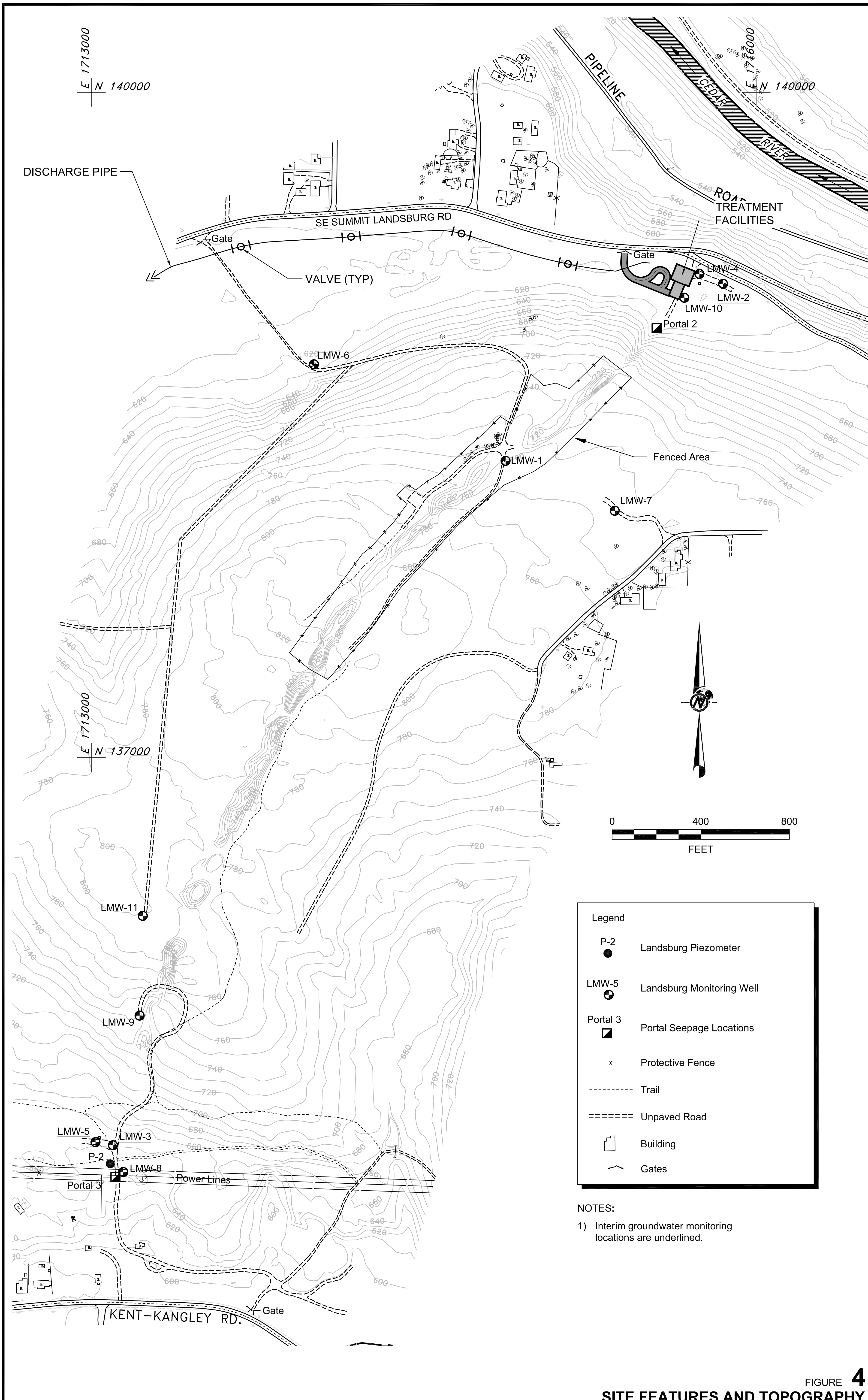
Golder Associates



Base map from USGS 7.5' topographic quadrangles "Cumberland" and "Hobart".

FIGURE 3
STUDY AREA BOUNDARY
PALMER/LANDSBURG MINE/WA

Golder Associates



NOTES:

1) Interim groundwater monitoring locations are underlined.

FIGURE 4

SITE FEATURES AND TOPOGRAPHY

PALMER/LANDSBURG MINE/WA

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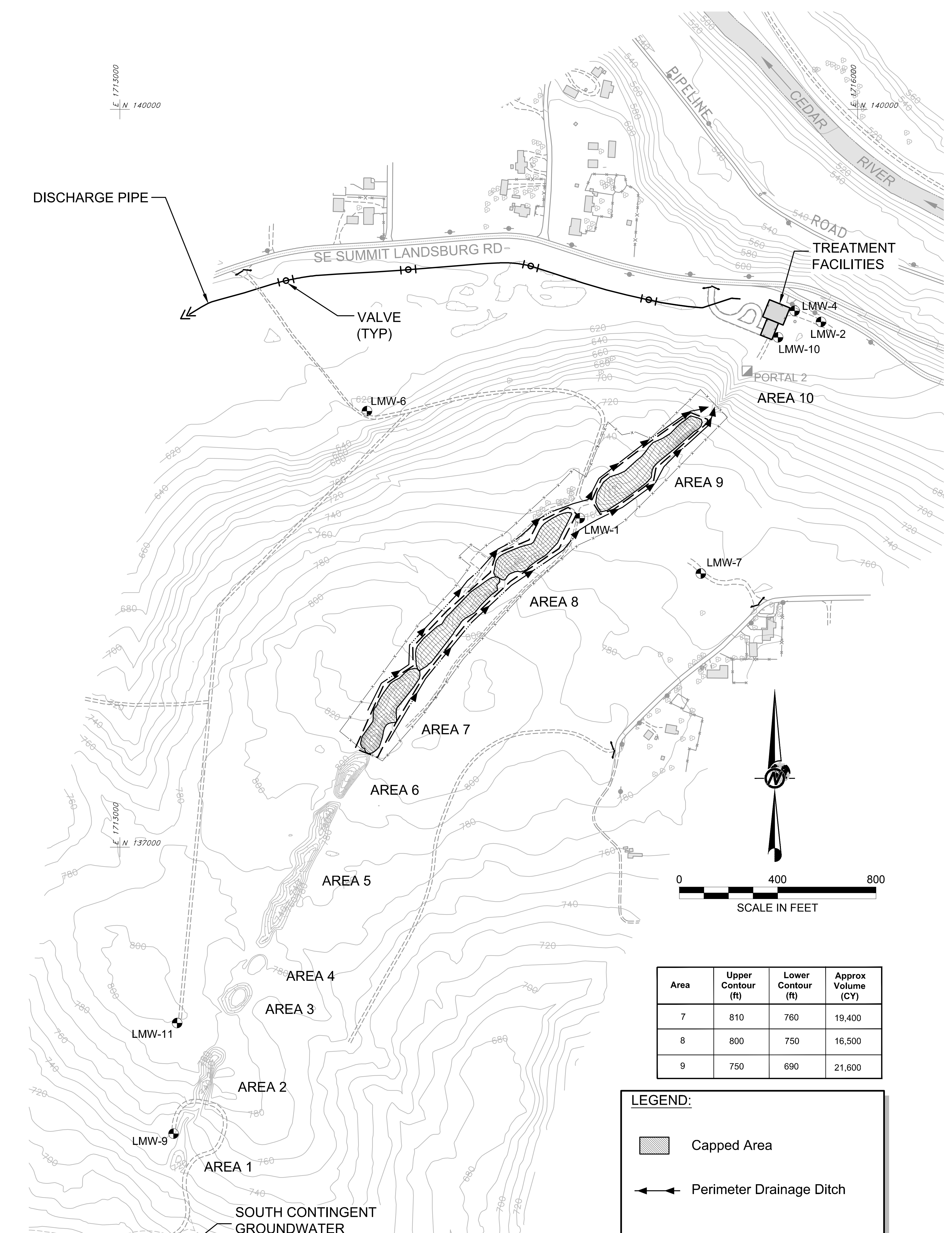
Golder Associates



Area	Upper Contour (ft)	Lower Contour (ft)	Approx Volume (CY)
7	810	760	19,400
8	800	750	16,500
9	750	690	21,600

LEGEND:

- Capped Area
- Perimeter Drainage Ditch
- Protective Fence
- LMW-5 Landsburg Monitoring Well
- Existing Unpaved Road
- Building

NOTES:
1. TOPOGRAPHY IN VICINITY OF TRENCHES WILL BE MODIFIED AS NECESSARY TO ACCOMMODATE CAP AND DITCHES.
2. ONLY TRENCH AREAS 7,8, AND 9 WILL BE BACKFILLED AND CAPPED

FIGURE 5

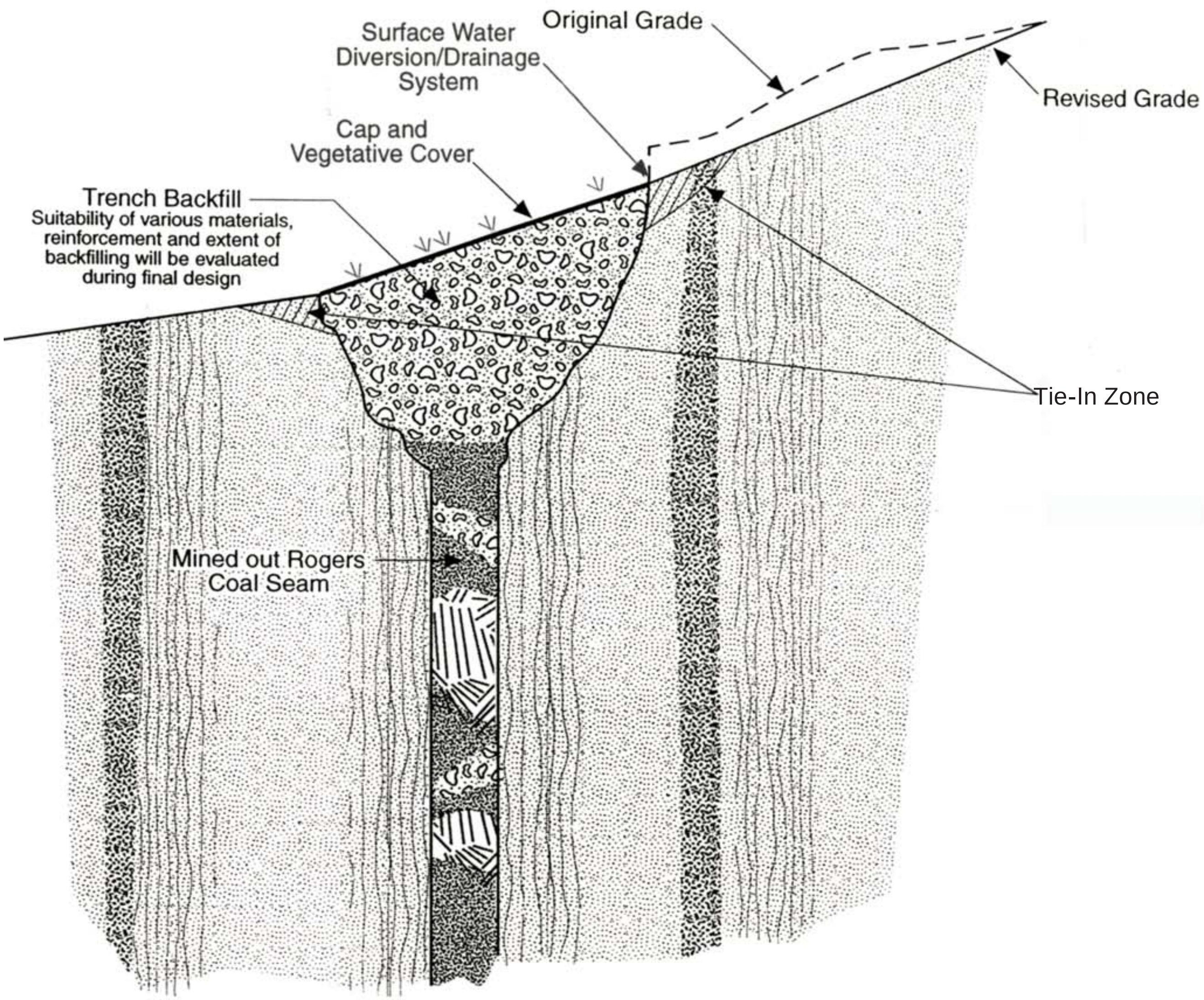
CAPPED AREA AND DRAINAGE DITCHES

PALMER/LANDSBURG MINE/WA

K:\CAD\Projects\1992\9231000\x002\R154\Exhibit E Introduction\923_1000_002_R154_F5r3.dwg | Fig 5 Capped Area and Drainage Ditches | Mod: 07/31/2013, 13:37 | Plotted: 07/31/2013, 14:25 | aforcier

Golder Associates

Conceptual Cross-Section
(not to scale)



Cap Design

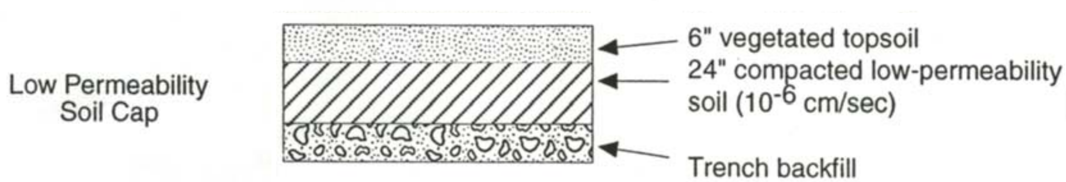


FIGURE 6
CAP DESIGN
PALMER/LANDSBURG MINE/WA

Golder Associates

REPORT

PART A

COMPLIANCE MONITORING PLAN

Landsburg Mine Site
MTCA Remediation Project
Ravensdale, Washington

Submitted To: Washington Department of Ecology
3190 – 160th Avenue SE
Bellevue, WA 98008

Submitted By: Golder Associates Inc.
18300 NE Union Hill Road, Suite 200
Redmond, WA 98052 USA

Submitted On Behalf Of: The Landsburg Mine Site PLP Group

June 7, 2017 **Project No. 923-1000-002.R154**

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1.0 COMPLIANCE MONITORING PLAN

This section contains the Compliance Monitoring Plan (CMP) for the Landsburg Mine Site (Site). The Site location is depicted in Figures A-1 and A-2 and is defined in Exhibit A to the Consent Decree. The purpose of this CMP is to describe the environmental monitoring for the Site that will be performed during remedial action construction activities (protection monitoring and performance monitoring) and following completion of the cleanup action construction activities (confirmational monitoring). Protection monitoring includes both worker health and safety monitoring and short-term groundwater monitoring for protection of the environment. Performance monitoring includes construction quality assurance (CQA) during the remedial action. Confirmational monitoring consists of groundwater monitoring and maintenance of the cap and begins after the cleanup construction activities. If the Groundwater Contingent Treatment System is implemented and operated, additional maintenance and monitoring will be required.

1.1 General

Under WAC 173-340-410, compliance monitoring consists of protection monitoring, performance monitoring, and confirmational monitoring, as described below. The Sampling and Analysis Plan required in conjunction with the CMP, which applies to both short-term and long-term groundwater monitoring, is provided in Section 2.

The primary purpose of the CMP is to identify the chemical compounds potentially posing a human or environmental health risk and/or which exceed potential regulatory criteria, and which are directly attributable to and the result of the prior waste disposal activities. For the purpose of this CMP, such compounds are referred to as “mine waste contaminants”.

1.1.1 Protection Monitoring

Protection monitoring is conducted to confirm “that human health and the environment are adequately protected during future construction and operation of an interim action or cleanup action as described in the safety and health plan” [WAC 173-340-410(a)]. Monitoring for protection of human health will be addressed in the Site-specific Construction Health and Safety Plan, which will be submitted to Washington Department of Ecology (Ecology) following development of the Engineering Design Report with Construction Specifications. Monitoring for protection of the environment will be provided by short-term groundwater monitoring, which is presented in Section 1.5.3 of this document.

1.1.2 Performance Monitoring

Performance monitoring confirms that the cleanup standard or other performance standards have been attained [see WAC 173-340-410(b)]. Because removal is not part of the selected remedy, and no media outside of the waste disposal areas of the mine are exposed above cleanup levels, performance monitoring will consist of CQA for the cap and associated drainage features. The CQA measures are outlined in

Section 1.6. A more detailed CQA Plan based on these measures will be provided in conjunction with the Engineering Design Report and the Construction Specifications, which will be submitted to Ecology as part of the detailed design process.

1.1.3 Confirmational Monitoring

Confirmational monitoring is performed to confirm the long-term effectiveness of the remedy, following completion of the constructed cleanup action [see WAC 173-340-410(c)]. Long-term maintenance and monitoring inspections of the cap are described in the O&M Plan (Part B). Confirmational monitoring in this CMP specifically describes long-term monitoring of groundwater.

Groundwater currently meets cleanup levels at the designated points of compliance monitoring wells. Groundwater monitoring of mine waste contaminants will be performed to allow contaminant detection in the event that a release occurs in the future. In the event that remediation trigger levels (presented in Table A-4 and described in Section 1.7.2) are exceeded in the future at compliance or sentinel monitoring locations, the source of the exceedance will be determined and appropriate action taken. A contingent groundwater extraction and treatment system plan has been conceptualized (Part C), which could be installed quickly if needed to prevent the off-Site migration of contaminants above cleanup levels

1.2 Remediation and Cleanup Levels

Remediation levels are concentrations of mine waste contaminants within specific media above which particular cleanup action components will be required as part of the cleanup action. A cleanup level is the maximum acceptable concentration of a mine waste contaminant 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., residential land use).

Model Toxics Control Act (MTCA) Methods A and B is the standard method for determining cleanup levels, and shall be considered applicable to the Landsburg Site. Method B and A cleanup levels assume a residential use scenario and are determined using risk-based equations or with consideration of Washington State background levels, as specified in MTCA regulations.

Method A is generally used for routine cleanups with relatively few contaminants. Since the cleanup at the Site is not considered routine, Method A, alone, is not applicable to this Site. Method A is applicable for compounds that do not have a Method B established cleanup level (e.g., total petroleum hydrocarbons [TPH] and lead), for compounds where MTCA has established cleanup levels based on background concentrations in the State of Washington, and for compounds where the Method B cleanup level is below laboratory analytical detection limits in accordance with Washington Administrative Code (WAC) 173-340-705(6).

For individual carcinogens, the Method B cleanup levels are based on the upper bound of the excess lifetime cancer risk of one in one million (1×10^{-6}). Total excess cancer risk under Method B for multiple substances and pathways cannot exceed one in one hundred thousand (1×10^{-5}), and the total hazard index for substances with similar types of toxic response must be less than one. In addition, Method B levels must comply with applicable or relevant and appropriate requirements (ARARs), state and federal regulations, or criteria (Maximum Contaminant Levels [MCLs], for instance). For mine waste contaminants that have an established Federal and State MCL promulgated, but represents a calculated excess cancer risk of 1×10^{-5} or hazard index of one, the Method B cleanup level shall be adjusted to not exceed an excess cancer risk of 1×10^{-5} or hazard index of one. However, no cleanup level shall be more stringent than an established Washington State background or Site-specific area background concentrations for the Site. Groundwater and surface water cleanup levels for the Site will be Method B cleanup levels or applicable Method A levels as described above.

1.3 Sentinel Wells

Sentinel wells will be included in the protection groundwater monitoring conducted during active remedial actions and during confirmational groundwater monitoring program, beginning after the completion of the remedial action construction activities. Sentinel wells will be used as an early warning signal for impacted groundwater migration. Four new sentinel wells will be installed prior to the start of the remedial action construction activities. Two sentinel wells will be installed in the northern portion of the Site and two in the south. The north sentinel well system will include a shallow well (approximately 30 feet deep) and a deeper well that will monitor groundwater at approximately the 150-foot depth within the mine. The south sentinel well system will include two wells installed at the 150-170-foot depth within the mine. Monitoring wells LMW-9 and LMW-11 are also considered sentinel wells, located south of the waste disposal area. The additional new south sentinel wells will serve two purposes:

1. Immediate detection of any waste constituent migrating toward the south beyond the waste disposal area; and
2. Effectiveness monitoring of groundwater level changes resulting from remedial actions.

The new sentinel wells are depicted on Figure A-7 and the approximate depths and screen lengths are provided in Table A-1 of this report.

1.4 Points of Compliance

A point of compliance is defined as a location where monitoring is conducted to determine that cleanup levels have been met. Under WAC 173-340-720(8)(c), “conditional points of compliance” for groundwater are set as close as practicable to the source of hazardous substances, not to exceed the property boundary. Conditional points of compliance are established for groundwater and surface water at the locations of groundwater and surface water discharge from the Site, as defined by the property boundary (property owned by Palmer Coking Coal Company, LLC (PCC). Figure A-6 depicts the compliance monitoring boundary and the points of compliance.

For the Landsburg Mine, the points of compliance for groundwater have been established in the Landsburg Mine Site Cleanup Action Plan (Exhibit B). Because groundwater from the trench is channeled by the trench sidewalls with vertically sloping rock strata, hydraulic conductivity is much greater longitudinally in the mine than laterally. As such, if a release were to occur, the nine monitoring wells located at the north and south ends of the mine and the two monitoring wells in the adjacent Frasier and Landsburg coal seams would provide detection along these critical pathways for migrating mine waste contaminants. As such, monitoring wells located near the north, south, east, and west sides of the property boundary are considered points of compliance. Specifically, monitoring wells LMW-2, LMW-3, LMW-4, LMW-5, LMW-8, and LMW-10, will be considered the north and south points of compliance. To monitor for the unlikely event that impacted groundwater is migrating laterally to the trench axis, LMW-6 and LMW-7, located within adjacent Frasier and Landsburg coal seams, will be used as the east and west points of compliance.

Having multiple wells at the north and south compliance boundaries allows monitoring of different groundwater depths within the aquifer. For example, shallow groundwater from the south portal (Portal #3) will be monitored by well LMW-8, and monitoring wells LMW-3 and LMW-5 monitor shallow and deeper zones of the aquifer at the south end. Additionally monitoring wells LMW-9, LMW-11, and two new southern sentinel wells will monitor various depth zones of the aquifer between the waste disposal area and the south compliance boundary. The north end compliance boundary is monitored at shallow and deeper zones by LMW-2 and LMW-4; respectively. Additionally, LMW-10 monitors the deepest aquifer zone of the Rogers seam near the north compliance boundary. The two new northern sentinel wells will provide monitoring of shallow and mid-level depths near the north portal (Portal #2); which is between the waste disposal area and the northern compliance boundary wells. Monitoring wells LMW-6 and LMW-7 will monitor groundwater within the Frasier and Landsburg coal seams that will intercept groundwater migrating west and east from the Site. The monitoring well locations are shown on Figure A-3 and A-6.

1.5 Protection Monitoring

Protection monitoring ensures that human health and the environment are adequately protected during remedial construction activities or cleanup actions.

1.5.1 Construction Health & Safety Plan

A Site-specific Construction Health and Safety plan will be developed following completion of the engineering plans and specifications and prior to on-Site remedial activities. The Health and Safety plan will specify protective clothing, equipment, and monitoring that will be required for protection of human health during the construction activities.

1.5.2 Spill Prevention, Control, And Countermeasure Plan

A Site-specific spill prevention, control and countermeasure (SPCC) plan will be established if necessary by the contractor (and ultimately approved by Ecology) for the hazardous substances and petroleum products if used and stored on the Site during construction. SPCC plans are required for certain facilities/projects for oil spill prevention, preparedness, and response to prevent oil discharges to navigable waters and adjoining shorelines. The Site-specific SPCC will require routine inspections and monitoring procedures for the hazardous substances and petroleum products, which will be implemented by the contractor. The inspections and monitoring will continue until hazardous substances and petroleum products are no longer used or stored on the Site. Construction stormwater plans will also be prepared as required by state and local agencies.

1.5.3 Protection Groundwater Monitoring

Short-term protection monitoring will be conducted during the remediation to ensure that there are no adverse effects to the environment from remediation activities. Backfilling the trench may increase the load on the buried drums and thus create the potential for collapse of intact drums that may still be in the trench. Drum failure induced by such loading, were it to occur, would be expected to occur quickly. Based upon the reported handling of drums during placement in the trench, and given the length of time since placement, it is expected that few if any intact drums remain in the trench. Leakage from ruptured drums would likely result in slow leakage of liquids (if present). In addition, surrounding soil and carbonaceous materials would provide containment and some adsorption of released liquids. Therefore, drum failure would not necessarily lead to groundwater impacts.

Short-term protection monitoring will commence when the trench backfilling begins, and will continue during the active trench backfilling and cap construction (estimated duration 16-20 weeks). The short-term monitoring will continue for a period of four weeks after completion of backfill and cap construction to provide an additional period of frequent (biweekly) monitoring for the detection of any load induced releases. The long-term groundwater monitoring programs follows the short-term groundwater monitoring to provide continual detection monitoring at the Site.

Short-term groundwater monitoring parameters and frequency are given in Table A-2. Monitoring wells included in the short-term protection groundwater monitoring program consist of the 10 existing wells LMW-2 through LMW-11, and the four sentinel wells (yet to be installed). This short-term protection monitoring will be performed under the Health and Safety Plan provided in Appendix HASP to this document. As a rapid screening tool, samples will be collected from the above listed wells bi-weekly (twice every month) and analyzed in the field for pH and specific conductance (as an indicator for metals and other inorganic compounds), dissolved oxygen, and turbidity. The protection sampling test parameters will be expanded on a monthly basis to include screening for TPH using NWTPH-HCID analysis and analysis of volatile organic compounds (VOCs) by United States Environmental Protection Agency (EPA) Method 8260. If atypical field parameters readings are detected in a well during sampling periods that only include field parameter, that well will be sampled and screened for TPH and analyzed for VOCs. Other potential mine waste contaminants including metals, semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs) and pesticides, will only be analyzed in specific monitoring wells during protection groundwater monitoring, if TPH or VOCs are detected and confirmed to be present. The Quality Assurance Project Plan (QAPP) provided in Appendix QAPP to this document defines the analytical method analytes, the sampling procedures, and quality controls that will be used during protection groundwater monitoring.

If a groundwater sample during short-term monitoring has an analyte detected at a concentration at or above 0.25 of the applicable MTCA cleanup level , the following steps will be taken:

1. If remedial action is still underway, construction activities will immediately be halted.
2. Ecology will be notified of the potential exceedance within two days.
3. The well(s) in which the exceedance occurred will be immediately re-sampled for verification and analyzed for VOCs and TPH with expedited turnaround.
4. If the re-analyses are below the groundwater trigger levels (0.25 of the MTCA cleanup levels), then no further action is required. Groundwater monitoring will resume as normal.
5. If verification sampling confirms an exceedance of at or above 0.25 of the MTCA cleanup level, the well(s) will be immediately sampled for the full suite of analytes (metals, SVOCs, PCBs, and pesticides) with expedited laboratory turnaround. If any analytes do not exceed the MTCA cleanup levels, but do exceed 0.25 of the MTCA level, groundwater from that well will be sampled for the analytes exceeding 0.25 of the MTCA cleanup levels every two weeks during the remaining construction period. In addition, an "alternative source evaluation" will be conducted to evaluate if the detection is caused by a source other than the waste disposed in the Roger's mine trenches. Results will be presented for Ecology review and approval. A final decision will be made by Ecology and the Landsburg Mine Potentially Liable Parties (PLP) Group as to whether the detection or detections were caused by a source unrelated to the Site.
6. If exceedance of groundwater MTCA cleanup levels is verified at a sentinel well, then appropriate corrective action will be determined and proposed for Ecology approval. If the alternative source of the detected analyte is not identified, the Group will take corrective action by installing and starting operation of the groundwater extraction and treatment system under the trigger level actions matrix discussed in Part C, the Contingent Groundwater Extraction and Treatment System Plan.

If, at the completion of all short-term monitoring, there are no exceedances of groundwater remediation levels, then confirmational (long-term) monitoring will begin as described in Section 1.7.

1.6 Performance Monitoring

Performance monitoring confirms that the cleanup standard or other performance standards have been attained. Because removal is not part of the selected remedy and no media are exposed above cleanup levels, performance monitoring will primarily consist of CQA for the cap and associated drainage features (Figures A-4 and A-5). A more detailed CQA Plan based on these measures will be provided in conjunction with the Engineering Design Report and the Construction Plans and Specifications, which will be submitted to Ecology as part of the detailed design process.

CQA monitoring will ensure that design drawings and specifications are adhered to during implementation of the remedial activities, including the following:

- Visual inspection of all soil or other material approved for trench backfill.
- Visual inspection of all loads of soil used for cap construction.
- Testing of materials (trench backfill material, topsoil, soil for cap liner, other materials required for ditch construction).
- Compaction and permeability testing for the low-permeability soil layer (cap liner).
- Cap layer thicknesses verification.
- Attainment of design grades.

Soil material tests and frequency will be specified in the CQA Plan based on final design and will be provided in the Engineering Design Report. Such tests typically include gradation per ASTM D422 and a moisture-density curve per ASTM D698.

Permeability of the cap soil will be determined using laboratory permeability testing on compacted soil samples, and compared to the moisture-density curve for the liner soil. Field CQA for compaction and attainment of cap liner permeability testing specifications will be included in the CQA Plan.

Attainment of design grades will be verified by geodetic surveying during construction. A final “as built” survey will be performed for comparison to the results of geodetic surveys for long-term monitoring/inspections conducted per the O&M Plan (see Part B).

1.7 Confirmational Monitoring

Long-term, or confirmational, monitoring is conducted to ensure that the Site remedy performs as expected over time. For the Landsburg Mine Site this entails monitoring groundwater quality emanating from the mine for changes in concentrations of chemicals, which may indicate a release. Monitoring will be performed using monitoring wells LMW-2, LMW-3, LMW-4, LMW-5, LMW-6, LMW-7, LMW-8, LMW-9, LMW-10, and LMW-11 and four additional sentinel wells (yet to be installed). These monitoring points are strategically located to intercept groundwater flow emanating along preferential flow paths from the north and south ends of the mine and laterally from the Frasier and Landsburg mines. Long-term confirmational monitoring will begin at the completion of the short-term protection monitoring. Long-term confirmational groundwater monitoring will continue until Ecology determines that residual hazardous substance concentrations no longer exceed cleanup or remediation levels as described in the CAP resulting from either (1) the application of new remediation technologies currently unavailable or (2) other circumstances or conditions that affect residual concentrations such that they no longer pose a risk to human health or the environment.

1.7.1 Monitoring Parameters and Frequency

Groundwater monitoring parameters and frequency are given in Table A-2.

During the first year following completion of the Site remediation, groundwater monitoring will be conducted quarterly. The first quarterly sampling round would consist of VOCs (by EPA Method 8260), SVOCs (by EPA Method 8270), chlorinated pesticides (by EPA Method 8081), PCBs (by EPA Method 8082), priority pollutant metals, and general wet chemistry parameters listed on Table A-2. The priority pollutant metals consist of the following thirteen (13) metals: antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc.

The QAPP provided in Appendix QAPP to this document defines the analyte list for each analytical method, the sampling procedures, and quality controls that will be used during confirmational groundwater monitoring. During the remaining three quarters of the first year of sampling, monitoring will be conducted with a reduced analyte list, and will include pH, specific conductance, turbidity, dissolved oxygen, priority pollutant metals, and VOCs (EPA Method 8260).

If no mine waste contaminants are detected at or above a concentration of 0.25 of the MTCA cleanup levels during the first year of sampling, the groundwater monitoring frequency will be reduced to semi-annually (2 times per year) for years two through five of the long-term confirmational monitoring program. The first round for each year of semi-annual sampling will include VOCs (EPA Method 8260), and SVOCs (EPA Method 8270), chlorinated pesticides (EPA Method 8081), PCBs (EPA Method 8082), priority pollutant metals, and general wet chemistry parameters listed on Table A-2. This round will be conducted during the expected low groundwater time of the year (approximately October/November), as this would be when any potential leakage would be less diluted and present at the highest potential concentrations. The second round each year would be limited to the reduced list of constituents and will be conducted during the expected high groundwater time of year (approximately April/May).

The frequency of long-term confirmational monitoring during years six through ten, if no mine waste contaminants are detected at concentrations of 0.25 of the MTCA cleanup levels, will be reduced to annual sampling and will include analysis for the VOCs, TPH, SVOCs, PCBs and chlorinated pesticides, priority pollutant metals, and general wet chemistry parameters. The annual monitoring will be conducted during the expected low groundwater time of the year.

If no mine waste contaminants are detected at concentrations at or above 0.25 of the MTCA cleanup levels at points of compliance during the first 10 years of monitoring, the frequency of confirmational monitoring will be reduced, but the sampling frequency will be analyte- and well location- dependent, as follows:

- Monitoring wells LMW-2, LMW-4, LMW-10, Deep North Sentinel Well (yet to be installed), Shallow North Sentinel Well (yet to be installed), LMW-6, and LMW-7 will have a monitoring frequency of 2.5 years for VOCs and TPH; and every 5 years will also include analyses for metals, SVOCs, PCBs, chlorinated pesticides, and wet chemistry parameters.
- LMW-3, LMW-5, LMW-8, LMW-9, MWL-11, South Shallow Sentinel Well (yet to be installed), Dual South Sentinel/Cap Effectiveness Well (yet to be installed) will have a monitoring frequency of 5 years for VOCs, TPH, metals, SVOCs, PCBs, chlorinated pesticides, and wet chemistry parameters.

These frequencies were based on the evaluation of BIOSCREEN modeling (Golder 2009a and 2009b) and Ecology's decision on long-term groundwater monitoring frequency (Ecology 2009). In response to the public's comments on the Draft Cleanup Action Plan, the above agreed upon frequency of groundwater monitoring is greater than indicated was necessary in the BIOSCREEN modeling. Table A-2 provides a summary of the monitoring frequency and test parameters for the entire long-term confirmational monitoring project. Long-term confirmational groundwater monitoring will continue until Ecology determines that residual hazardous substance concentrations no longer exceed cleanup or remediation levels as described in the CAP resulting from either (1) the application of new remediation technologies currently unavailable or (2) other circumstances or conditions that affect residual concentrations such that they no longer pose a risk to human health or the environment.

1.7.2 Response If Remediation Levels Are Exceeded

During all groundwater monitoring conducted at the Site since 1994, there have been no mine waste contaminants detected in Site groundwater monitoring wells. Because the specific mine waste contaminants that could exceed the cleanup levels are not known and because groundwater treatment technology depends on specific contaminants, the contingent groundwater extraction and treatment system cannot be specified, designed or installed until the specific mine waste contaminants requiring treatment are identified. A response action will depend on information gained during groundwater monitoring and cap inspections. The contingent groundwater extraction and treatment system triggers are established to allow sufficient time to design, install, and activate the system before groundwater concentrations reach cleanup levels at the compliance boundary wells.

In the event that a contaminant (that could be directly attributable to the disposal of waste in the trenches through an "alternative source evaluation") is detected and confirmed within groundwater from a sentinel well or compliance well at specific concentrations, contingent remedial actions will be triggered. Contingent remedial actions are summarized below.

<u>Sentinel Well Detections at or above 0.25 MTCA Cleanup Levels (see Figure A-8):</u>

- Following validation of the laboratory data (Quality Assurance/Quality Control [QA/QC]), if the detection at a sentinel well is at or above 0.25 of the MTCA Cleanup Level, the PLP Group will inform Ecology within seven (7) days and then confirm the detection by re-sampling the sentinel well. The sample will be analyzed for the analyte that was detected at or above 0.25 of the MTCA Cleanup Level. The PLPs will also notify the City of Kent Public Works by email or phone if and when it is confirmed that contamination has been detected at the Site
- If the analytical validation and confirmation re-sampling results confirm that the analyte is present within groundwater from the sentinel well at a concentration that is at or above 0.25 of the MTCA Cleanup Level, the PLP Group will notify Ecology within seven (7) days and then conduct an "alternative source evaluation" to evaluate if the detection is caused by a source other than the waste disposed in the Roger's mine trenches. Results will be presented for Ecology review and approval. A final decision will be made by Ecology and the PLP Group as to whether the detection or detections were caused by a source unrelated to the Site.
- If an alternative source of the detected analyte is not identified, the PLP Group will then commit to increasing the monitoring frequency as per Table A-3. The increased monitoring will only be for groundwater at the particular sentinel well and for the particular analyte having a validated and confirmed detection above 0.25 of the MTCA Cleanup Level. This sequence of steps for detections at sentinel wells is shown in Figure A-8.

<u>Sentinel Well Detections at or above 0.5 MTCA Cleanup Level:</u>

- Following validation of the laboratory data (QA/QC), if the detection is determined valid and the detected concentration is at or above 0.5 of the MTCA Cleanup Level at a sentinel well, the PLP Group will inform Ecology of the detection within seven (7) days and then confirm the detection by re-sampling the sentinel well and analyzing for the analyte that was detected at or above 0.5 MTCA Cleanup Level.
- If confirmation re-sampling does not confirm the presence of the contaminant at a concentration at or above 0.5 of the MTCA Cleanup Level, then the confirmational monitoring cycle will continue without the implementation of corrective remedial action to install the Contingent Groundwater Extraction and Treatment System (see Figure A-8).
- If the confirmation re-sampling confirms the concentration of the contaminant at or above 0.5 of the MTCA Cleanup Level in a sentinel well, Ecology will be informed within seven (7) days. The design, and permitting requirements associated with the Contingent Groundwater Extraction and Treatment System (presented in Part C) will be submitted to Ecology for approval within two to four weeks of the re-confirmation of results, no later than 30 days.

<u>Sentinel Well Detections at MTCA Cleanup Levels or above:</u>

- If the confirmational re-sampling of the sentinel well shows concentrations at or above MTCA cleanup levels, then the Contingent Groundwater Extraction and Treatment System (as described in Part C) will be installed as the corrective remedial action for containment and treatment of impacted groundwater. The anticipated time frames for the installation of the Contingent Groundwater Extraction and Treatment System are presented in Part C.

- Groundwater sampling will be expanded to the compliance wells located downgradient of the sentinel wells that had the detection and will be conducted at the same increased frequency as the sentinel wells (see Table A-3).

Compliance Well Detections at or above 0.5 MTCA Cleanup Levels or above:

- Groundwater containment (pumping and treatment) will not be initiated unless groundwater concentrations of contaminants meet or exceed 0.5 of the MTCA Cleanup Levels at the compliance boundary well(s). Treated groundwater will be discharged to the local POTW sewer (see Part C for more details).
- System startup, optimization, and operation (including pumping) is estimated to be completed in two weeks. See Part C for details on the pumping optimization for contaminant capture.

If a detection at a sentinel well does not increase to exceed the MTCA Cleanup Level, the increased frequency of groundwater monitoring at specific sentinel well(s) (as specified in Table A-3) can end and return to the regular long-term monitoring schedule in accordance with Table A-2 under any of the following conditions:

- If the validated and confirmed detection becomes non-detect at the same laboratory Method Detection Level (MDL) for three consecutive monitoring periods;
- If the trend analysis (using a minimum of eight monitoring events for statistical representativeness) shows a steady or decreasing trend; or
- If the trend analysis indicates that a rate of increase would not result in concentrations exceeding the MTCA Cleanup Level in a time period that is less than the routine long-term monitoring specified in Table A-2.

Groundwater Monitoring During Operation of the Contingent Groundwater Treatment System:

- During the contingent groundwater treatment system operation, compliance wells at the compliance boundary where the exceedance of 0.5 MTCA Cleanup Levels occurred will be monitored quarterly only for the analytes that were in exceedance. All other wells will be monitored as per the long-term monitoring program.
- Contingency groundwater extraction and treatment will continue until groundwater at the points of compliance and the pumped effluent are below 0.5 MTCA Cleanup Levels for four consecutive monitoring periods or a minimum of one year. An additional four quarters or one year of groundwater sampling will be conducted at the compliance wells after pumping is stopped. When the contingency groundwater extraction and treatment system is implemented, the compliance monitoring frequency of treatment system inflow and outflow must also be in accordance with the Metro discharge permit.
- As an added means to monitor contingent groundwater extraction system performance and compliance, a performance well or wells will be installed between the extraction well and compliance well to confirm contaminant capture is hydraulically effective and contaminants do not migrate past the Site boundaries by monitoring groundwater quality at the downgradient compliance wells. In response to Washington Department of Health's WDOH's recommendation, the Contingent Groundwater Extraction and Treatment System Plan (Part C) contains an expanded description of how the performance wells and variable pumping rates would be used to optimize the groundwater extraction system to establish hydraulic capture and ensure that contaminants do not migrate paste the Site boundaries.

1.7.3 Reporting

The Landsburg Mine PLPs will submit a letter report to Ecology within 60 days of all routine groundwater monitoring events. The report will summarize the sampling activity and provide tables of groundwater elevations and analytical results. The report will include the laboratory analytical reports and will be in accordance with Policy 840. The report will include a summary checklist box that says:

- No parameters exceeded the cleanup levels.
- The following parameters exceeded the cleanup levels (followed by a description of the parameters).

See Appendix QAPP for more details on requirements.

2.0 SAMPLING AND ANALYSIS PLAN

2.1 Monitoring Wells

Both short-term and long-term monitoring requires collection of representative groundwater samples from some or all of the following monitoring wells: LMW-2, LMW-3, LMW-4, LMW-5, LMW-6, LMW-7 LMW-8, LMW-9, LMW-10, and LMW-11. Additionally, four sentinel wells will be installed, before the start of the remedy, and will be sampled as part of the short-term and long-term monitoring program. Each sampling event will include the following:

- Measurement of static water levels.
- Well purging to insure representative sampling with the currently installed dedicated pumping systems.
- Measurement of field parameters pH, specific conductance, dissolved oxygen, temperature, and turbidity.
- Collection of all purged water in appropriate containers for temporary on-site storage prior to disposal.
- Collection of representative groundwater samples in appropriate containers.

Each of these activities will be subject to controls and strict QA protocols and procedures specified in the relevant technical procedures referenced in the attached QAPP (Appendix QAPP). Water levels will be taken according to the specifications of procedure TG-1.4-6a "Water Level Measurements." Sample collection and handling will be performed as described in procedure TG-1.2-20 "Collection of Groundwater Quality Samples." All instruments used for field analysis will be calibrated in accordance with manufacturer's recommendations. Chain of custody will be maintained in accordance with the procedure TG-1.2-23, "Chain of Custody."

The static water level will be measured at each well prior to the initiation of any other activities. An electric well sounder will be used for all manual water level measurements. The sounder will be cleaned before and after each use by a process involving a detergent rinse, followed by an organic free distilled/deionized water rinse. The water level will be measured from the elevation survey mark and will be recorded to the nearest 0.01 feet. All measurements, dates, times, and well identifiers will be recorded on Water Level Readings forms for maintenance in the project file.

Each of the ten groundwater monitoring wells are or will be equipped with a dedicated submersible pump**,** with Teflon-lined polyethylene discharge hose. The pumps purge groundwater under positive pressure. The pumps installed in wells LMW-3, LMW-4, LMW-5, and LMW-6 are equipped with a viton packer assembly approximately 10 feet above the pump unit. The packer is used in order to minimize the amount of water purged from each well. The packer assembly is inflated with nitrogen sealing off the water column above the packer thus significantly reducing the column of purge water required during sampling. The packer will be deflated after sample collection is complete.

Purging will involve the removal of a minimum of three well volumes, or purging will be conducted utilizing the EPA approved “Low Flow Sampling Technique” where appropriate. During purging, field parameters pH, conductivity, turbidity, and temperature will be periodically measured. Purging will continue beyond the three well volumes until the measured rate of change of the parameters is in accordance with TG-1.2-20 on consecutive readings. During purging of wells LMW-3, LMW-4, LMW-5, and LMW-6, the packer will be inflated prior to groundwater removal; hence a volume of well water represents entrained water below the packer. All field parameter measurements and purge volumes will be recorded on Sample Integrity Data Sheets.

All purge water produced during sampling will be collected in suitable containers for temporary on-site storage. The results of the groundwater sampling and analysis will be used to determine appropriate means of purge water disposal. The purge water will be disposed of in accordance with all applicable regulatory requirements. If the purge water is not considered to be contaminated (following receipt of laboratory analysis), this water will be discharged to the land surface in the area of each well.

Samples will be collected in bottles provided by the contract laboratory and of appropriate volume and type, including preservatives as appropriate, as detailed in the QAPP. After filling, the bottles will be immediately sealed, labeled and placed in a cooler maintained at temperatures less than 6 degrees Celsius. Samples will be transported to the laboratory for analysis with chain of custody documentation in sufficient time to perform the requested analyses within the applicable holding times.

Documentation for sampling will include bottle labels, completion of Sample Integrity Data Sheets and Chain of Custody Records. Sample coolers, that are not hand delivered to the laboratory, will be secured with chain of custody seals. The Sample Integrity Data Sheet will be used to document sample collection information, as further described in the QAPP.

2.2 Data Quality Review

For groundwater monitoring, laboratory analytical data will be subjected to a data quality review using the following criteria:

- Completeness: the data will be reviewed to ensure that all requested analyses are reported and that all required information has been provided;
- Consistency: the data will be checked to ensure that redundant information is reported consistently throughout the laboratory reports;
- Correctness: the data will be checked to ensure that samples reported using correctly applied algorithms for the calculation of sample concentrations (i.e., dilution factors applied properly), and
- Compliance: the data will be checked to ensure that all required QC specifications have been met.

Laboratory data will be reported to the MDL. Detections reported below the reporting limit (RL) but above the MDL will be qualified as estimated concentration (“J” qualifier). Deficiencies identified during data quality review will require correction prior to conducting data analysis activities. A brief quality review report will be prepared after each sampling round and will be included in the data reports. Groundwater data will be entered into the Ecology Environmental Information Management System (EIMS) in accordance with the Data Management Plan (DMP) in Appendix DMP to this document, after the data has been quality reviewed with appropriate qualifiers.

3.0 REFERENCES

Golder. 2009a. *BIOSCREEN Modeling Results and Long-Term Groundwater Monitoring Frequency*. Prepared for the Landsburg Mine Site PLP Group. October 13, 2009.

Golder. 2009b. *Draft Landsburg Mine Site Proposed Sentinel Wells and Long-Term Groundwater Monitoring Frequency.* Prepared for Landsburg Mine Site PLP Group. December 3, 2009.

Washington Department of Ecology. 2009. Letter from Jerome Cruz of Ecology to Douglas Morell of Golder Associates Inc. Dated January 21, 2009 (actually 2010). Northwest Regional Office. Bellevue, Washington.

TABLES

Table A-1: Sentinel Wells Proposed Construction Details

Sentinel Well	Approx. Well Depth (feet bgs)	Screen Length (feet)
Shallow North	<30	10
Deep North	150	10
South/Cap Effectiveness	170	10
South Shallow	150	10

Table A-2: Compliance Monitoring For Wells LMW-2, LMW-3, LMW-4, LMW-5, LMW-6, LMW-7, LMW-8, LMW-9, LMW-10, AND LMW-11; and Sentinel Wells

Analysis	Short-Term Monitoring[a]		Long-Term Monitoring								
			Year 1				Years 2 - 5		Years 6 - 10	Years 11+	
	Biweekly[b]	Monthly	1	2	3	4	1	2	Annual	1 every 2.5 years	1 every 5 years
pH[c]	X	X	X	X	X	X	X	X	X	X[d]	X
Sp. Conductance[c]	X	X	X	X	X	X	X	X	X	X[d]	X
Dissolved Oxygen[c]	X	X	X	X	X	X	X	X	X	X[d]	X
Turbidity[c]	X	X	X	X	X	X	X	X	X	X[d]	X
NWTPH-HCID		X	X	X	X	X	X	X	X	X[d]	X
Priority Metals			X	X	X	X	X	X	X		X
VOC (Method 8260)		X	X	X	X	X	X	X	X	X[d]	X
SemiVol. (Method 8270)			X				X		X		X
OCP, PCB's (Method 8081)			X				X		X		X

Notes:

During long-term monitoring, field parameters will only be monitored on those wells that are being sampled.

[a] Short-term monitoring will be performed during the trench backfill and cap construction.

[b] Biweekly monitoring (twice per month) will be extended for four weeks following completion of trench backfill and capping at the same schedule as noted above.

[c] The pH , Specific Conductance, DO, and turbidity analyses will be performed in the field.

X - means the analysis will be conducted on all compliance monitoring wells: LMW-2 through LMW-11; and the 4 new sentinel wells (yet to be installed).

X[d] - means the analysis will be conducted only on Northward wells: LMW-2, LMW-4, LMW-10, Deep North Sentinel Well (yet to be installed), Shallow North Sentinel Well (yet to be installed), LMW-6, and LMW-7.

Table A-3: Increase Monitoring Frequency at Sentinel Wells if Detection Occurs above 0.25 MTCA Cleanup Level

Analyses	Southern Pathway Sentinel Wells	Northern Pathway Sentinel Wells
VOCs, TPH	6 months	4 months
Metals, SVOCs, Pesticides	2 years	2 years

Table A-4: Contingent Groundwater Extraction and Treatment System Plan Triggers

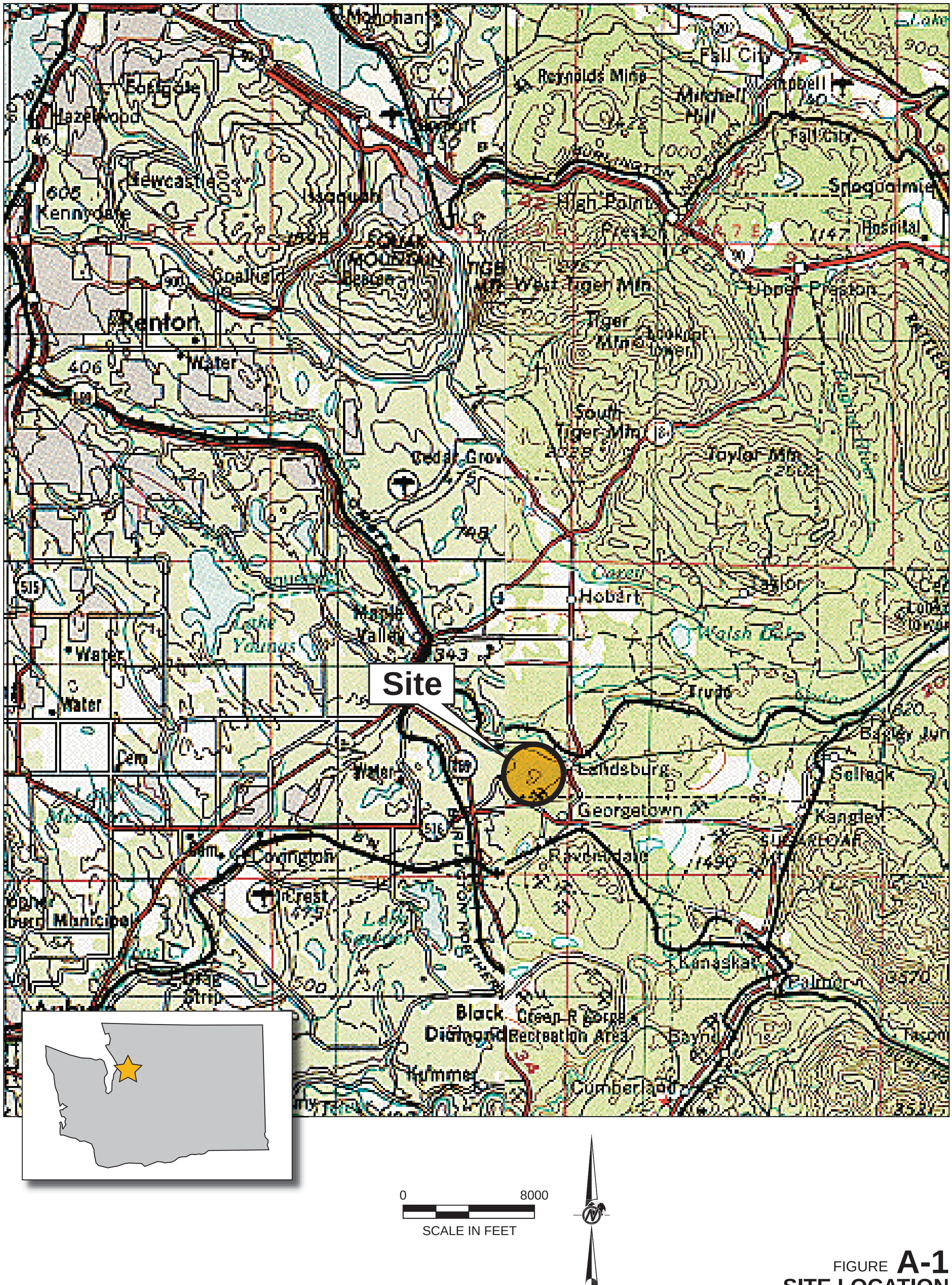
Contingency Plan Phase of Work	Trigger Event		Completion Time
	Sentinel well[1]	Compliance well	
Increased frequency of groundwater monitoring (see Table A-3) and conduct alternative source evaluation	**0.25 MTCA CUL**		
Submit to Ecology contingent groundwater extraction and treatment system Engineering and Desing Report (EDR), including schdule for all subsequent activities and permitting requirements	**0.5 MTCA CUL**		**Design submittal: Within 30 days**
			Ecology Review, approvals and permitting: (estimated 2 to 4 weeks)
System Installation	**Reaches cleanup levels**		**According to schedule in Ecology approved EDR (estimated 2 to 4 weeks)**
System startup, optimization, and operation (including pumping)		**0.5 MTCA CUL**	**According to schedule in Ecology approved EDR (estimated 2 weeks)**
System shutdown		**Compliance well and pumped effluent below 0.5 MTCA CUL for 4 monitoring events (minimum 1 year)**	

[1] Sentinel wells are closer to the wastes disposal area than compliance wells, to provide early detection of a contaminant release. Modeling of contaminant travel times indicate it will take from months to years before a cleanup level is reached at the compliance wells.

Note: Iron, manganese, and arsenic are analytes associated with the coal mine water and monitored concentrations are not associated with Landsburg Mine Waste and will not be used as a trigger, unless a significant increase in concentrations occur and an alternative source is not identified.

See Section 1.7.2 of the Compliance Monitoring Plan for trigger action response details.

FIGURES



Source: *USGS 1:250,000 Sheets,Seattle and Wenatchee*

FIGURE **A-1**

SITE LOCATION

PALMER/LANDSBURG MINE/WA

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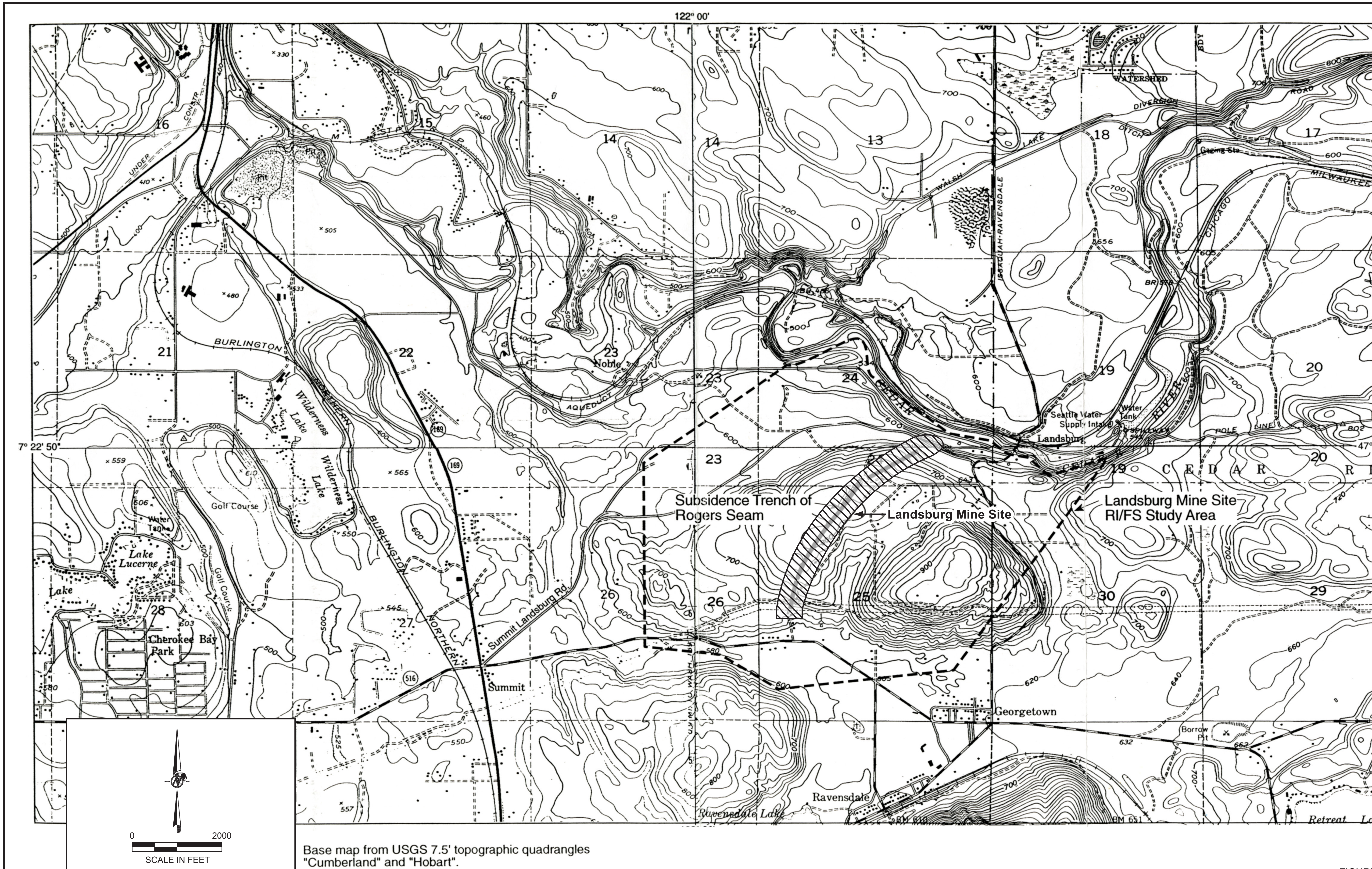

Base map from USGS 7.5' topographic quadrangles "Cumberland" and "Hobart".

FIGURE **A-2**
SITE VICINITY MAP
PALMER/LANDSBURG MINE/WA

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Golder Associates

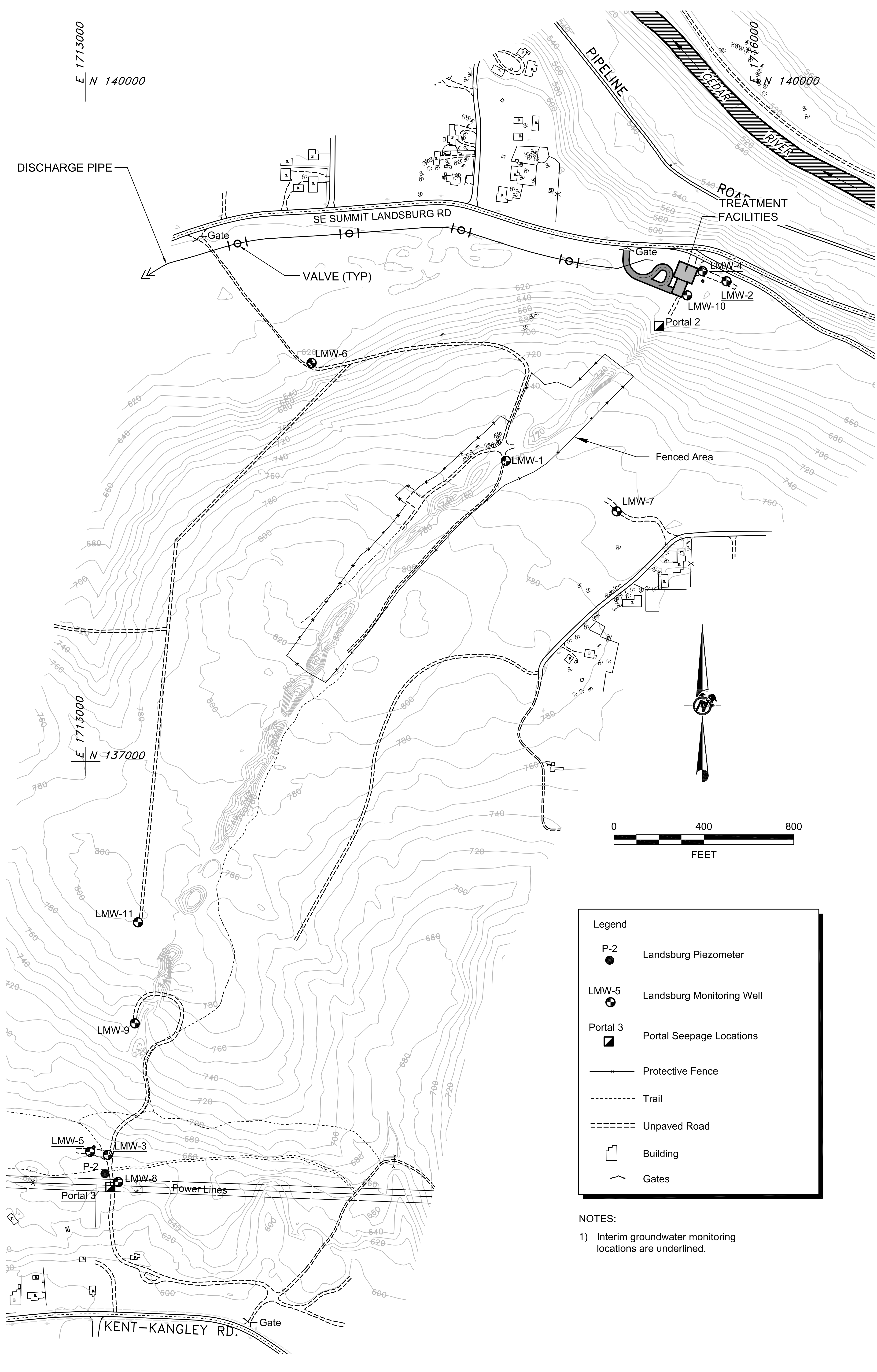
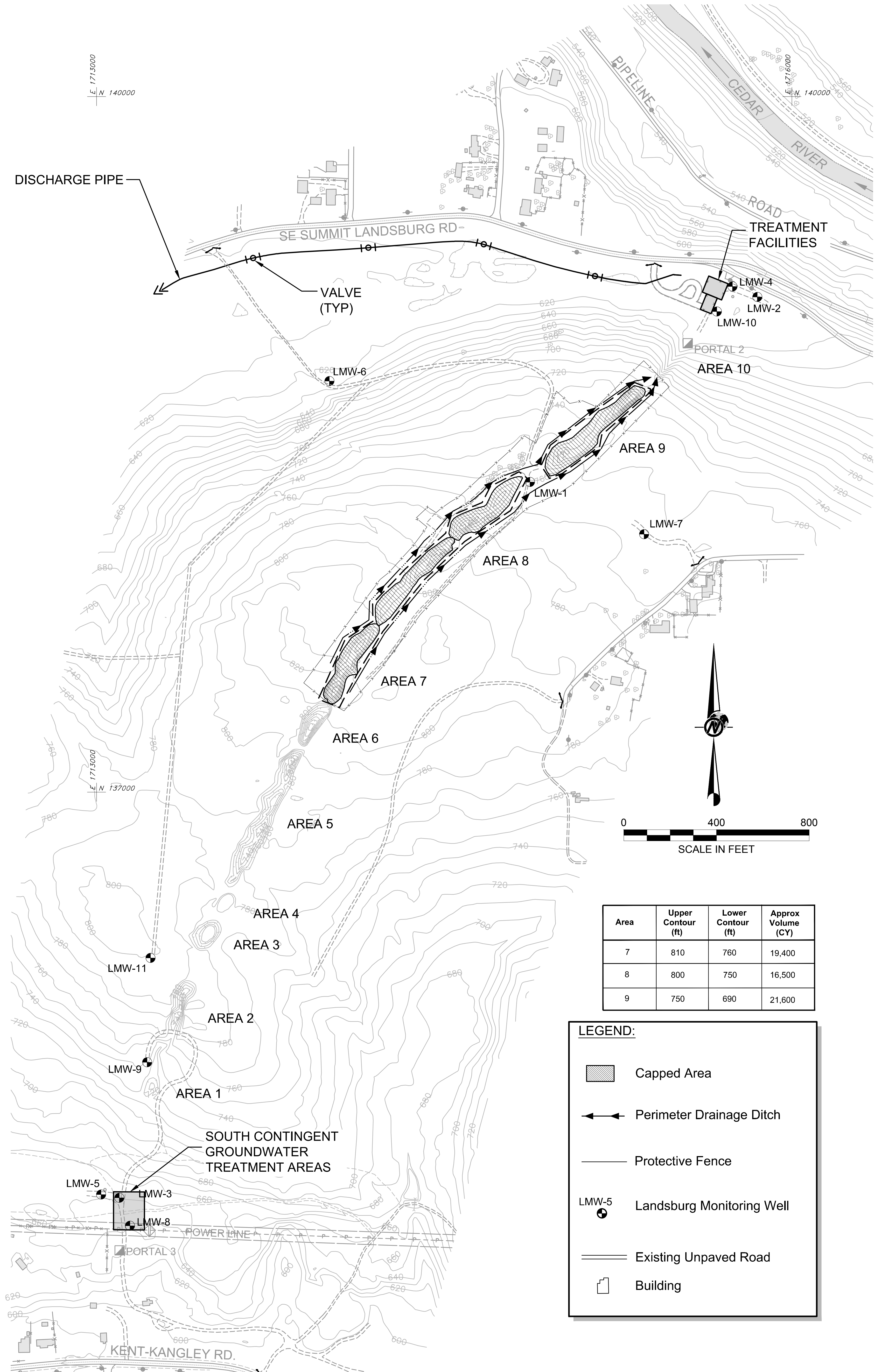


FIGURE **A-3**
SITE FEATURES AND TOPOGRAPHY
PALMER/LANDSBURG MINE/WA



Area	Upper Contour (ft)	Lower Contour (ft)	Approx Volume (CY)
7	810	760	19,400
8	800	750	16,500
9	750	690	21,600

LEGEND:

- Capped Area
- Perimeter Drainage Ditch
- Protective Fence
- LMW-5 Landsburg Monitoring Well
- Existing Unpaved Road
- Building

NOTES:

1. TOPOGRAPHY IN VICINITY OF TRENCHES WILL BE MODIFIED AS NECESSARY TO ACCOMMODATE CAP AND DITCHES.
2. ONLY TRENCH AREAS 7,8, AND 9 WILL BE BACKFILLED AND CAPPED

FIGURE **A-4**

CAPPED AREA AND DRAINAGE DITCHES

PALMER/LANDSBURG MINE/WA

K:\CAD\Projects\1992\9231000\x002\R154\CMP\923_1000_002_R154_FA-4r3.dwg | Fig A-4 Capped Area and Drainage Ditches | Mod: 07/31/2013, 13:36 | Plotted: 07/31/2013, 14:21 | aforcier

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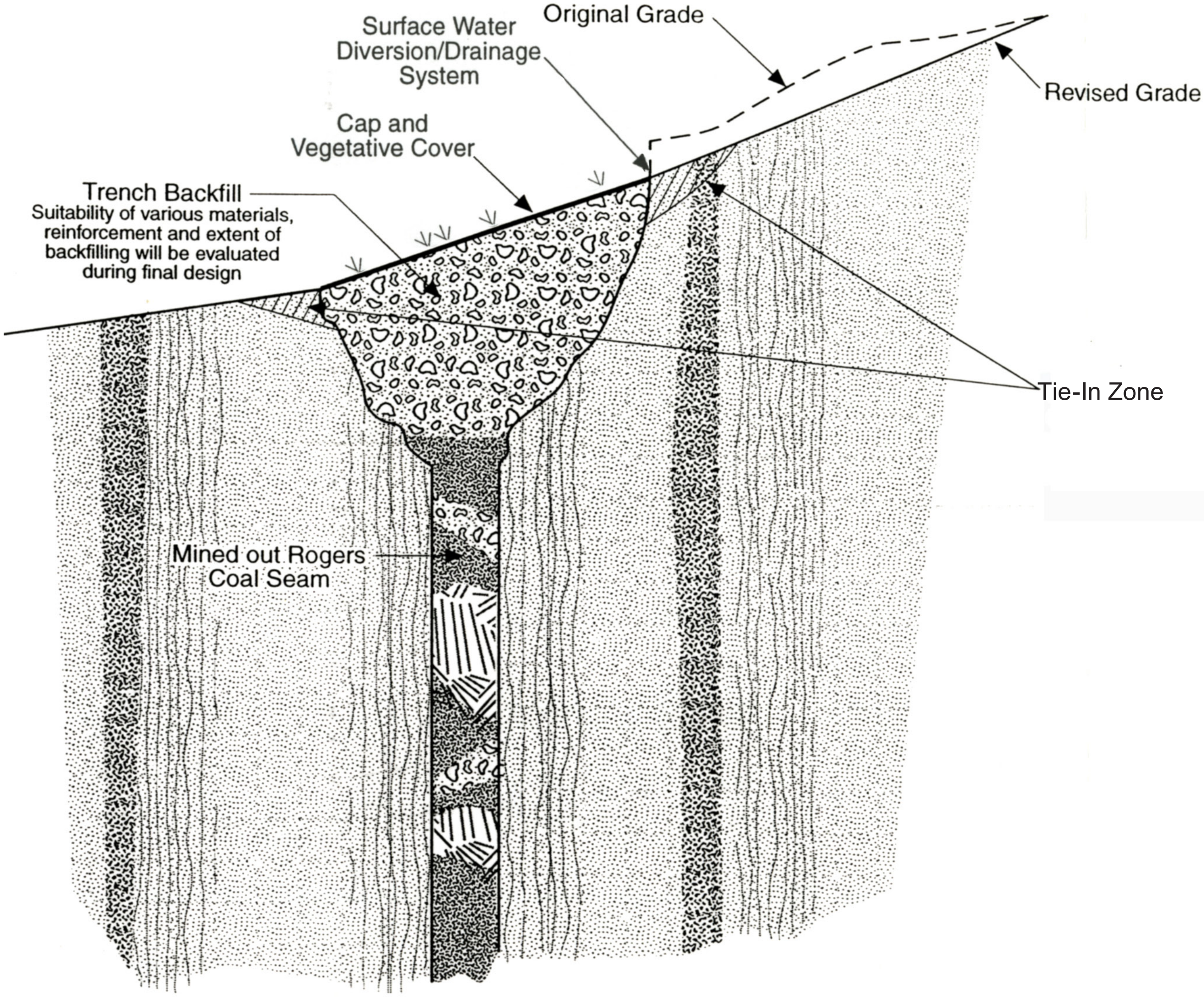
Conceptual Cross-Section
(not to scale)



Cap Design

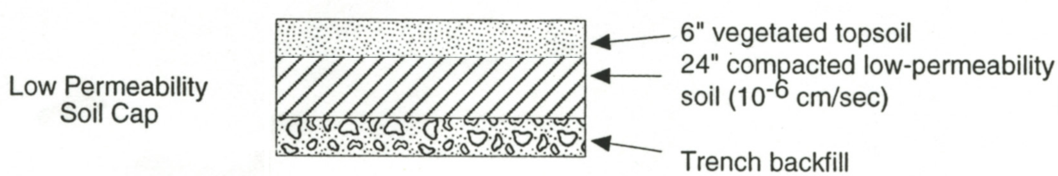


FIGURE **A-5**
CAP CROSS-SECTION
PALMER/LANDSBURG MINE/WA

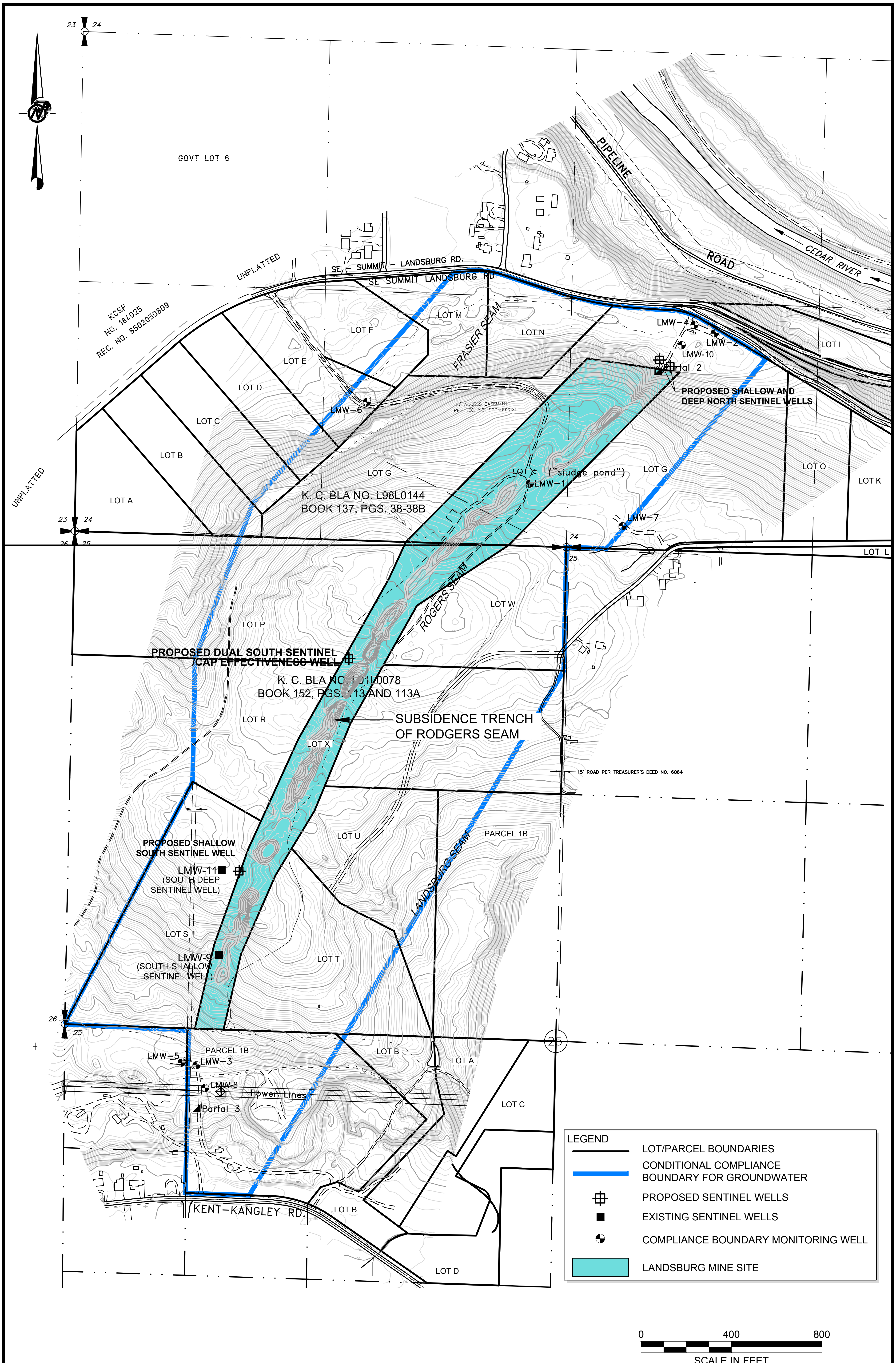
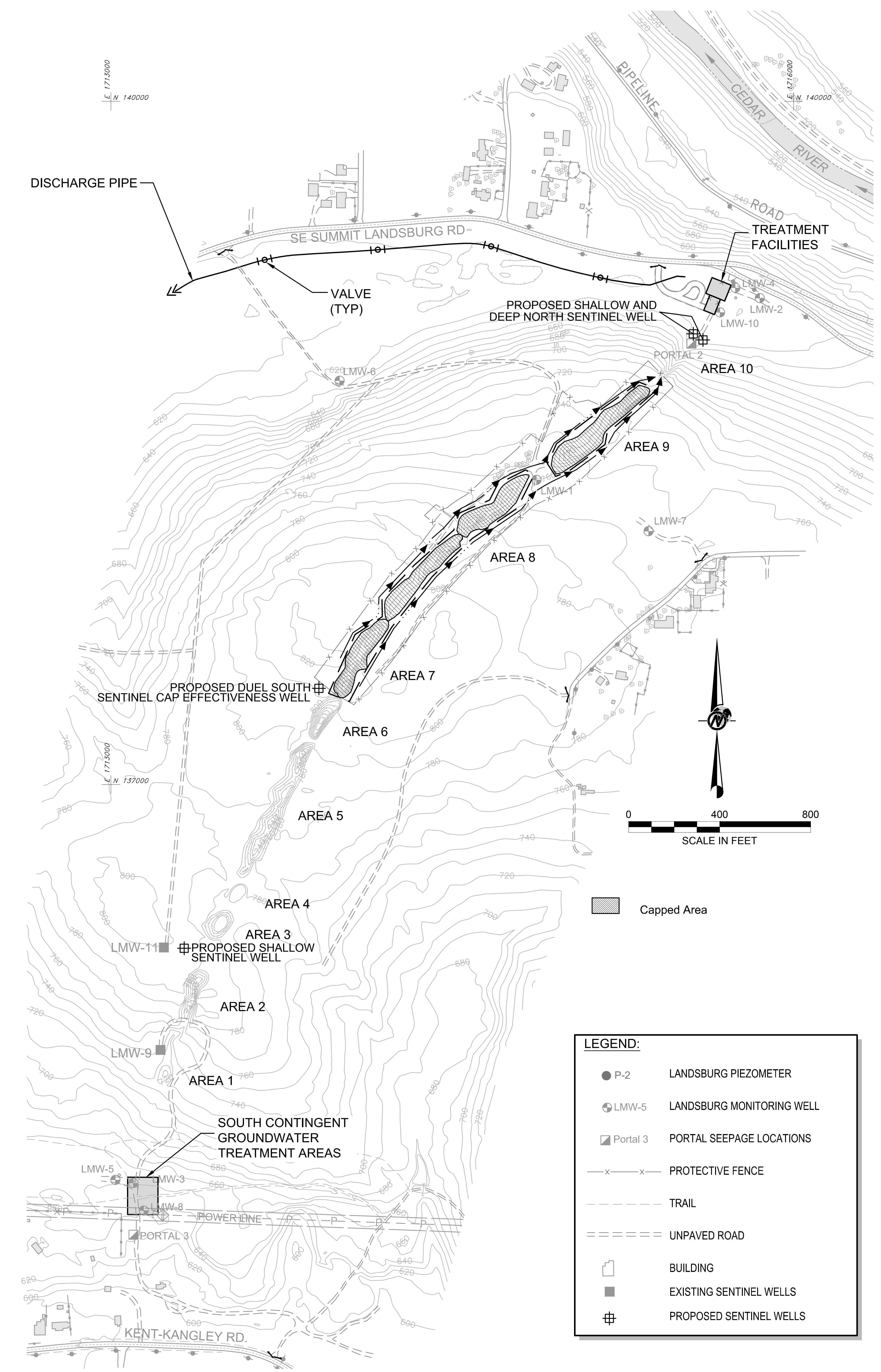


FIGURE **A-6**

GROUNDWATER POINT OF COMPLIANCE BOUNDARY

PALMER/LANDSBURG MINE/WA

NOTE:
1. LETTERS AT LOT X PROPERTY CORNERS CORRESPOND TO THE COORDINATES IN TABLE 1



NOTES:

1. TOPOGRAPHY IN VICINITY OF TRENCHES WILL BE MODIFIED AS NECESSARY TO ACCOMMODATE CAP AND DITCHES.
2. ONLY TRENCH AREAS 7,8, AND 9 WILL BE BACKFILLED AND CAPPED

FIGURE **A-7**

PROPOSED SENTINEL WELL LOCATIONS

PALMER/LANDSBURG MINE/WA

K:\CAD\Projects\1992\9231000\x002\R154\CMP\923_1000_002_R154_FA-7r3.dwg | Fig A-7 Proposed Sentinel Well Locations | Mod: 07/31/2013, 13:35 | Plotted: 07/31/2013, 14:21 | aforcier

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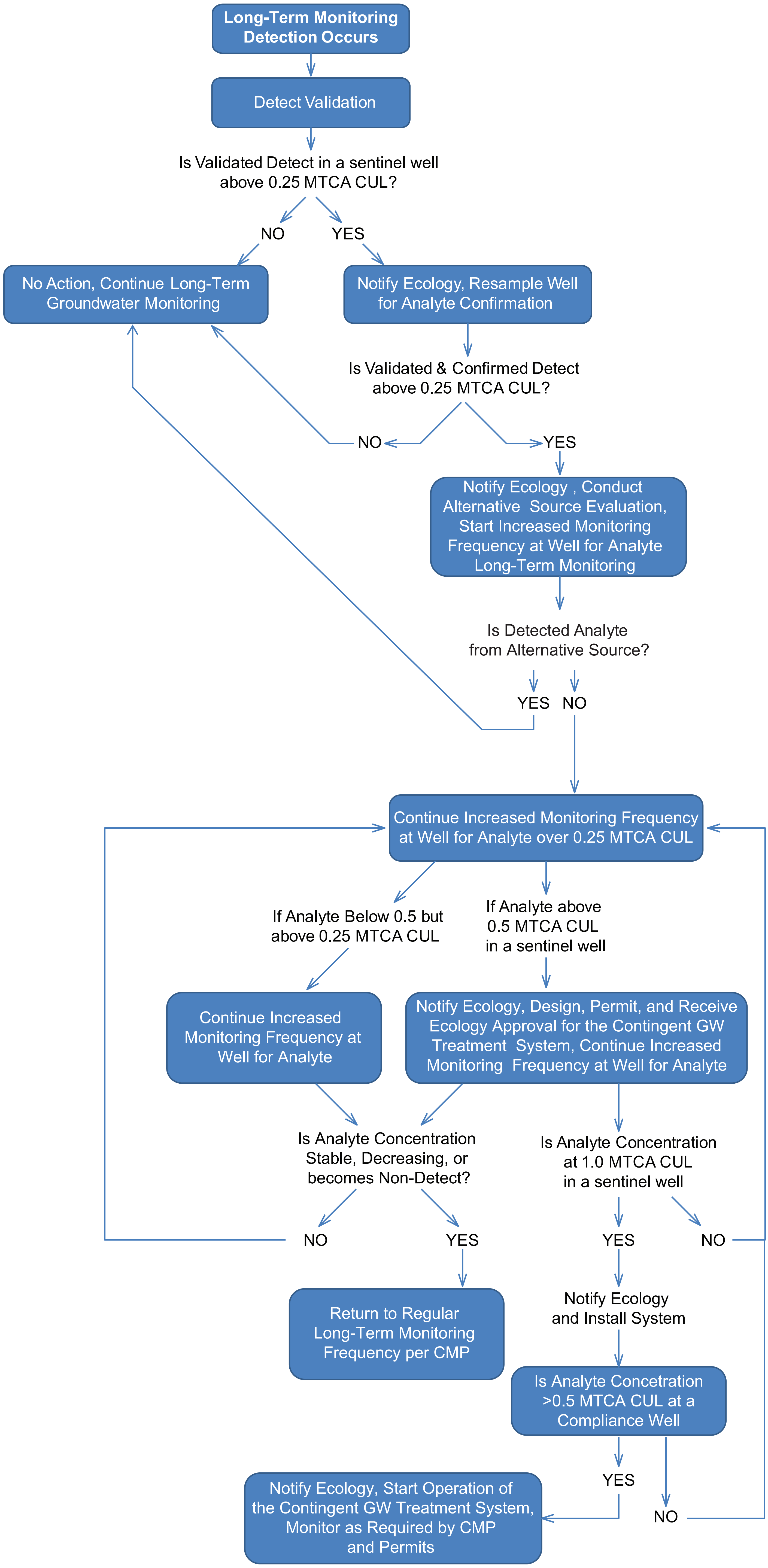

FIGURE **A-8**

REMEDIAL ACTION TRIGGERS FOR DETECTIONS AT SENTINEL AND COMPLIANCE WELLS

PALMER/LANDSBURG MINE/WA

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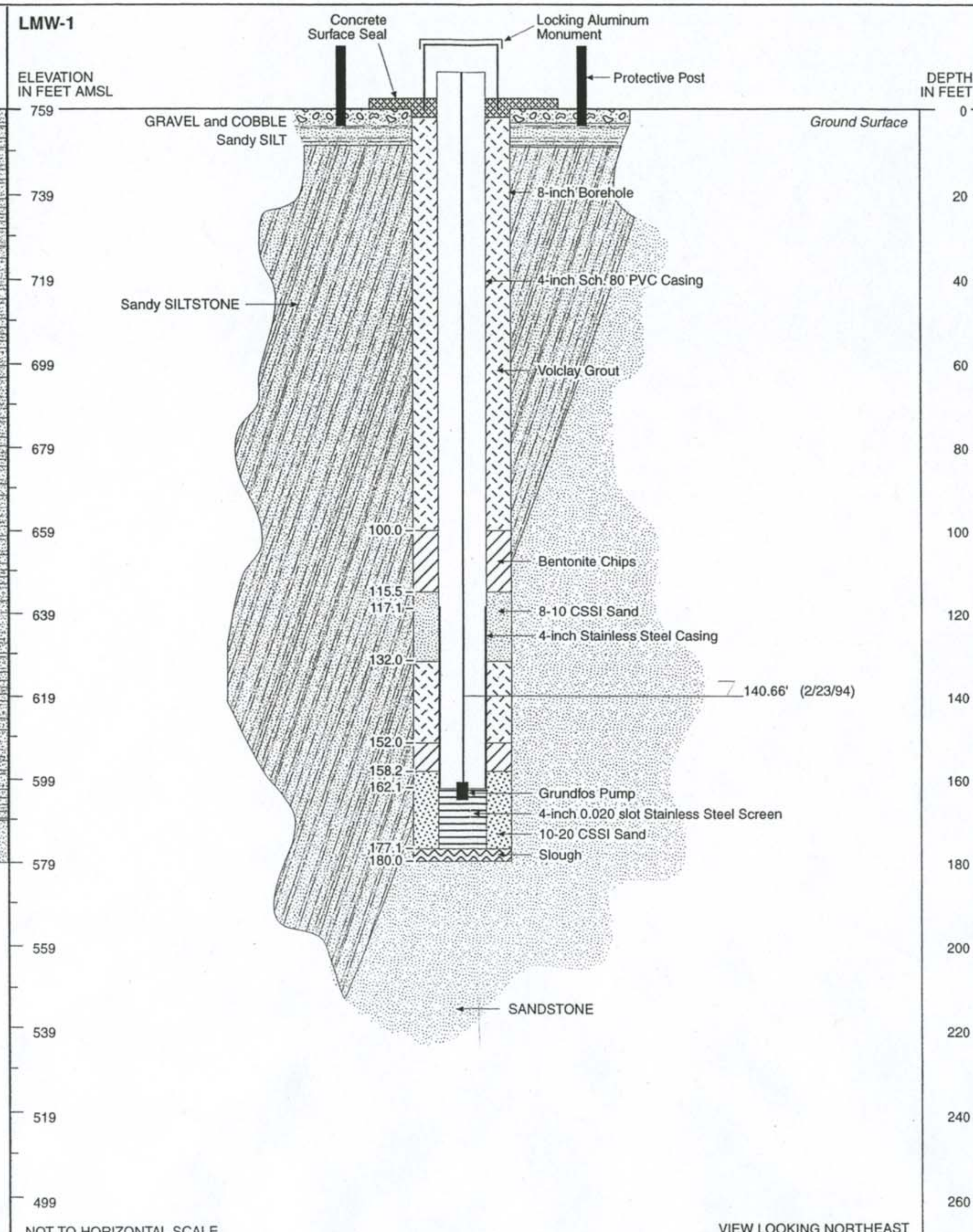
APPENDIX
LOGS

STRATIGRAPHY
ENCOUNTERED DURING
ROTARY DRILLING

DEPTH IN FEET	GENERAL SOIL DESCRIPTION
2.0	Sandy GRAVEL and COBBLE (FILL)
	Moderate yellowish brown (10YR 5/4), fine sandy SILT to silty fine SAND, trace gravel
9.5	Highly weathered, dark yellowish brown (10YR 4/2), very fine sandy SILTSTONE, dry
28.0	Fresh, pale yellowish brown (10YR 6/2), very fine sandy SILTSTONE, dry
48.0	Fresh, dark yellowish brown (10YR 4/2), very fine sandy SILTSTONE, damp
67.0	Fresh, pale yellowish brown (10YR 6/2), very fine sandy SILTSTONE, dry
105.0	Fresh, light olive gray (5Y 6/1) very fine sandy SILTSTONE, dry
142.0	Dry to approximately 150' Fresh, dark yellowish brown (10YR 4/2), very fine sandy SILTSTONE, wet
170.0	Fresh, dusky yellowish brown (10YR 2/2), fine SANDSTONE, wet
180.0	Total Depth 180.0' Water encountered at approximately 150'



CONSTRUCTION SUMMARY

MONITORING WELL: LMW-1
SURVEY COORDINATES: N-138,337.2724, E-1,714,869.6009
GROUND SURFACE ELEVATION (MSL): 759.24'
TOP OF CASING (PVC) ELEVATION: 761.45'

DRILLING SUMMARY

TOTAL DEPTH:	180.0' bgs
BOREHOLE DIAMETER:	8-inch
INCLINATION:	90°
DRILLER:	Burlington Environmental
ENGINEER:	G. Zimmerman
DRILL METHOD(S):	Air Rotary
DRILL RIG	Schramm T-660
BITS:	7 7/8-Tricone
DRILLING FLUID:	Air

WELL DESIGN AND SPECIFICATIONS

CASING STRING(S) C = CASING S = SCREEN

STRINGS	DEPTH (FT)	ELEVATION (MSL)
C1	(-3 – 15)	(762.24 – 744.24)
C2	-2.21 – 117.1	761.45 – 642.14
C3	117.1 –162.1	642.14 – 597.14
S1	162.1 – 177.1	597.14 – 582.14

CASING: C1	8-inch Temporary Steel Casing (removed)
CASING: C2	4-inch Diameter PVC
CASING: C3	4-inch Diameter Stainless Steel Casing
SCREEN: S1	0.020-inch Slotted 4-inch Dia. Stainless Steel
FILTER PACK:	10-20 CSSI Sand
GROUT SEAL:	Volclay Grout
BENTONITE:	Bentonite Chips

PUMP AND PACKER SUMMARY

Dedicated Sampling Pump: 2-horsepower Grundfos Submersible Pump Model MPI

STRINGS	DEPTH (FT)	ELEVATION (MSL)
Sampling Pump Intake	161.79	597.45
Packer Assembly	No packer	No packer

STRATIGRAPHY AND WELL COMPLETION LOG LMW-1
PALMER/LANDSBURG MINE/WA

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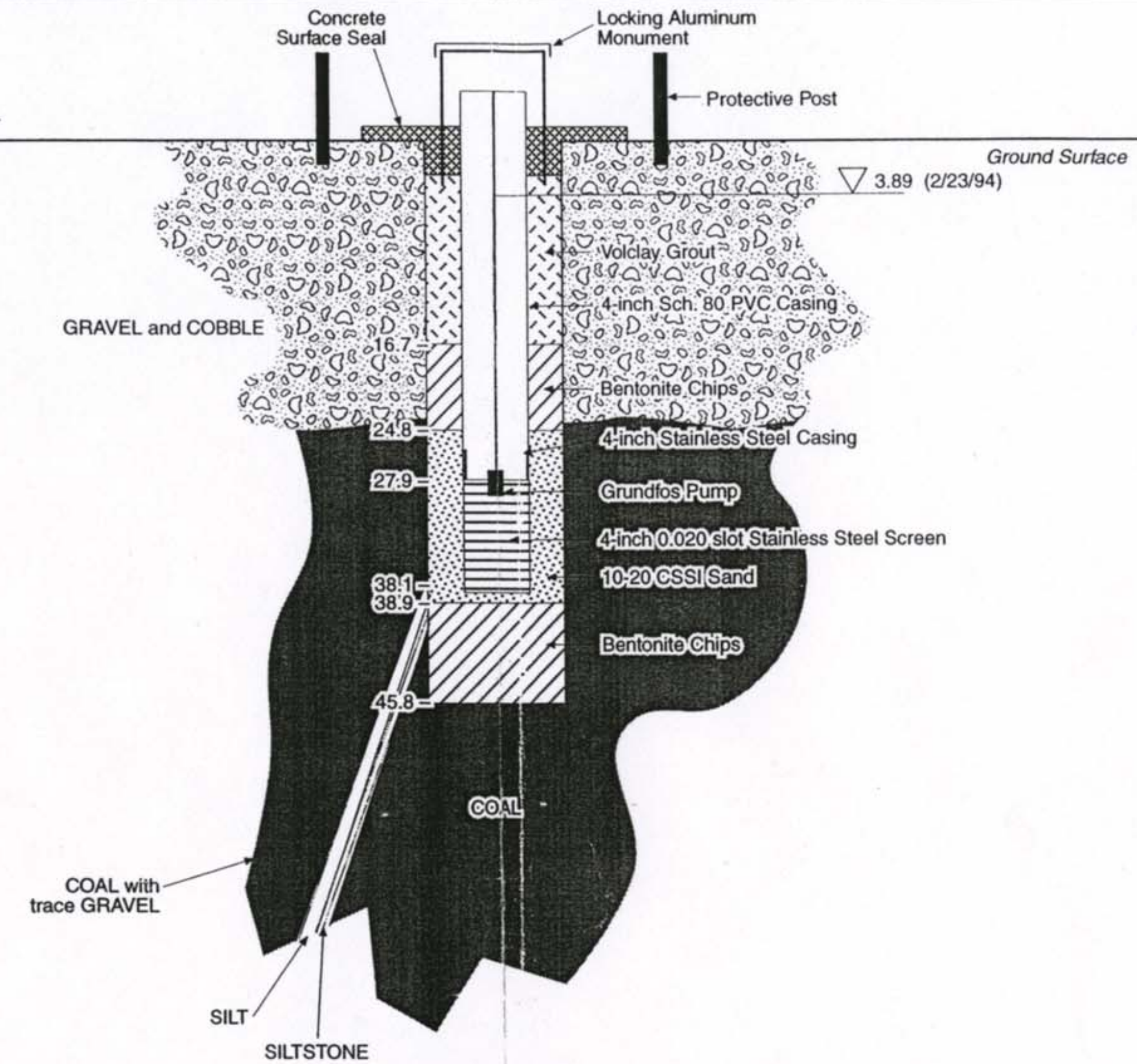
Golder Associates

STRATIGRAPHY
ENCOUNTERED DURING
ROTARY DRILLING

DEPTH IN FEET	GENERAL SOIL DESCRIPTION	GRAPHIC LOG	LMW-2 ELEVATION IN FEET AMSL
0	Grayish brown (5YR 3/2,) poorly sorted, subangular, GRAVEL and PEBBLES, little, medium to coarse Sand, dry (FILL)		612
14.5	Dusky brown (5YR 2/2), poorly sorted, subangular, GRAVEL and PEBBLES, little, medium to coarse Sand, little decayed wood and organic debris, moist (FILL)		
23.0	Brownish black (5YR 2/1) to grayish black (N2), COAL (fragments), trace fine gravel, (probably caved material) dry High increase in moisture 35'-38'		
38.0 40.0	Dusky yellowish brown (10YR 2/2), clayey SILT, little gravel, moist		
42.0	Fresh Dusky brown (5YR 2/2), fine sandy SILTSTONE, dry		
45.8	Fresh Black (N1), COAL, damp Total Depth 45.8' Water encountered at approximately 35'-48'		

Depth scale (feet): 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130

Elevation scale (feet AMSL): 612, 602, 592, 582, 572, 562, 552, 542, 532, 522, 512, 502, 492, 482



NOT TO HORIZONTAL SCALE

VIEW LOOKING NORTHEAST

CONSTRUCTION SUMMARY

MONITORING WELL: LMW-2
SURVEY COORDINATES: N-139,135.4807, E-1,715,850.9350
GROUND SURFACE ELEVATION (MSL): 611.79'
TOP OF CASING (PVC) ELEVATION: 614.15'

DRILLING SUMMARY

TOTAL DEPTH:	45.8' bgs
BOREHOLE DIAMETER:	8-inch
INCLINATION:	90°
DRILLER:	Burlington Environmental
ENGINEER:	G. Zimmerman
DRILL METHOD(S):	Air Rotary
DRILL RIG	Schramm T-660
BITS:	7 7/8-Tricone
DRILLING FLUID:	Air

WELL DESIGN AND SPECIFICATIONS

CASING STRING(S) C = CASING S = SCREEN

STRINGS	DEPTH (FT)	ELEVATION (MSL)
C1	(-2.5 – 40)	(614.29 – 571.79)
C2	-2.36 – 22.9	614.15 – 588.89
C3	22.9 – 27.9	588.89 – 583.89
S1	27.9 – 38.1	583.89 – 573.69

CASING: C1	8-inch Temporary Steel Casing (removed)
CASING: C2	4-inch Diameter, Schedule 80 PVC
CASING: C3	4-inch Stainless Steel Casing
SCREEN: S1	0.020-inch Slotted 4-inch Diameter Stainless Steel
FILTER PACK:	10-20 CSSI Sand
GROUT SEAL:	Volclay Grout
BENTONITE:	Bentonite Chips

PUMP AND PACKER SUMMARY

Dedicated Sampling Pump: 2-horsepower Grundfos Submersible Pump Model MPI

STRINGS	DEPTH (FT)	ELEVATION (MSL)
Sampling Pump Intake	27.64	584.15
Packer Assembly	No packer	No packer

STRATIGRAPHY AND WELL COMPLETION LOG LMW-2
PALMER/LANDSBURG MINE/WA

Golder Associates

STRATIGRAPHY
ENCOUNTERED DURING ROTARY DRILLING

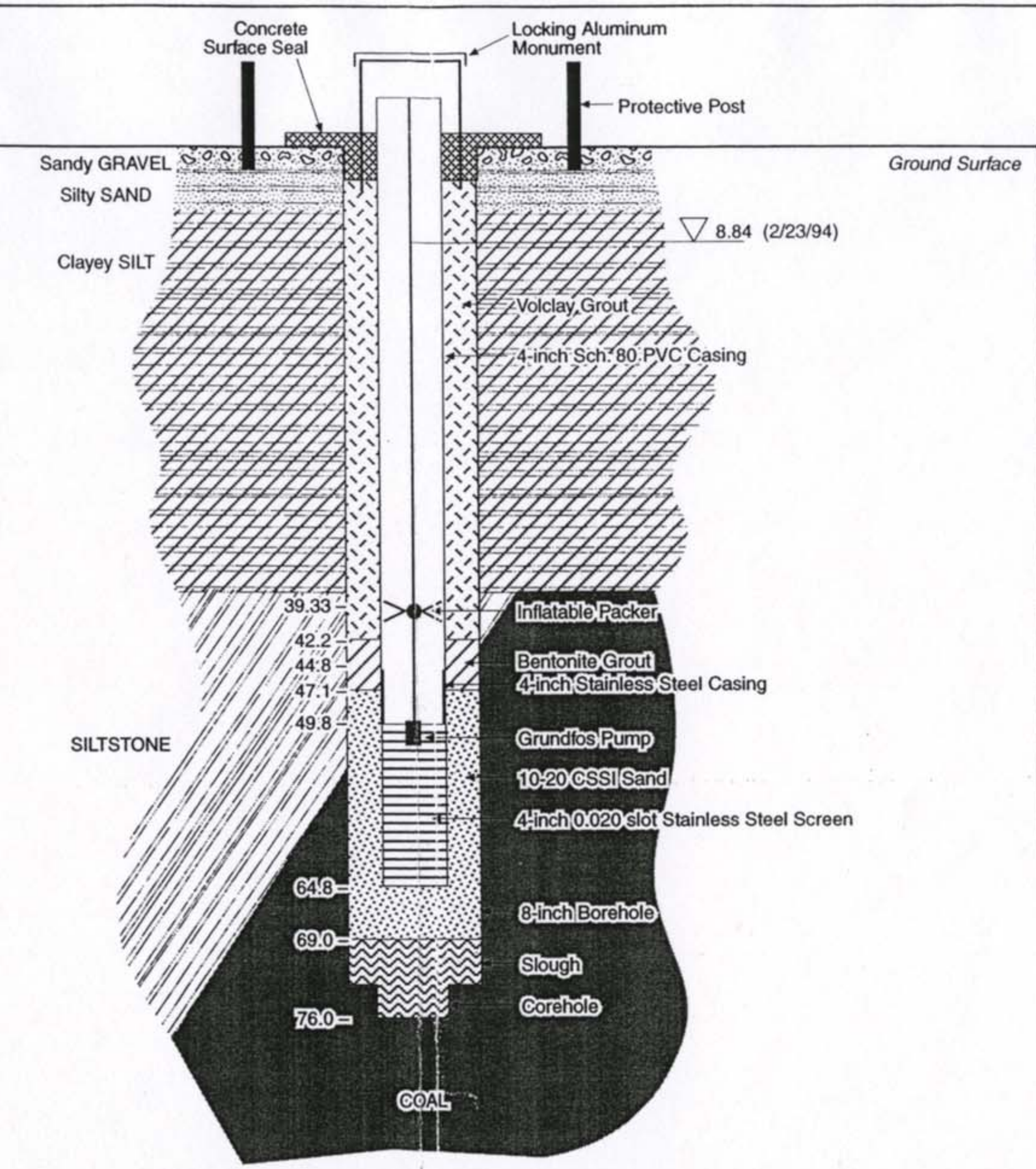
DEPTH IN FEET	GENERAL SOIL DESCRIPTION	ELEVATION IN FEET AMSL
0.5	Sandy GRAVEL	651
5.0	Pale yellowish brown (10YR 6/2), fine sandy SILT to silty fine SAND, little gravel, dry	
12.0	Olive gray (5Y 3/2), clayey SILT (moderate plasticity), damp	641
20.0	Olive gray (5Y 3/2), clayey SILT, trace to little fine Sand, dry to moist	631
	Slight increase in moisture	621
40.0	Fresh, dark yellowish brown (10YR 4/2), SILTSTONE, (hard, dense fragments)	611
49.0	Fresh, brownish black (5YR 4), COAL, (finely ground fragments)	601
	Total Depth 76.0' Water encountered at approximately 50' bgs	

DEPTH IN FEET: 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130

ELEVATION IN FEET AMSL: 651, 641, 631, 621, 611, 601, 591, 581, 571, 561, 551, 541, 531, 521

GRAPHIC LOG

LMW-3



NOT TO HORIZONTAL SCALE

VIEW LOOKING NORTH

CONSTRUCTION SUMMARY

MONITORING WELL: LMW-3

SURVEY COORDINATES: N-135,249.9481, E-1,713,098.2723

GROUND SURFACE ELEVATION (MSL): 650.84'

TOP OF CASING (PVC) ELEVATION: 653.51'

DRILLING SUMMARY

TOTAL DEPTH: 76.0' bgs

BOREHOLE DIAMETER: 8-inch

INCLINATION: 90°

DRILLER: Burlington Environmental

ENGINEER: R. Blegen

DRILL METHOD(S): Air Rotary

DRILL RIG: Schramm T-660

BITS: 7 7/8-Tricone

DRILLING FLUID: Air

WELL DESIGN AND SPECIFICATIONS

CASING STRING(S) C = CASING S = SCREEN

STRINGS	DEPTH (FT)	ELEVATION (MSL)
C1	(-2.0 – 6.0)	(652.84 – 646.84)
C2	-2.67 – 44.8	653.51 – 606.04
C3	44.8 – 49.8	606.04 – 601.04
S1	49.8 – 64.8	601.04 – 586.04

CASING: C1 8-inch Temporary Steel Casing (removed)

CASING: C2 4-inch Diameter Schedule 80 PVC

CASING: C3 4-inch Stainless Steel Casing

SCREEN: S1 0.020-inch slotted 4-inch Diameter Stainless Steel

FILTER PACK: 10-20 CSSI Sand

GROUT SEAL: Volclay Grout

BENTONITE: Bentonite Chips

PUMP AND PACKER SUMMARY

Dedicated Sampling Pump: 2-horsepower Grundfos Submersible Pump Model MPI

STRINGS	DEPTH (FT)	ELEVATION (MSL)
Sampling Pump Intake	49.33	601.51
Packer Assembly	39.33	611.51

STRATIGRAPHY AND WELL COMPLETION LOG LMW-3

PALMER/LANDSBURG MINE/WA

Golder Associates

STRATIGRAPHY
ENCOUNTERED DURING
ROTARY DRILLING

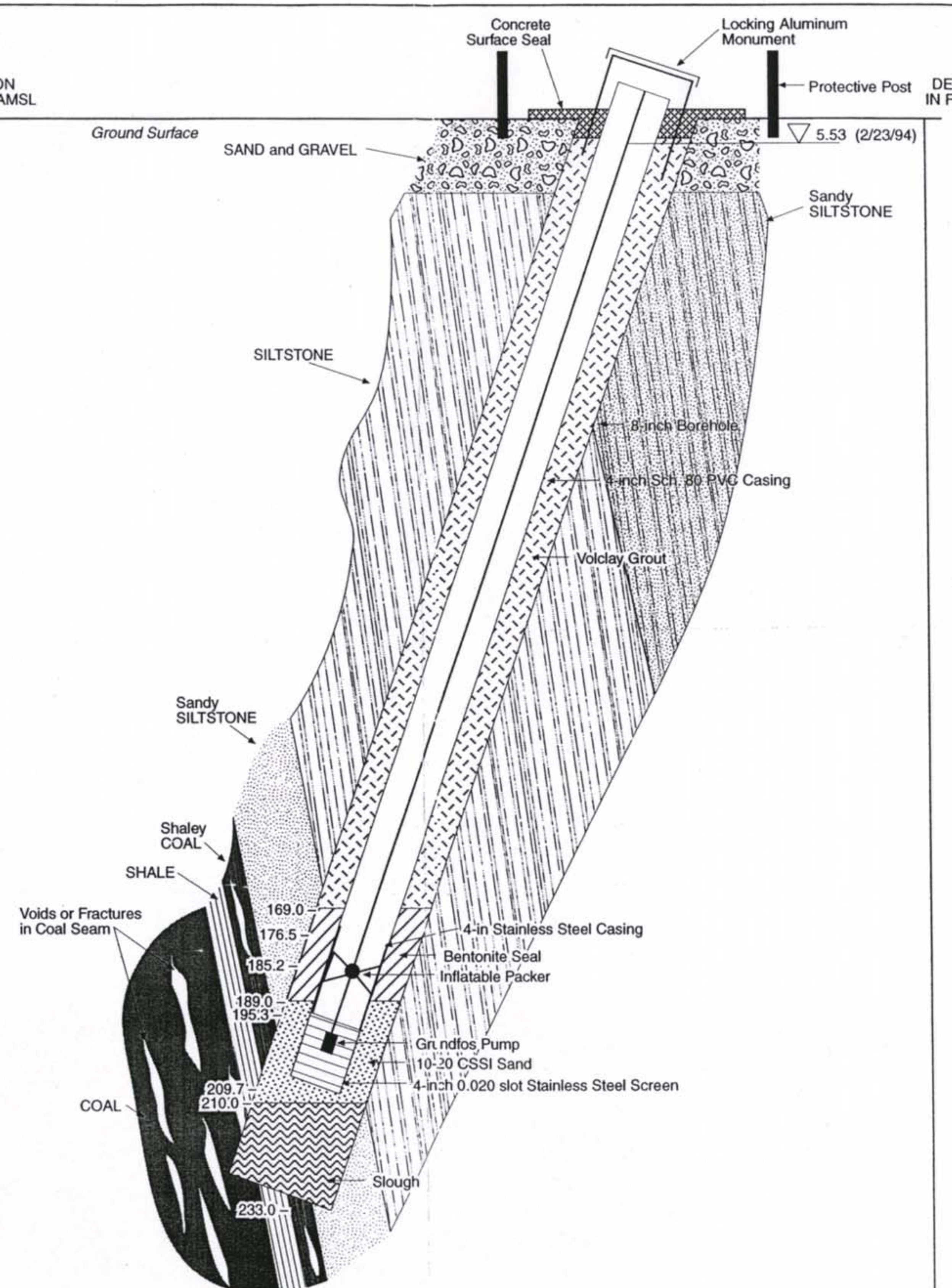
DEPTH IN FEET	GENERAL SOIL DESCRIPTION
4.7	Dark yellowish brown (10YR 4/2), medium to coarse, subangular, SAND, damp
15.0	Pale yellowish brown (10YR 6/2) to moderate yellowish brown (10YR 5/4), coarse GRAVEL, some to little, medium subangular sand, dry
28.0	Fresh, pale yellowish brown (10YR 6/2) to dark yellowish brown (10YR 4/2), very fine sandy SILTSTONE, dry
	Fresh, pale yellowish brown (10YR 6/2), SILTSTONE, damp
171.0	Fresh, dark yellowish brown (10YR 4/2), fine sandy SILTSTONE, damp
187.9	Fresh, pale yellowish brown (10YR 6/2), fine sandy SILTSTONE, damp
197.3	Fresh, shaley COAL, highwater discharge
214.2	(Void 202.9 to 203.9)
218.0	Fresh, SHALE
	(Void 218.0 to 219.8)
	Fresh, black (N1), COAL
233.0	Total Depth 233.0' Water encountered at approximately 197' bgs

DEPTH IN FEET: 0, 20, 40, 60, 80, 100, 120, 140, 160, 180, 200, 220, 240, 260

GRAPHIC LOG

LMW-4

ELEVATION IN FEET AMSL: 613, 593, 573, 553, 533, 513, 493, 473, 453, 433, 413, 393, 373, 353



NOT TO HORIZONTAL SCALE

VIEW LOOKING SOUTHWEST

DEPTH IN FEET: 0, 20, 40, 60, 80, 100, 120, 140, 160, 180, 200, 220, 240, 260

CONSTRUCTION SUMMARY

MONITORING WELL: LMW-4

SURVEY COORDINATES: N-139,180.3874, E-1,715,744.0750

GROUND SURFACE ELEVATION (MSL): 613.45'

TOP OF CASING (PVC) ELEVATION: 615.70'

DRILLING SUMMARY

TOTAL DEPTH:	233.0' bgs
BOREHOLE DIAMETER:	8-inch
INCLINATION:	70°
DRILLER:	Burlington Environmental
ENGINEER:	G. Zimmerman
DRILL METHOD(S):	Air Rotary
DRILL RIG	Schramm T-660
BITS:	7 7/8-Tricone and 7 7/8 Button Bit
DRILLING FLUID:	Air

WELL DESIGN AND SPECIFICATIONS

CASING STRING(S) C = CASING S = SCREEN

STRINGS	DEPTH (FT)	ELEVATION (MSL)
C1	(-4 – 16)	(617.4 – 597.4)
C2	-2.25 – 176.5	615.7 – 436.9
C3	176.5 – 195.3	436.9 – 418.15
S1	195.3 – 209.7	418.15 – 403.75

CASING: C1	8-inch Temporary Casing (removed)
CASING: C2	4-inch Diameter Schedule 80 PVC
CASING: C3	4-inch Diameter 30 Stainless Steel Casing
SCREEN: S1	0.020-inch slotted 4-inch Diameter Stainless Steel
FILTER PACK:	10-20 CSSI Sand
GROUT SEAL:	Volclay Grout
BENTONITE:	Bentonite Chips

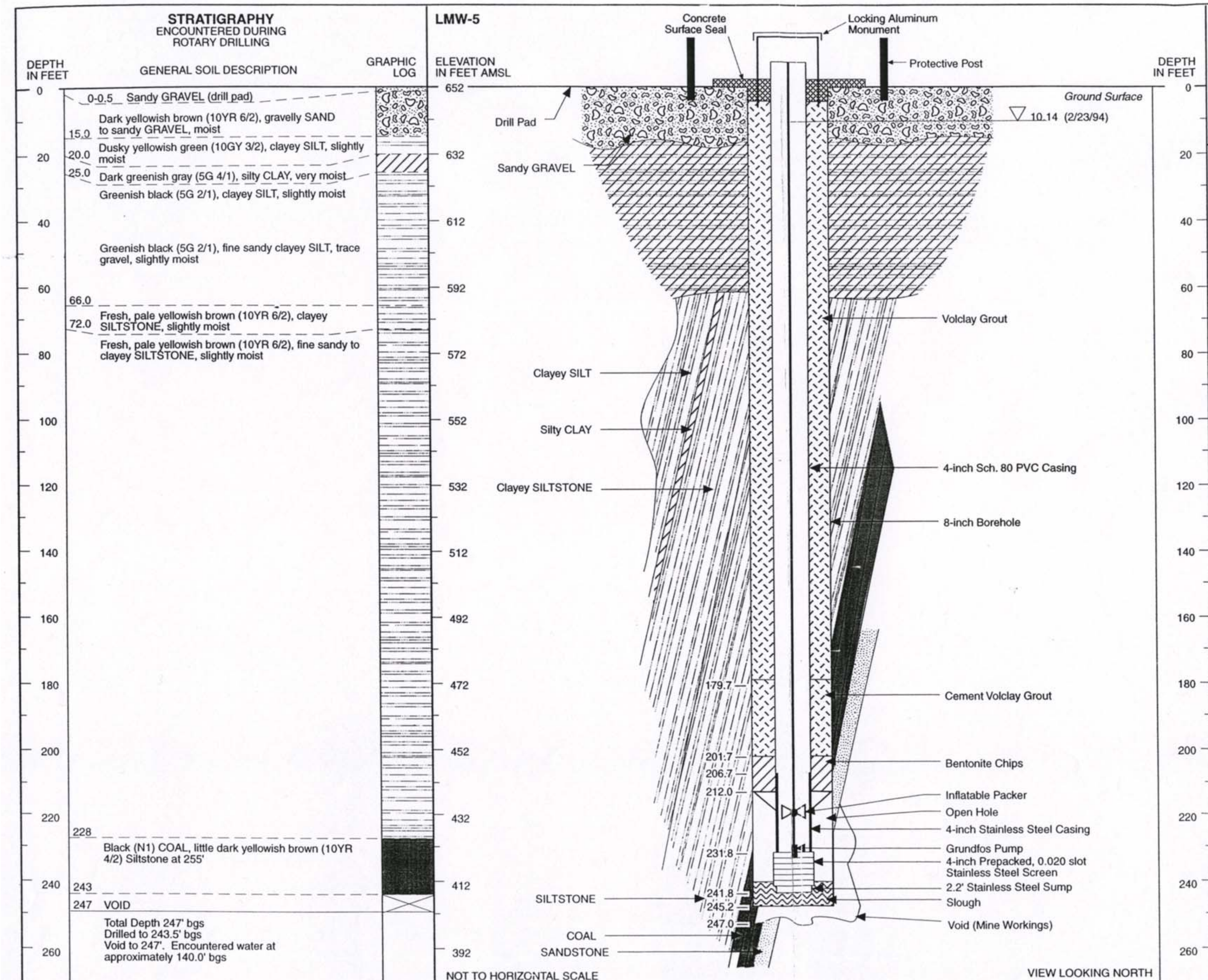
PUMP AND PACKER SUMMARY

Dedicated Sampling Pump: 2-horsepower Grundfos Submersible Pump Model MPI

STRINGS	DEPTH (FT)	ELEVATION (MSL)
Sampling Pump Intake	197.3	416.1
Packer Assembly	187.3	426.1

STRATIGRAPHY AND WELL COMPLETION LOG LMW-4
PALMER/LANDSBURG MINE/WA

Golder Associates



CONSTRUCTION SUMMARY

MONITORING WELL: LMW-5
SURVEY COORDINATES: N-135,263.6364, E-1,713,019.1629
GROUND SURFACE ELEVATION (MSL): 651.89'
TOP OF CASING (PVC) ELEVATION: 654.78'

DRILLING SUMMARY

TOTAL DEPTH:	245.2' bgs
BOREHOLE DIAMETER:	8-inch
INCLINATION:	90°
DRILLER:	Burlington Environmental
ENGINEER:	G. Zimmerman
DRILL METHOD(S):	Air Rotary
DRILL RIG	Schramm T-660
BITS:	7 7/8-Tricone
DRILLING FLUID:	Air

WELL DESIGN AND SPECIFICATIONS

CASING STRING(S) C = CASING S = SCREEN

STRINGS	DEPTH (FT)	ELEVATION (MSL)
C1	(-3.0 – 15.0)	(654.89 – 636.89)
C2	-2.89 – 206.7	654.78 – 445.19
C3	206.7 – 231.8	445.19 – 420.09
S1	231.8 – 241.8	420.09 – 410.09

CASING: C1	8-inch Temporary Steel Casing (removed)
CASING: C2	4-inch Diameter, Schedule 80 PVC
CASING: C3	4-inch Stainless Steel Riser
SCREEN: S1	0.020-inch Slotted 4-inch Diameter Stainless Steel Prepacked CSSI 10-20 Sand

PUMP AND PACKER SUMMARY

Dedicated Sampling Pump: 2-horsepower Grundfos Submersible Pump Model MPI

STRINGS	DEPTH (FT)	ELEVATION (MSL)
Sampling Pump Intake	232.11	419.78
Packer Assembly	222.11	429.78

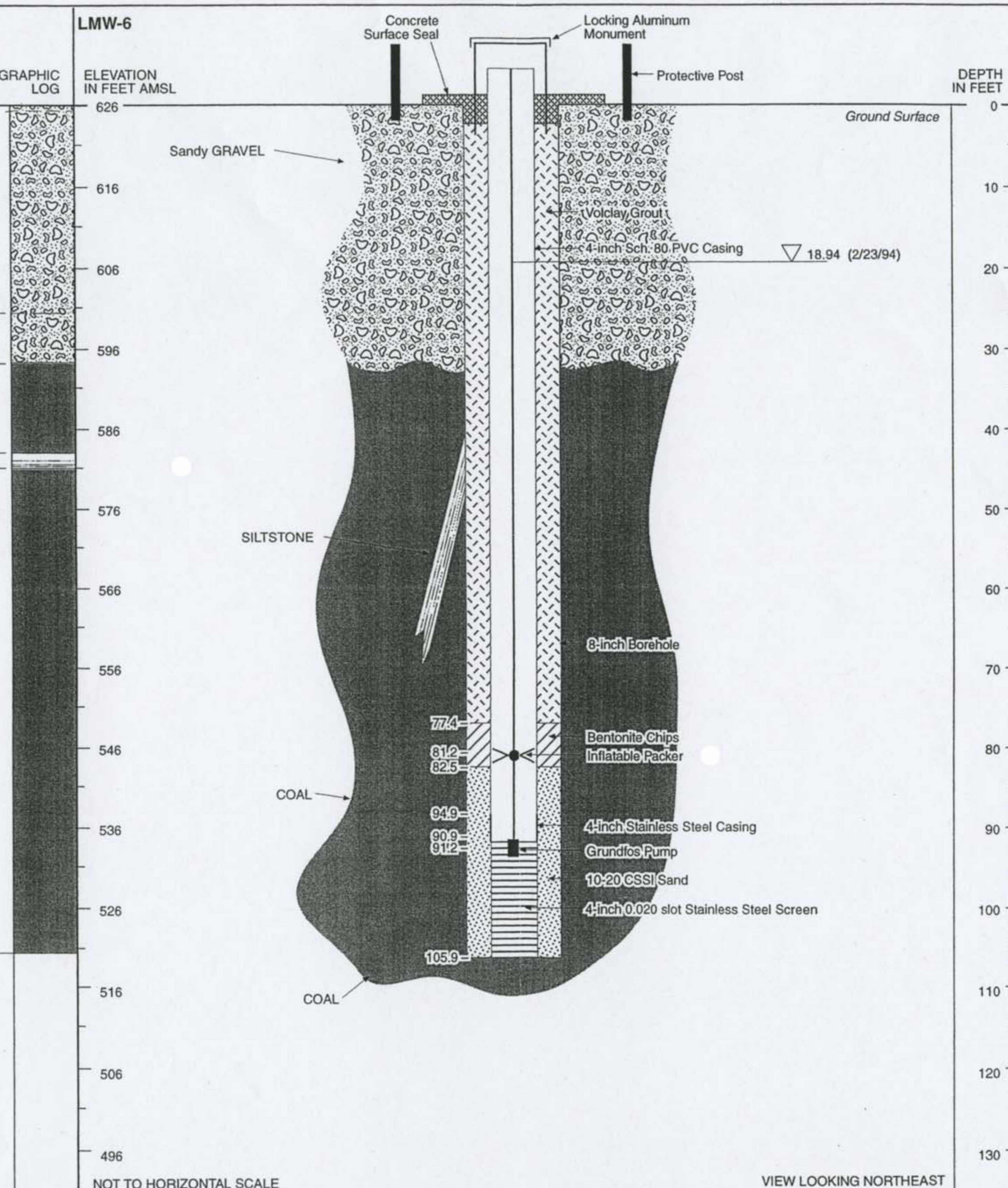
STRATIGRAPHY AND WELL COMPLETION LOG LMW-5
PALMER/LANDSBURG MINE/WA

9231000002R154cp04.ai | Mod: 04/07/10 | AMP

Golder Associates

STRATIGRAPHY
ENCOUNTERED DURING ROTARY DRILLING

DEPTH IN FEET	GENERAL SOIL DESCRIPTION
0.5	Sandy GRAVEL and COBBLE (pad)
	Pale yellowish brown (10YR 6/2), subangular GRAVEL, little medium to coarse subrounded sand, little silt, moist
26.0	Dusky yellowish brown (10YR 2/2), fine GRAVEL, some black (N1) COAL (fill)
32.0	Fresh, black (N1), COAL, damp to moist
43.5	Dusky brown (5YR 2/2), plastic SILT, trace sand, damp
45.0	Fresh, black (N1), COAL, dry
	Increased moisture
	Wet
	Trace SILTSTONE at TD
	Total Depth 105.9'
	Water encountered at approximately 45'-60' bgs



CONSTRUCTION SUMMARY

MONITORING WELL: LMW-6
SURVEY COORDINATES: N-138,772.6829, E-1,714,004.7812
GROUND SURFACE ELEVATION (MSL): 62602'
TOP OF CASING (PVC) ELEVATION: 628.80'

DRILLING SUMMARY

TOTAL DEPTH:	105.9' bgs
BOREHOLE DIAMETER:	8-inch
INCLINATION:	90°
DRILLER:	Burlington Environmental
ENGINEER:	G. Zimmerman
DRILL METHOD(S):	Air Rotary
DRILL RIG	Schramm T-660
BITS:	7 7/8-Rotary
DRILLING FLUID:	Air

WELL DESIGN AND SPECIFICATIONS

CASING STRING(S) C = CASING S = SCREEN

STRINGS	DEPTH (FT)	ELEVATION (MSL)
C1	(-2.1 – 34.5)	(628.12 – 591.52)
C2	-2.78 – 94.9	628.80 – 531.12
C3	94.9 – 90.9	531.12 – 535.12
S1	90.9 – 105.9	535.12 – 520.12

CASING: C1	8-inch Temporary Steel Casing (removed)
CASING: C2	4-inch Diameter Schedule 80 PVC
CASING: C3	4-inch Diameter Stainless Steel Casing
SCREEN: S1	0.020-inch Slotted 4-inch Diameter Stainless Steel
FILTER PACK:	10-20 CSSI Sand
GROUT SEAL:	Volclay Grout
BENTONITE:	Bentonite Chips

PUMP AND PACKER SUMMARY

Dedicated Sampling Pump: 2-horsepower Grundfos Submersible Pump Model MPI

STRINGS	DEPTH (FT)	ELEVATION (MSL)
Sampling Pump Intake	91.22	534.80
Packer Assembly	81.22	544.80

STRATIGRAPHY AND WELL COMPLETION LOG LMW-6
PALMER/LANDSBURG MINE/WA

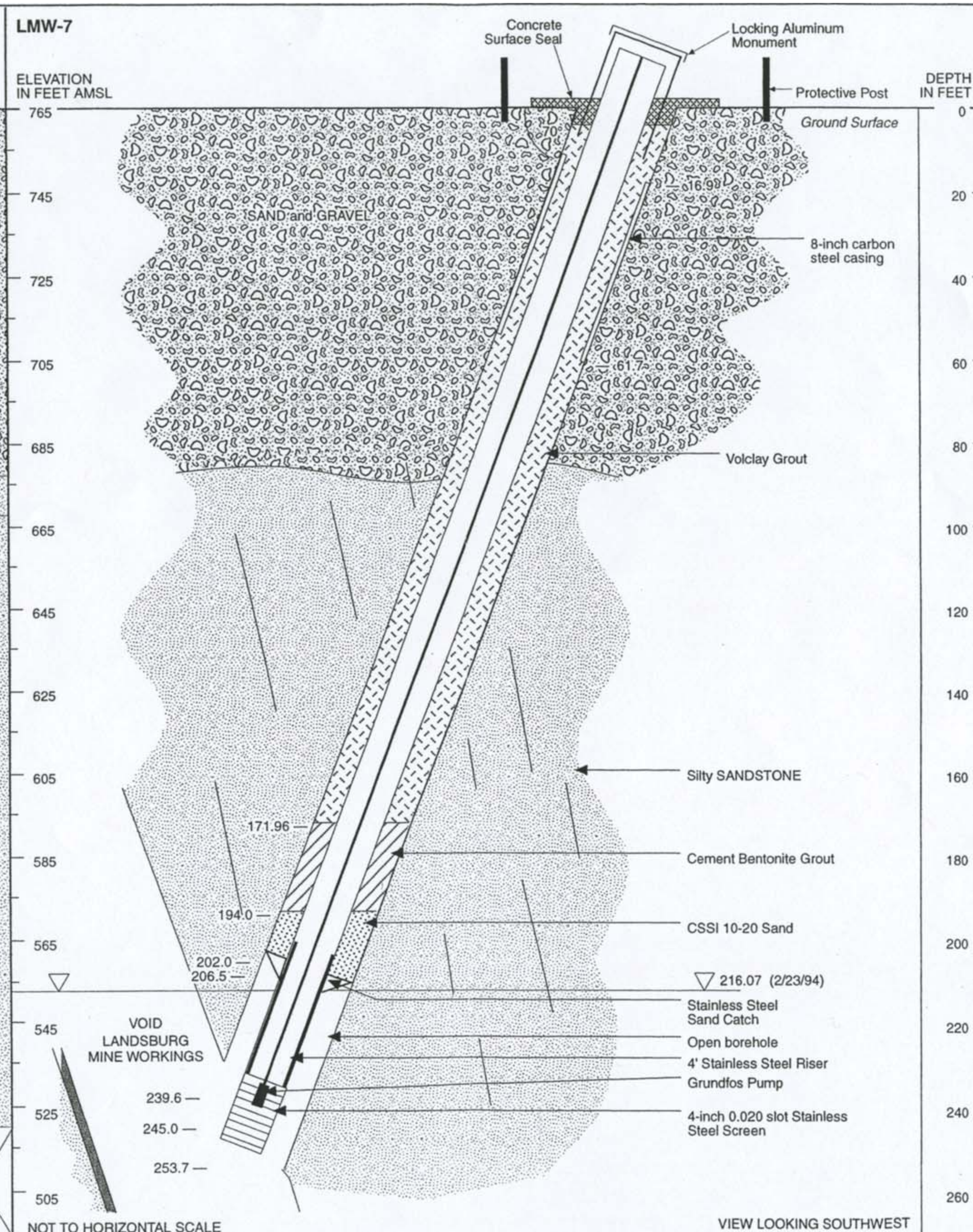
Golder Associates

STRATIGRAPHY
ENCOUNTERED DURING ROTARY DRILLING

DEPTH IN FEET	GENERAL SOIL DESCRIPTION
4.5	Dark yellowish brown (10YR 4/2) GRAVEL and SAND (drill pad and fill)
18.7	Medium gray (N5) clean BOULDER and COBBLE to olive gray (5Y4/1) sandy GRAVEL
82	Olive gray (5Y 4/1) gravelly, silty fine SAND to dark yellowish brown (10YR 4/2) SAND and GRAVEL, moist
87	Dark gray (N3) to grayish black (N2), ,silty fine SAND, little coal, little gravel
98	Fresh, dusky yellowish brown (10YR 2/2) to pale yellowish brown (10YR 6/2) silty SANDSTONE, slightly moist
245	Fresh, pale yellowish brown (10YR 6/2), silty, clayey, SANDSTONE, slightly moist
253.7	Void 245.0-281.0

Total Depth 281.0' bgs
Drilled to 253.7' bgs
Void to 281.0' bgs
Encountered water at approximately 225.0' bgs

GRAPHIC LOG



CONSTRUCTION SUMMARY

MONITORING WELL: LMW-7
SURVEY COORDINATES: N-138,112.1074, E-1,715,362.1856
GROUND SURFACE ELEVATION (MSL): 765.05'
TOP OF CASING (PVC) ELEVATION: 767.68'

DRILLING SUMMARY

TOTAL DEPTH:	253.72' bgs
BOREHOLE DIAMETER:	8-inch
INCLINATION:	70°
DRILLER:	Burlington Environmental
ENGINEER:	G. Zimmerman
DRILL METHOD(S):	Air Rotary
DRILL RIG	Schramm T-660
BITS:	7 7/8-Tricone
DRILLING FLUID:	Air

WELL DESIGN AND SPECIFICATIONS

CASING STRING(S) C = CASING S = SCREEN

STRINGS	DEPTH (FT)	ELEVATION (MSL)
C1	18.0 – 61.7	747.15 – 703.35
C2	-2.63 – 202.0	767.68 – 563.05
C3	202.0 – 239.6	563.05 – 525.45
S1	239.6 – 253.7	525.45 – 511.35

CASING: C1	8-inch Temporary Steel Casing
CASING: C2	4-inch Diameter, Schedule 80 PVC
CASING: C3	4-inch Stainless Steel Riser
SCREEN: S1	0.020-inch Slotted 4-inch Diameter Stainless Steel
FILTER PACK:	10-20 CSSI Sand
GROUT SEAL:	Volclay Grout
BENTONITE:	Bentonite Chips

PUMP AND PACKER SUMMARY

Dedicated Sampling Pump: 2-horsepower Grundfos Submersible Pump Model MPI

STRINGS	DEPTH (FT)	ELEVATION (MSL)
Sampling Pump Intake	242.44	522.61
Packer Assembly	NA	NA

STRATIGRAPHY AND WELL COMPLETION LOG LMW-7
PALMER/LANDSBURG MINE/WA

Golder Associates

RECORD OF BOREHOLE LMW-8

PROJECT: Landsburg Mine Site
PROJECT NUMBER: 923-1000.002.R280
LOCATION: Ravensdale, Washington

DRILLING METHOD: Becker Hammer
DRILLING DATE: 4-07-04
DRILL RIG: Foremost AP-1000

DATUM:
AZIMUTH: N/A
COORDINATES: N: 135,074.90 E: 1,353,229.41

ELEVATION: 645.1
INCLINATION: -90

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS per 6 in (140 lb hammer 30 inch drop)	N	REC / ATT	PENETRATION RESISTANCE BLOWS / ft (10 20 30 40); WATER CONTENT (PERCENT) W_p — W — W_l	NOTES WATER LEVELS WELL GRAPHIC
0	Becker Hammer	0.0 - 15.0 GM-Silty Gravels, Gravel-Sand-Silt Mixtures, Yellowish Brown, Some Sub-angular Sand, Loose, Wet at 9.0 feet.	GM									Portland Cement Type I-II (0-1'bgs)
3						1	GRAB					Static Water Level; Bentonite Grout Seal (1-6'bgs)
5												
6												20/40 Silica Sand (6-7.5'bgs)
8						2	GRAB					
10												10/20 Silica Filter Sand (7.5-13'bgs), Well Screen (8-13'bgs)
13						3	GRAB					
15		Boring completed at 15.0 ft.			630.1 / 15.0							
20												

1 in to 3 ft
DRILLING CONTRACTOR: Layne Christensen
DRILLER: Joe Macke

LOGGED: J. Kennedy
CHECKED: D. Morell
DATE: 6/21/2004

Golder Associates

RECORD OF BOREHOLE LMW-9

PROJECT: Landsburg Mine Site
PROJECT NUMBER: 923-1000.002.R280
LOCATION: Ravensdale, Washington

DRILLING METHOD: Becker Hammer
DRILLING DATE: 4-07-04 to 4-14-04
DRILL RIG: Foremost AP-1000

DATUM:
AZIMUTH: N/A
COORDINATES: N: 135,727.33 E: 1,353,324.04

ELEVATION: 741.17
INCLINATION: -90

BORING METHOD: Becker Hamme/Air Rotary

DEPTH (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)	NUMBER	TYPE	BLOWS per 6 in (140 lb hammer 30 inch drop)	N	REC / ATT	NOTES WATER LEVELS WELL GRAPHIC
0	0.0 - 44.0 GP-GM-Poorly Graded Gravels with Silt, Dark Yellowish Brown, Some Medium Sub-angular Sand, Loose, Dry	GP-GM							
5				1	GRAB				Portland Cement (0-10'bgs)
10				2	GRAB				
15				3	GRAB				
20				4	GRAB				
25				5	GRAB				
30				6	GRAB				
35				7	GRAB				
40				8	GRAB				
45	44.0 - 84.0 Sandy Siltstone-Gray to Dark Brown, Hard, Dry. Sample was breakable with fingers.		697.2 / 44.0	9	GRAB				
50				10	GRAB				
55				11	GRAB				
60				12	GRAB				
65				13	GRAB				
70				14	GRAB				
75				15	GRAB				Grout Seal (10-143.5'bgs)
80				16	GRAB				
85	84.0 - 111.0 Sandy Siltstone-Gray to Dark Brown, Colors Mottled Throughout Sample, Hard, Dry. Sample was breakable with fingers.		657.2 / 84.0	17	GRAB				
90				18	GRAB				
95				19	GRAB				Static Water Level
100									

PENETRATION RESISTANCE BLOWS / ft ■ (10, 20, 30, 40); WATER CONTENT (PERCENT) W_p — W — W_l

Log continued on next page

1 in to 13 ft
DRILLING CONTRACTOR: Layne Christensen
DRILLER: Joe Macke

LOGGED: J. Kennedy
CHECKED: D. Morell
DATE: 6/21/2004

Golder Associates

RECORD OF BOREHOLE LMW-9

PROJECT: Landsburg Mine Site
PROJECT NUMBER: 923-1000.002.R280
LOCATION: Ravensdale, Washington
DRILLING METHOD: Becker Hammer
DRILLING DATE: 4-07-04 to 4-14-04
DRILL RIG: Foremost AP-1000
DATUM:
AZIMUTH: N/A
COORDINATES: N: 135,727.33 E: 1,353,324.04
ELEVATION: 741.17
INCLINATION: -90

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS per 6 in (140 lb hammer 30 inch drop)	N	REC / ATT	PENETRATION RESISTANCE BLOWS / ft / WATER CONTENT (PERCENT) Wp W Wl (10 20 30 40)	NOTES WATER LEVELS WELL GRAPHIC
100	Becker Hammer/Air Rotary	84.0 - 111.0 Sandy Siltstone-Gray to Dark Brown, Colors Mottled Throughout Sample, Hard, Dry. Sample was breakable with fingers. *(Continued)*				20	GRAB					
105						21	GRAB					
110					630.2 / 111.0	22	GRAB					
		111.0 - 113.0 Sandy Siltstone-Gray to Dark Brown, Colors Mottled Throughout Sample, Small Flecks of coal in Sample, Very Hard, Wet. Sample was breakable with fingers.			628.2 / 113.0	23	GRAB					
115		113.0 - 118.0 Sandy Siltstone-Gray to Dark Brown, Colors Mottled Throughout Sample, Hard, Dry. Sample was breakable with fingers.			623.2 / 118.0							
120		118.0 - 150.0 Sandy Siltstone-Gray to Dark Brown, Colors Mottled Throughout Sample, Hard, Wet. Sample was breakable with fingers.				24	GRAB					
125						25	GRAB					
130						26	GRAB					
135						27	GRAB					
140						28	GRAB					
145						29	GRAB					20/40 Silica Sand (143-146'bgs)
150					591.2 / 150.0	30	GRAB					
		150.0 - 160.0 Sandy Siltstone-Gray to Dark Brown, Colors Mottled Throughout Sample, Laminations Apparent in Sample, Small Flecks of coal in Samples, Very Hard, Very Wet. Sample was breakable with fingers. Possible Rubble Zone of old Mine Workings.				31	GRAB					10/20 Silica Sand (146-159'bgs)
						32	GRAB					
155						33	GRAB					Well Screen (149-159'bgs)
160					581.2 / 160.0	34	GRAB					
		Boring completed at 159.0 ft.										
165												
170												
175												
180												
185												
190												
195												
200												

1 in to 13 ft
DRILLING CONTRACTOR: Layne Christensen
DRILLER: Joe Macke

LOGGED: J. Kennedy
CHECKED: D. Morell
DATE: 6/21/2004

Golder Associates

RECORD OF BOREHOLE LMW-10

PROJECT: Landsburg Mine Site
PROJECT NUMBER: 923-1000.002.R280
LOCATION: Ravensdale, Washington
DRILLING METHOD: Becker Hammer
DRILLING DATE: 4-23-04 to 5-11-04
DRILL RIG: Foremost AP-1000
DATUM:
AZIMUTH: N/A
COORDINATES: not surveyed
ELEVATION: N/A
INCLINATION: -90

BORING METHOD: Becker Hammer/Air Rotary

DEPTH (ft)	DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLE NUMBER	TYPE	BLOWS per 6 in (140 lb hammer 30 inch drop)	N	REC / ATT	NOTES WATER LEVELS WELL GRAPHIC
0	0.0 - 6.5 Gm-Silty Gravels- Gravel-Sand-Silt Mixtures, Dark Yellowish Brown, Medium to Coarse Sub-angular sand, Loose, Damp	GM							Portland Cement Type I-II (0-2'bgs)
6.5	6.5 - 15.0 Sandy-Siltstone-Yellowish Brown, Fine, Stiff, Dry		6.5						
10				1	GRAB				
15	15.0 - 79.0 Siltstone-Dark Brown/Gray, Hard(Breakable w/ Fingers), Dry		15.0						
20				2	GRAB				
30				3	GRAB				
40				4	GRAB				
50				5	GRAB				
60				6	GRAB				
70				7	GRAB				
79	79.0 - 80.0 Siltstone-Dark Brown/Gray, Hard(Breakable w/ Fingers), Small Fracture Zone of Clayey Material, Wet								
80	80.0 - 105.0 Siltstone-Dark Brown/Gray, Hard(Breakable w/ Fingers), Dry		80.0	8	GRAB				
90				9	GRAB				

PENETRATION RESISTANCE BLOWS / ft ■ (10, 20, 30, 40)
WATER CONTENT (PERCENT) W_p — W — W_l

Static Water Level

Log continued on next page

1 in to 13 ft
DRILLING CONTRACTOR: Layne Christensen
DRILLER: Joe Macke
LOGGED: J. Kennedy
CHECKED: D. Morell
DATE: 6/21/2004

Golder Associates

RECORD OF BOREHOLE LMW-10

PROJECT: Landsburg Mine Site
PROJECT NUMBER: 923-1000.002.R280
LOCATION: Ravensdale, Washington
DRILLING METHOD: Becker Hammer
DRILLING DATE: 4-23-04 to 5-11-04
DRILL RIG: Foremost AP-1000
DATUM:
AZIMUTH: N/A
COORDINATES: not surveyed
ELEVATION: N/A
INCLINATION: -90

DEPTH (ft)	BORING METHOD	SOIL PROFILE – DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES – NUMBER	TYPE	BLOWS per 6 in (140 lb hammer 30 inch drop)	N	REC / ATT	PENETRATION RESISTANCE BLOWS / ft (10 20 30 40) / WATER CONTENT (PERCENT) W_p — W — W_l	NOTES WATER LEVELS WELL GRAPHIC
100	Becker Hammer/Air Rotary	80.0 - 105.0 Siltstone-Dark Brown/Gray, Hard(Breakable w/ Fingers), Dry *(Continued)*				10	GRAB					
105		105.0 - 106.0 Siltstone-Dark Brown/Gray, Hard(Breakable w/ Fingers), Small Fracture Zone of Clayey Material, Wet			106.0							
110		106.0 - 153.0 Siltstone-Dark Brown/Gray, Hard(Breakable w/ Fingers), Dry				11	GRAB					
120						12	GRAB					
130						13	GRAB					Grout Bentonite Seal (2-258'bgs)
140						14	GRAB					
150						15	GRAB					
155		153.0 - 170.0 Siltstone-Dark Brown/Gray, Hard(Breakable w/ Fingers), Some Metallic Flecks in Sample, Dry			153.0							
160						16	GRAB					
170		170.0 - 181.0 Siltstone-Dark Brown/Gray, Hard(Not Breakable w/ Fingers), Dry			170.0	17	GRAB					
180						18	GRAB					
185		181.0 - 189.0 Siltstone-Mottled Dark Brown/Gray, Hard(Breakable w/ Fingers), Dry			181.0							
190		189.0 - 199.0 Siltstone-Mottled Dark Brown/Gray, Hard(Breakable w/ Fingers),Small Flecks of Coal in Sample, Dry			189.0	19	GRAB					
200					199.0							

Log continued on next page

1 in to 13 ft
DRILLING CONTRACTOR: Layne Christensen
DRILLER: Joe Macke

LOGGED: J. Kennedy
CHECKED: D. Morell
DATE: 6/21/2004

Golder Associates

RECORD OF BOREHOLE LMW-10

PROJECT: Landsburg Mine Site
PROJECT NUMBER: 923-1000.002.R280
LOCATION: Ravensdale, Washington

DRILLING METHOD: Becker Hammer
DRILLING DATE: 4-23-04 to 5-11-04
DRILL RIG: Foremost AP-1000

DATUM:
AZIMUTH: N/A
COORDINATES: not surveyed

ELEVATION: N/A
INCLINATION: -90

DEPTH (ft)	BORING METHOD	DESCRIPTION	USCS	ELEV. / DEPTH (ft)	SAMPLE NUMBER	TYPE	BLOWS per 6 in (140 lb hammer 30 inch drop)	N	REC / ATT	NOTES WATER LEVELS WELL GRAPHIC
200	Becker Hammer/Air Rotary	199.0 - 211.0 Siltstone-Dark Brown/Gray, Hard(Breakable w/ Fingers), Dry *(Continued)*			20	GRAB				
210					21	GRAB				
211		211.0 - 259.0 Siltstone-Dark Brown/Gray, Hard(Breakable w/ Fingers), Dry		211.0						
220					22	GRAB				
230					23	GRAB				
240					24	GRAB				
250					25	GRAB				
258										20/40 Silica Sand (258-260'bgs)
259		259.0 - 265.0 Siltstone-Light Brown/Gray, Hard(Not Breakable w/ Fingers), Dry		259.0						
260					26	GRAB				
265		265.0 - 266.0 Siltstone-Dark Brown/Gray, Hard(Breakable w/ Fingers), Fracture Zone of Clayey Material, Wet								
266		266.0 - 283.0 Siltstone- Dark Brown/Gray, Hard(Breakable w/ Fingers),Small Pieces of Coal in Sample, Wet		266.0						
270					27	GRAB				10/20 Silica Sand (260-287'bgs)
275										Well Screen (267-287'bgs)
280					28	GRAB				
283		283.0 - 289.0 Siltstone- Dark Brown/Gray, Hard(Breakable w/ Fingers), Small Pieces of Coal in Sample, Wet. NOTE-Small to Medium (3" to 4" Diameter) Rounded Cobbles. (Possible Rubble Zone of old Mine Workings.)		283.0						20/40 Silica Sand (287-289'bgs)
289		289.0 - 450.0 Siltstone-Dark Brown/Gray, Hard(Breakable w/ Fingers), Dry		289.0						
290					29	GRAB				
300										

PENETRATION RESISTANCE BLOWS / ft ■ 10 20 30 40
WATER CONTENT (PERCENT) W_p —W— W_l

Log continued on next page

1 in to 13 ft
DRILLING CONTRACTOR: Layne Christensen
DRILLER: Joe Macke

LOGGED: J. Kennedy
CHECKED: D. Morell
DATE: 6/21/2004

Golder Associates

RECORD OF BOREHOLE LMW-10

PROJECT: Landsburg Mine Site
PROJECT NUMBER: 923-1000.002.R280
LOCATION: Ravensdale, Washington
DRILLING METHOD: Becker Hammer
DRILLING DATE: 4-23-04 to 5-11-04
DRILL RIG: Foremost AP-1000
DATUM:
AZIMUTH: N/A
COORDINATES: not surveyed
ELEVATION: N/A
INCLINATION: -90

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS per 6 in (140 lb hammer 30 inch drop)	N	REC / ATT	PENETRATION RESISTANCE BLOWS / ft (10 20 30 40) / WATER CONTENT (PERCENT) W_p — W — W_l	NOTES WATER LEVELS WELL GRAPHIC
300	Becker Hammer/Air Rotary	289.0 - 450.0 Siltstone-Dark Brown/Gray, Hard(Breakable w/ Fingers), Dry *(Continued)*				30	GRAB					
305												
310						31	GRAB					
315												
320						32	GRAB					
325												
330						33	GRAB					
335												
340						34	GRAB					
345												
350						35	GRAB					
355												
360						36	GRAB					
365												
370						37	GRAB					Portland Cement Type I-II (289-450'bgs)
375												
380						38	GRAB					
385												
390						39	GRAB					
395												
400												

Log continued on next page

1 in to 13 ft
DRILLING CONTRACTOR: Layne Christensen
DRILLER: Joe Macke

LOGGED: J. Kennedy
CHECKED: D. Morell
DATE: 6/21/2004

Golder Associates

RECORD OF BOREHOLE LMW-11

PROJECT: Palmer/Landsburg Mine
PROJECT NUMBER: 923-1000-002.R280
LOCATION: Landsburg Mine, Ravensdale, WA
CLIENT:

DRILLING METHOD: Air Rotary
DRILLING DATE: 8/24/05
DRILL RIG: Ingersoll Rand T3W

DATUM:
AZIMUTH: n/a
COORDS: n/a

GS ELEVATION: 798
TOC ELEVATION:
INCLINATION: -90

DEPTH (ft)	BORING METHOD	DESCRIPTION	ICE BOND	USCS	ELEV. / DEPTH (ft)	NUMBER	TYPE	BLOWS per 6 in	N	REC / ATT	NOTES / WATER LEVELS
0	air rotary	0.0 - 0.3 QUARRY SPALLS (1 to 3 inch diameter)		SM	796.0 / 0.3						8 in. diameter monument pipe, 2.3 ft stickup, Pipe Clamp at 2.3 ft.
		0.3 - 2.0 Loose to compact, brown, silty fine SAND, trace to little medium to coarse sand and gravel, trace cobbles, little to some organics, dry. (SM) (TOPSOIL)			2.0	G-1	GRAB		--		
5						G-2	GRAB		--		concrete 0 to 9.5 ft
		2.0 - 27.0 Dense, tan, silty gravelly SAND to silty sandy GRAVEL, trace cobbles and boulders, subangular to subrounded, faceted, scattered gravel lenses, damp. (SM) (GLACIAL TILL)		SM							4-inch PVC well pipe
		Refusal on 3-foot diameter boulder. Move hole 3 feet south and 3 feet west.				G-3	GRAB		--		Centralizer
20		becomes gray.				G-4	GRAB		--		Cement Grout 9.5 to 33 ft
27		27.0 - 119.0 Fresh, thinly to thickly laminated, brownish gray (5YR 6/1) and light gray (N7), fine to medium grained, weak (R2) to medium strong (R4), interbedded, SILTSTONE, silty fine SANDSTONE, fine sandy SILTSTONE, (Puget Group), scattered thin coal laminae, beds dipping at approximately 70 degrees to west.			771.0 / 27.0	G-5	GRAB		--		
30						G-6	GRAB		--		Transition from a 12 in. hole to a 9 in. hole
40						G-7	GRAB		--		Bentonite Chips 33 to 43 ft
45						G-8	GRAB		--		"Pure Gold" Bentonite Grout 43 to 623.5 ft
53						G-9	GRAB		--		
71						G-10	GRAB		--		
80											

Log continued on next page

DEPTH SCALE:1 in to 10 ft
DRILLING CONTRACTOR: Cascade Drilling Inc.
DRILLER: Todd/Jarod

LOGGED: JdLC / AMJ
CHECKED:
DATE:

Golder Associates

Figure

RECORD OF BOREHOLE LMW-11

PROJECT: Palmer/Landsburg Mine
PROJECT NUMBER: 923-1000-002.R280
LOCATION: Landsburg Mine, Ravensdale, WA
CLIENT:

DRILLING METHOD: Air Rotary
DRILLING DATE: 8/24/05
DRILL RIG: Ingersoll Rand T3W

DATUM:
AZIMUTH: n/a
COORDS: n/a

GS ELEVATION: 798
TOC ELEVATION:
INCLINATION: -90

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION / VEGETATION:	ICE BOND	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS per 6 in (Hammer Weight: () Drop:)	N	REC / ATT	PENETRATION RESISTANCE BLOWS / ft ■ (0 0 0 0); WATER CONTENT (PERCENT) W_p ⊢ ⊖W ⊣ W_l (0 0 0 0)	NOTES WATER LEVELS GRAPHIC
80		27.0 - 119.0 Fresh, thinly to thickly laminated, brownish gray (5YR 6/1) and light gray (N7), fine to medium grained, weak (R2) to medium strong (R4), interbedded, SILTSTONE, silty fine SANDSTONE, fine sandy SILTSTONE, (Puget Group), scattered thin coal laminae, beds dipping at approximately 70 degrees to west. *(Continued)*											
85							G-11	GRAB		--			
90													
95							G-12	GRAB		--			
100													measured overnight during drilling 103.2 ft 8/31/05; 103.9 ft 9/1/05; Perched water level measured during drilling.
105													
110							G-13	GRAB		--			
115													
120	air rotary	119.0 - 138.0 Fresh, thinly laminated, light brown gray (5YR 6/1) to pinkish gray, interbedded, fine to medium grained, very weak (R1) to weak (R2), silty fine to medium SANDSTONE, and, fine sandy SILTSTONE, with scattered thin laminae of coal (Puget Group).				679.0 / 119.0	G-14	GRAB		--			"Pure Gold" Bentonite Grout
125													
130							G-15	GRAB		--			
135													
140		138.0 - 172.0 Fresh, laminated, light brownish gray (5YR 6/1) and light gray, fine grained, medium strong (R3), silty fine SANDSTONE (Puget Group).				660.0 / 138.0	G-16	GRAB		--			measured overnight during drilling 142.8 ft; 143.6 ft; 144 ft; 9/13/05; 9/6/05
145													
150		becomes very light gray (N8)					G-17	GRAB		--			
155													measured post drilling 155.3 ft 9/19/05; 155.4 ft 9/20/05; 9/21/05; Static ground water measured during well installation.
160													

Log continued on next page

DEPTH SCALE:1 in to 10 ft
DRILLING CONTRACTOR: Cascade Drilling Inc.
DRILLER: Todd/Jarod

LOGGED: JdLC / AMJ
CHECKED:
DATE:

Figure

RECORD OF BOREHOLE LMW-11

DRILLING METHOD: Air Rotary
DRILLING DATE: 8/24/05
DRILL RIG: Ingersoll Rand T3W

DATUM:
AZIMUTH: n/a
COORDS: n/a

GS ELEVATION: 798
TOC ELEVATION:
INCLINATION: -90

DEPTH (ft)	BORING METHOD	DESCRIPTION	ELEV. / DEPTH (ft)	SAMPLE NUMBER	TYPE	N	NOTES / WATER LEVELS
160	air rotary	138.0 - 172.0 Fresh, laminated, light brownish gray (5YR 6/1) and light gray, fine grained, medium strong (R3), silty fine SANDSTONE (Puget Group). *(Continued)*		G-18	GRAB	--	
165		becomes light brownish gray					
172		172.0 - 258.0 Fresh, thinly laminated, light brownish gray (5YR 6/1) and and light gray, fine grained, medium strong (R3), alternating fine sandy SILTSTONE and silty fine SANDSTONE (PUGET GROUP).	626.0 / 172.0	G-19	GRAB	--	
185							"Pure Gold" Bentonite Grout 43 to 623.5 ft
188		becomes very light gray, silty fine to medium SANDSTONE		G-20	GRAB	--	
195		becomes light brownish gray, SILTSTONE					
198		becomes interbedded SILTSTONE AND SANDSTONE					
200				G-21	GRAB	--	
205		becomes very light gray, silty fine to medium SANDSTONE					
207		becomes light brownish gray, SILTSTONE					
210				G-22	GRAB	--	
220		becomes very light gray, silty fine to medium SANDSTONE		G-23	GRAB	--	
226				G-25	GRAB	--	
227		becomes interbedded silty fine SANDSTONE and fine sandy SILTSTONE					
232				G-24	GRAB	--	
240							

Log continued on next page

RECORD OF BOREHOLE LMW-11

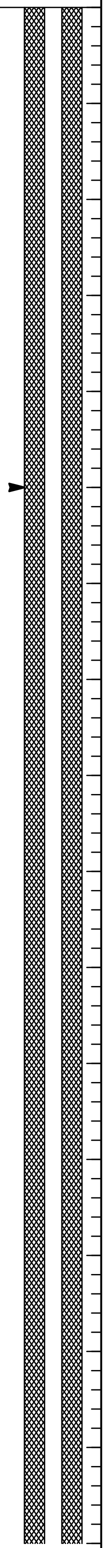
PROJECT: Palmer/Landsburg Mine
PROJECT NUMBER: 923-1000-002.R280
LOCATION: Landsburg Mine, Ravensdale, WA
CLIENT:

DRILLING METHOD: Air Rotary
DRILLING DATE: 8/24/05
DRILL RIG: Ingersoll Rand T3W

DATUM:
AZIMUTH: n/a
COORDS: n/a

GS ELEVATION: 798
TOC ELEVATION:
INCLINATION: -90

DEPTH (ft)	BORING METHOD	DESCRIPTION	ELEV. / DEPTH (ft)	NUMBER	TYPE	N	NOTES / WATER LEVELS
240	air rotary	172.0 - 258.0 Fresh, thinly laminated, light brownish gray (5YR 6/1) and and light gray, fine grained, medium strong (R3), alternating fine sandy SILTSTONE and silty fine SANDSTONE (PUGET GROUP). *(Continued)*					
247		becomes very light gray, silty fine to medium SANDSTONE					
258		258.0 - 311.0 Fresh, laminated, very light gray and light brownish gray, fine grained, strong (R4), interbedded silty fine to medium SANDSTONE and fine sandy SILTSTONE (Puget Group).	540.0 / 258.0				
262				G-26	GRAB	--	
265							"Pure Gold" Bentonite Grout 43 to 623.5 ft
267		becomes light brownish gray, SILTSTONE, trace fine organics (peat/coal)					
276				G-27	GRAB	--	
280		becomes very light gray, strong (R4), silty fine to medium SANDSTONE					
283		becomes medium strong (R3)					
288				G-28	GRAB	--	
290		becomes strong (R4)					
294		harder drilling, coarse cuttings					
296		becomes weak (R2), crumbly SANDSTONE					
300				G-29	GRAB	--	
301		becomes strong (R4), SILTSTONE					
308				G-30	GRAB	--	
311		311.0 - 380.0 Fresh, laminated, light olive gray and brownish gray, fine grained, medium strong (R2), interbedded, fine sandy SILTSTONE and silty fine to medium SANDSTONE (Puget Group), trace thin laminae of shale and coal.	487.0 / 311.0				
317		trace fine brown organics (peat) within SILTSTONE		G-31	GRAB	--	
320							



Log continued on next page

Golder Associates

DEPTH SCALE:1 in to 10 ft
DRILLING CONTRACTOR: Cascade Drilling Inc.
DRILLER: Todd/Jarod

LOGGED: JdLC / AMJ
CHECKED:
DATE:

Figure

RECORD OF BOREHOLE LMW-11

DRILLING METHOD: Air Rotary
DRILLING DATE: 8/24/05
DRILL RIG: Ingersoll Rand T3W

DATUM:
AZIMUTH: n/a
COORDS: n/a

GS ELEVATION: 798
TOC ELEVATION:
INCLINATION: -90

DEPTH (ft)	BORING METHOD	SOIL PROFILE: DESCRIPTION (VEGETATION:)	ICE BOND	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	BLOWS per 6 in (Hammer Weight: () Drop:)	N	REC / ATT	PENETRATION RESISTANCE BLOWS / ft ■ (0 0 0 0); WATER CONTENT (PERCENT) W_p —O^W— W_l (0 0 0 0)	NOTES WATER LEVELS GRAPHIC
320	air rotary	311.0 - 380.0 Fresh, laminated, light olive gray and brownish gray, fine grained, medium strong (R2), interbedded, fine sandy SILTSTONE and silty fine to medium SANDSTONE (Puget Group), trace thin laminae of shale and coal. *(Continued)*											
325													
		becomes very light gray, silty fine to medium SANDSTONE with trace very thin coal laminae					G-32	GRAB		--			
330		becomes interbedded SILTSTONE and SANDSTONE with trace coal laminae											
335							G-33	GRAB		--			
340													
		becomes silty fine to medium SANDSTONE, medium strong (R3), trace coal laminae					G-34	GRAB		--			
345													
350													"Pure Gold" Bentonite Grout 43 to 623.5 ft
355							G-35	GRAB		--			
360		becomes brownish gray, laminated, SILTSTONE					G-36	GRAB		--			
365													
370		becomes interbedded SILTSTONE and SANDSTONE, fractured, minor water produced from formation					G-37	GRAB		--			
375							G-38	GRAB		--			
380		380.0 - 391.0 Fresh, crudely laminated, very light gray to pale yellowish brown (10YR 6/2), strong (R4), silty fine SANDSTONE (Puget Group), trace coal laminae, trace siltstone laminae, healed 1/16-inch wide joints with CaC03 infilling.				418.0 / 380.0							
385													
390		391.0 - 421.0 Fresh, laminated, very light gray, fine grained, medium strong (R3), silty fine to medium SANDSTONE (Puget Group), trace siltstone laminae, mild reaction with HCl.				407.0 / 391.0	G-39	GRAB		--			
395							G-40	GRAB		--			
400													

Log continued on next page

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DEPTH SCALE:1 in to 10 ft
DRILLING CONTRACTOR: Cascade Drilling Inc.
DRILLER: Todd/Jarod

LOGGED: JdLC / AMJ
CHECKED:
DATE:

Figure

PROJECT: Palmer/Landsburg Mine
PROJECT NUMBER: 923-1000-002.R280
LOCATION: Landsburg Mine, Ravensdale, WA
CLIENT:

RECORD OF BOREHOLE LMW-11

DRILLING METHOD: Air Rotary
DRILLING DATE: 8/24/05
DRILL RIG: Ingersoll Rand T3W

DATUM:
AZIMUTH: n/a
COORDS: n/a

GS ELEVATION: 798
TOC ELEVATION:
INCLINATION: -90

DEPTH (ft)	BORING METHOD	DESCRIPTION	ELEV. / DEPTH (ft)	NUMBER	TYPE	BLOWS per 6 in	N	NOTES / WATER LEVELS
400	air rotary	391.0 - 421.0 Fresh, laminated, very light gray, fine grained, medium strong (R3), silty fine to medium SANDSTONE (Puget Group), trace siltstone laminae, mild reaction with HCl. *(Continued)*						
410				G-41	GRAB		--	
421		421.0 - 500.0 Fresh, laminated, light olive gray and brownish gray, fine grained, weak (R2) to medium strong (R3), interbedded, fine sandy SILTSTONE and silty fine to medium SANDSTONE (Puget Group).	377.0 / 421.0	G-42	GRAB		--	
428		becomes weak (R2), silty fine SANDSTONE						"Pure Gold" Bentonite Grout 43 to 623.5 ft
431		becomes SILTSTONE						
434		becomes weak (R2), interbedded silty fine SANDSTONE and fine sandy SILTSTONE						
435				G-43	GRAB		--	
439		becomes medium strong (R3), SILTSTONE						
445				G-44	GRAB		--	
447		becomes weak (R2), silty fine to medium SANDSTONE with scattered SILTSTONE beds.						
455				G-45	GRAB		--	
468				G-46	GRAB		--	
470		becomes medium strong (R3), SANDSTONE with trave very thin coal laminae						
473		becomes weak (R1), SANDSTONE						
480								

Log continued on next page

DEPTH SCALE:1 in to 10 ft
DRILLING CONTRACTOR: Cascade Drilling Inc.
DRILLER: Todd/Jarod

LOGGED: JdLC / AMJ
CHECKED:
DATE:

Figure

RECORD OF BOREHOLE LMW-11

PROJECT: Palmer/Landsburg Mine
PROJECT NUMBER: 923-1000-002.R280
LOCATION: Landsburg Mine, Ravensdale, WA
CLIENT:

DRILLING METHOD: Air Rotary
DRILLING DATE: 8/24/05
DRILL RIG: Ingersoll Rand T3W

DATUM:
AZIMUTH: n/a
COORDS: n/a

GS ELEVATION: 798
TOC ELEVATION:
INCLINATION: -90

DEPTH (ft)	BORING METHOD	SOIL PROFILE – DESCRIPTION (VEGETATION:)	ICE BOND	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES NUMBER	TYPE	BLOWS per 6 in (Hammer Weight: () Drop:)	N	REC / ATT	PENETRATION RESISTANCE BLOWS / ft / WATER CONTENT (PERCENT) Wp W Wl	NOTES WATER LEVELS GRAPHIC
480	air rotary	421.0 - 500.0 Fresh, laminated, light olive gray and brownish gray, fine grained, weak (R2) to medium strong (R3), interbedded, fine sandy SILTSTONE and silty fine to medium SANDSTONE (Puget Group). *(Continued)*											
485		becomes interbedded SILTSTONE and SANDSTONE					G-47	GRAB		--			
490		becomes weak (R2), silty fine to medium SANDSTONE with scattered thin coal laminae											
495							G-48	GRAB		--			
500		500.0 - 520.0 Fresh, laminated, light olive gray, brownish gray (5YR 4/1), and pale yellowish brown (10YR 6/2), fine grained, weak (R2), interbedded, silty fine to medium SANDSTONE and coaly SILTSTONE and coaly SHALE (Puget Group).				298.0 500.0	G-49	GRAB		--			
510													"Pure Gold" Bentonite Grout 43 to 623.5 ft
515		hole producing minor water					G-50	GRAB		--			
518							G-51	GRAB		--			
520		520.0 - 532.0 Fresh, laminated, brownish gray (5YR 4/1) and pale yellowish brown (10 YR 6/2), weak (R2) to medium strong (R3), interbedded, SILTSTONE, and silty fine SANDSTONE (Puget Group). hole producing minor water				278.0 520.0	G-52	GRAB		--			
530							G-53	GRAB		--			
532		532.0 - 585.0 Fresh, laminated, brownish gray, fine grained, medium strong (R3), silty fine to SANDSTONE (Puget Group).				266.0 532.0							
540							G-54	GRAB		--			
555							G-55	GRAB		--			
560													

Log continued on next page

DEPTH SCALE:1 in to 10 ft
DRILLING CONTRACTOR: Cascade Drilling Inc.
DRILLER: Todd/Jarod

LOGGED: JdLC / AMJ
CHECKED:
DATE:

Golder Associates

Figure

RECORD OF BOREHOLE LMW-11

PROJECT: Palmer/Landsburg Mine
PROJECT NUMBER: 923-1000-002.R280
LOCATION: Landsburg Mine, Ravensdale, WA
CLIENT:

DRILLING METHOD: Air Rotary
DRILLING DATE: 8/24/05
DRILL RIG: Ingersoll Rand T3W

DATUM:
AZIMUTH: n/a
COORDS: n/a

GS ELEVATION: 798
TOC ELEVATION:
INCLINATION: -90

VEGETATION:

DEPTH (ft)	BORING METHOD	DESCRIPTION	ELEV. / DEPTH (ft)	SAMPLE NUMBER	TYPE	N	NOTES / WATER LEVELS
560	air rotary	532.0 - 585.0 Fresh, laminated, brownish gray, fine grained, medium strong (R3), silty fine to SANDSTONE (Puget Group). *(Continued)*					
565		silty fine SANDSTONE grading in and out of sandy SILTSTONE.					
		fractured/jointed, coarse cuttings, minor water produced from formation		G-56	GRAB	--	
577				G-57	GRAB	--	
583		fractured/jointed, coarse cuttings, minor water produced from formation		G-58	GRAB	--	
585		585.0 - 645.0 Fresh, laminated, brownish gray, fine grained, weak (R2) to medium strong (R3), interbedded, fine sandy SILTSTONE and silty fine to medium SANDSTONE (Puget Group).	213.0 / 585.0				
597				G-59	GRAB	--	
600							"Pure Gold" Bentonite Grout 43 to 623.5 ft
606				G-60	GRAB	--	
614		fractured/jointed, coarse cuttings, minor water produced from formation		G-61	GRAB	--	
628				G-62	GRAB	--	
630							Transition from a 9 in. hole to a 8 in. hole
636							Cement Grout 623.5 to 649 ft
637				G-63	GRAB	--	

Log continued on next page

DEPTH SCALE: 1 in to 10 ft
DRILLING CONTRACTOR: Cascade Drilling Inc.
DRILLER: Todd/Jarod

LOGGED: JdLC / AMJ
CHECKED:
DATE:

Golder Associates

Figure

PROJECT: Palmer/Landsburg Mine
PROJECT NUMBER: 923-1000-002.R280
LOCATION: Landsburg Mine, Ravensdale, WA
CLIENT:

RECORD OF BOREHOLE LMW-11

DRILLING METHOD: Air Rotary
DRILLING DATE: 8/24/05
DRILL RIG: Ingersoll Rand T3W

DATUM:
AZIMUTH: n/a
COORDS: n/a

GS ELEVATION: 798
TOC ELEVATION:
INCLINATION: -90

DEPTH (ft)	BORING METHOD	SOIL PROFILE — DESCRIPTION (VEGETATION:)	ICE BOND	USCS	ELEV. / DEPTH (ft)	SAMPLES NUMBER	TYPE	BLOWS per 6 in (Hammer Weight: () Drop:)	N	REC / ATT	NOTES / WATER LEVELS / GRAPHIC
640	air rotary	585.0 - 645.0 Fresh, laminated, brownish gray, fine grained, weak (R2) to medium strong (R3), interbedded, fine sandy SILTSTONE and silty fine to medium SANDSTONE (Puget Group). *(Continued)*			153.0 645.0						
645		645.0 - 657.0 Fresh, laminated, brownish gray, fine grained, weak (R2) to medium strong (R3), silty fine to SANDSTONE (Puget Group).				G-64	GRAB		--		10/20 silica sand used for sounding hole
655		657.0 - 700.0 Fresh, laminated, brownish gray to dark gray, fine grained, weak (R2) to medium strong (R3), interbedded, silty fine to SANDSTONE and fine sandy SILTSTONE (Puget Group), scattered thin coal laminae.			141.0 657.0	G-65	GRAB		--		Bentonite Pellets 651 to 665 ft
663		metal shavings in cuttings									
665		increase in water produced from formation				G-66	GRAB		--		10/20 silica sand used for sounding hole
668		scattered wood fragments, some painted									
672						G-67	GRAB		--		
678		scattered wood fragments (to 1/2-inch diamter), and trace metal shavings				G-68	GRAB		--		Bentonite Pellets 667 to 688 ft
680		680 to 690 feet-water produced from formation									Centralizer
683						G-69	GRAB		--		
688		metal shavings in cuttings				G-70	GRAB		--		20/40 Sand (Colorado Silica) 688 to 690 ft
690		becomes brownish gray to dark gray to light gray									Centralizer 10/20 Sand Pack (Colorado Silica) 690 to 707 ft
698					98.0 700.0	G-71	GRAB		--		
700		700.0 - 707.0 Fresh, laminated, black, very fine grained, very weak (R1), bituminous? COAL (Puget Group).									Stainless steel screen, double walled, pre-packed sand pack
705		hole producing very large volumes of water (>400 gallons/minute), returned drill water becomes black, cuttings are coarse chunks of angular COAL and brownish gray silty fine SANDSTONE and SILTSTONE. This is a rubbley zone (according to the driller) that represents the collapsed mine.			91.0	G-72	GRAB		--		Centralizer
707						G-73	GRAB		--		S.S. ring bit left in hole

Borehole completed at 707.0 ft.

Depth scale: 640, 645, 650, 655, 660, 665, 670, 675, 680, 685, 690, 695, 700, 705, 710, 715, 720

PENETRATION RESISTANCE BLOWS / ft ■ 0 0 0 0
WATER CONTENT (PERCENT) W_p W W_l 0 0 0 0

Golder Associates

DEPTH SCALE:1 in to 10 ft
DRILLING CONTRACTOR: Cascade Drilling Inc.
DRILLER: Todd/Jarod

LOGGED: JdLC / AMJ
CHECKED:
DATE:

Figure

RECORD OF BOREHOLE P-2

PROJECT: Landsburg Mine Site
PROJECT NUMBER: 923-1000.002.R280
LOCATION: Ravensdale, Washington
DRILLING METHOD: Becker Hammer
DRILLING DATE: 4-16-04
DRILL RIG: Foremost AP-1000
DATUM:
AZIMUTH: N/A
COORDINATES: N: 135,118.35 E: 1,353,212.70
ELEVATION: 648.7
INCLINATION: -90

DEPTH (ft)	BORING METHOD	DESCRIPTION	USCS	ELEV. / DEPTH (ft)	NUMBER	TYPE	BLOWS per 6 in (140 lb hammer 30 inch drop)	N	REC / ATT	PENETRATION RESISTANCE BLOWS / ft / WATER CONTENT (PERCENT)	NOTES WATER LEVELS PIEZOMETER GRAPHIC
0	Becker Hammer	0.0 - 19.0 GM-Silty Gravels-GRAVEL-Sand-Silt Mixtures, Light to Dark Brown, Loose, Moist	GM								Portland Cement Type I-II (0-2'bgs)
10					1	GRAB					Grout Bentonite Seal (2-15'bgs)
15					2	GRAB					
19		19.0 - 39.0 GP-Poorly Graded Gravels-GRAVEL-Sand Mixtures with Silt, Light to Dark Brown, Loose, Moist	GP-GM	629.7 / 19.0							
20					3	GRAB					Collapse Zone. Well was installed and casing was pulled back to allow borehole to collapse around the well to create seal above open mine shaft (15-39'bgs).
25					4	GRAB					
30					5	GRAB					
35					6	GRAB					
39		39.0 - 44.0 Void	void	609.7 / 39.0							
40					7	GRAB					Well Screen (39-44'bgs)
44		44.0 - 68.0 CL-Inorganic Silty Clay of Medium Plasticity	CL	604.7 / 44.0							
45					8	GRAB					
50					9	GRAB					
55					10	GRAB					Bentonite Chips (44-70'bgs)
60					11	GRAB					
65					12	GRAB					
68		68.0 - 70.0 Sandstone-Dark to Light Yellowish Brown, Stiff, Dry		580.7 / 68.0							
70		Boring completed at 70.0 ft.		578.7 / 70.0	13	GRAB					

Static Water Level

1 in to 10 ft
DRILLING CONTRACTOR: Layne Christensen
DRILLER: Joe Macke

LOGGED: J. Kennedy
CHECKED: D. Morell
DATE: 6/21/2004

Golder Associates

APPENDIX
QAPP

REPORT

APPENDIX QAPP

QUALITY ASSURANCE PROJECT PLAN FOR COMPLIANCE GROUNDWATER MONITORING AT THE LANDSBURG MINE SITE

Submitted To: Washington Department of Ecology
3190 – 160th Avenue SE
Bellevue, WA 98008

Submitted By: Golder Associates Inc.
18300 NE Union Hill Road, Suite 200
Redmond, WA 98052 USA

Submitted On Behalf Of: The Landsburg Mine Site PLP Group

June 7, 2017 **Project No. 923-1000-002.R154**

Golder Associates

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF ATTACHMENTS

1.0 PROJECT DESCRIPTION

1.1 Project Objective and Historical Background

This Quality Assurance Project Plan (QAPP) was prepared for the Landsburg Mine Site Potentially Liable Party (PLP) Group by Golder Associates Inc. (Golder) as Attachment QAPP-A to the Compliance Monitoring Plan (CMP) for the Landsburg Mine Site. The overall objective of the CMP is to describe groundwater monitoring to be conducted at the site under the Compliance Monitoring Plan. This QAPP provides procedures for making accurate measurements and obtaining representative, accurate, and precise analytical data.

1.2 Site Description

A discussion of the Landsburg Mine site is provided in the introduction to the Compliance Monitoring Plan, Operations and Maintenance Plan and Contingency Groundwater Extraction and Treatment System Plans.

1.3 Sampling Program Design

The sampling locations and frequency, sampling procedures and analyses to be performed are presented in Sections 1.5 through 1.7 of the CMP.

2.0 PROJECT ORGANIZATION

2.1 Organizational Structure

The organizational structure for Compliance Groundwater Monitoring for the Landsburg Mine site is shown graphically in Figure QAPP-1. All Golder personnel can be reached at the following address:

Golder Associates Inc.
18300 NE Union Hill Road, Suite 200
Redmond, Washington 98052-3333

Telephone: (425) 883-0777
Facsimile: (425) 882-5498

Project Manager

The Project Manager is responsible for planning and executing all environmental sampling and analysis for groundwater monitoring and for preparation of analytical data reports, including submittals to Washington State Department of Ecology (Ecology). The Project Manager prepares the specifications for, and administers the subcontracts for laboratory analysis.

Chemist/Validator

The Chemist/Validator reports to the Project Manager. He/she is responsible for coordinating with the offsite laboratories to obtain required analyses, and for sample tracking, chain of custody, and other sampling and analysis documentation. The Chemist/Validator maintains the data center files, including tabulating, compiling, and archiving data. The Chemist/Validator is responsible for the review and validation of laboratory analysis reports.

Database Coordinator

The Database Coordinator reports to the Project Manager. The Database Coordinator is responsible for setting up the project database, designing and formatting data tables, preparing customized data reports, entering essential information, troubleshooting, and maintenance of the database.

Field Sampling Personnel

The Field Sampling Personnel report to the Project Manager. The Field Sampling Personnel are responsible for collecting all field samples in accordance with the CMP. In addition, the Field Sampling Personnel are responsible for assembly, organization and maintenance of all information collected during field activities (including sampling logbook, daily activity logbook, geologic boring logs, chain-of-custody forms, well construction details, and water-level measurements).

2.2 Use of Subcontractors

An analytical laboratory will be selected to provide analyses of water samples acquired during groundwater monitoring. Upon selection, the laboratory QA plan will be incorporated as Attachment QAPP-A of this QAPP.

2.3 Planning Structure

Compliance Groundwater Monitoring at the Landsburg Mine site is supported by several planning documents, which are briefly described as follows:

- **Quality Assurance Project Plan:** This QAPP is designed to support groundwater monitoring activities involving field and/or laboratory investigations, and is prepared in compliance with the requirements of *Guidelines and Specifications for Preparing Quality Assurance Project Plans* (Ecology 1991).
- **Data Management Plan**: the Data Management Plan (DMP) describes the procedural controls that will be used to manage and protect original field records, other project quality records, and the management, protection, and reporting of validated analytical data from all sampling investigations.
- **Health and Safety Plan**: the Health and Safety Plan (HASP) describes all necessary personal protective gear, site controls, and monitoring requirements applicable to onsite activities conducted during Compliance Groundwater Monitoring that are required pursuant to 20 Code of Federal Regulations (CFR) 1910.120.

3.0 DATA QUALITY OBJECTIVES

An objective of the CMP activities is to provide analytical data that is of known and defensible quality. Table QAPP-1 summarizes referenced methods for analysis of media by sampling event. Table QAPP-2 lists all parameters of interest defined for water sampling during long-term monitoring, which are comprised of inorganic and organic parameters from the United States Environmental Protection Agency (EPA) Contract Laboratory Program (CLP) Statements of Work for Organic and Inorganic compounds (EPA 2016a,b), and other major groundwater constituents, as defined by Ecology for the purposes of this project. Organic and inorganic constituents will be analyzed using EPA standard methods as defined in *Test Methods for Evaluating Solid Waste (SW-846)* (EPA 2014).

The objectives for analytical data quality are defined in terms of the quantitation limits achievable using the referenced analytical methods, and in terms of the resulting goals for precision, accuracy, representativeness, completeness, and comparability of analytical data. Quantitation limits are provided for each analytical parameter in Table QAPP-2, and are cross-referenced to applicable standard EPA reference methods. The quality objectives established for long-term monitoring are described as follows:

- Precision: analytical precision shall be reported as required by the governing EPA reference method cited in Table QAPP-2.
- Accuracy (Bias): accuracy shall be reported as required by the governing EPA reference method cited in Table QAPP-2.
- Representativeness: Goals for sample representativeness are addressed qualitatively by the sampling locations and intervals defined in Section 2 of the CMP. The rationale behind the sampling schedule and the selection of sampling locations is also discussed in Section 2 of the CMP. In addition, the use of standard procedures for sample acquisition (as described in Section 4 of this QAPP) will facilitate the collection of representative data.
- Completeness: Completeness is defined as the percentage of valid analytical determinations with respect to the total number of requested determinations in a given sample delivery group; completeness goals are established at 90 percent. Failure to meet this criterion shall be documented and evaluated in the data validation process described in Section 8 of this QAPP, and corrective action taken as warranted on a case-by-case basis.
- Comparability: Approved analytical procedures shall require the consistent use of the reporting techniques and units specified by the EPA reference methods cited in Table QAPP-2 in order to facilitate the comparability of data sets from sequential sampling rounds in terms of their precision and accuracy.

4.0 SAMPLING AND OTHER FIELD PROCEDURES

4.1 Selected Procedures, by Task

Table QAPP-3 lists the technical procedures that have been developed to support sampling activities, data validation, and other technical activities required during long-term monitoring. Technical procedures applicable to individual activities are available in the Golder Associates Inc. (Golder) Redmond, Washington office for review.

4.2 Document Distribution, Variation Request, and Change Control Considerations

The technical procedures cited in this QAPP, the CMP, the HASP, and the DMP, and all other procedures cited in this QAPP are subject to the distribution control requirements of QP-5.0-1, "Document Preparation, Distribution, and Change Control." Quality Procedures (QP) applicable to individual activities are available in the Golder Associates Inc. Redmond, Washington office for review.

Variations from established field procedure requirements may be necessary in response to unique circumstances encountered during sampling activities. All such variations must be documented on a Procedure Alteration Checklist (PAC) and submitted to the Project Manager and QA Officer for review and approval. The Project Manager or his assigned Field Sampling Personnel is authorized to implement non-substantive variations based on immediate need, provided that the Project Manager and QA Officer are notified within 24 hours of the variation, and the PAC is forwarded to the Project Manager and QA Officer for review within 2 working days. Substantive variations require notification of the Project Manager, QA Officer and PLP Technical Leader prior to implementation and a PAC is forwarded for review within 2 working days. If the variation is unacceptable to either reviewer, the activity shall be re-performed or other corrective action taken as indicated in the "Comments" section of the PAC. Changes to the requirements of this QAPP, the CMP, the HASP, or the DMP shall be controlled through the Long-Term Change Notice (ICN) procedures.

4.3 Sample Quantities, Types, Locations, and Intervals

Sample quantities, types, locations, and intervals for the surface water/portal sampling and the groundwater sampling from monitoring wells shall be as specified in Section 2 of the CMP. Field quality control samples shall be included in the minimum quantities specified in Section 7 of this QAPP. Reference samples (i.e., performance audit samples) shall not be identified as such to the laboratory, but shall be identified as equipment or field blanks. Appropriate documentation of the purpose of the sample shall be maintained in the field log, identified by the assigned sample number; copies shall be separately provided to the data validator. See Sections 6 and 8 of this QAPP.

4.4 Sample Container Type, Volume, Preservation, and Handling Requirements

All sample containers, container preparation services, preservatives, trip blank, and sample coolers shall be provided by the analytical laboratory as part of their agreement for services. Sample container type, volume requirements, preservation requirements, and special handling requirements are listed by sample matrix and analytical category in Table QAPP-4.

All samples shall be sealed, labeled, properly identified, and submitted to the analytical laboratory under formal chain of custody requirements as described in Section 4.6 of this QAPP.

4.5 Sample Identification and Labeling Requirements

Each sample shall be uniquely identified by well number or location, type code, and date. Type codes reference the analytical method or analytes as presented in the second or third column of Table QAPP-2. The sample container shall be labeled and sealed. Identification numbers shall be recorded on the field report forms shown in the applicable sampling procedures, and on the chain of custody/sample analysis request form supplied by the analytical laboratory.

4.6 Chain of Custody Considerations

All samples obtained during the course of this investigation shall be controlled as required by procedure, TG-1.2-23 "Chain of Custody." Chain of custody forms shall be completed for each shipment of samples as described in the procedure. Sample analysis request forms supplied by the analytical laboratory or chain of custody forms shall be completed instead of Sample Integrity Data Sheets; such forms shall specifically identify the applicable reference methods specified in Table QAPP-2 as appropriate for each individual sample. Chain-of-custody forms shall be initiated for return of residual samples as required by the laboratories' own chain of custody procedures. All laboratory chain of custody and sample tracking procedures shall ensure traceability of analytical results to the original samples through unique internal identification codes that are traceable to unique sample identification numbers as specified in Section 4.5 above. Approved laboratory chain of custody and sample tracking procedures will be addressed in laboratory QA plan, to be included (upon laboratory selection and plan approval) for information as Attachment QAPP-A to this QAPP.

4.7 Sampling Equipment Decontamination

All non-dedicated sampling equipment (in contact with sample) shall be thoroughly cleaned prior to each sampling event to prevent cross-contamination between samples and to ensure accurate representation of analytes of interest in each sample interval. Personnel performing decontamination shall wear rubber gloves, face shields, and such other safety equipment as directed by the project-specific HASP. Samplers and sampling tools shall be disassembled as necessary and placed in clean, dedicated drums or troughs fitted with gravity drains. Non-dedicated equipment shall be cleaned with a portable hand-held sprayer or brushed with water and non-phosphate detergent, and then rinsed with organic-free distilled/deionized water. Samplers shall be reassembled using clean rubber gloves; all decontaminated samplers and sampling tools shall be sealed in clean plastic bags pending their next use. All wash and rinse fluids shall be transferred to storage drums pending characterization and final disposal at the direction of the Project Manager.

4.8 Calibration Requirements

Calibration of all measuring and test equipment, whether in existing inventory or purchased for this investigation, shall be controlled as required by procedure QP-11.1, "Calibration and Maintenance of Measuring and Test Equipment." Lease equipment shall require certifications or other documentation demonstrating acceptable calibration status for the entire period of use for this project. Field calibration requirements shall be in compliance with the technical procedure describing the instrument's use and/or with the manufacturer's instructions issued with the equipment. Method- and analytical equipment-specific calibration requirements applicable within the individual analytical laboratories identified in Section 2.2 of this QAPP are addressed within the laboratory QA plans to be included (upon laboratory selection and plan approval) as Attachment QAPP-A to this QAPP.

5.0 ANALYTICAL PROCEDURES

Table QAPP-2 cross-references the analytes of interest of this investigation to the standard reference methods and method detection limits that shall be established as contractual requirements between the Landsburg PLP Group and the subcontracted analytical laboratory. These requirements will be reflected in the laboratory QA plan; which will be included for information as Attachment QAPP-A of this QAPP after approval.

6.0 DATA REDUCTION, VALIDATION, AND REPORTING

6.1 Minimum Requirements for Laboratory Analytical Data Packages

All analytical data packages submitted by the analytical laboratory shall include the following:

- Sample receipt, chain-of-custody and shipping documentation, including identification of field sampling personnel, shipping personnel (or organization); copies of completed chain of custody documentation noting dates of sample receipt;
- Analytical results for each sample containing the reduced results for all analytes/constituents requested in the chain of custody, request for analysis or purchase order;
- Analytical quality control results for laboratory method blanks, spikes, duplicates, laboratory control samples, matrix spike/matrix spike duplicates, surrogates and internal standards; and
- Sample extraction and preparation data including dates of sample extraction and analysis.

All data packages for all analytical parameters shall be reviewed and approved by the analytical laboratory's QA Officer prior to submittal for validation.

6.2 General Validation Requirements

All analytical data packages from each sample delivery group shall be validated by the detailed review and calculation over check processes described in National Functional Guidelines documents from the EPA CLP (EPA 2017). The analytical data packages will undergo a Tier II level validation. The guidelines help to ensure that the laboratory has met all contractual requirements, all applicable reference method requirements, and has met the data quality objectives discussed previously in Section 3 and Table QAPP-2. A sample delivery group may be interpreted as the group of samples delivered to the laboratory in a single week.

The data validator shall document all contacts made with the laboratory to resolve questions related to the data package, and shall prepare a technical review documenting the evaluation of laboratory blanks, field blanks, equipment blanks, duplicates, matrix spikes/matrix spike duplicates, laboratory control samples, calibration data (as applicable for the specified method), and any requalification of analytical results that may be required as a result of the validation exercise. The validation report, laboratory contact documentation, copies of the laboratory sample concentration reports, and the as-reviewed laboratory data package shall be routed to the Project Manager for data assessment purposes and to the permanent project records, as required by the DMP.

7.0 QUALITY CONTROL PROCEDURES

All analytical samples shall be subject to quality control measures in both the field and laboratory. The following minimum field quality control requirements apply to all analyses. These requirements are adapted from SW-846 (EPA 2014)

- Field duplicate samples. Depending on the availability of sufficient sample quantities, field duplicate water samples shall be collected at a minimum of one duplicate for each period of sampling activity (i.e., sampling event). Duplicate samples shall be retrieved from the same sampling location using the same equipment and sampling technique, and shall be placed into identically prepared and preserved containers. All field duplicates shall be analyzed independently as an indication of gross errors in sampling techniques.
- Blind (reference) samples. At the Project Manager's direction, blind reference samples may be introduced into any sampling round for performance audit purposes. Blind samples shall be represented as field or equipment blanks to the laboratory.
- Spiked samples. At the Project Manager's direction, spiked samples for performance audit purposes may be prepared for volatile aromatic, semivolatile base/neutral, and metallic analytes. Spiked samples shall be prepared by adding an aliquot of an EPA reference compound to the reagent water, and shall be represented as field or equipment blanks to the analytical laboratory.
- Field blanks. Field blanks shall consist of pure deionized distilled water, transferred into a sample container at the site and preserved with the reagent specified for the analytes of interest. Field blanks are used as a check on reagent and environmental contamination, and shall be collected at the same frequency as field duplicate samples.
- Equipment blanks. Equipment blanks shall consist of pure deionized distilled water washed through decontaminated non-dedicated sampling equipment and placed in containers identical to those used for actual field samples. Equipment blanks are used to verify the adequacy of non-dedicated sampling equipment decontamination procedures, and shall be collected at the same frequency as field duplicate samples, if non-dedicated sampling equipment is used.
- Trip blanks. Trip blanks consist of pure deionized distilled water added to one clean volatile organic sample vial, accompanying a batch of samples shipped during a sampling activity or period. Trip blanks shall be returned unopened to the laboratory, and are prepared as a check on possible contamination originating from container preparation methods, shipment, handling, storage, or site conditions. The analyses of the trip blank will be at the Project Manager's direction.
- Matrix spike and matrix spike duplicate samples. Although these are samples upon which laboratory quality control checks are performed, the actual matrix that is spiked is extra volume of a sample that is collected in the field and labeled appropriately to notify the laboratory of the extra volume for quality control purposes.

The internal quality control checks performed by the analytical laboratory shall meet the following minimum requirements:

- Temperature monitoring of the transport coolers upon receipt to the laboratory. The monitoring temperature may be recorded from infra-red sensor instruments or by record of the temperature blank vial (if used), by the receiving personnel at the receiving laboratory. Temperature receipt data must be recorded on a receipt form or chain of custody record, to be included in the laboratory deliverable report as agreed to under the contract with the testing laboratory.

- Matrix spike and matrix spike duplicate samples. Matrix spike and matrix spike duplicate samples require the addition of a known quantity of a representative analyte of interest to the sample as a measure of recovery percentage. The spike shall be made in a replicate of a field duplicate sample. Replicate samples are separate aliquots removed from the same sample container in the laboratory. Spike compound selection, quantities, and concentrations shall be described in the laboratories analytical procedures. One sample shall be spiked per analytical batch, or once every 20 samples, whichever is greater.
- Quality control reference samples. A quality control reference sample shall be prepared from an independent standard at a concentration other than that used for calibration, but within the calibration range. Reference samples are required as an independent check on analytical technique and methodology, and shall be run with every analytical batch, or every 20 samples, whichever is greater, or as specified in individual analytical methods. Acceptance criteria for quality control reference samples are prescribed by the EPA's CLP National Functional Guidelines (2017).

8.0 PERFORMANCE AND SYSTEMS AUDITS

Performance and systems audits shall be performed at the request of the Landsburg PLP Group to systematically verify the quality of critical elements of the total measurement system. The two types of audits are defined as follows:

- Performance Audits: In a performance audit, quantitative data are independently obtained for comparison with data routinely obtained by the measurement system.
- Systems Audits: Systems audits involve a qualitative on-site evaluation of field operations, laboratories, or other organizational elements of the measurement system for compliance with established quality assurance program and procedure requirements.

For this Site, performance audit requirements shall be met by the analysis of a minimum of one spiked performance audit sample per each (target analyte list/target compound list) TAL/TCL method. The performance audit samples shall not be identified as such to the laboratory, but shall be represented as a standard field sample using the sample numbering system as established for the project . They may be made from traceable standards or from routine samples spiked with a known concentration of a known compound.

Additional performance and system audits may be scheduled as a consequence of corrective action requirements, or may be performed upon request by the authorized representative of the Landsburg PLP Group or Ecology. Any discrepancies observed during the evaluation of performance audit results or during system audit surveillance activities that cannot be immediately corrected to the satisfaction of the investigator shall be documented on a nonconformance report and resolved in compliance with procedure QP-14.0-1, "Control of Nonconformances, Incidents, and Corrective Action."

9.0 PREVENTIVE MAINTENANCE

All measurement and testing equipment used in the field and laboratory that directly affects the quality of the analytical data shall be subject to preventive maintenance measures that ensure minimization of measurement system downtime. The subcontracted analytical laboratories shall be responsible for performing or managing the maintenance of their analytical equipment; maintenance requirements, spare parts lists, and instructions shall be incorporated in the laboratory QA plan, which will be included in Attachment QAPP-A after approval.

10.0 DATA ASSESSMENT PROCEDURES

As previously discussed in Section 6, analytical data shall first be compiled and reduced by the laboratory and validated by project personnel in compliance with National Functional Guideline documents (EPA 2017), and then reported to Ecology using an Ecology-specified application program. Data assessment will be performed on the distributions and statistical characteristics of the validated data, and will consist primarily of comparisons of the data to applicable regulatory levels and background concentrations to determine if a potential release of chemicals from the mine site has occurred.

11.0 REFERENCES

Golder Associates, Inc. (Golder). 1994. Quality Procedure QP 5.1-0 Document Preparation, Distribution, and Change Control, Golder Associates Quality Procedure, 1994.

Golder Associates, Inc. (Golder). 1994. Quality Procedure QP 11.1 Calibration and Maintenance of Measuring and Test Equipment', Golder Associates Quality Procedure, 1994.

Golder Associates, Inc. (Golder). 1994. Quality Procedure QP 14.0-1 Control of Non-Conformances Incidents and Corrective Actions, Golder Associates Quality Procedure, 1994.

United States Environmental Protection Agency (EPA) 2014. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods Compendium (SW-846). https://www.epa.gov/hw-sw846/sw-846-compendium.

EPA 2016a. EPA Contract Laboratory Program Statement of Work for Organic Superfund Methods Multi-Media, Multi-Concentration SOM02.3.

EPA 2016b. EPA Contract Laboratory Program Statement of Work for Inorganic Superfund Methods Multi-Media, Multi-Concentration SOM02.3.https://www.epa.gov/clp/contract-laboratory-program-analytical-statements-work-sows.

EPA 2017. Contract Laboratory Program National Functional Guidelines for Data Review. January 2017. https://www.epa.gov/clp/contract-laboratory-program-national-functional-guidelines-data-review.

TABLES

Table QAPP-1: Compliance Monitoring For Groundwater Sampling Matrix

Analysis	Short-Term Monitoring[a]		Long-Term Monitoring								
			Year 1				Years 2 - 5		Years 6 - 10	Years 11+	
	Biweekly[b]	Monthly	1	2	3	4	1	2	Annual	1 every 2.5 years	1 every 5 years
pH[c]	X	X	X	X	X	X	X	X	X	X[d]	X
Sp. Conductance[c]	X	X	X	X	X	X	X	X	X	X[d]	X
Dissolved Oxygen[c]	X	X	X	X	X	X	X	X	X	X[d]	X
Turbidity[c]	X	X	X	X	X	X	X	X	X	X[d]	X
NWTPH-HCID		X	X	X	X	X	X	X	X	X[d]	X
Priority Metals			X	X	X	X	X	X	X		X
VOC (Method 8260)		X	X	X	X	X	X	X	X	X[d]	X
SemiVol. (Method 8270)			X				X		X		X
OCP, PCB's (Method 8081)			X				X		X		X

Notes:

During long-term monitoring, field parameters will only be monitored on those wells that are being sampled.

[a] Short-term monitoring will be performed during the trench backfill and cap construction.

[b] Biweekly monitoring (twice per month) will be extended for four weeks following completion of trench backfill and capping at the same schedule as noted above.

[c] The pH , Specific Conductance, DO, and turbidity analyses will be performed in the field.

X - means the analysis will be conducted on all compliance monitoring wells: LMW-2 through LMW-11; and the 4 new sentinel wells (yet to be installed).

X[d] - means the analysis will be conducted only on Northward wells: LMW-2, LMW-4, LMW-10, Deep North Sentinel Well (yet to be installed), Shallow North Sentinel Well (yet to be installed), LMW-6, and LMW-7.

Table QAPP-2
Parameters of Interest and Analytical Methods
For Water Sampling Investigations at the Landsburg Mine

Category / ANALYTE	UNITS	SW-846 Method[b]	Reporting Limit (RL)[a]	Detection Limit (MDL)[e]
Field Parameter[c]				
pH	stnd	SM 4500H+	0.10	NA
Conductivity	uS/cm	SM 2510	20	NA
Dissolved Oxygen	mg/L	SM 4500-O	0.20	NA
Temperature	°C	SM 2550 B	0.5	NA
E_h	Rel mV		30.0	NA
Turbidity	NTU		0.50	NA
Metals				
Aluminum	mg/L	6010C	1.0	0.0085
Antimony	mg/L	200.8	0.003	0.0003
Arsenic	mg/L	200.8	0.003	0.0003
Barium	mg/L	6010C	0.5	0.0007
Beryllium	mg/L	6010C	0.01	0.00016
Cadmium	mg/L	6010C	0.002	0.00018
Calcium	mg/L	6010C	0.50	0.0112
Chromium	mg/L	6010C	0.01	0.0012
Cobalt	mg/L	6010C	0.01	0.00027
Copper	mg/L	200.8	0.003	0.0002
Iron	mg/L	6010C	0.20	0.0075
Lead	mg/L	200.8	0.01	0.00155
Magnesium	mg/L	6010C	0.50	0.00961
Manganese	mg/L	6010C	0.01	0.0003
Mercury	mg/L	7470	0.001	0.0001
Nickel	mg/L	6010C	0.01	0.00386
Potassium	mg/L	6010C	0.50	0.0657
Selenium	mg/L	200.8	0.025	0.00499
Silver	mg/L	6010C	0.005	0.00043
Sodium	mg/L	6010C	0.50	0.0113
Thallium	mg/L	200.8	0.002	0.000008
Vanadium	mg/L	6010C	0.003	0.0004
Zinc	mg/L	6010C	0.02	0.0016
Volatile Organic Compounds				
1,1,1,2-Tetrachloroethane	µg/L	8260C	0.5	0.04
1,1,1-Trichloroethane	µg/L	8260C	1.0	0.041
1,1,2,2-Tetrachloroethane	µg/L	8260C	0.1	0.06
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/L	8260C	1.0	0.043
1,1,2-Trichloroethane	µg/L	8260C	0.2	0.129
1,1-Dichloroethane	µg/L	8260C	1.0	0.05
1,1-Dichloroethene	µg/L	8260C	1.0	0.05
1,1-Dichloropropene	µg/L	8260C	0.1	0.03

Table QAPP-2
Parameters of Interest and Analytical Methods
For Water Sampling Investigations at the Landsburg Mine

Category / ANALYTE	UNITS	SW-846 Method[b]	Reporting Limit (RL)[a]	Detection Limit (MDL)[e]
1,2,3-Trichlorobenzene	µg/L	8260C	0.25	0.11
1,2,3-Trichloropropane	µg/L	8260C	0.25	0.13
1,2,4-Trichlorobenzene	µg/L	8260C	0.5	0.11
1,2,4-Trimethylbenzene	µg/L	8260C	1.0	0.02
1,2-Dibromo-3-Chloropropane	µg/L	8260C	0.5	0.37
1,2-Dibromoethane	µg/L	8260C	0.1	0.08
1,2-Dichlorobenzene	µg/L	8260C	1.0	0.04
1,2-Dichloroethane	µg/L	8260C	1.0	0.07
1,2-Dichloropropane	µg/L	8260C	1.0	0.04
1,3,5-Trimethylbenzene	µg/L	8260C	1.0	0.02
1,3-Dichlorobenzene	µg/L	8260C	1.0	0.04
1,3-Dichloropropane	µg/L	8260C	0.1	0.06
1,4-Dichlorobenzene	µg/L	8260C	1.0	0.04
2,2-Dichloropropane	µg/L	8260C	0.1	0.05
2-Butanone	µg/L	8260C	5.0	0.81
2-Chloroethyl vinyl ether	µg/L	8260C	0.5	0.25
2-Chlorotoluene	µg/L	8260C	0.1	0.02
2-Hexanone	µg/L	8260C	5.0	0.90
4-Chlorotoluene	µg/L	8260C	1.0	0.02
4-Isopropyltoluene	µg/L	8260C	0.1	0.03
4-Methyl-2-pentanone	µg/L	8260C	2.5	0.97
Acetone	µg/L	8260C	5.0	2.06
Acrolein	µg/L	8260C	2.5	2.48
Acrylonitrile	µg/L	8260C	1	0.60
Benzene	µg/L	8260C	1.0	0.03
Bromobenzene	µg/L	8260C	0.2	0.06
Bromochloromethane	µg/L	8260C	0.2	0.06
Bromodichloromethane	µg/L	8260C	0.2	0.05
Bromoform	µg/L	8260C	1.0	0.06
Bromomethane	µg/L	8260C	1.0	0.25
Carbon disulfide	µg/L	8260C	1.0	0.04
Carbon tetrachloride	µg/L	8260C	0.3	0.04
Chlorobenzene	µg/L	8260C	1.0	0.02
Chlorodibromomethane	µg/L	8260C	1.0	0.05
Chloroethane	µg/L	8260C	1.0	0.09
Chloroform	µg/L	8260C	1.0	0.03
Chloromethane	µg/L	8260C	1.0	0.10
cis-1,2-Dichloroethene	µg/L	8260C	1.0	0.04
cis-1,3-Dichloropropene	µg/L	8260C	0.2	0.06
Dibromomethane	µg/L	8260C	0.2	0.15
Ethylbenzene	µg/L	8260C	1.0	0.04
Hexachloro-1,3-butadiene	µg/L	8260C	0.25	0.07
Iodomethane	µg/L	8260C	0.5	0.23
Isopropylbenzene	µg/L	8260C	1.0	0.02
Methylene Chloride	µg/L	8260C	1.0	0.49
m-Xylene & p-Xylene	µg/L	8260C	1.0	0.05
Naphthalene	µg/L	8260C	1.0	0.12

Table QAPP-2
Parameters of Interest and Analytical Methods
For Water Sampling Investigations at the Landsburg Mine

Category / ANALYTE	UNITS	SW-846 Method[b]	Reporting Limit (RL)[a]	Detection Limit (MDL)[e]
n-Butylbenzene	µg/L	8260C	1.0	0.03
N-Propylbenzene	µg/L	8260C	1.0	0.02
o-Xylene	µg/L	8260C	1.0	0.04
sec-Butylbenzene	µg/L	8260C	1.0	0.02
Styrene	µg/L	8260C	1.0	0.05
tert-Butylbenzene	µg/L	8260C	1.0	0.03
Tetrachloroethene	µg/L	8260C	1.0	0.05
Toluene	µg/L	8260C	1.0	0.04
trans-1,2-Dichloroethene	µg/L	8260C	1.0	0.05
trans-1,3-Dichloropropene	µg/L	8260C	0.2	0.08
trans-1,4-Dichloro-2-butene	µg/L	8260C	1.0	0.32
Trichloroethene	µg/L	8260C	1.0	0.05
Trichlorofluoromethane	µg/L	8260C	1.0	0.04
Vinyl Acetate	µg/L	8260C	1.0	0.07
Vinyl Chloride	µg/L	8260C	0.1	0.06
Semivolatile Organic Compounds				
1,2,4-Trichlorobenzene	µg/L	8270D	1.0	0.495
1,4-Dioxane	µg/L	8270D	0.4	0.08
1,2-Dichlorobenzene	µg/L	8270D	1.0	0.436
1,3-Dichlorobenzene	µg/L	8270D	1.0	0.499
1,4-Dichlorobenzene	µg/L	8270D	1.0	0.47
1-Methylnaphthalene	µg/L	8270D	1.0	0.3
2,4,5-Trichlorophenol	µg/L	8270D	5.0	1.706
2,4,6-Trichlorophenol	µg/L	8270D	3.0	1.235
2,4-Dichlorophenol	µg/L	8270D	3.0	1.10
2,4-Dimethylphenol	µg/L	8270D	3.0	1.1
2,4-Dinitrophenol	µg/L	8270D	20	5.474
2,4-Dinitrotoluene	µg/L	8270D	3.0	1.277
2,6-Dinitrotoluene	µg/L	8270D	3.0	1.3
2-Chloronaphthalene	µg/L	8270D	1.0	0.34
2-Chlorophenol	µg/L	8270D	1.0	0.246
2-Methylnaphthalene	µg/L	8270D	1.0	0.3
2-Methylphenol (o-Cresol)	µg/L	8270D	1.0	0.329
2-Nitroaniline	µg/L	8270D	3.0	1.5
2-Nitrophenol	µg/L	8270D	3.0	0.979
3 & 4-Methylphenol (m,p-Cresols)	µg/L	8270D	2.0	0.63
3,3'-Dichlorobenzidine	µg/L	8270D	5.0	1.8
3-Nitroaniline	µg/L	8270D	3.0	1.5
4,6-Dinitro-2-methylphenol	µg/L	8270D	10	4.928
4-Bromophenyl phenyl ether	µg/L	8270D	1.0	0.262
4-Chloro-3-methylphenol	µg/L	8270D	3.0	1.1
4-Chloroaniline	µg/L	8270D	5.0	1.733
4-Chlorophenyl phenyl ether	µg/L	8270D	1.0	0.342
4-Nitroaniline	µg/L	8270D	3.0	2.0
4-Nitrophenol	µg/L	8270D	10	2.895

Table QAPP-2
Parameters of Interest and Analytical Methods
For Water Sampling Investigations at the Landsburg Mine

Category / ANALYTE	UNITS	SW-846 Method[b]	Reporting Limit (RL)[a]	Detection Limit (MDL)[e]
Acenaphthene	µg/L	8270D	1.0	0.347
Acenaphthylene	µg/L	8270D	1.0	0.3
Anthracene	µg/L	8270D	1.0	0.303
Benzo(a)anthracene	µg/L	8270D	0.5	0.373
Benzo(a)pyrene	µg/L	8270D	1.0	0.425
Benzo(b)fluoranthene	µg/L	8270D	2.0	0.8
Benzo(ghi)perylene	µg/L	8270D	1.0	0.464
Benzo(k)fluoranthene	µg/L	8270D	2.0	0.8
Benzoic Acid	µg/L	8270D	20	8.647
Benzyl Alcohol	µg/L	8270D	5.0	0.2
Bis(2-chloroethoxy)methane	µg/L	8270D	1.0	0.252
Bis(2-chloroethyl)ether	µg/L	8270D	1.0	0.5
Bis(2-chloroisopropyl)ether	µg/L	8270D	1.0	0.5
Bis(2-ethylhexyl)phthalate	µg/L	8270D	3.0	2.1
Butyl benzyl phthalate	µg/L	8270D	1.0	0.402
Carbazole	µg/L	8270D	3.0	0.3
Chrysene	µg/L	8270D	1.0	0.397
Dibenz(a,h)anthracene	µg/L	8270D	1.0	0.437
Dibenzofuran	µg/L	8270D	1.0	0.3
Diethyl phthalate	µg/L	8270D	1.0	0.407
Dimethyl phthalate	µg/L	8270D	1.0	0.3
Di-n-butyl phthalate	µg/L	8270D	1.0	0.304
Di-n-octyl phthalate	µg/L	8270D	1.0	0.331
Fluoranthene	µg/L	8270D	1.0	0.3
Fluorene	µg/L	8270D	1.0	0.3
Hexachlorobenzene	µg/L	8270D	1.0	0.335
Hexachlorobutadiene	µg/L	8270D	3.0	0.604
Hexachlorocyclopentadiene	µg/L	8270D	5.0	1.862
Hexachloroethane	µg/L	8270D	2.0	0.61
Indeno(1,2,3-cd)pyrene	µg/L	8270D	1.0	0.435
Isophorone	µg/L	8270D	1.0	0.4
Naphthalene	µg/L	8270D	1.0	0.326
Nitrobenzene	µg/L	8270D	1.0	0.3
N-Nitrosodi-n-propylamine	µg/L	8270D	3.0	0.365
N-Nitrosodiphenylamine	µg/L	8270D	3.0	1.209
Pentachlorophenol	µg/L	8270D	10	2.746
Phenanthrene	µg/L	8270D	1.0	0.3
Phenol	µg/L	8270D	3.0	0.445
Pyrene	µg/L	8270D	1.0	0.379
PCBs [d]				
Aroclor 1016	µg/L	8082B	0.05	0.0175
Aroclor 1221	µg/L	8082B	0.05	0.0175
Aroclor 1232	µg/L	8082B	0.05	0.0175
Aroclor 1242	µg/L	8082B	0.05	0.0175
Aroclor 1248	µg/L	8082B	0.05	0.0175

Table QAPP-2
Parameters of Interest and Analytical Methods
For Water Sampling Investigations at the Landsburg Mine

Category / ANALYTE	UNITS	SW-846 Method[b]	Reporting Limit (RL)[a]	Detection Limit (MDL)[e]
Aroclor 1254	µg/L	8082B	0.05	0.0175
Aroclor 1260	µg/L	8082B	0.05	0.0174
Pesticides				
Aldrin	µg/L	8081B	0.05	0.010
alpha-BHC	µg/L	8081B	0.05	0.009
beta-BHC	µg/L	8081B	0.05	0.010
delta-BHC	µg/L	8081B	0.05	0.009
gamma-BHC	µg/L	8081B	0.05	0.016
alpha-Chloradine	µg/L	8081B	0.05	0.008
gamma-Chloradine	µg/L	8081B	0.05	0.008
4,4'-DDD	µg/L	8081B	0.1	0.019
4,4'-DDE	µg/L	8081B	0.1	0.018
4,4'-DDT	µg/L	8081B	0.1	0.017
Dieldrin	µg/L	8081B	0.1	0.017
Endosulfan I	µg/L	8081B	0.05	0.009
Endosulfan II	µg/L	8081B	0.1	0.014
Endosulfan sulfate	µg/L	8081B	0.1	0.024
Endrin	µg/L	8081B	1.0	0.017
Endrin aldehyde	µg/L	8081B	0.1	0.016
Endrin ketone	µg/L	8081B	0.1	0.015
Heptachlor	µg/L	8081B	0.05	0.011
Heptachlor epoxide	µg/L	8081B	0.05	0.008
Methoxychlor	µg/L	8081B	1.0	0.074
Toxaphene	µg/L	8081B	5.0	0.22

Table QAPP-2
Parameters of Interest and Analytical Methods
For Water Sampling Investigations at the Landsburg Mine

Category / ANALYTE	UNITS	SW-846 Method[b]	Reporting Limit (RL)[a]	Detection Limit (MDL)[e]
Hydrocarbon Identification				
Gas Range Screening	mg/L	NWTPH-HCID	0.425	0.25
Diesel Range Screening	mg/L	NWTPH-HCID	0.50	0.50
Heavy Fuel Oil Screening	mg/L	NWTPH-HCID	1.0	1.0
Gas Range Analysis	mg/L	NWTPH-Gx	0.1	0.0061
Diesel Range Analysis	mg/L	NWTPH-Dx	0.1	0.033
Heavy Fuel Oil Analysis	mg/L	NWTPH-Dx	0.2	0.056

Notes:

a- RL is the Reporting Limit and is the laboratory Practical Quantitation Limit (PQL). All values are laboratory specific, but shall be considered minimums.

b- From SW-846, Test Method for Evaluating Solid Waste (EPA 2014)

c- Field calibration and use in accordance with manufactures instructions and Golder quality procedures QP 11.1. The values under "RL" column represent required accuracy of the field instruments.

d- MDL studies performed for A-1016 and A-1260 congeners only. Other MDLs assumed.

e- MDL is the Method Detection Limit and is specific to a laboratory from the results of MDL studies performed by the laboratory. The MDL's can change based on the results of future MDL studies.

f- Low level Polycyclic Aromatic Hydrocarbons analyzed by method EPA 8270D-SIM

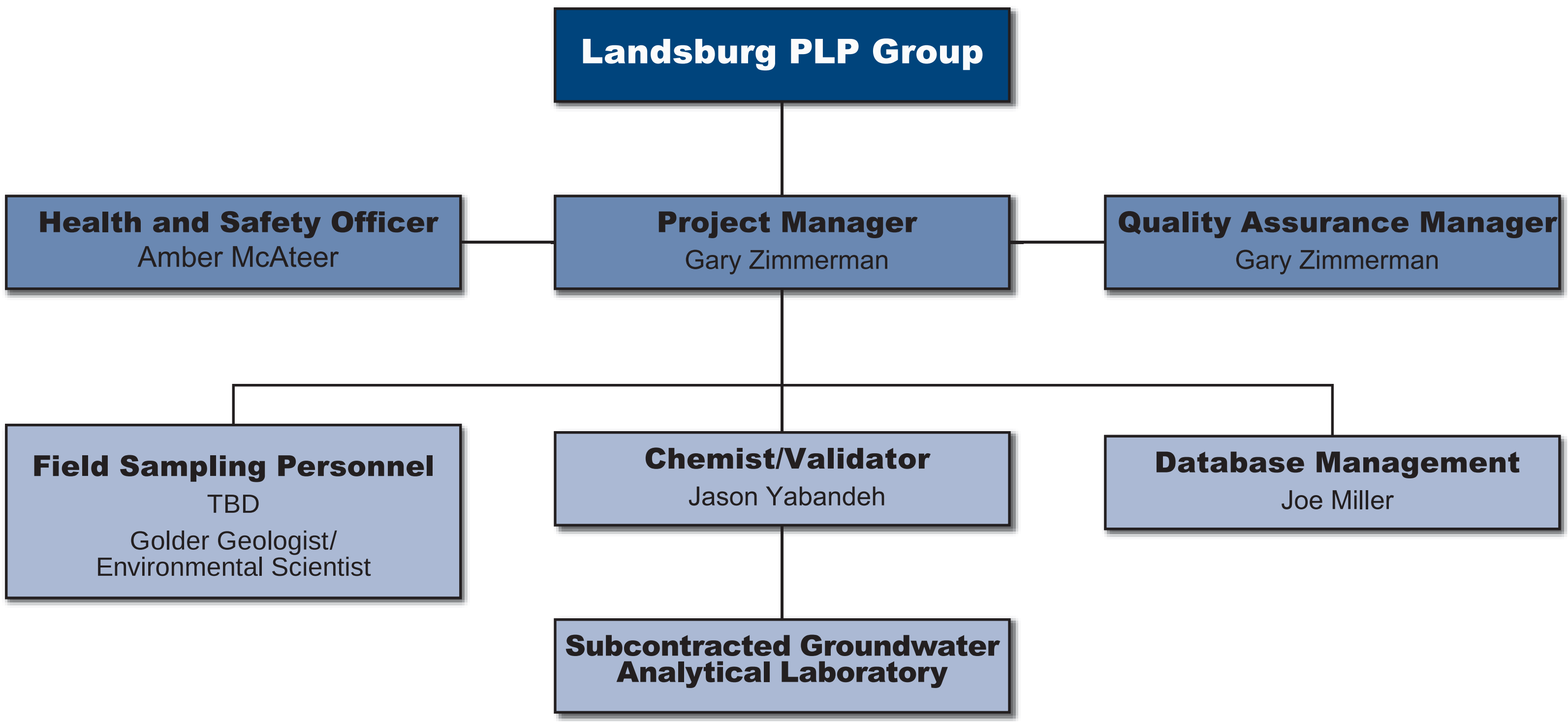
TABLE QAPP-3
SUPPORTING PROCEDURES LIST

TG-1.2-20	"Collection of Groundwater Quality Samples"
TG-1.2-23	"Chain of Custody"
TG-1.4-6	"Water Level Measurement"
TG-1.2-12	"Monitoring Well Drilling and Installation"
TP-1.2-26	"Surface Water Sampling Methods"
QP-5.0-1	"Document Preparation, Distribution, and Change Control"
QP-10.1	"Surveillance Inspection"
QP-11.1	"Calibration and Maintenance of Measuring and Test Equipment'
QP-14.0-1	"Control of Nonconformances, Incidents, and Corrective Action"

TABLE QAPP-4
Sample Container Types, Volumes, Preparation, Handling Preservation, and Holding Times

Analytes of Concern	Container Type	Special Handling	Preservation	Maximum Holding Time
pH, Specific Conductance, Dissolved Oxygen Eh (Redox) Turbidity	Field Measured			Field Measurements
Metals,	1, 500 mL narrow mouth polyethylene bottle	Fill to neck, 0.45 um filter if required when source is turbid (>5 NTU)	Preserve to pH < 2 with Nitric Acid.	6 months 28 days for Mercury
NWTPH-Hydrocarbon Identification	2, 500 mL amber glass bottle	Fill to neck	None, store in dark at 4°C±2°C.	7 Days
TPH Gasoline	2, 40 mL glass vial, Teflon-lined silicon septum cap	Fill completely with no air bubbles	Preserve to pH < 2 with Hydrochloric Acid.	14 days
TPH Diesel and Heavy Oil	2, 500 mL amber glass bottle	Fill to neck	None, store in dark at 4°C±2°C.	7 Days
Volatile Organics	3, 40 mL glass vial, Teflon-lined silicon septum cap	Fill completely with no air bubbles	HCL, pH < 2 for aromatics, Sodium thiosulfate for halocarbons, store in dark at 4°C±2°C.	14 days
Semi-volatile Organics	2, 1,000 mL narrow mouth amber glass bottles, Teflon-lined cap. Collect an additional 1,000 mL aliquot for MS/MSD analysis if required.	Fill to neck	None, store in dark at 4°C±2°C.	7 days for extraction, 40 days for analysis after extraction
Organochlorine Pesticides/PCBs	2, 1,000 mL narrow mouth amber glass bottles, Teflon-lined cap. Collect an additional 1,000 mL aliquot for MS/MSD analysis if required	Fill to neck	None, store in dark at °C±2°C	7 days for extraction, 40 days for analysis after extraction

FIGURES



QAPP-1
ORGANIZATION CHART
PALMER/LANDSBURG MINE/WA

Golder Associates

APPENDIX QAPP-A
LABORATORY QA PLAN (TO BE INCLUDED UPON SELECTION)

APPENDIX
DMP

REPORT

APPENDIX DMP

DATA MANAGEMENT PLAN
FOR COMPLIANCE MONITORING
AT THE LANDSBURG MINE SITE

Submitted To: Washington Department of Ecology
3190 – 160th Avenue SE
Bellevue, WA 98008

Submitted By: Golder Associates Inc.
18300 NE Union Hill Road, Suite 200
Redmond, WA 98052 USA

Submitted On Behalf Of: The Landsburg Mine Site PLP Group

June 7, 2017 **923-1000-002.R154**

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1.0 DATA MANAGEMENT

This Data Management Plan (DMP) was prepared for the Landsburg Potentially Liable Party (PLP) Group by Golder Associates Inc. (Golder) as Attachment B of the Compliance Monitoring Plan (CMP) for remedial action at the Landsburg Mine site. The CMP is one of the Project Plans for the Landsburg Mine Site Cleanup Action Plan.

Data management involves the routing and storage of all incoming data and correspondences unique to the project activities for security, ease of access, and compliance with project goals. The DMP will incorporate up-to-date procedures for acquiring data, storing data, and providing for the efficient retrieval of data. Additionally, the DMP incorporates guidance from the Washington State Department of Ecology (Ecology) to allow electronic data transfer from a project specific database. This data management plan describes standards in place to complete the data management process.

1.1 Records Management

All records generated during the course of the remedial action and Compliance Monitoring activities at the Landsburg Mine site, will be filed and maintained in access controlled project archives, as required by Golder Quality Procedure QP-16.1 “Quality Assurance Records Management,” the duplicate storage requirements of QP-16.1 Section 8.1.3 w not apply. Records that provide evidence of a service or a communication relevant to the project are defined as completed and signed documents. Records produced during the course of the project may include, but not be limited to, the following:

- Incoming and outgoing correspondence and facsimile transmissions, and relevant email communication;
- Analytical data packages and analytical quotes;
- Project contracts, agreements, and amendments;
- Purchase orders and subcontractor agreements, quotes, and receipts;
- Historical file copies of the data and communication provided by the Landsburg PLP Group, and Ecology;
- A historical file of all versions of the Remedial Investigation/Feasibility Study (RI/FS) Work Plan, RI/FS, Quality Assurance Project Plan (QAPP), DMP, Health and Safety Plan (HASP), CMP, and supporting Quality Assurance (QA) and technical procedures that are used during this project;
- Technical field logs and field reports;
- Interim change reports, procedure alteration checklists, surveillance inspection reports, and nonconformance/incidence reports; and,
- Computer disk files, electronic copies of analytical data, and technical support parameters.

1.2 Analytical Data Management

Laboratory data will be provided to Golder in electronic format from all analytical laboratories. A paper copy will be routed to the data validator for confirmation of analytical data receipt and subsequent validation activities. Electronic data, by compact disk, or by electronic (email) delivery will be reserved by the data management specialist. Validated analytical data packages will be routed to the project records for controlled storage and the validated data shall be processed into the analytical database in accordance with guidance in Technical Procedure TP-2.2-12 “Analytical Data Management” (See Table QAPP-1).

1.3 Data Review and Reporting

After data has been received, validated, and reviewed, concentrations of any detected analytes will be compared to Site cleanup levels and the trigger levels as defined in the CMP. Results of the monitoring event will be included in a compliance monitoring report. The report will include the date of the sampling event, a discussion of groundwater findings, a tabular presentation of groundwater analytical results, and a comparison to established action levels for the site. At this time, the data will also be uploaded to an appropriate site specific database such as EQuIS (maintained by Golder) as well as the electronic Environmental Information Management (EIMS) System for acceptance by Ecology.

1.3.1 Database

Database files will be created for each compliance-monitoring round. The laboratory data will be compiled in an appropriate site specific database such as EQuIS Environmental Data Management Software. Database files will be created and data processed in accordance with the procedures outlined in Technical Procedure TP-2.2-12 “Analytical Data Management.” Information fields which will be entered into the project database will include the following:

- Monitoring well information – location (x, y), elevation, screened interval, borehole diameter, casing diameter;
- Groundwater elevation data – date and time of measurement, measuring device, measured depth to groundwater from measuring point, elevation of measuring point, elevation of groundwater;
- Sample designation information – sample ID, QA/QC identification, date and time of sample collection;
- Analytical data containing laboratory data qualifiers and revised data qualifiers assigned during the data validation process; and
- Table of data quality qualifier abbreviations and descriptions.

1.3.2 The Environmental Information Management System

The EIM System (Ecology 2007b) is Ecology's main database for environmental monitoring data. The EIM was developed to aid in the transfer of data for project sites in Washington State that are being monitored by Ecology, or will eventually be reviewed by Ecology through various state programs. The EIM will facilitate, for both the PLPs and Ecology, efficient data transfer and review of data for the key components of the Landsburg Mine site, including the following:

- Project Study - an organized set of monitoring actions for collecting data about an area that will include site setting information, project status, and agency or public involvement.
- Location Information - locations are where the data are collected and could include Geographic Information System (GIS) data, and sample reference information.
- Data Results - physical observations, field measurements, or laboratory analyses of samples will include the bulk of a database collected for the duration of the project.

The transfer of data will be facilitated by an online import tool (the EIM System) for sites that are required to submit data electronically to Ecology. Golder will utilize the EIM, as well as maintaining their own secure site specific database such as EQuIS, to record physical and chemical measurements and provide for retrieval of the data into reporting formats.

1.4 Records Turnover

Records turnover will be conducted at times specified by the client or by the Ecology project manager, utilizing the EIM System and /or traditional reporting formats. The scope of the interim record distribution shall be specified by the client or the Ecology project manager, or both. Records turnovers shall be in accordance with the Quality Procedure QP-16.1 and shall be inspected before transmittal by the Golder project manager or his designee.

2.0 REFERENCES

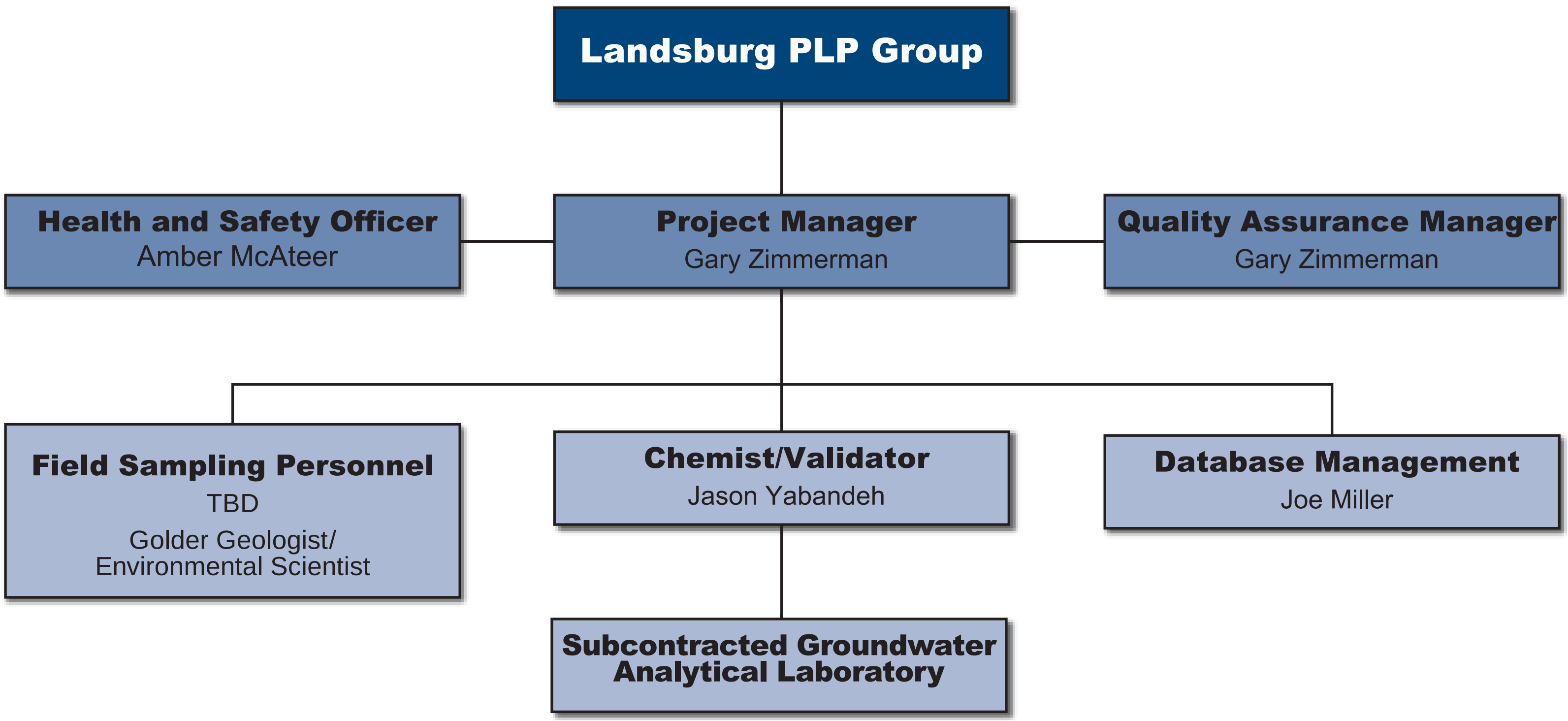
Washington State Department of Ecology (Ecology). 2007a. Model Toxics Control Act Statute and Regulation, Compiled by Washington State Department of Ecology, Toxics Cleanup Program, Publication No. 94-06, Rev. November, 2007.

Ecology. 2007b. EIM Submittal Guidelines www.ecy.wa.gov/eim Version 2006.01.

Golder Associates, Inc. (Golder). 1995. Technical Procedure TP-2.2-12 “Analytical Data Management. March.

Golder. 1996. Quality Procedure 16.1 “Quality Assurance Records Management”. July.

FIGURE



DMP-1
ORGANIZATION CHART
PALMER/LANDSBURG MINE/WA

Golder Associates

APPENDIX
HASP

REPORT

APPENDIX HASP

HEALTH AND SAFETY PLAN
FOR COMPLIANCE MONITORING
AT THE LANDSBURG MINE SITE

Submitted To: Washington Department of Ecology
3190 – 160th Avenue SE
Bellevue, WA 98008

Submitted By: Golder Associates Inc.
18300 NE Union Hill Road, Suite 200
Redmond, WA 98052 USA

Submitted On Behalf Of: The Landsburg Mine Site PLP Group

June 7, 2017 **923-1000-002.R154**

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1.0 GENERAL CONSIDERATIONS

1.1 Introduction

The purpose of this document is to establish standard health and safety procedures for employees engaged in groundwater monitoring programs described in the Landsburg Compliance Monitoring Plan, performed at the Landsburg Mine Site located approximately 1½ miles northwest of Ravensdale, Washington.

The levels of protection and the procedures specified in this plan are based on the information obtained during the site Remedial Investigation Study (Golder, 1996) and subsequent interim groundwater monitoring events, and represent the minimum health and safety requirements to be observed by all employees while engaged in this project. Unforeseeable or changing site conditions may warrant the need for higher levels of protection. Should any situation arise which is obviously beyond the scope of this plan and the procedures specified herein, work activities shall be immediately halted pending discussion with the Health and Safety Officer and Project Manager, and revision of the specified health and safety procedures.

All personnel conducting site-monitoring activities must read this health and safety plan carefully, participate in a comprehensive safety briefing, and sign the Project Health and Safety Briefing Acknowledgment Form (see Attachment HSP-B) prior to engaging in any fieldwork on-site. If there are any questions or concerns that you do not feel are adequately addressed, you are encouraged to ask the Health and Safety Officer or available on-site Health and Safety personnel. Follow the designated health and safety procedures, be alert to the hazards associated with performing the identified tasks on this site and above all else, use common sense and exercise reasonable caution at all times.

1.2 Organizational Structure and Responsibilities

The personnel responsible for the health and safety of employees on this project are the Site Health and Safety Coordinator, the Health and Safety Officer, and the Project Manager as designated below:

Designated Site Health and Safety Coordinator	See Discussion of Field Personnel Below
Health and Safety Officer	Amber McAteer
Project Manager	Gary Zimmerman

The Project Manager has the overall responsibility for project health and safety and shall have the authority to take whatever actions may be necessary to provide a safe working environment for all project personnel, including the authority to upgrade the level(s) of personal protective equipment utilized as he or she sees fit, pending subsequent discussion with and concurrence by the Health and Safety Officer.

The Health and Safety Officer is responsible for establishing appropriate health and safety procedures for the project and shall have the requisite authority to implement those procedures including, if necessary, the authority to temporarily delay start-up or shut the project down for health and safety reasons.

The Site Health and Safety Coordinator is responsible for ensuring that designated health and safety procedures are implemented in the field. The Site Health and Safety Coordinator also has the authority to temporarily halt operations based on conditions observed in the field.

All field work will be performed by personnel fully trained under the required OSHA and WISHA regulations, and shall meet all of the medical surveillance/training requirements set forth in Sections 1.3 and 1.4 below.

The ultimate responsibility for the health and safety of the individual employee rests with the employee himself, and his or her colleagues. Each employee is responsible for exercising the utmost care and good judgment in protecting his or her own health and safety and that of fellow employees. Should any employee observe a potentially unsafe condition or situation, it is the responsibility of that employee to immediately bring the observed condition to the attention of the appropriate health and safety personnel as designated above, and to follow-up the verbal notification by completing the "Incident" report form provided in Attachment HSP-C.

Should an employee find himself or herself in a potentially hazardous situation, the employee shall immediately discontinue the hazardous activity and either personally effect appropriate preventative or corrective measures, or immediately notify the Project Manager or Site Health and Safety Coordinator of the nature of the hazard. In the event of an immediately dangerous or life threatening situation, employees are directed to temporarily "stop work" immediately until the hazardous situation is evaluated and corrected.

"Extenuating circumstances" such as budget or time constraints, equipment breakdown, changing or unexpected conditions, etc., never justify unsafe work practices or procedures. In fact, exactly the opposite is true. Under stressful circumstances all project personnel particularly on-site managers must be aware of the temptation to consciously or unconsciously compromise health and safety standards, and be especially safety conscious. Every employee is expected to consider "safety first" at all times.

1.3 Medical Surveillance and Training

All personnel engaged in on-site activities on this project must have baseline physical examinations and be participants in an on-going medical surveillance program. In addition, all on-site personnel must receive an initial 40 hours of off-site hazardous waste site investigation health and safety training including: hazard identification; basic site safety; the appropriate selection, use, and maintenance of respiratory protection and personal protective clothing; decontamination procedures; and the proper calibration and use of monitoring instrumentation.

Workers on site only occasionally for a specific limited task such as surveying and who are unlikely to be exposed to constituents of concern over permissible exposure limits, recommended exposure limits, or published exposure limits shall receive a minimum of 24 hours of instruction off the specific work site, and a minimum of one day of actual on-site field experience under the direct supervision of a trained, experienced supervisor.

All personnel will also be required to participate in a task-specific health and safety briefing including review and discussion of the provisions of this health and safety plan.

1.4 Respiratory Protection

All employees who may be required to use air purifying or air supplying respirators must be adequately trained as set forth above, and be included in a medical surveillance program and approved for the use of said respiratory protection by a licensed physician. Prior to using any air purifying respirator in the field, each employee must be qualitatively fit tested for the specific size, make, and model of respirator he or she will be using according to the procedures set forth in Appendix C of the 29 CFR 1910.1001 asbestos regulations. Beards (including a few days growth), large sideburns, or mustaches which may interfere with a proper respirator seal are not permitted. Eyeglasses with temple bars which may compromise the respiratory/face seal are not permitted. Prior to using any air-supplying respirator, each employee must have hands-on training in check-out and donning procedures, and use of the specific type of apparatus that will be used on-site.

1.5 General Work Safety Practices

The following personal hygiene and work practice guidelines are intended to minimize employees' risk of injuries and/or adverse health effects. These guidelines represent the minimum standard procedures for controlling recognized potential hazards associated with this project and are to be followed by employees <u>at all times</u>.

- A multi-purpose dry chemical fire extinguisher, a complete field first aid kit, and a bottle of emergency eye wash solution shall be maintained in every company vehicle.
- Eating, drinking, smoking, taking medications, chewing gum, etc., is prohibited in the immediate vicinity of sampling activities.
- Do not handle samples, or any other potentially contaminated items unless wearing NBR (nitrite butyl rubber) or neoprene rubber gloves.
- Thoroughly wash hands and, if necessary, face before eating or putting anything in your mouth. Avoid hand to mouth contamination.
- Be cognizant of the wind direction at all times. Stand upwind of monitoring wells during groundwater sampling whenever possible.
- Be alert to potentially changing exposure conditions as evidenced by perceptible odors, discoloration, oily sheen or unusual appearance of purge water.

- Field sampling activities will be conducted by at minimum, two person teams, so that each person can monitor or assist in the health and safety of the other.
- Be alert to the symptoms of fatigue and heat stress, and their effect on the normal capabilities, caution, and judgment of personnel.
- Establish prearranged hand signals or other means of emergency communication when wearing respiratory equipment, since this equipment seriously impairs speech communications. At a minimum: thumbs up - yes, everything is okay; thumbs down - no; hands on throat - I'm choking or can't breathe; hands on top of head - need assistance; grip partner's wrist or both hands around partner's waist - leave area immediately; thumb over shoulder - let's get out of here, etc.
- Noise may pose a health and safety hazard. A good rule of thumb is if you have to raise your voice in order to communicate at a distance of three feet in steady state (continuous) noise, noise levels are in excess of 85 dBA and hearing protection should be used. Hearing protection is available and should be included in your standard field kit along with hard hat, safety glasses, etc.
- Always use an appropriate level of personal protection. Inadequate levels of protection can result in otherwise preventable exposure; excessive levels of safety equipment can impair efficiency and increase the potential for heat stress, back strain and accidents.

1.6 Heat Stress

Working in protective clothing or in high ambient air temperatures can greatly increase the likelihood of heat fatigue, heat exhaustion, and heat stroke, the latter being a life-threatening condition. When working in such conditions or in personal protective equipment in ambient temperatures greater than 65°F, employees shall use the "buddy system" to monitor each other's pulse rate at the start of each rest period. If the pulse rate exceeds 110 beats per minute, the employee shall take his or her oral temperature with a clean disposal colormetric oral thermometer. If the oral temperature exceeds 99.6°F, the next work period shall be shortened by one-third. The pulse rate and oral temperature shall be monitored again at the beginning of the next rest period; and if the oral temperature exceeds 99.6°F, the work period shall again be shortened by one-third etc., until the oral temperature is below 99.6°F. Under no circumstances shall any employee be permitted to return to work if his or her temperature exceeds 100.6°F. All employees are to be alert to the possibility and symptoms of heat stress. Should any of the following symptoms occur: extreme fatigue, cramps, dizziness, headache, nausea, profuse sweating or pale, clammy skin, the employee is to leave the work area, rest, cool off, and drink plenty of cool water/electrolyte drinks, etc. Sufficient cool potable water and clean disposal cups shall be maintained at all times in the rest area. If the symptoms do not subside after a reasonable rest period, the employee shall notify the on-site Health and Safety Coordinator and seek medical assistance.

1.7 Confined Spaces and IDLH Conditions

"IDLH" conditions or situations that are immediately dangerous to life and health are of utmost concern from a health and safety standpoint. IDLH conditions are most commonly associated with confined spaces involving oxygen deficient or explosive atmospheres, acutely toxic chemical asphyxiants such as hydrogen sulfide (H_2S), carbon monoxide, and hydrogen cyanide (HCN), or acute exposure to extremely toxic substances which may cause delayed health effects such as radionuclides. It is unlikely that this project will involve work in any confined or partially confined space, or that employees will encounter IDLH conditions. Nevertheless, the hazards associated with confined spaces are of such severity that all employees should be aware of the need for extreme caution in entering a confined space.

A task-specific confined space entry plan shall be required prior to any employee entering a confined or partially confined space. A confined space is any space not normally intended for human occupancy, having limited egress (access to an exit) and the potential for the presence or accumulation of a toxic or explosive atmosphere. This includes manholes, crawlspaces, trenches, and all test pits greater than 4 feet in depth in potentially contaminated soil.

2.0 SITE BACKGROUND AND PROJECT DESCRIPTION

2.1 Site Background

A brief discussion of the Landsburg Mine site is provided in the Introduction to this set of plans and in Section 2 of this HSP. This Introduction also presents the nature and extent of contamination detected in air, soil, groundwater, and surface water samples collected as part of the remedial investigation as well as during other site preliminary and interim investigations. An evaluation of this data concludes that apart from soils located within the subsidence trench in the area of known waste disposal activities, soil, groundwater, and surface water media in the RI/FS Study Area do not exhibit concentrations of chemical constituents above naturally occurring background levels. The contaminants of concern detected within the trench include chromium, lead, PCBs, bis-(2-ethylhexyl)phthalate, methylene, chloride, TCE and TPH. These compounds were detected in excess of applicable MTCA cleanup levels. Table HSP-1 presents the allowable exposure limits for chemicals of concern at the Landsburg Mine site. The chemicals listed in Table HSP-1 are those chemicals which were detected in trench soils during site investigations; as such, they are chemicals that could potentially be encountered during compliance groundwater monitoring. Table HSP-2 provides a summary of health effects for constituents of concern. It is important to note that these chemicals were not detected in groundwater samples during the RI.

2.2 Project Description

The proposed site remedy (low permeability soil cap - see Introduction) will eliminate direct contact with the waste remaining within the trench, and remove potential ambient air impacts. Therefore, the only remaining potential migration pathway is groundwater emanating from the mine. The Compliance Monitoring Plan established the groundwater-monitoring program which will be implemented to determine whether chemicals within the mine, remain contained after remedial measures are implemented.

The Compliance Monitoring Plan is divided into short-term monitoring, conducted during the site remediation, and long-term monitoring which extends for the post-closure period following completion of the site remedy. Both the short-term and long-term monitoring are based upon collecting samples from groundwater emanating from the mine along preferential flow paths to the North and South. The samples will be collected from site groundwater monitoring wells (LMW-2, LMW-3, LMW-4, LMW-5, LMW-6 and LMW-7) installed during the RI, from site monitoring wells (LMW-8, LMW-9, LMW-10, and LMW-11) installed during subsequent investigations to the RI/FS, and from four Sentinel wells to be installed prior to the completion of the remedial action. Figure HSP-1 depicts the location of site monitoring wells. Complete details of groundwater monitoring are provided in the Compliance Monitoring Plan. The following sections describe specific health and safety procedures which shall be followed during groundwater monitoring.

3.0 TASK SPECIFIC REQUIREMENTS AND PROCEDURES

3.1 Task - Groundwater Sampling From Monitoring Wells

3.1.1 Task Description

Groundwater will be sampled from wells LMW-2 through LMW-11 and Sentinel wells (yet to be installed). The planned monitoring frequency is presented in the Compliance Monitoring Plan.

Each sampling event will include the following general activities:

- Measurement of static water levels
- Well purging to insure sample representativeness with dedicated submersible pumping system
- Measurement of field parameters pH, turbidity, dissolved oxygen, electrical conductivity (EC) and temperature periodically during purging
- Collection of all purge water in appropriate containers for on-site temporary storage prior to disposal
- Sample collection

3.1.2 Potential Hazards and Precautionary Measures

At any contaminated site, volatile organic compounds may volatilize from contaminated water and reach liquid/vapor phase equilibrium concentrations in the monitoring well headspace. Well sampling personnel may be exposed to volatile organic vapors emanating from the well head via inhalation, and to all chemical contaminants present via dermal contact with contaminated groundwater and/or subsequent hand to mouth contamination (ingestion). Sampling personal should stand up-wind of the casing while opening the well, monitor the total organic vapor levels in the air in the immediate vicinity of the well head, and wear appropriate PPE as discussed below.

3.1.3 Personal Protective Equipment/Clothing

Sampling personnel shall wear steel-toed boots, hard hats (only required when active remediation is occurring near the well), safety glasses, and in the absence of any perceptible/detectable contamination, only one pair of N-Dex disposable gloves. In the presence of visible contamination, perceptible odors, or a "hit" (see below) at the well casing on the organic vapor monitor (OVM) above action levels, engineering controls will be implemented. If engineering controls are not protective for workers against the contamination, then sampling personnel shall also wear outer NBR rubber gloves, and full face air purifying respirators equipped with organic vapor cartridges.

3.1.4 Air Monitoring and Action Levels

Well monitoring personnel shall always approach and open the well casing from upwind.

Investigators shall monitor total organic vapor levels at the wellhead and in the immediate area (breathing zone) with a Thermo Environmental,Microtip, or equivalent OVM. The OVM shall be bench calibrated under manufactures specifications to 100-ppm isobutylene prior to going in the field, and at the beginning and end of each day in the field.

Investigators shall turn on, zero and calibrate the instruments at the beginning of the work day, upwind of the well to be sampled and any other potential sources.

Upon any reading in the breathing zone that is perceptible above background or any reading greater than 50 ppm at the well casing, or any indication of potential airborne contamination (i.e., perceptible odors, visible vapors) employees shall immediately stand up-wind from the well. Sampling personnel will don air purifying respirators if engineering controls cannot mitigate the potential for exposure.

In the event of any reading in the breathing zone greater than 50 ppm aside from a momentary spike, investigators shall move upwind and leave the area. In that event it shall be necessary to contact the project manager and reevaluate the work plan accordingly.

Air monitoring at the well heads shall continue until the Health and Safety Office indicates that monitoring is no longer required for the protection of sampling personnel.

3.1.5 Decontamination

Sampling personnel must don a new pair of gloves for each sampling procedure. Prior to getting into a vehicle and/or upon completion of all sampling employees must:

1. Rinse boots if contact with well water occurred.
2. Wash and remove, or remove and discard outer gloves (if applicable).
3. Remove hardhat and respirator (if applicable). Discard cartridges and place respirator in bucket of soapy water.
4. Remove boots if contact with well water occurred
5. Remove Tyvek (if applicable) - discard.
6. Remove inner gloves - discard.

4.0 CONTINGENCY AND EMERGENCY PROCEDURES

The following procedures have been established to deal with emergency situations that might occur during monitoring field activities. Employees shall have a cellular phone on site, or be within the immediate vicinity of a previously located telephone, at all times. Employees should familiarize themselves with the location of the nearest phone, and medical facilities. In the event of an emergency situation, employees shall follow the procedures specified below. When help arrives, employees shall defer all emergency response authority to appropriate responding agency personnel.

If an unanticipated, potentially hazardous situation arises, such as indicated by visible contamination, unusual or excessive odors, fire, etc., personnel shall temporarily cease operations, move away to a safe area upwind of the hazard and contact the Health and Safety Officer.

In the event of a serious emergency situation, employees shall contact the local fire department or paramedic as appropriate and inform them of the nature of the emergency, and then notify the designed project health and safety personnel.

4.1 Medical Emergency Response Plan

Should any person working at the site be injured or become ill, notify the onsite Health and Safety Coordinator and initiate the following emergency response plan:

Note: The nature of chemical contamination anticipated on this project does not present an immediate threat to human health. Other than removal of outer protective garments and gross contamination (e.g., mud) immediate emergency treatment of injuries should take precedence over personal decontamination.

1. In the event of an injury, if able, the injured person should proceed to the nearest available source of first aid. Emergency medical technicians are available at **Auburn Regional Medical Center**. Phone number and location is listed below. If the injured party is extremely muddy, remove outer garments and if necessary, wash the injured area with soap and water. If the "injury" involves a potential overexposure to hazardous gases or vapors (headache, dizziness, nausea, disorientation), get the victim to fresh air and take him or her to **Auburn Regional Medical Center (253-833-7711)** for a complete physical examination as soon as possible. **Auburn Regional Medical Center is located at 202 North Division St., Auburn, WA. See Attachment HSP-A for a map and directions to the hospital.**

   If the injury involves foreign material in the eyes, immediately flush the eyes with emergency eye wash solutions and rinse with copious amounts of water at the portable emergency eye wash station.

2. If the victim is unable to walk, but is conscious and there is no evidence of spinal injury, perform immediate first aid and call paramedics or transport the injured person to Auburn Regional Medical Center. If the victim cannot be moved without causing possible further injury such as in the case of a severe compound fracture, take

necessary emergency steps to control bleeding and immediately call for medical assistance as discussed below.

If the victim is unconscious or unable to move, or if there is any evidence of spinal injury, Do Not Move The Injured Person Unless Absolutely Necessary To Save His or Her Life, until the nature of the injury has been determined. Administer rescue breathing if the victim is not breathing, control severe bleeding and immediately seek medical assistance as discussed below.

3. If further medical treatment is required and:

   a. the injury is not immediately life threatening, contact **Auburn Regional Medical Center at (253-833-7711)** and take the injured party to the hospital by private automobile.

   b. the injury is severe, immediately call Paramedics (**911**). In the interim, determine the status of **Auburn Regional Medical Center** and advise them of the situation. **If Auburn General Hospital is unable to respond immediately and adequately, for any reason, contact the Enumclaw Regional Hospital (360-825-2505) or Airlift Northwest (1-800-426-2430).**

4. If the injured person is a Golder Associates Inc. employee, a fellow employee (if available) will accompany the injured person to the hospital to ensure prompt and proper medical attention. After proper medical treatment has been obtained, the companion employee should notify the Health and Safety Officer and prepare a written report.

4.2 Fire and Explosions

The dry chemical fire extinguisher provided to employees are effective for fires involving ordinary combustibles such as wood, grass, etc., flammable liquids, and electrical equipment. They are appropriate for small, localized fires such as a drum or burning refuse, a small burning gasoline spill, a vehicle engine fire, etc. No attempt should be made to use the provided extinguisher for well-established fires or large areas or volumes of flammable liquids.

In the case of fire, prevention is the best contingency plan. There should be no smoking in the vicinity of flammable materials and smoking materials, where permitted, should be extinguished with care.

Catalytic converters on the underside of vehicles are sufficiently hot to ignite dry grass and shrubs. Employees should avoid driving over dry grass and shrubs that are higher than the ground clearance of the vehicle, and be aware of the potential fire hazard posed by the catalytic converter, at all times. Never allow a running vehicle to sit in a stationary position over dry grass or other combustible materials.

In the event of a fire or explosion:

1. If the situation can be readily controlled with available resources without jeopardizing the health and safety of yourself or other site personnel, take immediate action to do so. If not:

2. Isolate the fire to prevent spreading if possible.

3. Clear the area of all personnel working in the immediate vicinity.

4. Immediately notify the site emergency personnel and the local fire department.

4.3 Unforeseen Circumstances

The Health and Safety procedures specified in this plan are based on the best information available at this time. Unknown conditions may exist, and known conditions may change. This plan cannot possibly account for every unknown or anticipate every contingency. Should substantially higher levels of contamination be encountered in the soil or groundwater, or should any situation arise which is obviously beyond the scope of monitoring, respiratory protection and decontamination procedures specified herein, work activities shall be modified (such as moving to another location) or halted, pending discussion with the company Health and Safety Officer and implementation of appropriate protective measures. If necessary, complete a Field Safety Procedures Change Authorization form (Attachment HSP-D).

TABLES

Table HASP-1

ALLOWABLE OCCUPATIONAL EXPOSURE LIMITS

SUBSTANCE	STRICTEST EXPOSURE LIMIT[a] (mg/m^3)
TOTAL METALS	
Antimony	0.5 TLV[d]
Arsenic	0.002 (REL[c] for inorganic arsenic, 15 min. ceiling)
Cadmium	Reduce exposure to lowest feasible concentration (REL[c]) 0.005
Chromium	0.5 (TLV[d] for trivalent chrome), 0.05 (TLV[d] for hexavalent chrome)
Copper	1.0 (TLV[d])
Lead - inorg. as Pb	0.05 (TLV[d])
Mercury - inorganic	0.05 mg Hg/m^3 (REL[c])
Nickel	0.015 mg Ni/m^3 (TLV[d])
Selenium	0.2 (TLV[d])
Silver - metal	0.01 (TLV[d])
Zinc oxide	5.0 (TLV[d])
Cyanide	5 mg CN/m^3 (TLV[d])
VOCs	
1,1,1-Trichloroethane	350 ppm (TLV[d])
1,1-Dichloroethene	1 ppm (TLV[d])
1,2-Dichlorobenzene	50 ppm ceiling (REL[c])
1,1-Dichloroethane	100 ppm (TLV[d])
1,2-Dichloroethane	1 ppm (TLV[d])
1,2,4-Trimethylbenzene	25 ppm (TLV[d])
1.3.5-Trimethlybenzene	25 ppm (TLV[d])
1,4-Dichlorobenzene	75 ppm (TLV[d])
4-Isopropyltoluene	NA[e]
4-Methyl-2-pentanone	50 ppm (TLV[d]) (Hexone)
Acetone	750 ppm (TLV[d])
Benzene	0.1 ppm (REL[c])
Chloroethane	1000 ppm (TLV[d])
Chlorobenzene	75 ppm (TLV[d])
cis-1,2-Dichloroethene	200 ppm (REL[c])

Table HASP-1 (Cont.)

ALLOWABLE OCCUPATIONAL EXPOSURE LIMITS

SUBSTANCE	STRICTEST EXPOSURE LIMIT[a] (mg/m^3)
Ethylbenzene	100 ppm (TLV[d])
Isopropylbenzene	50 ppm (TLV[d])
Naphthalene	10 ppm (TLV[d])
n-Propylbenzene	None
Methylene chloride	100 ppm (TLV[d])
Styrene	50 ppm (TLV[d])
sec-Butylbenzene	None
Tetrachloroethene	50 ppm (TLV[d])
Toluene	100 ppm (TLV[d])
Total Xylenes	100 ppm (TLV[d])
Trichloroethene	25 ppm (REL[c])
Trichlorofluoromethane	1000 ppm (TLV[d])
Vinyl Chloride	Lowest reliably detectable level (REL[c]) 0.5 ppm (TLV[d])
2-Butanone	20 ppm (REL[c])
SEMIVOLATILE ORGANIC COMPOUNDS	
2-Chlorophenol	None
2-Methylphenol	2.3 ppm (REL[c])
4-Methylphenol	2.3 ppm (REL[c])
2,4-Dimethylphenol	None
Benzyl Alcohol	None
Benzoic Acid	None
Bis(2-ethylhexyl) Phthalate	5 mg/m^3 (TLV[d])
Bis(2-chloroethyl) Ether	5 ppm (TLV[d])
Butylbenzyl Phthalate	None
Dimethyl Phthalate	5 mg/m^3 (TLV[d])
Isophorone	5 ppm ceiling (REL[c])
Phenol	5 ppm (TLV[d])
ORGANOCHLORINE PESTICIDES AND PCBs	
Aroclor 1242	Reduce exposure to lowest feasible limit (REL[c]) 1 mg/m^3 (TLV[d])

Table HASP-1 (Cont.)

ALLOWABLE OCCUPATIONAL EXPOSURE LIMITS

SUBSTANCE	STRICTEST EXPOSURE LIMIT[a] (mg/m^3)
Aroclor 1254	Reduce exposure to lowest feasible limit (REL[c]) 0.5 mg/m^3 (TLV[d])

Notes:

[a]Unless otherwise noted, all values are 8-hr time weighted average concentrations in air.

[b]Permissible exposure limit promulgated by the Occupational Safety and Health Administration (29 CFR 1910.1000)

[c]Recommended exposure limit published by the National Institute for Occupational Safety and Health (1988)

[d]Threshold limit value promulgated in WAC 296-62-07515, Table 1.

[e]Not applicable

Tabel HASP-2

SUMMARY OF HEALTH EFFECTS FOR CONSTITUENTS OF POTENTIAL CONCERN[a]

SUBSTANCE	HEALTH EFFECTS	
	ACUTE	**CHRONIC**
TOTAL METALS		
Antimony	Violent respiratory irritation, vomiting, pulmonary congestion	Dry throat, nausea, headache, sleeplessness, loss of appetite, dizziness
Arsenic	Gastrointestinal disturbances, diarrhea	Lung and skin cancer, skin changes and warts
Cadmium	Gastrointestinal disturbances, severe pneumonitis four to eight hours after acute exposure	Chronic bronchitis, kidney disease
Chromium	Respiratory Irritation, dermatitis	Lung cancer
Copper	Lung irritation, severe gastritis, diarrhea	
Lead	Abdominal pain, constipation, headache, fatigue, sleep disturbance	Anemia, peripheral nervous system damage, central nervous system (CNS) damage, kidney damage
Mercury	Lungs; pneumonitis, bronchitis	Weakness, irritability, mouth soreness
Nickel	Respiratory irritation	Respiratory tract cancer
Selenium	Skin irritation, respiratory irritation	Respiratory irritation
Silver		Eye/skin discoloration
Zinc	Skin irritation, respiratory irritation	Gastrointestinal disturbances
Cyanide	Extremely fast-acting acute asphyxiant, headache, dizziness, confusion, unconsciousness, death	
VOCs		
1,1,1-Trichloroethane	Headache, dizziness, light-headedness, nausea, disorientation/confusion, vomiting, eye/nose/respiratory irritation, skin irritation/burning sensation, dry, scaly, fissured dermatitis	Dermatitis, liver and kidney damage
1,1-Dichloroethene	Headache, dizziness, light-headedness, nausea, disorientation/confusion, vomiting, eye/nose/respiratory irritation, skin irritation/burning sensation, dry, scaly, fissured dermatitis	Dermatitis, liver and kidney damage

Table HASP-2 (Cont.)

SUMMARY OF HEALTH EFFECTS FOR CONSTITUENTS OF POTENTIAL CONCERN[a]

SUBSTANCE	HEALTH EFFECTS	
	ACUTE	CHRONIC
1,2-Dichlorobenzene		
1,1-Dichloroethane		
1,2-Dichloroethane		
1,2,4-Trimethylbenzene		
1.3.5-Trimethlybenzene		
1,4-Dichlorobenzene		
4-Isopropyltoluene		
4-Methyl-2-pentanone		
Acetone	CNS depression in high concentrations	Extremely low toxicity, liver, kidney damage, after prolonged exposure to high concentrations
Benzene	Headache, dizziness, light-headedness, nausea, disorientation/confusion, vomiting, eye/nose/respiratory irritation, skin irritation/burning sensation, dry, scaly, fissured dermatitis	known human carcinogen, leukemogenic
Chloroethane		
Chlorobenzene		
cis-1,2-Dichloroethene		
Ethylbenzene		
Isopropylbenzene		
Naphthalene		
n-Propylbenzene		
Methylene chloride	Potent anesthetic, CNS depression, skin burns	dermatitis, CNS depression, liver changes, animal carcinogen
Styrene		
sec-Butylbenzene		
Tetrachloroethene		Dermatitis, CNS depression, anesthetic death, liver damage, heart sensitization
Toluene		

Tale HASP-2 (Cont.)

SUMMARY OF HEALTH EFFECTS FOR CONSTITUENTS OF POTENTIAL CONCERN[a]

SUBSTANCE	HEALTH EFFECTS	
	ACUTE	**CHRONIC**
Total Xylenes		
Trichloroethene		Dermatitis, peripheral nervous system damage, heart sensitization, liver damage, animal carcinogen
Trichlorofluoroethane		
Vinyl Chloride		known human carcinogen, lung cancer, liver cancer, brain cancer
2-Butanone		
SEMIVOLATILE ORGANIC COMPOUNDS		
2-Chlorophenol	Hyperactivity, muscle weakness, tremors	Liver, kidney damage
2-Methylphenol	Skin/eye irritation, muscular weakness, depression, collapse	CNS damage, liver and kidney damage, edema of lung
4-Methylphenol	Skin/eye irritation, muscular weakness, depression collapse	CNS damage, liver and kidney damage, edema of lung
2,4-Dimethylphenol		
Benzyl Alcohol		
Benzoic Acid		
Bis(2-ethylhexyl) Phthalate	Irritation of eyes, lungs, mucous membranes, drowziness, dizziness	Bronchitis, pulmonary edema
Bis(2-chloroethyl) Ether	Irritation of eyes, lungs, mucous membranes, drowziness, dizziness	Bronchitis, pulmonary edema
Butylbenzyl Phthalate		
Dimethyl Phthalate		
Isophorone		
Phenol	Corrosive to all tissue, paleness, weakness, headache, collapse	Liver, kidney damage

Table HASP-2 (Cont.)

SUMMARY OF HEALTH EFFECTS FOR CONSTITUENTS OF POTENTIAL CONCERN[a]

ORGANOCHLORINE PESTICIDES AND PCBs		
Aroclor 1242	Eye and skin irritation, chloracne	Eye and skin irritation, chloracne, liver damage, animal carcinogen
Aroclor 1254		

[a]Source:

National Institute for Occupational Safety and Health, 1990, *NIOSH Pocket Guide to Chemical Hazards*, National Institute for Occupational Safety and Health, Cincinnati, Ohio.

Key, Marcus M., Austin F. Henschel, Jack Butler, Robert N. Ligo, Irving R. Tabershaw (editors), 1977, *Occupational Diseases: A Guide to Their Recognition*, National Institute for Occupational Safety and Health.

Sax, N.I., 1984, *Dangerous Properties of Industrial Materials*, 6th Edition, Van Nostrand Reinhold Company, New York, New York.

FIGURES

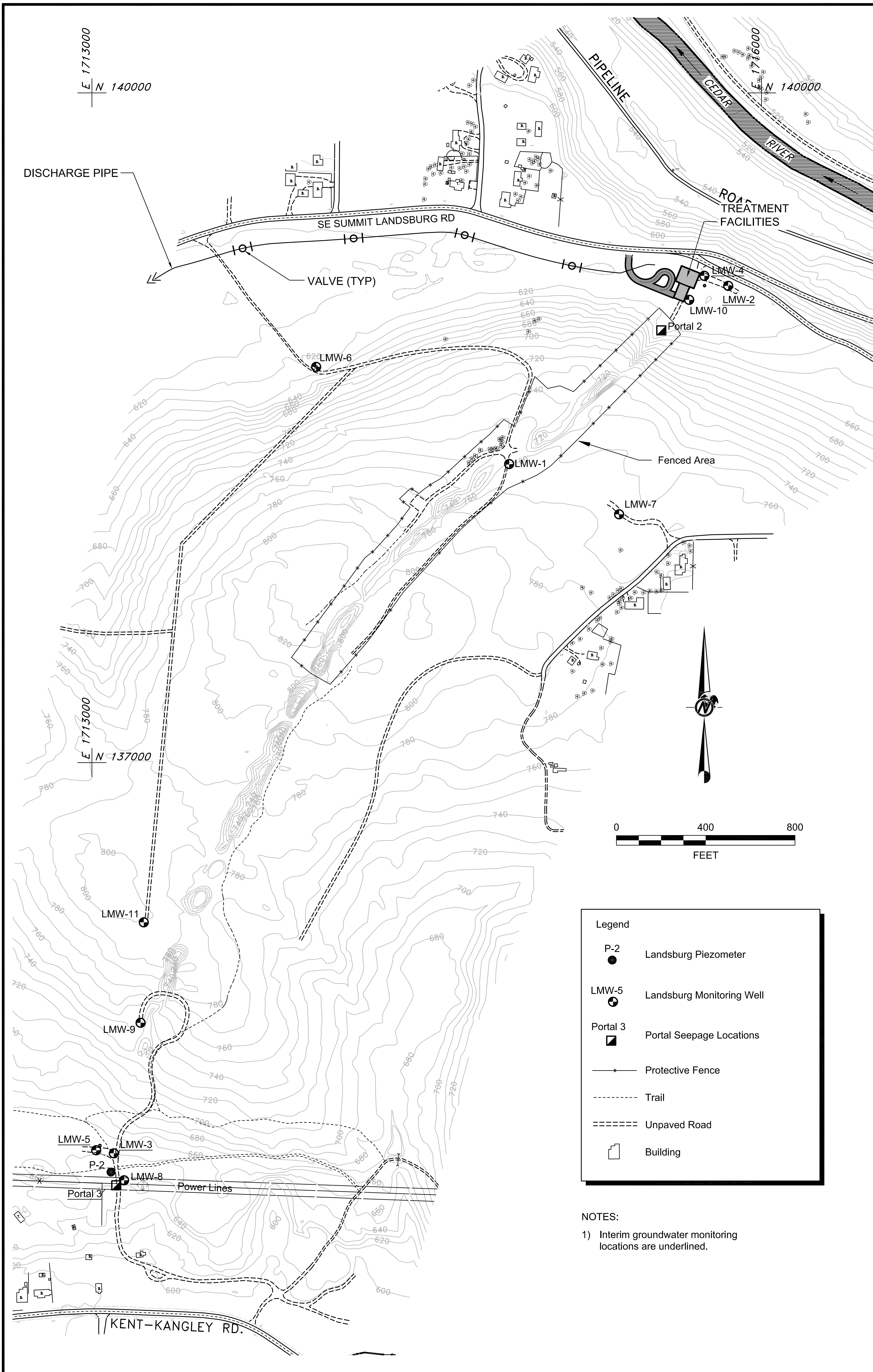
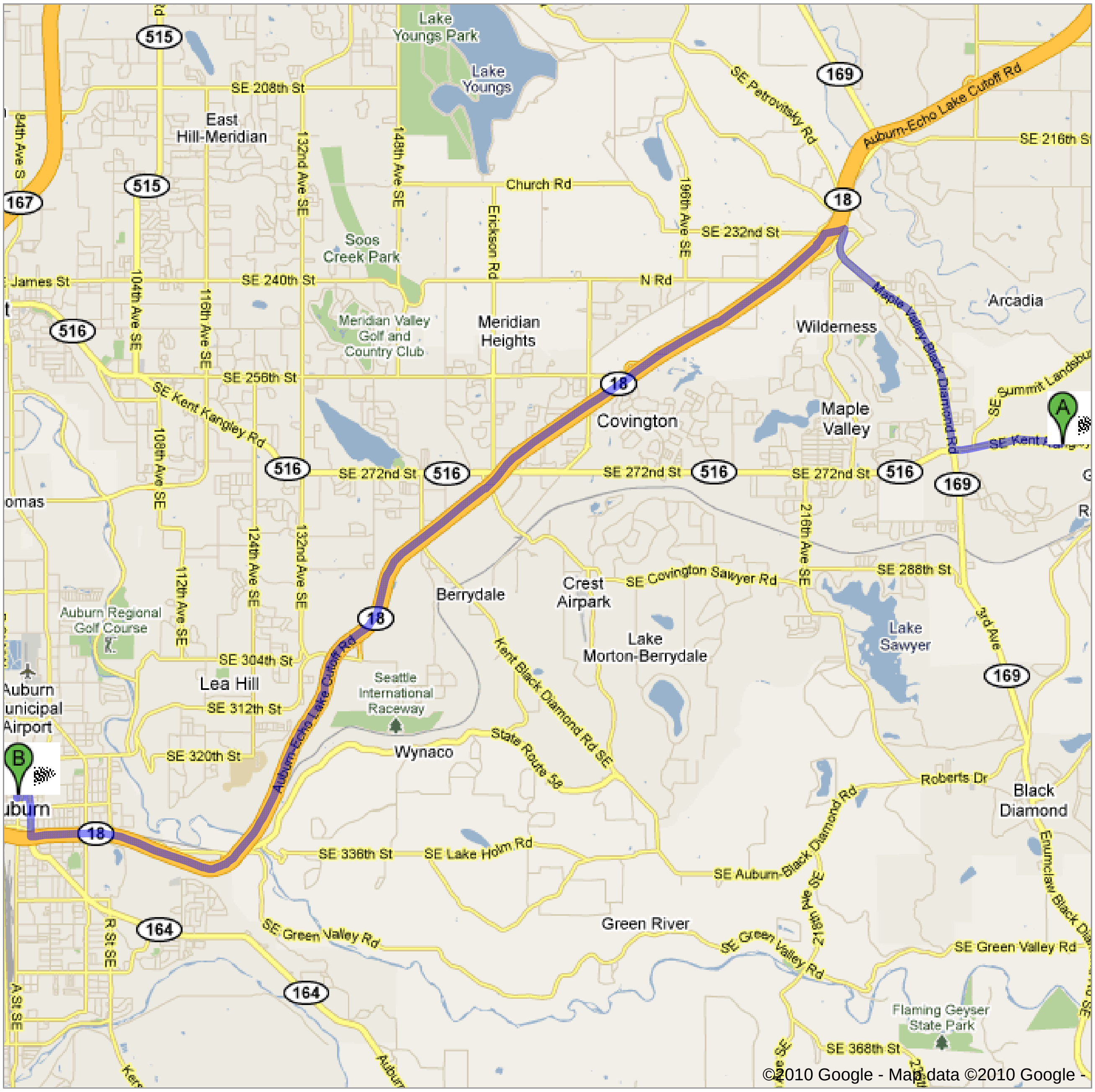


FIGURE **HSP-1**
SITE FEATURES AND TOPOGRAPHY
PALMER/LANDSBURG MINE/WA

APPENDIX HASP-A
MAP TO HOSPITAL

Google maps

Directions to Auburn Regional Medical Center - Hospital
202 N Division St # Main, Auburn, WA 98001-4939
- (253) 833-7711
16.1 mi – about **24 mins**



SE Kent Kangley Rd

1.	Head **west** on **SE Kent Kangley Rd** toward **SE Summit Landsburg Rd** About 2 mins	go 1.1 mi total 1.1 mi
2.	Take the 2nd **right** onto **Maple Valley-Black Diamond Rd** About 5 mins	go 2.7 mi total 3.9 mi
3.	Turn **left** at **SE 231st St** About 1 min	go 0.2 mi total 4.1 mi
4.	Turn **left** to merge onto **WA-18 W** toward **Auburn** About 13 mins	go 11.3 mi total 15.4 mi
5.	Take the **WA-164 E** exit toward **Auburn/Muckleshoot Reservation**	go 0.1 mi total 15.5 mi
6.	Turn **right** at **Auburn Way S** About 2 mins	go 0.4 mi total 15.9 mi
7.	Turn **left** at **2nd St NE** About 1 min	go 0.1 mi total 16.0 mi
8.	**2nd St NE** turns **right** and becomes **A St NE** Destination will be on the left	go 125 ft total 16.1 mi

Auburn Regional Medical Center - Hospital
202 N Division St # Main, Auburn, WA 98001-4939 - (253) 833-7711

APPENDIX HASP-B
SAFETY BRIEFING ACKNOWLEDGMENT FORM

HEALTH AND SAFETY FORMS

Project Name:

Project Number:

Tailgate Safety Briefing Sign-In Log

Date: **Time:**

Briefing Conducted By:	Signature:	Company Name:

This sign-in log documents the tailgate safety briefing conducted in accordance with 29 CFR § 1910.120) "Hazardous Waste Operations and Emergency Response" as well as other applicable regulatory requirements. Personnel who perform work operations onsite are required to attend each safety briefing and acknowledge receipt of such briefings daily.

TOPICS COVERED:

General PPE usage	Decontamination Procedures	Emergency Procedures
Hearing Conservation	Smoking, Eating, and Drinking	Existing Work Zones
Respiratory Protection	Slips, Trips, and Falls	Lockout/Tagout Safety
Personal Hygiene	Heat Stress	Excavation/Confined Space Safety
Exposure Guidelines	Site Control	New Work Procedures

Personnel Sign-in List

Printed Name	Signature	Company Name

ON SITE SAFETY BRIEFING TRACKING FORM

Meeting Type- Site Orientation or Tailgate Talk	Meeting Attendee	Initials*	Date	Topics Discussed / Concerns Brought Forward

***Please ensure that all workers (including other contractors) attending the safety meeting, initial the column beside their name**

APPENDIX HASP-C
INCIDENCE REPORT FORM

INCIDENT REPORT FORM

This report is to be completed by someone familiar with the incident. It should be completed and returned to the Health and Safety Officer whenever an incident occurs. If in doubt, fill it out.

Incident: any expected or unexpected happening that interrupts the work sequence or process and that may result in injury, illness, or property damage to the extent that it causes loss.

Project Title/Number: ____________________

Completed by: ____________________

Date of Incident: ____________________ Date of Report: ____________________

PERSONNEL INVOLVED
List of all personnel involved in the incident:

TYPE OF INCIDENT
Describe the incident:

INJURIES
List injured personnel and the injuries:

PREVAILING CONDITIONS
Describe the prevailing weather, surface, equipment conditions which may have had a factor in the incident:

PERSONNEL PROTECTIVE EQUIPMENT
List PPE used prior to and during the incident:

SITE MONITORING
Describe any real time monitoring that took place prior to, during and/or after the incident:

ACTIONS

List personnel and outside agencies that responded:

NOTIFICATIONS

Were the following notified? Police ☐ Fire ☐ EMS ☐ OSHA ☐ Other ☐

RECOMMENDATIONS

List recommendations to avoid/correct the incident:

COMMENTS

REVIEWED BY:

______________________ Site Health and Safety Coordinator

______________________ Project Manager

______________________ Project Director

APPENDIX HASP-D
FIELD SAFETY PROCEDURES CHANGE AUTHORIZATION

FIELD SAFETY PROCEDURES CHANGE AUTHORIZATION

This Safety Procedures Change Authorization Form will be completed and signed before any safety procedures identified in this Site Safety Plan can be modified by the Field Team. All revisions to safety procedures must be approved by the Project Manager.

Change

Number:

Date:

Duration of Task to be changed:

Description of Procedures modification: ______________________________

____

____

____

Justification: ______________________________

____

____

____

Person Requesting Change:	***Verbal Authorization Received From:***
Name:	Name:
Title:	Title:
Signature	Approved by:
	(Signature of person named above to be obtained within 48 hours of verbal authorization)

REPORT

PART B

OPERATION AND MAINTENANCE PLAN

Landsburg Mine Site
MTCA Remediation Project
Ravensdale, Washington

Submitted To: Washington Department of Ecology
3190 – 160th Avenue SE
Bellevue, WA 98008

Submitted By: Golder Associates Inc.
18300 NE Union Hill Road, Suite 200
Redmond, WA 98052 USA

Submitted On Behalf Of: The Landsburg Mine Site PLP Group

June 7, 2017 **Project No. 923-1000-002.R154**

Table of Contents

LIST OF FIGURES

1.0 OPERATION AND MAINTENANCE PLAN

This section contains the Operation and Maintenance (O&M) Plan for the Landsburg Mine Site. The purpose of the O&M Plan is to provide technical guidance and procedures to ensure effective confirmational monitoring of the operation and maintenance of the constructed cleanup actions under both normal and emergency conditions.

O&M will consist primarily of routine inspection of the cap and associated drainage features, along with any necessary repairs. The selected remedy for the Landsburg Mine Site is construction of a low-permeability soil cap followed by long-term maintenance and monitoring (see Section 1.4). Because no treatment system is involved, many of the items often included in an O&M Plan (i.e., relating to treatment systems) are not relevant for this plan. Operation of the cap consists of periodic routine inspections and maintenance. Maintenance consists of repairs to the cap and/or associated drainage system (see Figures B-1 and B-2) to address erosion and settling that adversely affect the integrity of the remedy, as detected during monitoring.

Construction Quality Assurance (CQA) of cap construction is briefly described in the Compliance Monitoring Plan (Part A) under performance monitoring (Section 1.6 of Part A) with the specific CQA Plan to be developed and provided with the Engineering Design and Specifications. Groundwater monitoring is described in the Compliance Monitoring Plan under confirmation (long-term) monitoring (Section 1.7).

Additional as-built engineering drawings, designs, and specifications will be added to this O&M plan following completion of the remedial construction activities.

This O&M Plan does not include O&M for the Contingent Groundwater Extraction and Treatment System. If a contingent treatment system is required in the future, at that time a treatment technology specific O&M Plan will be developed and submitted to the Washington State Department of Ecology (Ecology) for review after identification of the specific groundwater threat. The groundwater treatment system-specific O&M Plan would be incorporated into this O&M Plan as an attachment.

1.1 Routine Inspections

Routine inspections will be conducted of the site cap and drainage features following the schedule given in Section 1.3. The site maintenance inspections will focus on the condition of the cap and drainage ditches, including:

- Erosion
- Cap settlement
- Vegetative cover
- Animal burrowing
- Drainage ditches

Photographs will be taken during the inspection to document the results of the inspection and assist in observation of changes over time. Site maintenance inspection logs will be completed for each inspection noting the condition of the cap and drainage ditches and corrective actions taken as described in Section 1.4.

Erosion

Erosion of the cap and cover may occur due to stormwater run-off and wind. Inspectors will note rills, gullies, or other evidence of significant erosion. Inspectors will look for visual evidence of soil loss from the cap. Soil loss over large areas of the cap will be detected by measuring and recording the soil depth against cap monuments. The cap monuments will be installed in the cap during its construction. When the monuments are installed, a survey will precisely measure the location and depth of soil at the monument. The cap monuments will not penetrate the cap (low-permeability layer). Erosion will be indicated by a decrease in the depth of soil at the monuments. Severe erosion and/or settling of the cap will be evidenced if the inspector can see down to the low permeability materials through the vegetated cover soils.

At the north end of the cap, long-term erosion will be controlled by the final engineered grade that is sufficient for the cap materials and also by establishing a stable vegetative cover suitable for the local climate. For the south end of the cap, the cap will terminate at a mine pillar (between Trench 7 and 6). The cap will be sloped for drainage toward the east and/or west into stormwater diversion ditches. The cap side slopes will be engineered and stabilized by the final grade that is acceptable for the cap materials and will also be stabilized by a vegetative cover.

Inspectors will check for soil accumulation in drainage ditches, which is evidence of erosion and also could prevent proper operation of the ditches. Inspectors will also note the presence and extent of debris accumulation in the ditches, which could also prevent their proper operation.

Cap Settlement

During routine inspections, the cap will be visually observed by the inspector traveling the length of the cap on foot. The inspector will look for signs of differential cap settlement, such as low spots or ponding. The inspector will also look for cracks or other signs of cap penetration. Overall settling of the cap will be determined by site surveys (see Section 1.2). Some cap settlement is expected.

Vegetative Cover

Visual inspection of the vegetative cover will be performed during each inspection round. Inspectors will check the condition and density of the vegetative cover, and note the presence of any deep-rooted plants. Dead or absent vegetation will produce areas susceptible to erosion and will be noted for maintenance.

Animal Activity

Visual inspection of the cover for evidence of burrowing animals will be performed during each monitoring round.

Drainage Ditches

Visual inspection of the cap's drainage ditches will be performed during each inspection round. The drainage ditches will be inspected for signs of blockage, unusually damp soil, localized settlement, or displacement. Excessive debris observed within the drainage system will be noted for subsequent removal. Damage to the drainage channel that significantly reduces the channel's capacity to drain water away from the cap will be noted for repair. Discharge points for the drainage ditches will also be inspected during each inspection round.

1.2 Cap Geodetic Surveys

Cap geodetic surveys will be conducted by a qualified surveyor registered in the State of Washington. Surveys will be conducted using geodetic benchmark(s) established in exposed bedrock adjacent to the capped areas. The benchmark(s) will be established by a state-certified surveyor prior to the completion of the cap. The geodetic benchmark(s) will allow for the comparison and calibration of the surveyed cap data. The survey will cover the cap area and adjacent drainage ditches. The survey will measure the location and elevation of high and low points of the cap and drainage ditches for comparison to original grades and in comparison to the geodetic benchmark(s). The survey will also measure cap elevations on a 50-foot grid, with additional survey points around areas of differential settlement as determined by visual observation.

1.3 Schedule

Routine inspections as described in Section 1.1 will be performed quarterly in the first year, semi-annually for the next four (4) years, and annually thereafter until completion of the post-closure period. Additional inspections will be conducted if warranted.

Geodetic surveying of the cap as described in Section 1.2 will be performed quarterly in the first year, when most settlement will occur, semi-annually for the next four (4) years, and then annually for the next five (5) years.

Additionally, special surveys will be conducted if warranted based on results of routine inspections.

1.4 Maintenance

Maintenance will be conducted as necessary based on inspection and geodetic survey results, and will consist of repairs to address:

- Cap settlement
- Erosion damage to the cap and drainage ditches
- Removal of debris from the drainage ditches
- Burrowing animals
- Vegetative cover

Maintenance to address minor settling and/or erosion of the cap will consist of adding topsoil to restore the original grades and/or correct undesirable drainage patterns. If the erosion and/or settling are severe, the cap will be rebuilt in the damaged area so that the integrity of the low-permeability soil layer (liner) is maintained, in terms of both liner depth and continuity. Severe erosion and/or settling of the cap will be evident if the inspector can see the low permeability materials through the vegetated cover soils. For repair of major cap settlement, a special survey will be conducted of the repaired area to document successful completion of the maintenance. For minor cap settlement, no special survey will be conducted. Cap maintenance work will typically be performed during the dryer summer months.

The drainage ditches will be cleaned, repaired, or modified as required to maintain their proper operation. Excessive debris observed within the drainage system will be removed during the inspection.

If they are presenting a significant problem, burrowing animals will be trapped and removed from the site. The burrows will be excavated and the cap repaired.

If the vegetative cover is insufficient, the affected area will be reseeded. If reseeding is not successful, then a more suitable plant species may be substituted, or another suitable repair conducted (depending on the cause of the problem). Tree saplings or other deep-rooted plants growing on the cap will be mowed or removed. The cap will be mowed as needed to inhibit tree growth and to promote vegetative cover growth. Trees and other deep-rooting plants will be removed since they could penetrate the low-permeability cap and create a potential infiltration conduit.

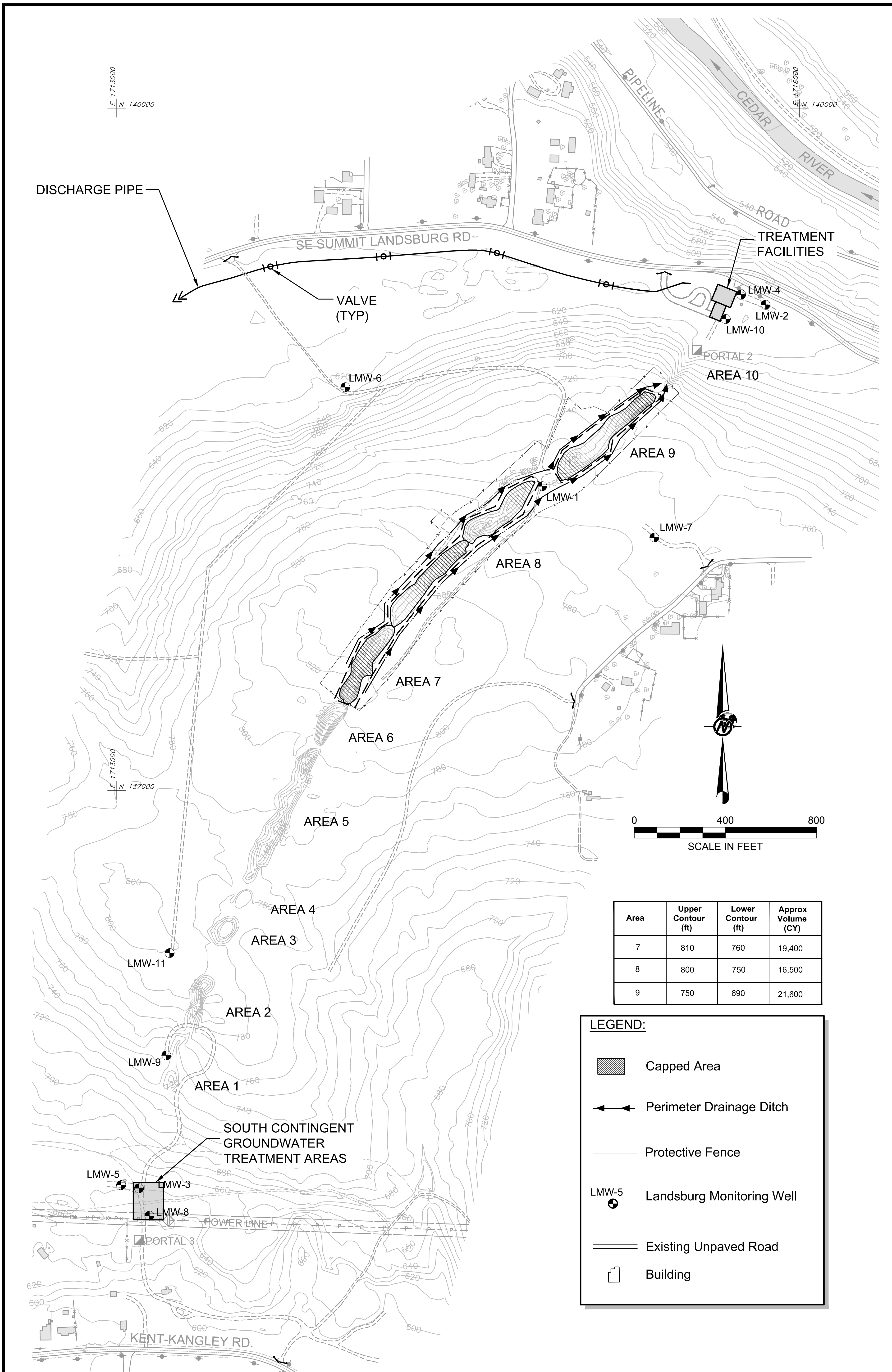
1.5 Inspection of the Cap after an Earthquake

In the event of an earthquake of Intensity IV or greater (Modified Mercalli Intensity Scale) in the area, the cap will be inspected for damage and repaired accordingly. The north and south portal areas will be inspected for ground ruptures, fractures, earth displacements, or similar damage to original (pre-earthquake) landscape. If portal water surfaces due to the earthquake event, it will be inspected for signs of anomalous water quality (color, turbidity, odor, etc.). Ecology will be notified of site conditions within seven (7) days and a decision will be made between the property owner and Ecology on taking groundwater samples from site wells in accordance with the sampling network, protocols, and analytical methods of the CMP in the Consent Decree (Exhibit D). Contingency actions will be implemented in accordance with this plan.

1.6 Reporting

The Landsburg Mine Potentially Liable Parties (PLPs) will submit a letter report to Ecology within 30 days of an inspection, survey, or major maintenance activity conducted under this O&M Plan. The PLPs for the Landsburg Site consist of Palmer Coking Coal Company, LLP; PACCAR Inc.; Weyerhaeuser Company; Browning-Ferris Industries of Illinois, Inc.; and the BNSF Railway Company. The report will include the date(s) of the activity, and the results of the inspection, survey, or maintenance activities. For geodetic surveys, the report will include a table containing the survey data (Northing, Easting, and elevation) and a figure showing cap elevations. For routine inspections, the report may include site photographs showing key features and document inspection observations. For maintenance activities, the report will describe the maintenance activity and document successful completion of the activity (including any special survey data).

FIGURES



Area	Upper Contour (ft)	Lower Contour (ft)	Approx Volume (CY)
7	810	760	19,400
8	800	750	16,500
9	750	690	21,600

LEGEND:

- Capped Area
- Perimeter Drainage Ditch
- Protective Fence
- LMW-5 Landsburg Monitoring Well
- Existing Unpaved Road
- Building

NOTES:
1. TOPOGRAPHY IN VICINITY OF TRENCHES WILL BE MODIFIED AS NECESSARY TO ACCOMMODATE CAP AND DITCHES.
2. ONLY TRENCH AREAS 7,8, AND 9 WILL BE BACKFILLED AND CAPPED

FIGURE **B-1**

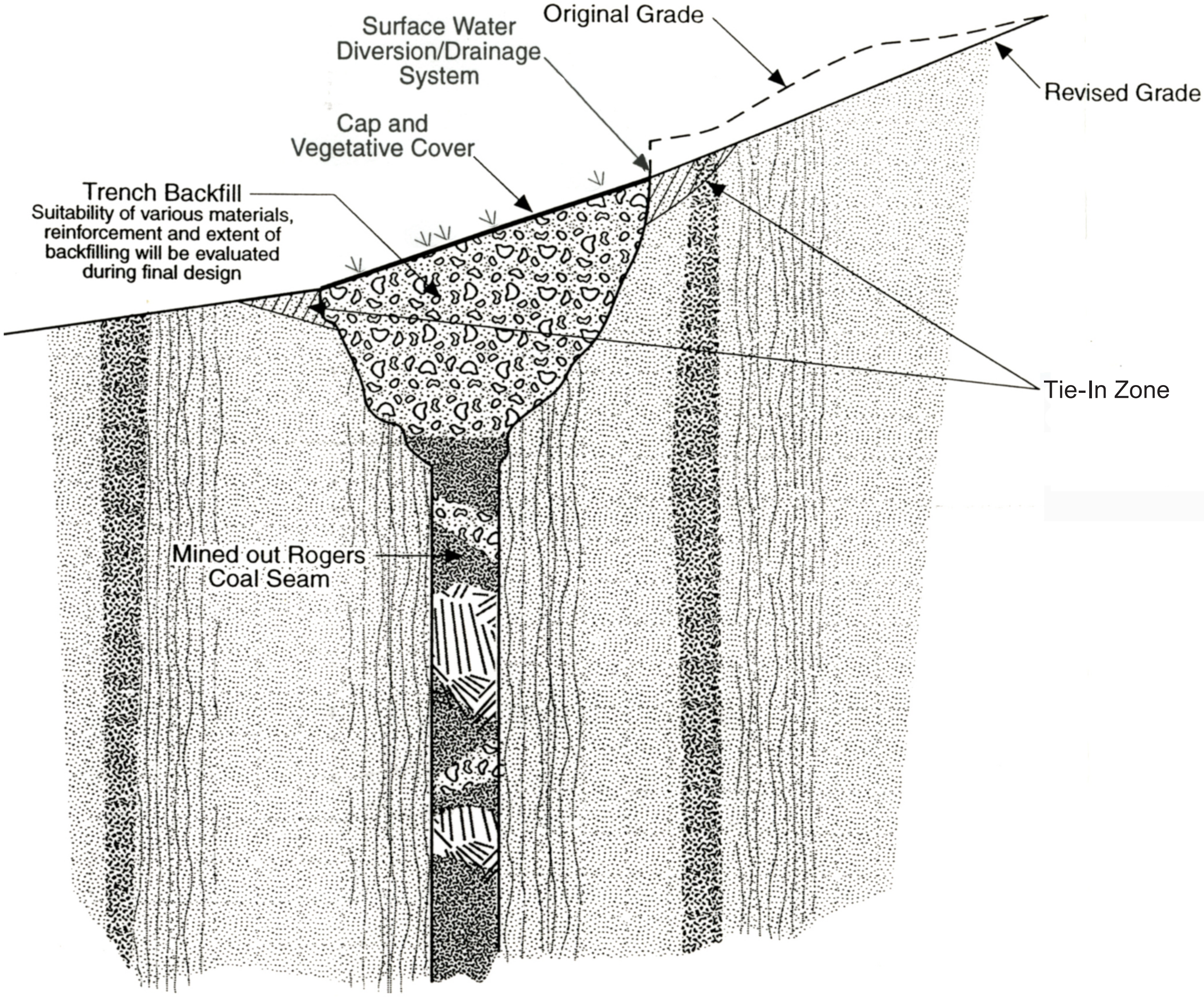
CAPPED AREA AND DRAINAGE DITCHES

PALMER/LANDSBURG MINE/WA

K:\CAD\Projects\1992\9231000\x002\R154\O & M\923_1000_002_R154_B-1r2.dwg | Fig B-1 Capped Area and Drainage Ditches | Mod: 07/31/2013, 13:38 | Plotted: 07/31/2013, 14:26 | aforcier

Golder Associates

Conceptual Cross-Section
(not to scale)



Cap Design

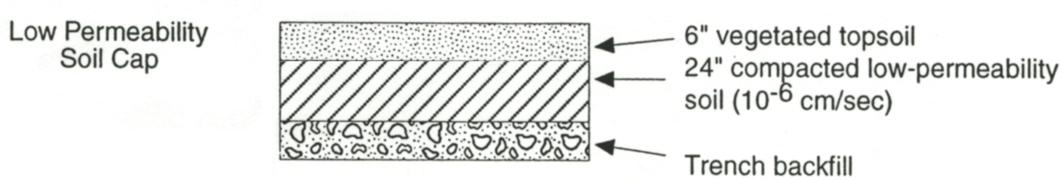


FIGURE **B-2**
CAP DESIGN
PALMER/LANDSBURG MINE/WA

Golder Associates

REPORT

PART C

CONTINGENT GROUNDWATER EXTRACTION AND TREATMENT SYSTEM PLAN

Landsburg Mine Site
MTCA Remediation Project
Ravensdale, Washington

Submitted To: Washington Department of Ecology
3190 – 160th Avenue SE
Bellevue, WA 98008

Submitted By: Golder Associates Inc.
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Redmond, WA 98052 USA

Submitted On Behalf Of: The Landsburg Mine Site PLP Group

June 7, 2017 **Project No. 923-1000-002.R154**

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1.0 PURPOSE AND SCOPE

This Contingent Groundwater Extraction and Treatment System Plan (Plan) is Part C of the Compliance Monitoring Plan (CMP) and provides the basic elements of a contingency plan for the implementation and operation of a groundwater extraction and treatment system for the Landsburg Mine Site (Site). This document is a supplement to the Cleanup Action Plan (CAP). The primary purpose of the CAP is to identify the chemical compounds potentially posing a human or environmental health risk and/or that exceed potential regulatory criteria, and that are directly attributable to, and the result of, the prior waste disposal activities within the Rogers coal mine (Rogers Seam) at the Site. For the purpose of this Contingency Plan, such compounds are referred to as “mine waste contaminants.” This Plan describes the step-wise process that would be implemented to design, construct, and initiate a groundwater extraction and treatment system at the Site to prevent migration of mine waste contaminants beyond the compliance boundary if detected in Site groundwater wells above established trigger levels. A summary of the trigger levels and associated actions is provided in Table C-1. The complete description of trigger levels and associated response actions is presented in Section 1.7.2 of the CMP.

Based on all groundwater monitoring conducted at the Site since 1994, groundwater at the Landsburg Mine compliance boundaries currently meets all applicable cleanup levels under the Washington Department of Ecology (Ecology) Model Toxics Control Act (MTCA).

In the event that a mine waste contaminant (that could be directly attributable to the disposal of waste in the trenches through an “alternative source evaluation”) is detected and confirmed within groundwater from a sentinel well or compliance well at specific concentrations (Table C-1), contingent remedial actions will be triggered. Monitoring of sentinel wells provide early detection for mine waste contaminants. Trigger levels for system design, set at 0.5 of the MTCA cleanup levels established at these sentinel wells, provide the early detection necessary to allow sufficient time to design an extraction and treatment system, specific to the detected contaminant, that can be constructed and activated prior to contaminants reaching the compliance boundary at concentrations at or above MTCA cleanup levels.

If mine waste contaminants are detected at or above 0.5 of the MTCA cleanup levels at the compliance wells, it will be desirable to activate a groundwater extraction and treatment system as soon as possible. By monitoring sentinel wells and preparing the fundamentals of an extraction and treatment system in advance, the installation of the systems can be accomplished faster and within time to prevent contaminants from being released beyond the compliance boundaries at concentrations above MTCA cleanup levels. Because it is unknown if any mine waste contaminants will ever exceed trigger levels in the future, and if so, which mine waste contaminants will be in exceedance, it is not possible to design a specific groundwater treatment system at this time. Furthermore, groundwater treatment technology is continuing to evolve and improve, so a treatment system designed now may not be the best available technology in the future.

This Plan describes the fundamentals of a groundwater treatment system that are suitable for a wide variety of constituents and are expected to cover the vast majority of potential mine waste contaminants at the Landsburg Mine. The systems described in this Plan can be implemented quickly but will require optimization under operating conditions to maximize performance. Prior to implementation of these contingent systems, an Operation and Maintenance (O&M) Plan and a performance monitoring plan tailored to the specific contaminants will be developed to verify effectiveness of the facilities.

2.0 GROUNDWATER MONITORING & EXISTING INFRASTRUCTURE

2.1 Compliance Monitoring

Long-term, or confirmational, monitoring is conducted to ensure that the site remedy performs as expected over time. For the Landsburg Mine, this entails monitoring groundwater quality at the Site for changes in groundwater quality, which may indicate a contaminant release. Monitoring will be performed using existing monitoring wells LMW-2, LMW-3, LMW-4, LMW-5, LMW-6, LMW-7, LMW-8, LMW-9, LMW-10, and LMW-11, and four additional sentinel wells (yet to be installed). These monitoring points are strategically located to intercept groundwater flowing along preferential flow paths from the north and south ends of the mine and laterally towards the Frasier and Landsburg mines. Long-term confirmational groundwater monitoring would begin at the completion of the short-term protection and performance monitoring. Long-term confirmational groundwater monitoring will continue until Ecology determines that residual hazardous substance concentrations no longer exceed cleanup or remediation levels as described in the CAP resulting from either (1) the application of new remediation technologies currently unavailable or (2) other circumstances or conditions that affect residual concentrations such that they no longer pose a risk to human health or the environment.

2.1.1 Compliance Boundary

The approved standards for groundwater at the Landsburg Mine are defined within the CAP. Conditional points of compliance are established for groundwater and surface water at the locations of groundwater and surface water discharge from the site as defined by the property boundary (owned by Palmer Coking Coal Company, LLP [PCC]). Figure C-1 depicts the compliance boundary and conditional points of compliance for the Site. Specifically for the north end of the mine site, the point of compliance will be the northern PCC property boundary. For the south side of the mine site, the point of compliance will be the southern PCC property boundary. Monitoring wells LMW-2, LMW-4, and LMW-10 serve as the northern point of compliance monitoring points; monitoring wells LMW-3, LMW-5, and LMW-8 serve as the southern point of compliance monitoring points. For the east and west conditional compliance boundary for groundwater, monitoring wells LMW-7 and LMW-6, respectively, will be used for compliance monitoring.

2.2 Sentinel Wells

Four additional sentinel wells will be installed prior to construction of the cap. The sentinel wells will aid in early detection of migrating mine waste contaminants in the groundwater. Two sentinel wells will be in the north and two additional sentinel wells will be added in the south. Figure C-1 illustrates the locations of the proposed additional sentinel wells. Figure C-2 depicts the depth profile of the compliance and sentinel well systems along the Rogers Seam.

2.2.1 South Sentinel Well System

Two additional sentinel wells will be added to the existing monitoring wells in the south (LMW-9 and LMW-11) for a total of four sentinel wells that will be used for the early detection of waste constituents. Both of these new sentinel wells will be installed to monitor near the surface of the water table within the mine, because the two flow paths with the highest potential for contaminants to migrate toward the south are along the surface of the water table and near the bottom of the mine. One new sentinel well will be located near LMW-11, and is estimated to be about 150 feet deep. This new sentinel well, together with LMW-9 and LMW-11, will be used as trigger monitoring points for initiating remedial actions involving the contingent groundwater extraction and treatment system and will be installed before construction of the cap. The other new sentinel well will be placed just south of the capped waste disposal trenches (estimated depth of about 170 feet). This additional new “dual purpose” sentinel well location will serve two purposes:

1. Immediate detection of any waste constituent that may be migrating toward the south beyond the waste disposal area; and
2. Effectiveness monitoring of groundwater level changes resulting from remedial actions.

This dual purpose sentinel and effectiveness monitoring well will be a sufficient distance from the south monitoring wells so as to determine whether future groundwater is able to flow toward the south from the waste disposal area. This sentinel well will be installed prior to filling the waste disposal trenches in order to further define the groundwater divide and monitor water level changes in the Rogers coal mine due to remedial actions.

2.2.2 North Sentinel Well System

Two sentinel wells will be installed to provide early detection for the northern compliance boundary of the Site, which currently lacks early detection sentinel monitoring wells with the possible exception of LMW-10, which is about 150 feet south of the north compliance monitoring wells (LMW-2 and LMW-4). Figures C-1 and C-4 also show the location and approximate depth of the north sentinel wells, which will be located adjacent to the north portal (Portal #2). These sentinel wells will be installed before construction of the cap.. One sentinel well will monitor the shallow groundwater table (at less than 30 feet below ground surface [bgs]) and the other sentinel well will monitor the groundwater at approximately the 150-foot depth within the mine. These two additional sentinel wells, together with monitoring of LMW-10, provide appropriate vertical coverage of groundwater flowing within and emanating from the mine before reaching the north compliance boundary.

2.3 Contingent Groundwater Treatment System Infrastructure

To speed up the installation (if necessary) of a contingent treatment system, the components of the treatment system infrastructure that have long lead times (i.e., those requiring permits) have already been installed. Infrastructure was installed in 2008 near the north portal (Portal #2) (Golder 2009), while infrastructure for the south portal (Portal #3) is planned to be installed during the remedial action. The following is a discussion of the infrastructure that has already been, or will be installed by the completion of the remediation action. Figure C-3 depicts the Site and the location of the contingent groundwater treatment system infrastructure components for the north and south portal areas.

2.3.1 North Portal Infrastructure

The infrastructure that was selected for early installation were the items that have a long lead time or permitting issues that might slow the installation process. For example, a fenced gravel pad area to support the extraction/treatment equipment was installed north of Portal #2. A discharge pipeline was installed from the treatment pad extending to the west to be eventually tied into the local Metro Publically Owned Treatment Works (POTW) sewer. Additionally, an electrical transformer and control box for equipment hook-up have been installed. The area has lighting and is fenced for security. The groundwater extraction well, necessary pumps, piping, and storage (surge tanks) will not be installed unless and until the contingency triggers have been met, because lead times are relatively short for these items. Figure C-4 depicts the infrastructure at the north portal.

2.3.2 South Portal Infrastructure

Similar to the north portal, infrastructure to support a contingent groundwater extraction and treatment system will be installed during the remedial action. The infrastructure that would be installed at the south portal will include a gravel pad (to support future groundwater extraction well, pumps, and groundwater storage (surge) tanks), an electrical transformer, lighting, and an equipment control panel, within a fenced area. The existing gravel access road near the south portal will be connected and improved for heavy truck access. The groundwater extraction well, pumps, and groundwater storage tanks will not be installed unless and until the contingency triggers have been met (see Table C-1). A temporary pipeline leading from the south portal to the treatment system at the north portal could be installed quickly and used to transport contaminated groundwater to the north portal for treatment and discharge to the Metro POTW sewer. If a temporary pipeline is initially used, it could eventually be replaced with a buried permanent pipeline. Figure C-5 depicts the infrastructure that will be installed at the south portal.

3.0 DESIGN BASIS AND PROCESS SELECTION

The design flow rate for the treatment system ranges from 10 to 40 gallons per minute (gpm). This rate was selected based on historical pumping rates of 30 to 40 gpm that were required to dewater the underground mine during operation. Additionally, Golder Associates Inc. (Golder) calculated a mass water balance along the mine Site (see Exhibit B, Appendix C - Responsiveness Summary). The water balance conservatively assumed all rainfall within 100 feet east and west of the Rogers mine trench would enter the trench groundwater system. This water balance exercise also concluded that a pumping rate of 40 gpm would be sufficient to prevent migration of contaminants beyond the compliance boundary. Although groundwater extraction at 30 to 40 gpm is expected to meet or exceed the groundwater extraction rate necessary to prevent off-site migration of groundwater affected by mine waste contaminants, the system will initially be capable of pumping rates of 100 gpm or more. Pumping tests to further define the optimal extraction rates necessary to inhibit migration of contaminants can most effectively occur during construction and startup of the extraction system. Because the amount of water entering the former mine will be changed by placing the low permeability cap and diverting surface water from entering the north mine subsidence trenches, conducting any further containment studies before remedial actions are implemented would not provide data that could be used in the system design. Section 4 of this plan details the designed adaptability of the contingent extraction system plan, which allows the required pumping rate to be determined after the contingent groundwater system is installed.

Following installation of the additional sentinel wells, the network of sentinel wells and compliance wells will monitor various depth intervals across the vertical aquifer. The depth interval where contaminants are detected would be used to design the extraction well construction to target an optimal depth interval for plume capture. In addition to the sentinel wells and compliance wells, performance wells would be installed between the extraction well and the compliance boundary. Conceptual layout of the extraction well and performance well locations are shown on Figures C-4 and C-5. Well P-2 can be used as a performance well at the south portal area. The performance wells and the pumping well(s) will be equipped with automated pressure transducers to record water level changes during optimization pump testing and during the extraction of groundwater. Groundwater level changes monitored in performance wells, sentinel wells, and compliance wells together with the drawdown in the pumping well would provide the data to analyze the effectiveness of the aquifer capture zone at a given pumping rate. Variable pumping rates can be used to optimize the drawdown and plume capture. Monitoring the groundwater quality at the compliance wells will provide data for demonstration of compliance for the system.

Impacted groundwater would be extracted from the pumping wells located near the mine portal that is located closest to where the groundwater contaminants are detected. The mine portals are hydraulically up-gradient from the north or south site boundaries. These pumping wells will mainly extract groundwater emanating from the mine workings. Figure C-3 shows contingent treatment facility locations and the proposed extraction well locations for the north and south site boundaries. In the event that groundwater extraction and treatment will be needed, it is relatively more likely that affected groundwater will be found only at one of these locations. In the event that affected groundwater is found at both locations, the treatment system would be located at the north site boundary, with water pumped from the south boundary to the north treatment system.

Treated groundwater will be discharged to a POTW sewer. A discharge permit will be required to discharge pre-treated groundwater to the sewer. The treatment system effluent discharge pipeline has been installed, but does not currently connect to the Metro POTW sanitary sewer adjacent to the Tahoma Junior High School. If groundwater capture and treatment becomes necessary, the effluent from the treatment system will be temporarily trucked to the Metro POTW intake at Four Corners, Maple Valley, Washington until the discharge pipeline is connected. The discharge pipeline will be installed in accordance with King County requirements as stated in the letter from Karen Wolf to Jerome Cruz dated February 15, 2006 and provided in Appendix A. Ecology will assist in obtaining permission to place the remainder of the effluent discharge pipeline along the S.E. Summit-Landsburg Road right-of-way or the adjacent King County open space land that is located along the road right-of-way.

Figures C-4 and C-5 show the general layout of the contingent extraction and treatment systems at the north and south property boundaries, respectively. Electrical transformers and control boxes for equipment hook-up have been installed at the north portal. The power equipment is in place and ready for use in case the contingent groundwater treatment system needs to be implemented. Similar infrastructure will be installed at the south portal during the remedial action.

The mine waste contaminants can be broadly classified into either organic or inorganic chemicals, with corresponding relevant treatment processes. Because the specific mine waste contaminants that would be encountered are uncertain, the treatment processes in the contingent systems cannot be identified at this time. Once contaminant remediation levels are reached or exceeded and confirmed at specific sentinel wells that triggers this contingent remedial action (Table C-1), the design of the contingent system will be submitted to Ecology along with a contingent system-specific O&M Plan for approval. The designs presented in the Contingent Groundwater Extraction and Treatment System Plan, will be detailed or revised in an Engineering Design Report (EDR), and an O&M Plan will be prepared and submitted to Ecology, all within one month after confirmation of an exceedance of 0.5 of the MTCA cleanup level at a sentinel well.

If contingent groundwater extraction and treatment is required, it would continue until groundwater is below 0.5 of the MTCA cleanup level at the points of compliance wells and in samples collected from the pumped effluent for four consecutive monitoring events (minimum of 1 year). The compliance monitoring frequency of treatment system inflow and outflow, if and when the contingency groundwater extraction and treatment system is implemented, will be determined by the Metro POTW discharge permit. Both inflow and outflow are measured in order to evaluate the concentrations of mine waste contaminants entering the treatment system and the percentage that are being removed by the treatment system. The results of the inflow analysis will help determine whether the extracted groundwater requires treatment to meet Metro POTW discharge limitations as outlined in the permit. If inflow results meet discharge limitations (i.e., are below limitations) then the extracted groundwater can be directly discharged to the POTW without prior treatment.

4.0 SYSTEM DESIGN AND INSTALLATION PROCESS

The following is the general guide to the design and installation process for the contingent groundwater treatment system. Step 1 will be implemented when confirmed sentinel well results are detected at or above 0.5 MTCA cleanup levels (Table C-1). Steps 2 through 4 presented below will be immediately initialized and conducted concurrently, once it has been determined that the treatment system must be installed (i.e., when confirmed sentinel well results are at or above MTCA cleanup levels); while steps 5 and 6 will be conducted at the soonest appropriate time, once the design is sufficiently complete to order, install, connect, and operate the equipment for groundwater extraction and treatment. Step 7 will be implemented immediately when compliance well levels are at or above 0.5 MTCA cleanup levels.

1. Design Treatment System
2. Initiate Completion of North Discharge Pipeline
3. Install South Discharge Pipeline (if groundwater is impacted at the south portal)
4. Install Extraction Well, Performance Monitoring Wells, And Pump
5. Order and install necessary Equipment
6. Hook-up Equipment to power source and conduct startup testing
7. Start Operation of the Contingent Groundwater Pump and Treat System

Further detail on Steps 1 through 4 is provided below. As necessary, additional detail on Steps 5 through 7 will be provided in the EDR and O&M Plan, if required.

4.1 Design Treatment System

If the prescribed trigger levels for design are exceeded (Table C-1), the contingent groundwater treatment system will be designed and presented to Ecology in a Draft EDR together with a system specific O&M Plan. The EDR and O&M Plan will be prepared to adequately remediate the specific mine waste contaminants that have been detected in the sentinel well(s). A treatment system will only be designed for and installed at the north portal area, but will service either or both contaminated groundwater from the north and south compliance boundaries. The design phase cannot occur until it has been identified that a contingent treatment system is necessary, because treatment technology is continually evolving and is very contaminant specific. The Draft EDR will be used for meeting the substantive requirements of a King County building permit, if required. After Ecology approves the treatment system design and required substantive requirements are met, the necessary equipment will be ordered and shipped to the site. Likely, equipment will be an off-the-shelf modular unit that can be increased or decreased in series, depending upon the system requirements. The idea is to have flexibility in the treatment system to adjust to changing site conditions. If the prescribed trigger levels for design are exceeded (Table C-1), the draft EDR and O&M Plan will be submitted to Ecology within one month. The estimated time for Ecology and King County review and approval is between two to four weeks. Two to four weeks is anticipated to be needed to order and install the treatment system. If the reviews and approvals are taking longer than anticipated, options that can become operational in a few weeks exist; for example: ordering and installing a temporary treatment system (consisting of rental Baker tanks and pumps), which can be used if pre-treatment of the groundwater effluent is not necessary prior to discharge to the Metro POTW; and trucking of extracted groundwater to the nearest POTW sewer intake. Additional protection can quickly be provided though pumping from the existing sentinel wells and/or compliance wells to capture groundwater contaminants until the full extraction system is installed. All of these additional measures can be implemented to prevent mine waste contaminants from moving offsite at concentrations above applicable MTCA cleanup levels.

4.2 Initiate Completion of North Discharge Pipeline

If the prescribed trigger levels for installation are exceeded (Table C-1) at the site, system components will be installed there as follows. The discharge pipeline in the north needs to be completed to directly discharge pre-treated groundwater to a Metro POTW. This entails connecting the existing pipeline to the local Metro POTW sewer. This also requires obtaining the necessary permits and discharge authorization from King County Metro POTW to discharge pre-treated water into the sewer system. The time frame necessary to apply and get authorization should be a maximum of one month since the discharge limitations for Metro POTW are greater than the MTCA cleanup levels. The discharge pipeline will be installed in accordance with King County requirements as stated in the letter from Karen Wolf (King County) to Jerome Cruz (Ecology) dated February 15, 2006 and provided in Appendix A. If authorization for extending the discharge pipeline is taking too long, as a temporary measure, the treated groundwater effluent will be temporarily trucked to the nearest Metro POTW sewer intake (likely Four Corners in Maple Valley), until the existing buried pipeline can be connected directly to the Metro POTW sewer (assuming the groundwater meets all discharge limits). Upon receiving discharge authorization, the POTW will likely require routine testing and reporting of the condition of the treated water prior to disposal to ensure that discharge limitations are met. The required testing for effluent discharge will be stated in the Treatment System O&M Plan.

4.3 Install South Extraction Pipeline (if needed)

If the prescribed trigger levels for installation are exceeded (Table C-1) at the south end of the site, system components will be installed there as follows. A temporary or a permanent pipeline will be installed to convey extracted groundwater from the south portal up to the north portal pad area for treatment. A temporary above ground pipeline could be installed, if needed before the permanent (underground) pipeline is constructed. The estimated time frame to order and install a temporary pipeline connecting the south portal to the north portal is one month. If extraction and disposal of the southern boundary groundwater is required before the temporary pipeline can be installed, effluent will be temporarily trucked to the nearest Metro POTW sewer intake (likely Four Corners in Maple Valley), until the existing buried pipeline can be connected directly to the Metro POTW sewer (assuming the groundwater meets all discharge limits).

4.4 Install Extraction Well, Performance Monitoring Wells And Pump

The extraction well(s), performance monitoring wells and dedicated extraction pump(s) will be installed at each end of the site that exceeds prescribed trigger levels (Table C-1). The extraction system consists of one extraction well located at the end of the mine where the trigger level was exceeded. If the trigger levels are exceeded at both ends of the site, an extraction well would be installed at both the north and south ends. The extraction well(s) will only be installed at optimum location and depth (for the screened interval) within the site where contaminated groundwater is encountered and emanating from the Rogers Seam. The new 6- to 8-inch diameter extraction well(s) would be installed while the treatment system is being, purchased and delivered. The extraction wells are anticipated to take about two to four weeks to contract and construct. If needed, the existing monitoring or sentinel wells can be used temporarily to extract groundwater and contain the plume until the permanent extraction well is installed and operational. Submersible pumps and associated controls would be placed in each of the extraction wells. The groundwater extraction system would be the same configuration regardless of which treatment system (organics or inorganics) is needed. A general schematic of an extraction well is illustrated in Figure C-6.

In addition to the extraction well(s), two performance wells will be installed between the extraction well and the compliance boundary. The performance wells will be installed to target separate depth intervals downgradient of the extraction well. Pressure transducers installed within the extraction wells, performance wells and potentially in the sentinel wells will be used to determine water levels and established that an inward (towards the extraction well) hydraulic gradient and contaminant containment has been achieved across the vertical depth interval where mine waste contaminants were detected. A temporary, variable speed pump (which are available from any of the local drilling companies) could initially be used in the extraction well to determine the necessary pumping rate required to create the inward hydraulic gradients and capture of the groundwater contaminants. Based on this initial testing, the final pump will be sized to achieve the determined optimal pumping rate, but will also be variable speed (likely in the 10 to 40 gpm range) to allow continued refinement of the extraction rate. The results of the optimization tests will be submitted to Ecology in a groundwater contaminant capture report. Well pumps would primarily operate on water level control within the wells. High water level in treatment system tanks (Figure C-7) would also automatically shut off the well pumps.

TABLES

Table C-1: Contingent Groundwater Extraction and Treatment System Plan Triggers

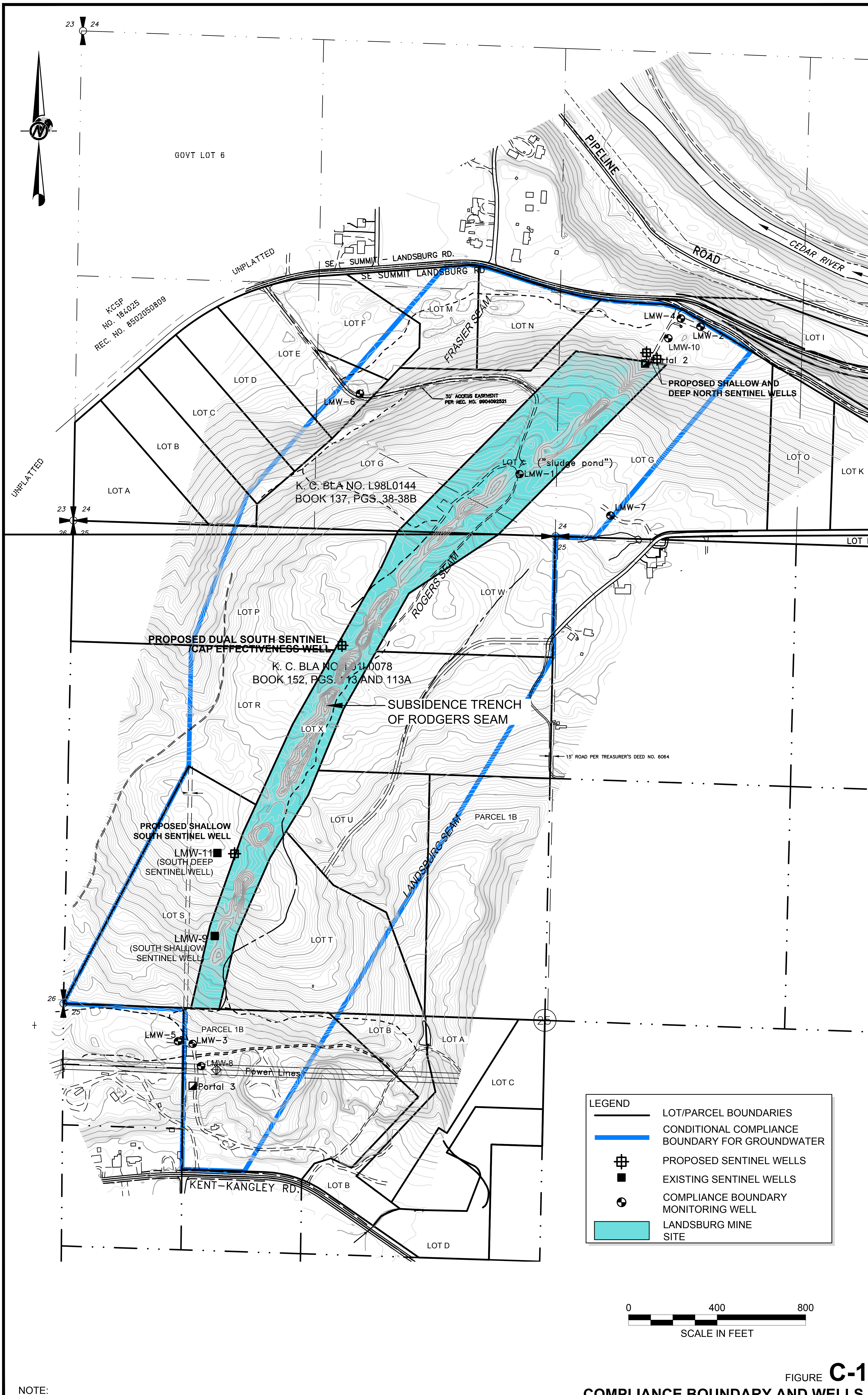
Contingency Plan Phase of Work	Trigger Event		Completion time
	Sentinel well[1]	Compliance well	
Increased frequency of groundwater monitoring (see Table A-3 of the CMP) and conduct alternative source evaluation	0.25 MTCA CUL		
Submit to Ecology contingent groundwater extraction and treatment system Engineering and Desing Report (EDR), including schdule for all subsequent activities and permitting requirements	0.5 MTCA CUL		Design submittal: Within 30 days
			Ecology Review, approvals and permitting: (estimated 2 to 4 weeks)
System Installation	1.0 MTCA CUL		According to schedule in Ecology approved EDR (estimated 2 to 4 weeks)
System startup, optimization, and operation (including pumping)		0.5 MTCA CUL	According to schedule in Ecology approved EDR (estimated 2 weeks)
System shutdown		Compliance well and pumped effluent below 0.5 MTCA CUL for 4 monitoring events (minimum 1 year)	

[1] Sentinel wells are closer to the wastes disposal area than compliance wells, to provide early detection of a contaminant release. Modeling of contaminant travel times indicate it will take from months to years before a cleanup level is reached at the compliance wells.

Note: Iron, manganese, and arsenic are analytes associated with the coal mine water and monitored concentrations are not associated with Landsburg Mine Waste and will not be used as a trigger, unless a significant increase in concentrations occur and an alternative source is not identified.

See Section 1.7.2 of the Compliance Monitoring Plan for trigger action response details.

FIGURES



NOTE:
1. LETTERS AT LOT X PROPERTY CORNERS CORRESPOND TO THE COORDINATES IN TABLE 1

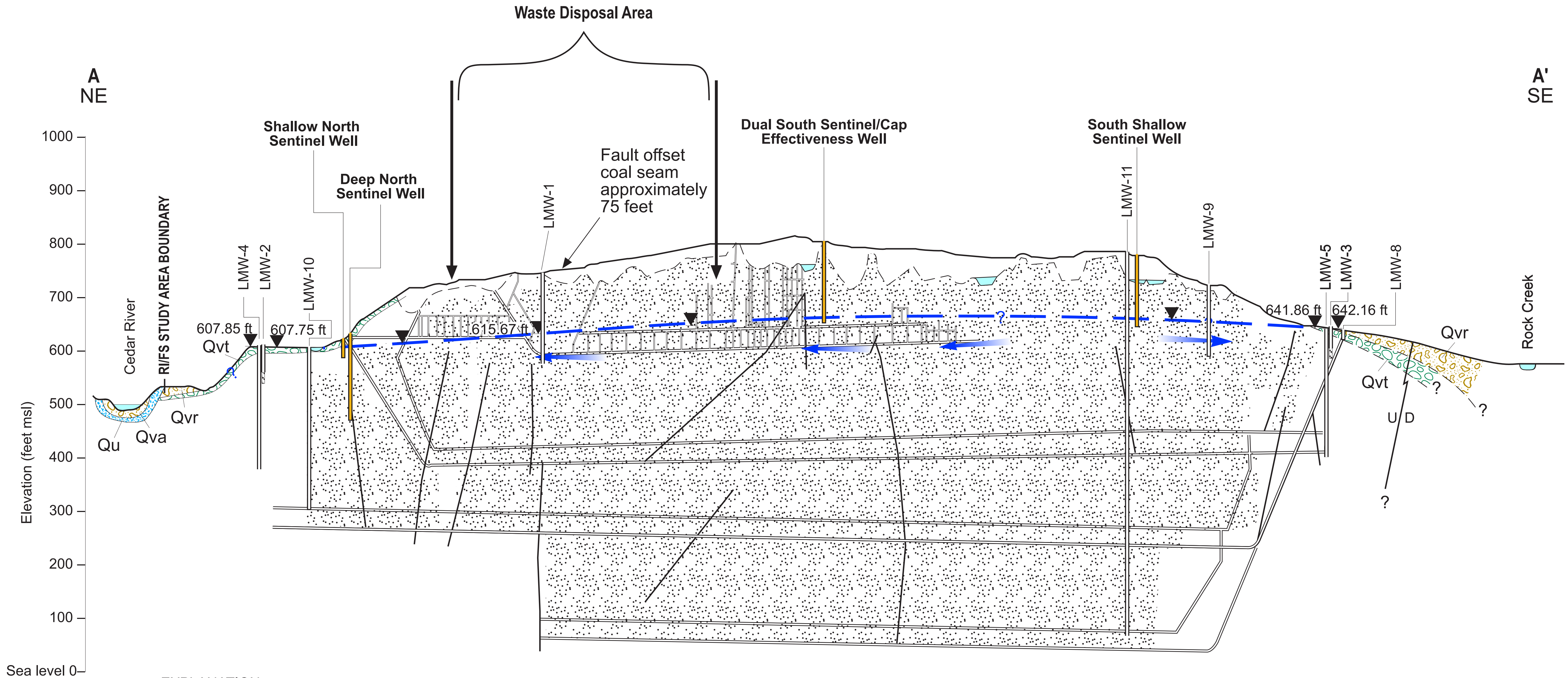
FIGURE **C-1**

COMPLIANCE BOUNDARY AND WELLS

PALMER/LANDSBURG MINE/WA

K:\CAD\Projects\1992\9231000\x002\R154\Exhibit E Part C Contingency Plan\923_1000_002_R154_FC-1r4.dwg | Fig C-1 Compliance Boundary and Wells | Mod: 08/02/2013, 16:00 | Plotted: 08/05/2013, 08:04 | JAsprinio

Golder Associates



EXPLANATION

- Potentiometric surface
- Outline of trench bottom
- Water Level (ft. amsl) 2/23/94
- Qvt Till, compact mixture of gravel occasional boulders in clayey silty sand matrix
- Sandstone
- Surface water feature
- Anticipated collapsed zone within mine
- Qu Drift, till, fluvial sand and gravel, lacustrine sand, silt, clay and peat
- Qvr Recessional outwash, well sorted sand and pebble-cobble
- Qva Advanced outwash pebble-cobble gravel may include very fine sand
- Monitoring Interval
- Groundwater Flow Direction

Sources for the Geology and Mine Information:
J.E. Luzier 1969; surficial geology
State of Washington, Water Well reports
Mine Superintendant's Records
Landsburg Well Logs

0 500
FEET

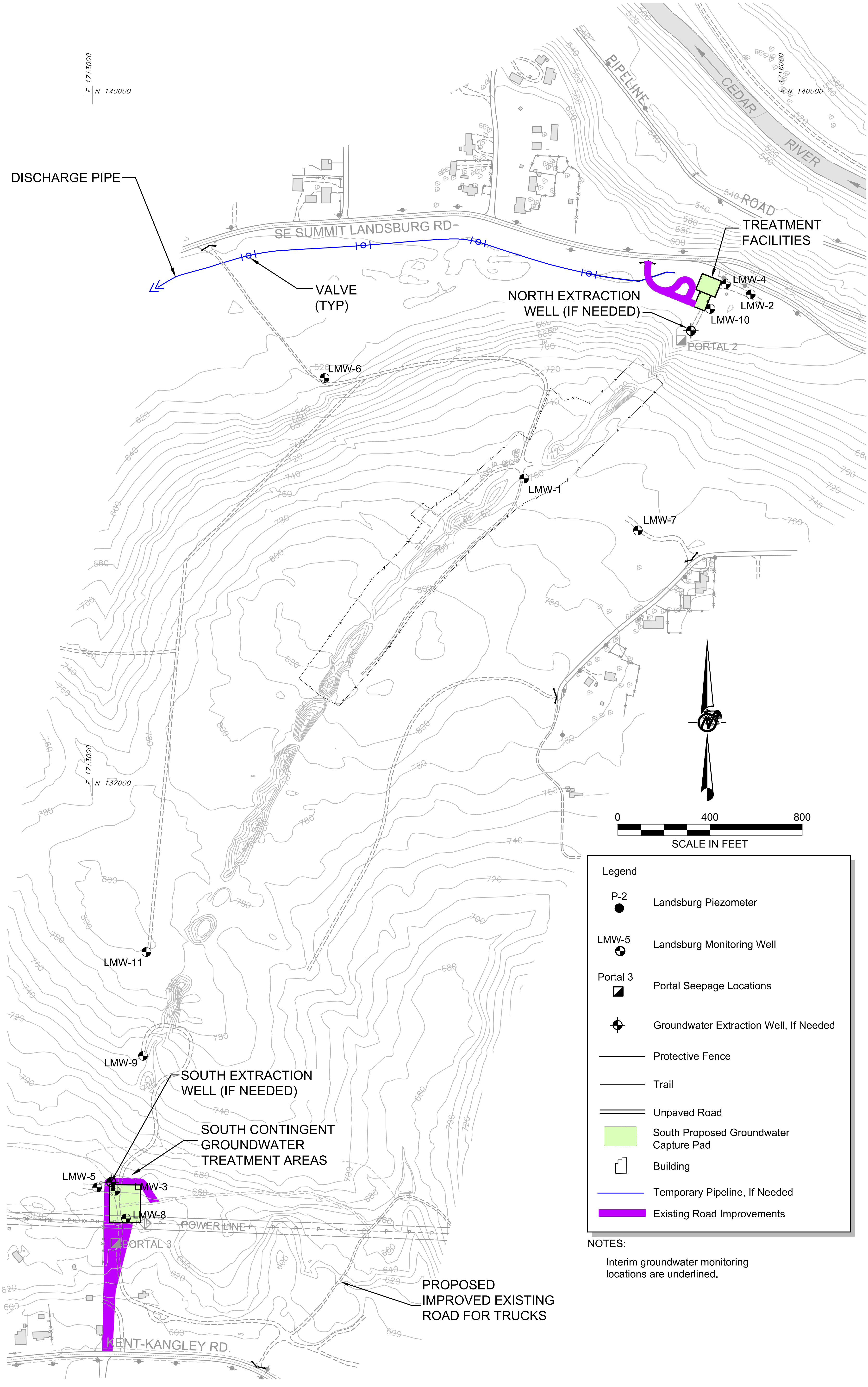
NOTE: Vertical to horizontal scale ratio is 2.5:1
Wells are project normal into the strike of the Cross-Section A-A'

Assuming groundwater discharge at the north and south end of mine.

FIGURE **C-2**
CROSS-SECTION OF NORTH TO SOUTH AT COAL SEAM WITH SENTINEL AND COMPLIANCE WELLS
PALMER/LANDSBURG MINE/WA

9231000_002_R154_005.ai | Mod: 03/30/17 |

Golder Associates



NOTES:

Interim groundwater monitoring locations are underlined.

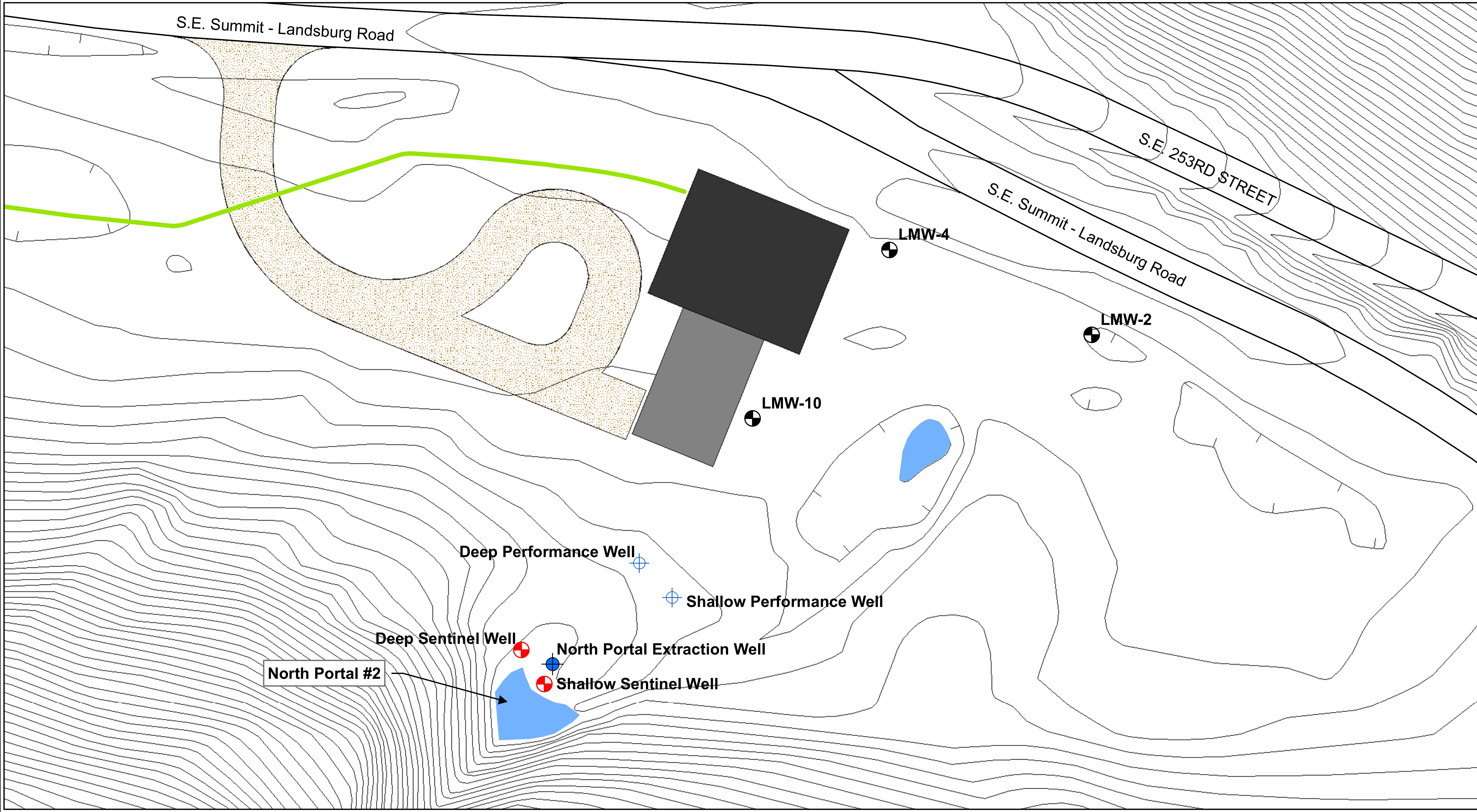
FIGURE **C-3**

INFRASTRUCTURE FOR CONTINGENT GROUNDWATER TREATMENT SYSTEM

PALMER/LANDSBURG MINE/WA

G:\PalmerCokingCoalCo\LandburgMineWA\99_PROJECTS\9231000002_Ph1_Remediation\R154\02_PRODUCTION\DWG\9231000002_R154_003.dwg | C-3 Infastructure for Contingent GW TReat. | Mod: 05/25/2017, 10:54 | Plotted: 05/25/2017, 11:05 | TRybar

Golder Associates



LEGEND

- Extraction Well (if needed)
- Monitoring Well
- Performance Well
- Proposed Sentinel Well
- Wetland Boundary (estimated - not surveyed)
- Existing Pipeline
- Contour (2 ft interval)
- Access Road to Treatment Area

Proposed Treatment Facility

- Existing Treatment Facility Area
- Existing Parking and Laydown Area

0 50
Scale in Feet

Map Projection:
Washington State Plane,
North Zone, NAD 83, Feet

Source: USGS, Terraserver

N

This figure was originally produced in color. Reproduction in black and white may result in a loss of information.

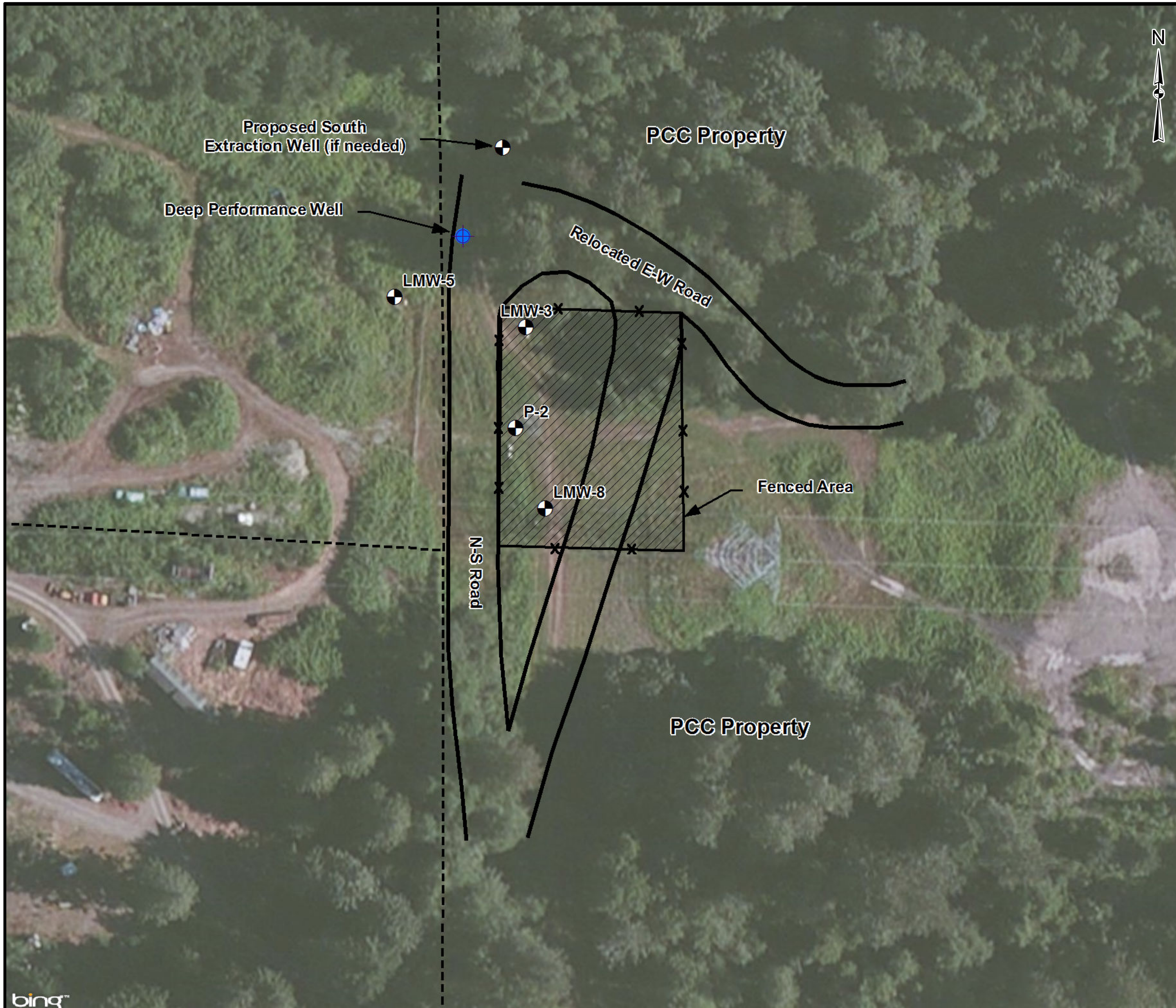
FIGURE **C-4**

NORTH PORTAL INFRASTRUCTURE FOR THE CONTINGENT GROUNDWATER TREATMENT SYSTEM

PALMER/LANDSBURG MINE/WA

Document Path: G:\PalmerCokingCoalCo\LandburgMineWA\99_PROJECTS\9231000002_Ph1_Remediation\R154\02_PRODUCTION\MXD\FIGURES\RevA\9231000002_R154_001_FC-4_RevA_NorthPortal.mxd Date: 4/20/2017 User Name: BVang-Johnson

Golder Associates



LEGEND

- Well
- Deep Performance Well
- South Portal Contingent Groundwater Extraction Area
- Truck Access Roadway
- Property Boundary
- Fence

NOTES

1.) P-2 and LMW-8 can also serve as performance wells.

REFERENCES

1.) Bing Maps (Imagery)
2.) Golder Associates Inc.
3.) COORDINATE SYSTEM: NAD 1983 StatePlane Washington North FIPS 4601 Feet

60 0 60
Feet

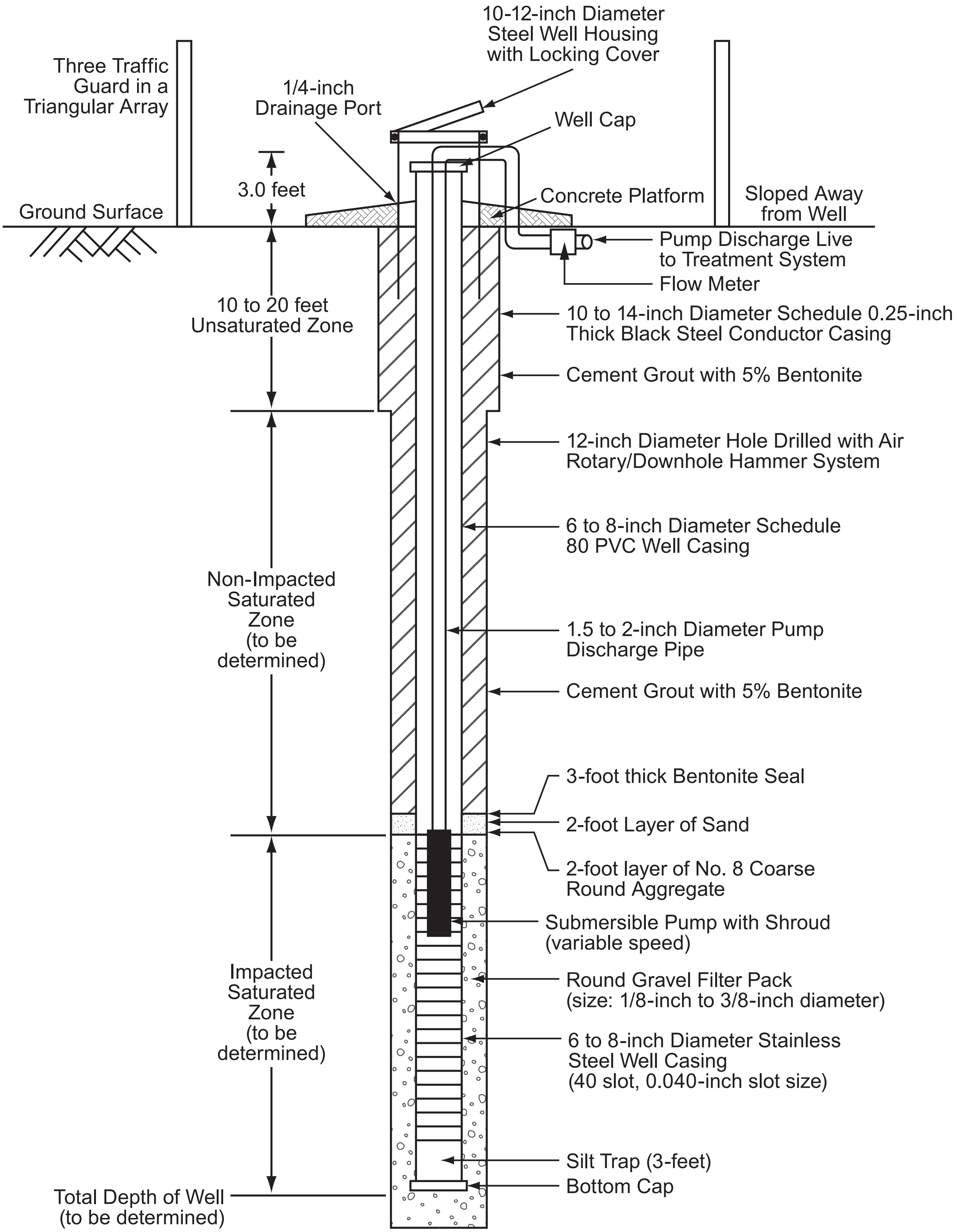
PROJECT
LANDSBURG MINE
KING COUNTY, WASHINGTON

TITLE
SOUTH PORTAL INFRASTRUCTURE FOR THE CONTINGENT GROUNDWATER TREATMENT SYSTEM

Golder Associates

PROJECT NO. 9231000-002			
DESIGN	BVJ	25 May 2017	SCALE: AS SHOWN REV. 0
GIS	BVJ	25 May 2017	
CHECK	DM	25 May 2017	FIGURE: C-5
REVIEW	GZ	25 May 2017	

Document Path: G:\PalmerCokingCoalCo\LandburgMineWA\99_PROJECTS\9231000002_Ph1_Remediation\R154\02_PRODUCTION\MXD\FIGURES\Rev0\9231000002_R154_002_FC-5_Rev0_SouthPortal.mxd Date: 5/25/2017 User Name: BVang-Johnson

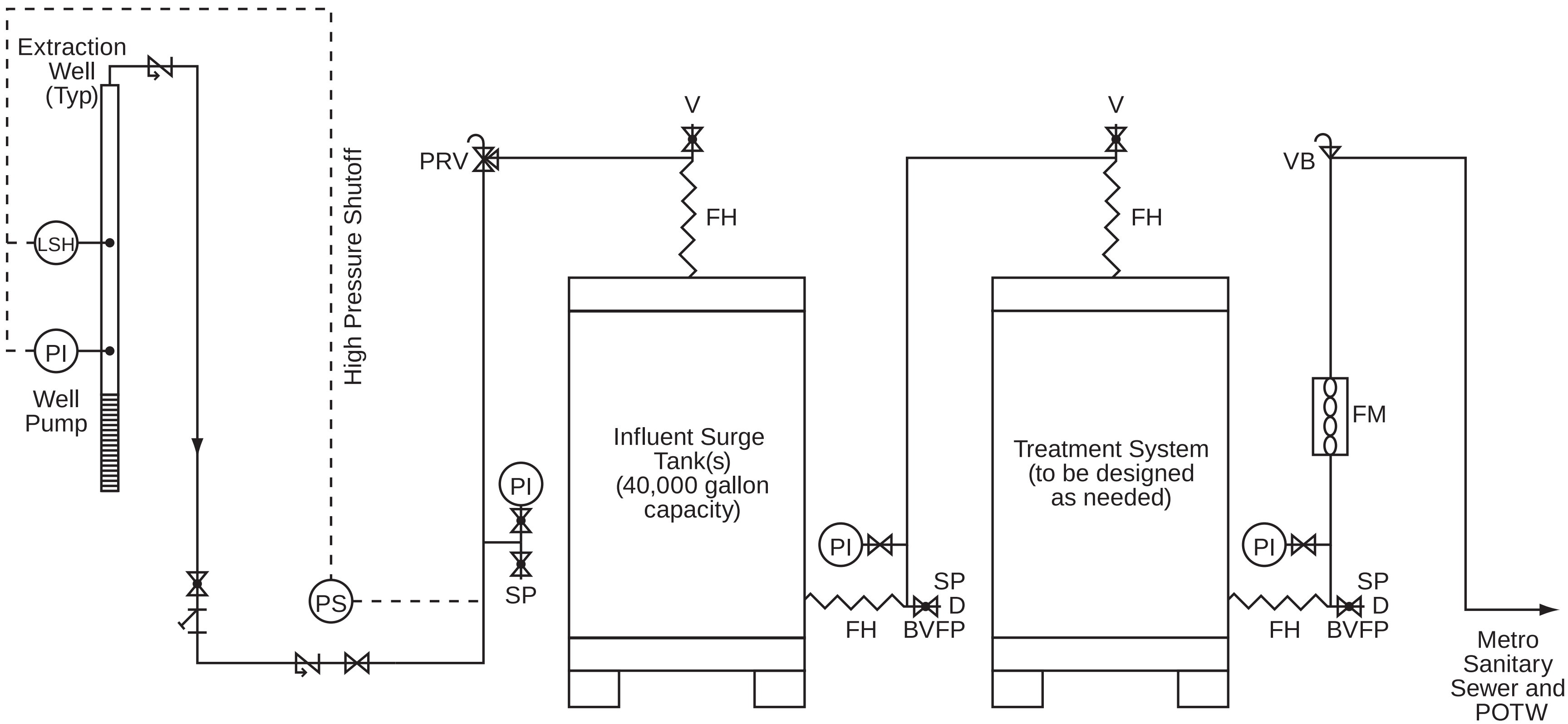


NOT TO SCALE

FIGURE **C-6**

GENERALIZED CONSTRUCTION DIAGRAM OF A GROUNDWATER EXTRACTION WELL

PALMER/LANDSBURG MINE/WA



NOT TO SCALE

LEGEND

BF	Bag Filter	⋈	Gate Valve
⋈	Ball Valve	PI	Pressure
	Check Valve		Pressure Relief
D	Drain	SP	Sample Port
FH	Flex Hose	V	Vent
FM	Flow Meter	VB	Vacuum Breaker
FP	Fill Port		Y-Strainer

FIGURE **C-7**

NORTH PORTAL #2
GROUNDWATER TREATMENT
PROCESS DIAGRAM
PALMER/LANDSBURG MINE/WA

Golder Associates

APPENDIX A
KING COUNTY LETTER TO WASHINGTON STATE DEPARTMENT OF ECOLOGY

King County
Ron Sims
King County Executive
701 Fifth Avenue, Suite 3210
Seattle, WA 98104
206-296-4040 Fax 206-296-0194
TTY Relay: 711
www.metrokc.gov

February 15, 2006

Jerome Cruz, Site Manager
Washington State Department of Ecology
3190 160th Avenue SE
Bellevue, WA 98008

Dear Mr Cruz:

Thank you for the opportunity to comment on the Agreed Order Amendment for the Landsburg Mine Site.

King County appreciates the opportunities we have had to meet with you and your staff on the proposed changes to the Agreed Order and the State Environmental Policy Act documents. Several King County staff also attended the public meeting conducted by the Department of Ecology on February 7, 2006 to listen to questions and comments from the community. I have reviewed the proposal with knowledgeable King County staff in our departments of Development and Environmental Services (DDES), Natural Resources and Parks (DNRP), and Public Health (DPH). Our comments are as follows:

1. King County agrees in concept to allow the dry sewer pipe from the mine site to be placed in the ground, and left unconnected and unused, until monitoring determines that contaminants threaten public health and safety.

2. The sewer pipe from the mine to the Tahoma School District's Jr. High School will be a tightline dedicated solely for the disposal of waters from the mine and only upon determination of a threat to public health and safety, as required by the King County Code.

3. An amendment to the Soos Creek Sewer District Comprehensive Plan approved by the King County Council will be required prior to the connection from the mine site to the Tahoma School District tightline sewer line. This amendment will address the new tightline sewer to serve the mine site and also the proposed connection to the existing tightline sewer serving the school. Additionally, the Department of Ecology will presumably need to coordinate and obtain approval from Soos Creek and the School District to connect to their facilities.

4. Based on comments raised at the February 7, 2006, public meeting, King County will further analyze placing the sewer pipe under the Summit-Landsburg Road rather than placing the pipe through the King County park land as currently proposed by the

Department of Ecology. We will work with you to develop a schedule to allow for this analysis.

5. Monitoring reports of test wells at the mine site must be routinely sent by either the Department of Ecology or the site trustee to the Environmental Health Division of Public Health-Seattle and King County, with appropriate staff as identified by the Division.

6. The waste from the mine must be pre-treated to standards established by King County Wastewater Division's Industrial Pre-Treatment Program before it may be discharged into the wastewater system. The PLPs or the trustee are responsible for all fees associated with the permitting for such disposal and the ongoing service costs of sewer disposal.

We assume that the other institutional controls associated with the cleanup plan will conform to the requirements of the Model Toxics Control Act, including periodic review by the Department of Ecology and consultation with King County as the local and use authority. King County's technical review group, comprised of myself and the staff copied below, is ready to work with you and your staff in the coming months to address these issues as the project moves forward. If you have any further questions, please do not hesitate to call me at 206-296-3423.

Again, thank you for your attention to our comments and concerns.

Sincerely,

Karen Wolf

Karen Wolf
Sr. Executive Policy Advisor

cc: Paul Reitenbach, Senior Policy Analyst, DDES
Laura Wharton, Supervisor, Wastewater Treatment Division, DNRP
Bob Hirsch, Government Relations Administrator, Wastewater Treatment Division, DNRP
Dave Monthie, Regional Water Policy Analyst, DNRP
Larry Fay, Section Manager, Community Environmental Health, Public Health-Seattle and King County
Bill Lasby, Health and Environmental Investigator, Community Environmental Health, Public Health-Seattle and King County
Joe Rochelle, Senior Deputy, Office of the Prosecuting Attorney (PAO)
Kevin Wright, Assistant Chief Civil Deputy, PAO
William Blakeney, Supervising Attorney, PAO

EXHIBIT E

RESTRICTIVE COVENANT

Exhibit E-1: Environmental Covenant

After Recording Return to:
William Kombol
PALMER COKING COAL COMPANY, LLP
P.O. Box 10
Black Diamond, WA 98010
(425) 432-3542 – Fax (425) 432-3883

Department of Ecology
Northwest Regional Office
3190 160th Ave. SE
Bellevue, WA 98008-5452

Environmental Covenant

Grantor: Palmer Coking Coal Company, LLP
Grantee: State of Washington, Department of Ecology
Legal: See Exhibit 1
Tax Parcel Nos.: See Exhibit 2
Map Pages: See Figure 1 and Figure 2

Grantor, **Palmer Coking Coal Company, LLP**, hereby binds Grantor, its successors and assigns to the land use restrictions identified herein and grants such other rights under this environmental covenant (hereafter "Covenant") made this **____** day of **_______________**, 2017 in favor of the State of Washington Department of Ecology ("Ecology"). Ecology shall have full right of enforcement of the rights conveyed under this Covenant pursuant to the Model Toxics Control Act, RCW 70.105D.030(1)(g), and the Uniform Environmental Covenants Act, RCW 64.70.110.

This Covenant is made pursuant to RCW 70.105D.030(1)(f) and (g) and WAC 173-340-440 by Palmer Coking Coal Company, LLP, its successors and assigns, and Ecology, its successors and assigns.

The property that is the subject of this Covenant is the subject of a remedial action (the "Remedial Action") taking place at the area Ecology has designated as the Landsburg Mine Site. The Remedial Action is described in the following document[s]:

Consent Decree, and all exhibits thereto, including the final Cleanup Action Plan for the Landsburg Mine Site, entered in *State of Washington Department of Ecology v. Palmer Coking Coal Company, LLP, et al*., King County Superior Court Cause No. ___________________ (the "Consent Decree"). These documents are on file at Ecology's Northwest Regional Office.

This Covenant is required because the Remedial Action to be implemented under the Consent Decree requires containment of hazardous substances and a conditional point of compliance has been established for groundwater.

The undersigned, Palmer Coking Coal Company, LLP ("Palmer"), is the fee owner of real property in the County of King, State of Washington that is subject to this Covenant. The legal description of the property that is subject to this Covenant, which consists of both the Cap Protection Area and the Groundwater and Portal Protection Area, is attached as Exhibit 1, and made a part hereof by reference. The Cap Protection Area and Groundwater and Portal Protection Area shall be collectively referred to in this Covenant as "the Property" and are shown on Figures 1 and 2 respectively.

Palmer Coking Coal Company, LLP makes the following declaration as to limitations, restrictions, and uses to which the Property may be put and specifies that such declarations shall constitute covenants to run with the land, as provided by law and shall be binding on all parties and all persons claiming under them, including all current and future owners of any portion of or interest in the Property (hereafter "Owner").

<u>Section 1</u>.

a. Uses of the Property shall be limited to uses that are not incompatible with the Remedial Action.

b. Any activity on the Property that interferes with the integrity of the Remedial Action and continued protection of human health and the environment is prohibited.

c. Any activity on the Property that may result in the release or exposure to the environment of a hazardous substance that remains on the Property as part of the Remedial Action, or create a new exposure pathway, is prohibited without prior written approval from Ecology.

d. No groundwater may be withdrawn from the Property for any non-remedial purpose. Water emanating directly from the former mine portal areas (Portals 2 and 3 on Figure 2) shall not be used for any non-remedial purpose. No water emanating from Portal 2 or Portal 3 shall be allowed to travel from the Property as surface water.

e. Warning signs shall be posted and maintained in appropriate locations approved by Ecology on the Property sufficient to provide: (i) notice of restrictions on use of groundwater and water discharging from the former mine portals (Portals 2 and 3) the Property as set forth in this Covenant, and (ii) notice of and identification of the boundary of the Cap Protection Area.

f. (Cap Protection Area only)

i. All structures or buildings are prohibited within the Cap Protection Area unless they are part of the Remedial Action. Consistent with Section 1.b above, structures or buildings placed within the Cap Protection Area shall not interfere with or compromise the integrity or effectiveness of the cap, nor cause subsidence or vertical loads that may collapse buried drums or mobilize buried waste beneath the cap and trench infilling. With approval from Ecology, variances from this restriction may be allowed if necessary for the purpose of emergency remediation of buried contamination or to mitigate threats from contamination within the mine workings, so long as the buildings or structures do not compromise the Remedial Action as outlined in the Cleanup Action Plan, attached as an exhibit to the Consent Decree.

ii. Consistent with Section 1.c above, any activity on the Property that may result in the release or exposure to the environment of the contaminated soil and waste contained as part of the Remedial Action, or create a new exposure pathway, is prohibited. Some examples of activities that are prohibited in the Cap Protection Area include: drilling; digging; placement of any objects or use of any equipment which deforms or stresses the surface beyond its load bearing capability; piercing the surface with a rod, spike or similar item; bulldozing; or earthwork.

iii. Routine maintenance of the cap required by the Consent Decree that involves disturbance of the ground surface (e.g., excavation, filling, grading) does not require Ecology approval.

iv. Structures or buildings placed within the Cap Protection Area that are not prohibited by Section1.f.i (above) must be designed to prevent the accumulation of gases at hazardous concentrations within.

g. (Groundwater and Portal Protection Area only) Redevelopment of land within designated buffer zones around the former mine portals for residential, industrial, or commercial purposes is prohibited, except that road construction, road maintenance, and utilities and other infrastructure improvements shall be allowed to the extent such activities will not interfere with the installation, integrity, and function of any Contingency Groundwater Treatment System infrastructure that may be required.

i. For Portal 2 at the north end, the buffer zone will encompass the area depicted in Figure 3.

ii. For Portal 3 at the south end the buffer zone will consist of the area depicted in Figure 4.

h. Infrastructure for the Contingent Groundwater Treatment Systems. The infrastructure for Contingent Groundwater Treatment Systems located near Portals 2 and 3 to the north and south, respectively (Figure 1) must be maintained for the duration of the Consent Decree. Consistent with Section 1.b above, any activities that may affect the integrity or function of these structures and access to these structures is prohibited.

Section 2. The Owner of the Property must give thirty (30) day advance written notice to Ecology of the Owner's intent to convey any of its interests in the Property. No voluntary conveyance of title, easement, lease, or other interest in the Property shall be consummated by the Owner without adequate and complete provision for continued monitoring, operation, and maintenance of the Remedial Action.

Section 3. The Owner must restrict land leases to uses and activities consistent with this Covenant and notify all lessees of the restrictions on the use of the Property.

Section 4. The Owner, after conferring with the other parties to the Consent Decree (or their successors or assigns), must notify and obtain approval from Ecology before initiating any use of the Property that is inconsistent with the terms of this Covenant. Ecology may approve any inconsistent use only after public notice and comment.

Section 5. The Owner shall allow authorized representatives of Ecology and designees of the other parties to the Consent Decree (or their successors or assigns) the right to enter the Property at reasonable times for the purpose of performing and evaluating the Remedial Action as outlined in the CAP; to take samples; to inspect remedial actions conducted at the property; to determine compliance with this Covenant; and to inspect records that are related to the Remedial Action.

Section 6. The Owner of the Property reserves the right under WAC 173-340-440 to record an instrument that provides that this Covenant shall no longer limit use of the Property or be of any further force or effect. However, such an instrument may be recorded only after the Owner of the Property confers with the parties (or their successors and assigns) to the Consent Decree and only if Ecology, after public notice and opportunity for comment, concurs.

PALMER COKING COAL COMPANY, LLP

____
William Kombol
Manager

Dated: __________________

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

____
[Name of Person Acknowledging Receipt]
[Title]

Dated: ___________________

STATE OF WASHINGTON
COUNTY OF KING

On this ______ day of ___________________, 2017, I certify that William Kombol personally appeared before me, acknowledged that he is the Manager of the corporation that executed the within and foregoing instrument, and signed said instrument by free and voluntary act and deed of said corporation, for the uses and purposes therein mentioned, and on oath stated that he was authorized to execute said instrument for said corporation.

____
Notary Public in and for the State of Washington, residing at
________________.
My appointment expires________________.

Exhibit 1
Legal Description

FILL IN FULL LEGAL DESCRIPTION WHEN AVAILABLE AFTER REMEDIAL ACTION CONSTRUCTION

CAP PROTECTION AREA:

GROUNDWATER AND PORTAL PROTECTION AREA:

Exhibit 2
Tax Parcel Numbers

(TO BE COMPLETED)

Figures 1 & 2

Cap Protection Area Map & Groundwater and Portal Protection Area Map

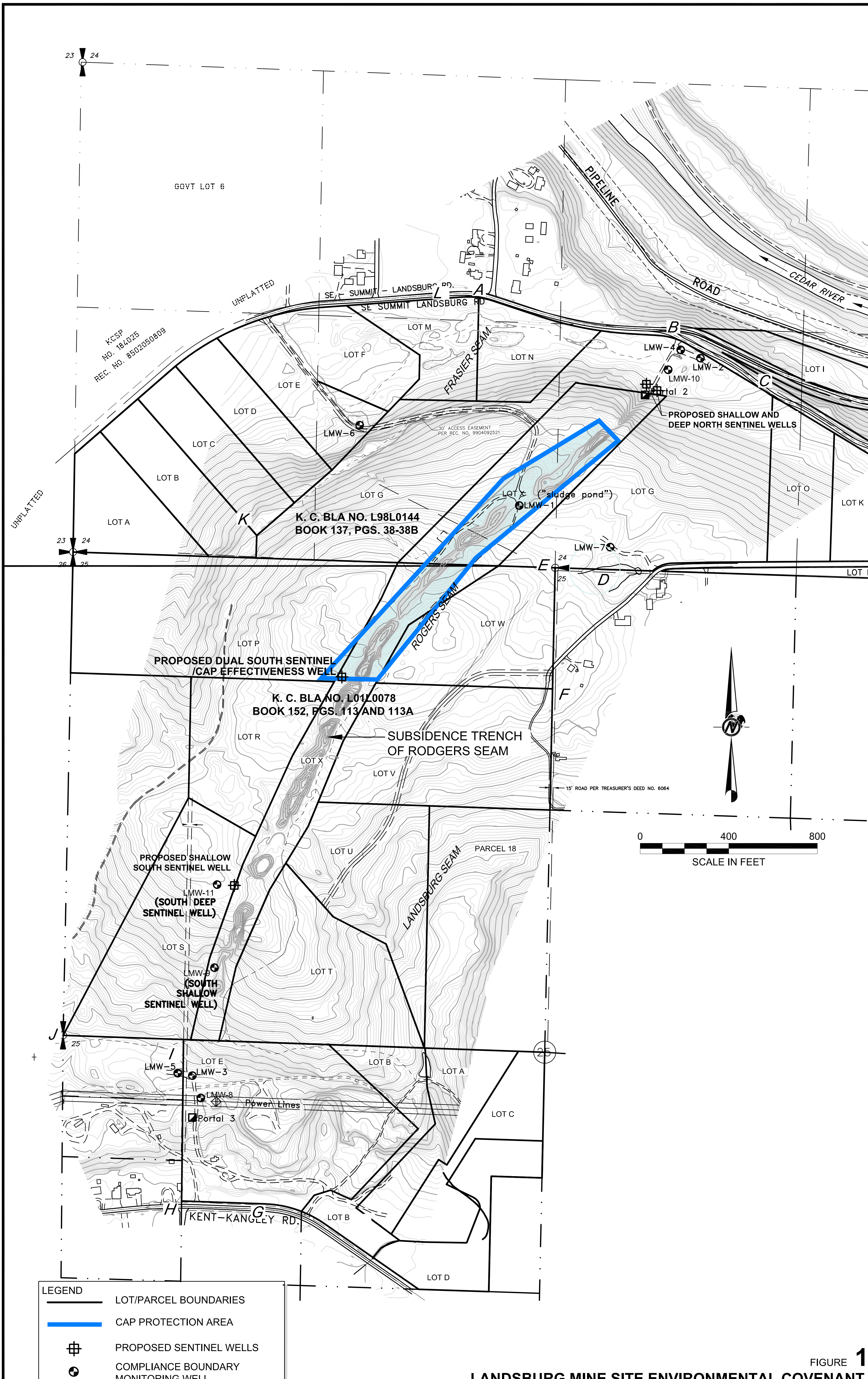


FIGURE 1

LANDSBURG MINE SITE ENVIRONMENTAL COVENANT
CAP PROTECTION AREA

PALMER/LANDSBURG MINE/WA

K:\CAD\Projects\1992\9231000\x002\R154\Exhibit F Restrictive Covenants\923_1000_002_R154_F2.dwg | 1 CAP PROTECTION AREA | Mod: 04/05/2013, 11:21 | Plotted: 04/05/2013, 11:47 | DCutter

Golder Associates

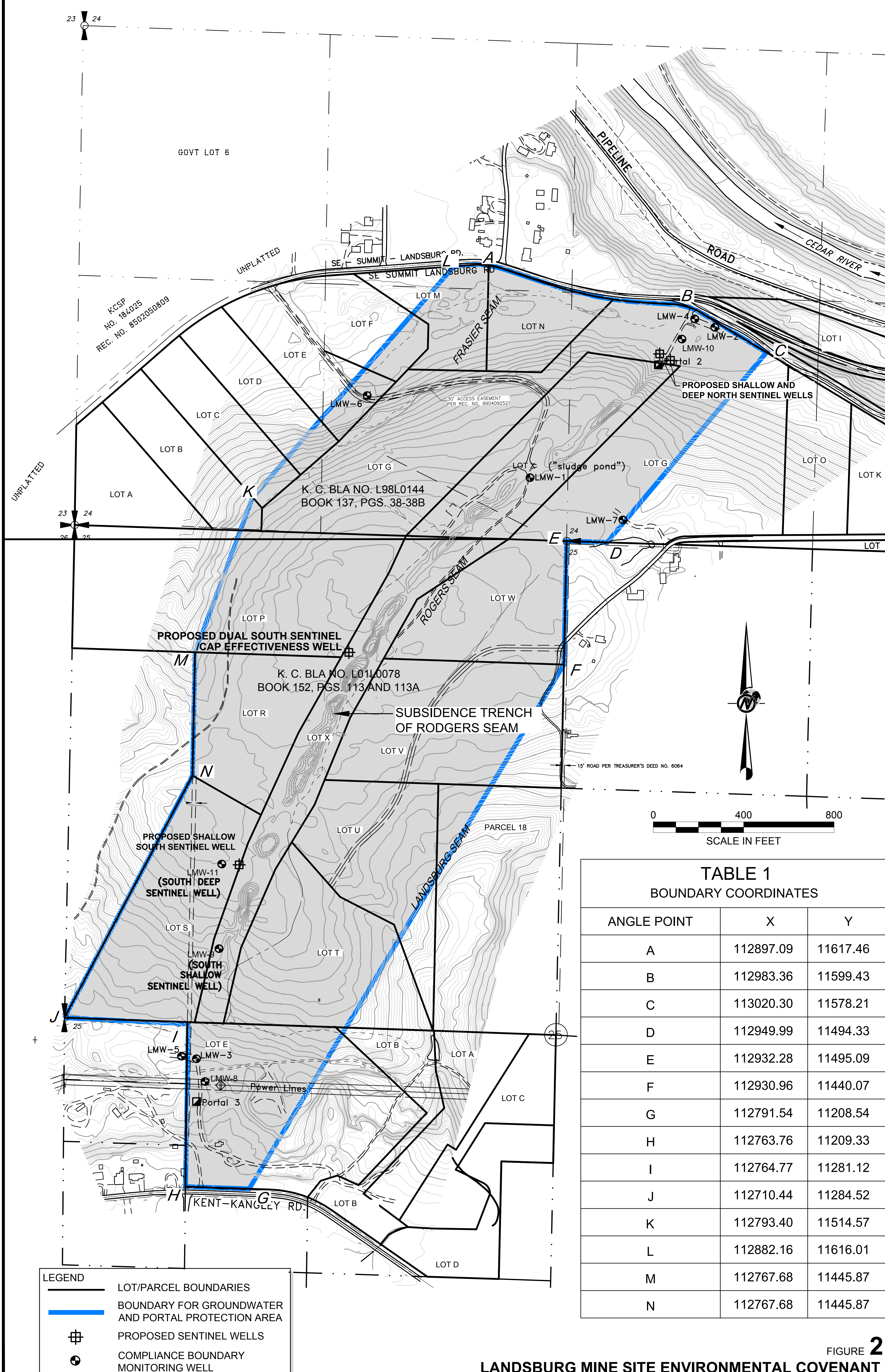


TABLE 1
BOUNDARY COORDINATES

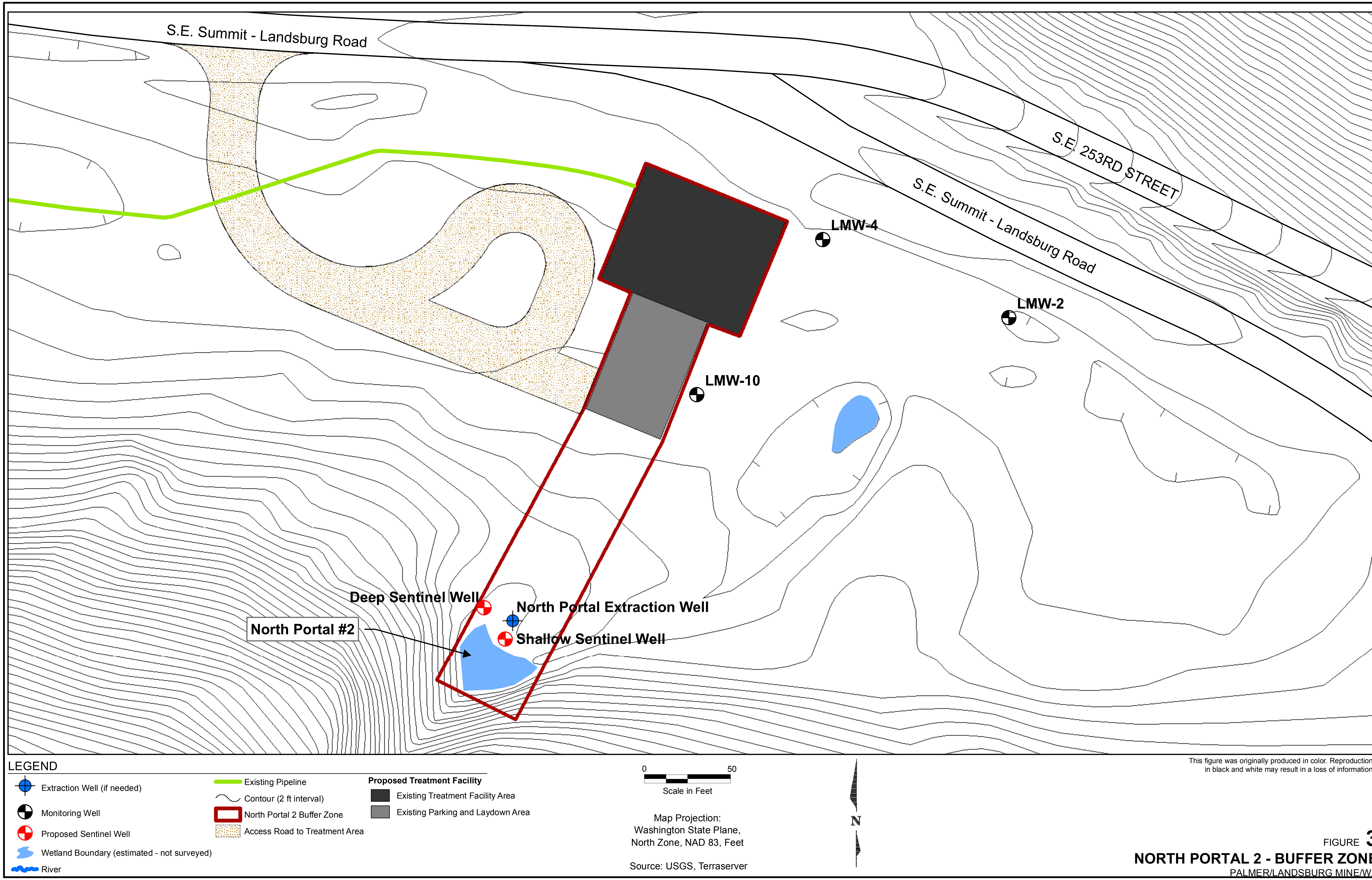
ANGLE POINT	X	Y
A	112897.09	11617.46
B	112983.36	11599.43
C	113020.30	11578.21
D	112949.99	11494.33
E	112932.28	11495.09
F	112930.96	11440.07
G	112791.54	11208.54
H	112763.76	11209.33
I	112764.77	11281.12
J	112710.44	11284.52
K	112793.40	11514.57
L	112882.16	11616.01
M	112767.68	11445.87
N	112767.68	11445.87

FIGURE 2
LANDSBURG MINE SITE ENVIRONMENTAL COVENANT
GROUNDWATER AND PORTAL PROTECTION AREA
PALMER/LANDSBURG MINE/WA

K:\CAD\Projects\1992\9231000\x002\R154\Exhibit F Restrictive Covenants\923_1000_002_R154_F2.dwg | 2 GROUNDWATER PROTECTION AREA | Mod: 07/31/2013, 15:45 | Plotted: 08/01/2013, 08:38 | aforcier

Golder Associates

Figures 3 & 4
North Portal 2 Buffer Zone & South Portal 3 Buffer Zone



This figure was originally produced in color. Reproduction in black and white may result in a loss of information.

FIGURE 3

NORTH PORTAL 2 - BUFFER ZONE

PALMER/LANDSBURG MINE/WA

Golder Associates

9231000002F05R05.mxd | MOD: 05/15/2013 | THAMMOND

LEGEND

- Well
- South Portal Buffer Zone
- Truck Access Roadway
- Property Boundary

REFERENCES

1.) Bing Maps (Imagery)
2.) Golder Associates Inc.
3.) COORDINATE SYSTEM: NAD 1983 StatePlane Washington North FIPS 4601 Feet

60 0 60 Feet

PROJECT
LANDSBURG MINE
KING COUNTY, WASHINGTON

TITLE
SOUTH PORTAL 3 - BUFFER ZONE

Golder Associates

PROJECT NO. 9231000-002			
DESIGN	BVJ	25 May 2017	SCALE: AS SHOWN REV. 0
GIS	BVJ	25 May 2017	
CHECK	DM	25 May 2017	FIGURE: 4
REVIEW	GZ	25 May 2017	

Exhibit E-2: Environmental Covenant

After Recording Return to:
[CURRENT OWNER]
[insert address]

Department of Ecology
Northwest Regional Office
3190 160th Ave. SE
Bellevue, WA 98008-5452

Environmental Covenant

Grantor: [Current Owner]
Grantee: State of Washington, Department of Ecology
Legal: See Exhibit 1
Tax Parcel Nos.: See Exhibit 2
Map Pages: See Figure 1

Grantor, **__________**, hereby binds Grantor, its successors and assigns to the land use restrictions identified herein and grants such other rights under this environmental covenant (hereafter "Covenant") made this ____ day of _______________, 2017 in favor of the State of Washington Department of Ecology ("Ecology"). Ecology shall have full right of enforcement of the rights conveyed under this Covenant pursuant to the Model Toxics Control Act, RCW 70.105D.030(1)(g), and the Uniform Environmental Covenants Act, RCW 64.70.110.

This Covenant is made pursuant to RCW 70.105D.030(1)(f) and (g) and WAC 173-340-440 by **[Current Owner],** his successors and assigns, and Ecology, its successors and assigns.

The property that is the subject of this Covenant is contiguous to property that is the subject of a remedial action (the "Remedial Action") taking place at the area Ecology has designated as the Landsburg Mine Site. The Remedial Action is described in the following document[s]:

Consent Decree, and all exhibits thereto, including the final Cleanup Action Plan for the Landsburg Mine Site, entered in *State of Washington Department of Ecology v. Palmer Coking*

Coal Company, LLP, et al., King County Superior Court Cause No. ____________________ (the "Consent Decree"). These documents are on file at Ecology's Northwest Regional Office.

This Covenant is required because the Remedial Action to be implemented under the Consent Decree requires certain institutional controls to be established at and near the Landsburg Mine Site. These institutional controls are to protect human health and the environment, maintain the long-term effectiveness of the Remedial Action, and preserve the future opportunity to install a contingent groundwater extraction and treatment system, if the installation of such a system proves necessary.

The undersigned, **[Current Owner]**, is the fee owner of real property in the County of King, State of Washington, that is subject to this Covenant. The legal description of the property that is subject to this Covenant is attached as Exhibit 1.

[Current Owner] makes the following declaration as to limitations, restrictions, and uses to which the Property may be put and specifies that such declarations shall constitute covenants to run with the land, as provided by law and shall be binding on all parties and all persons claiming under them, including all current and future owners of any portion of or interest in the Property (hereafter "Owner").

Section 1.

a. Uses of the Property shall be limited to uses that are not incompatible with the Remedial Action.

b. Any activity on the Property that interferes with the integrity of the Remedial Action and continued protection of human health and the environment is prohibited.

c. Any activity on the Property that may result in the release or exposure to the environment of a hazardous substance that remains on the Property as part of the Remedial Action, or create a new exposure pathway, is prohibited without prior written approval from Ecology.

d. No groundwater may be withdrawn from the Property for any non-remedial purpose.

Section 2. The Owner of the Property must give thirty (30) day advance written notice to Ecology of the Owner's intent to convey any of its interests in the Property. No voluntary conveyance of title, easement, lease, or other interest in the Property shall be consummated by the Owner without adequate and complete provision for continued monitoring, operation, and maintenance of the Remedial Action.

Section 3. The Owner must restrict land leases to uses and activities consistent with this Covenant and notify all lessees of the restrictions on the use of the Property.

Section 4. The Owner, after conferring with the parties to the Consent Decree (or their successors or assigns), must notify and obtain approval from Ecology before initiating any use of the Property that is inconsistent with the terms of this Covenant. Ecology may approve any inconsistent use only after public notice and comment.

Section 5. The Owner shall allow authorized representatives of Ecology and designees of the other parties to the Consent Decree (or their successors or assigns) the right to enter the Property at reasonable times for the purpose of performing and evaluating the Remedial Action as outlined in the CAP; to take samples; to inspect remedial actions conducted at the property; to determine compliance with this Covenant; and to inspect records that are related to the Remedial Action. Under this section, the Owner of the Property specifically consents to entry on to the Property by the above persons for purposes of installing and operating portions of the contingent groundwater extraction and treatment system that is part of the Remedial Action to be implemented under the Consent Decree, if the installation of such a system proves necessary.

Section 6. The Owner of the Property reserves the right under WAC 173-340-440 to record an instrument that provides that this Covenant shall no longer limit use of the Property or be of any further force or effect. However, such an instrument may be recorded only after the Owner of the Property confers with the parties (or their successors and assigns) to the Consent Decree and only if Ecology, after public notice and opportunity for comment, concurs. To the extent the provisions of this Environmental Covenant conflict with the provisions of the Deed recorded under King County recording number 199808180540, the provisions of this Covenant shall control.

____
[CURRENT OWNER]

Dated: __________________

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

____
[Name of Person Acknowledging Receipt]
[Title]

Dated: __________________

STATE OF WASHINGTON
COUNTY OF KING

On this ______ day of ___________________, 2017, I certify that [CURRENT OWNER] personally appeared before me, acknowledged that he is the Manager of the corporation that executed the within and foregoing instrument, and signed said instrument by free and voluntary act and deed of said corporation, for the uses and purposes therein mentioned, and on oath stated that he was authorized to execute said instrument for said corporation.

____
Notary Public in and for the State of Washington, residing at
________________.
My appointment expires________________.

Exhibit 1
Legal Description

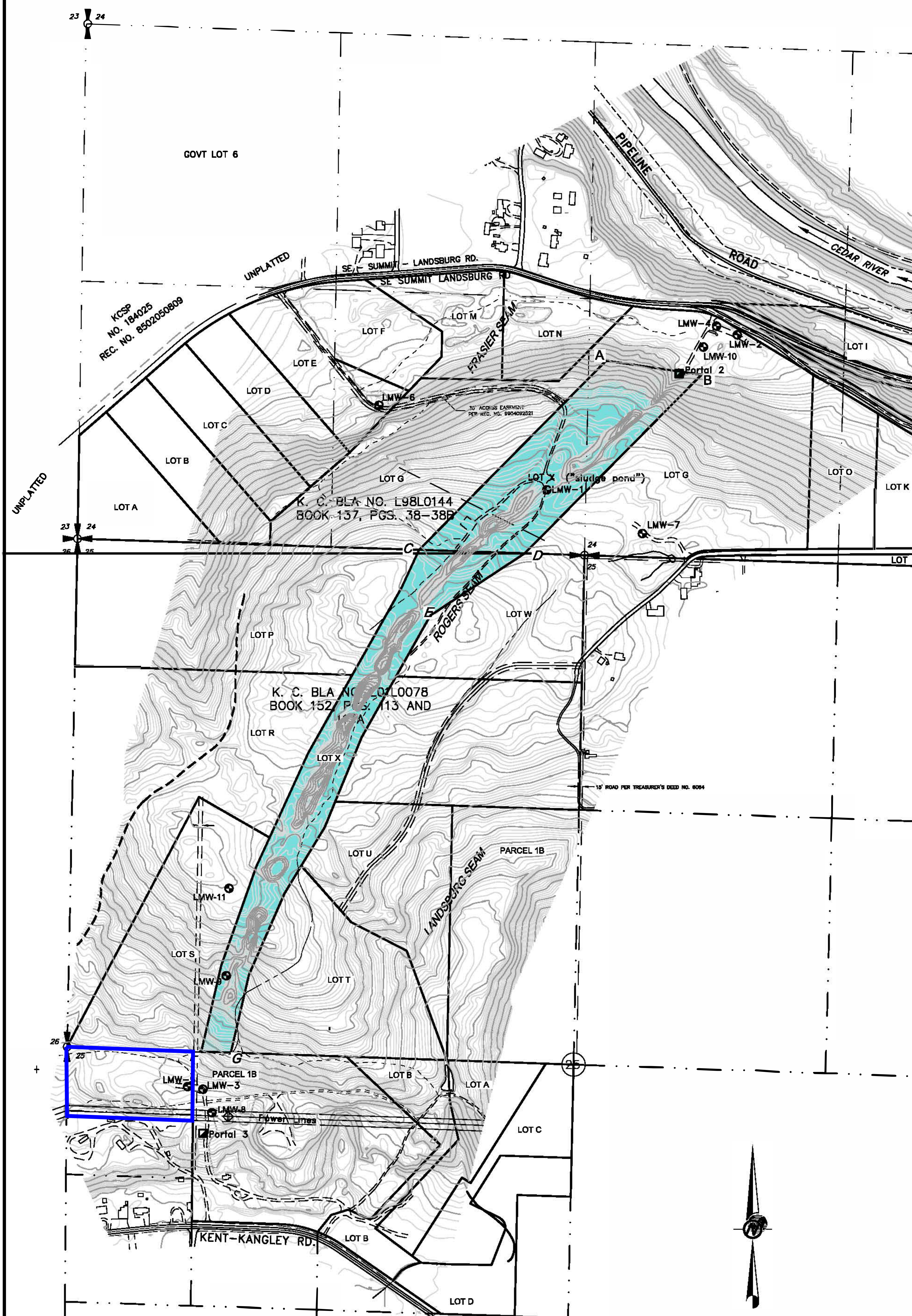
FULL LEGAL DESCRIPTION :

Quarter Section-Section-Township-Range: SW-25-22-6

N 1/2 OF NW 1/4 OF NW 1/4 OF SW 1/4 E 20 FT FOR RD LESS C/M RGTS SUBJ TO TRANS LN R/W

Exhibit 2
Tax Parcel Numbers

King County Tax Parcel Number: 252206-9066



0 400 800

SCALE IN FEET

LEGEND	
	PCC - LOT / PARCEL BOUNDARY
	LANDSBURG MINE SITE
	PARCEL 2522069066

FIGURE 1

ENVIRONMENTAL COVENANT, PARCEL 2522069066

PALMER/LANDSBURG MINE/WA

K:\CAD\Projects\1992\9231000\a002\R154\Exhibit A\923_1000_002_F1.dwg | 11x17 | Mod: 04/28/2010, 10:43 | Plotted: 04/28/2010, 12:47 | SSimmons

Golder Associates

EXHIBIT F

REMEDIAL ACTION PERMITS

TECHNICAL MEMORANDUM

TO:	Landsburg PLP Group	**DATE:**	June 7, 2017
FR:	Douglas Morell and Gary Zimmerman	**OUR REF:**	923-1000-002.R154
RE:	Potential Permit Requirements for Remedial Actions at the Landsburg Mine Site		

1.0 INTRODUCTION

Golder has evaluated and listed potential permits that may be required for remedial actions at the Landsburg Mine Site (Site). There are two major remedial actions that may occur at the Site identified in the Cleanup Action Plan (CAP). Because many of the required permits are specific for each major remedial action, we have divided the permits to each.

The remedial action that will be implemented is to cap the disposed industrial wastes in-place and reduce the amount of groundwater emanating from the Site. The mine trenches where industrial wastes were disposed (north half of the mine) will be cleared of trees and vegetation and backfilled with imported fill material or with borrow material from the Palmer Coking Coal Company (PCC) contiguous property. A low permeability closure cap will be placed over the backfilled trenches and sloped to drain off the cap footprint. Surface water diversion ditches will be installed along the sides of the mine trenches to collect surface water flow from the low permeability cap and divert surface water outside of the diversion trenches to keep it from reaching the remediation cap or entering any remaining mine subsidence trenches.

The second major remedial action that may potentially become necessary is in the case where groundwater emanating from the mine becomes contaminated and requires capture and treatment. Currently, groundwater emanating from the mine is not contaminated. The CAP addresses this potential remedial action as the Contingent Groundwater Treatment System. This treatment system would require permits specific to its installation and operation, should it be implemented. The permits required can only be identified as potential, because the treatment system is not designed. It is not currently known whether any groundwater treatment will be necessary. Currently, the specific contaminants of any potential future contaminated groundwater are not known and, therefore, the treatment technology is currently not known. The required specific permits are listed as potential, but may not be needed depending on whether treatment is necessary and the type of treatment that ultimately is employed.

The Model Toxics Control Act (MTCA) exempts remedial actions from the procedural requirements of certain state and local laws [RCW 70.105D.090], if conducted under a Consent Decree. Here, the remedial actions will be implemented under a Consent Decree and would have these exemptions. Specific procedural requirements exempted under a MTCA Consent Decree include portions of RCW Chapters 70.94, 70.95, 70.105, 77.55, 90.48, 90.58, and any laws requiring or authorizing local government permits or approvals for remedial actions. The procedural exemption does not apply to state and local laws if such exemption would result in the loss of approval from a Federal agency necessary for the State to administer any Federal law under these chapters. Specific examples of this exception to the procedural exemption are addressed by Ecology in Publication No. 15-09-339. Even though the remedial actions are exempt from procedural requirements under RCW 70.105D.090(1), Ecology must ensure compliance with the substantive requirements associated with each exempted procedural requirement. For any permit that is procedurally exempt, the PLPs may obtain the permit in order to demonstrate compliance, but are not required to do so. If a State or local permit is not exempted under MTCA, they will be specifically identified below; otherwise only the substantive requirements of the State or local laws listed below are applicable. Federal permits listed below are not exempted by MTCA. Most State and local permits are exempted under MTCA and are identified below.

2.0 LOW PERMEABILITY CLOSURE CAP AND SURFACE WATER DIVERSION

2.1 Federal

2.1.1 Clean Water Act

Potentially a Section 404 (Clean Water Act) Permit will be required from the Army Corps of Engineers (Corps) for the filling of or other impacts to wetlands at the site. It is anticipated that the work would be conducted/authorized under a Corps Nation Wide Permit 38 (NWP 38; Cleanup of Hazardous and Toxic Waste). NWP 38 requires pre-construction notification to the Corps (a Joint Aquatic Resources Permit Application [JARPA]). Consultation with the Corps will be needed to determine whether or not wetlands within the mine subsidence trenches and in surrounding areas of the mine are jurisdictional and regulated under Section 404. The Corps will make the jurisdictional decision on the wetland applicability and will, as necessary, consult with appropriate agencies for Section 7 (Endangered Species Act) and Section 106 (National Historic Preservation Act).

If a Section 404 permit is required, a Biological Assessment (Section 7) may be required. If applicable, the Corps would conduct Section 7 consultation with the U.S. Fish and Wildlife Service and potentially the National Oceanic and Atmospheric Administration (NOAA Fisheries).

The project may be subject to the Spill Prevention, Control, and Countermeasure (SPCC) Regulation 40 CFR part 112 if the construction project will include the storage of more than 1,320 gallons of oil on the Site. The Storage of over 1,320 gallons of fuel or oil is unlikely during remedial actions.

2.2 State of Washington

2.2.1 State Environmental Policy Act

State Environmental Policy Act (SEPA) review is required to obtain any local or state permits for the project including permits from Ecology. The Landsburg PLP Group prepared a SEPA Checklist for the Cleanup Action and submitted it to Ecology (SEPA lead) to initiate SEPA review. Ecology issued a Determination of Non Significance (DNS) for the Cleanup Action on October 11, 2013. The SEPA checklist and DNS were published as Appendix B to the Draft Cleanup Action Plan that was published for public comment in 2013. The DNS is included as Appendix B to the final Cleanup Action Plan (Exhibit B).

2.2.2 Section 401 of the Clean Water Act (Water Quality Certification)

If the proposed project requires a Section 404 permit from the Corps as discussed above, a water quality certification would also be required from Ecology for any activity that may result in a discharge into surface waters, including wetlands. Ecology provides certification that the discharge complies with the discharge requirements and the aquatic protection requirements of state law. Conditions of the 401 Certification become conditions of the federal permit. If work is authorized under a NWP 38, approval is granted for the Section 401 permit.

If the Corps does not assert jurisdiction over the Site wetlands, an administrative order would ordinarily be required from the State of Washington. However, the Cleanup Action is exempt from the procedural requirements of RCW 90.48.120. Again a consultation with the State Department of Ecology will identify whether an administrative order would ordinarily be required, and if so, how to achieve compliance with the substantive regulatory requirements of RCW 90.48.120. The State has no minimum size exemption for wetlands.

2.2.3 National Pollutant Discharge Elimination System under the Clean Water Act

A National Pollutant Discharge Elimination System Permit (NPDES) is required from Ecology for ground disturbance during construction affecting more than 1 acre of ground for potential stormwater discharge to surface water. This permit is to protect and maintain water quality and prevent or minimize sediment, chemicals, and other pollutants from entering surface water and groundwater. This permit is required at least 60 days prior to any construction activity that could result in a discharge of stormwater. Coverage under the Construction Stormwater General Permit will be obtained for the Cleanup Action. Obtaining coverage under this permit will require the submission of a Notice of Intent application and the development of a Stormwater Pollution Prevention Plan. An updated General Permit was issued by Ecology and went into effect on May 5, 2017.

2.2.4 Section 106 of the National Historic Preservation Act

A Cultural Resources review (Section 106) could also potentially be required. If required, the Corps would conduct Section 106 consultation with the Department of Archaeology and Historic Preservation (DAHP) and affected tribes.

2.2.5 Washington State Forest Practices Act

Forestry Practices Permit from the Washington Department of Natural Resources will be required because more than 5,000 board feet will be cleared. This permit is not exempt by MTCA.

2.2.6 Coastal Zone Management Certification

If any federal approvals are required, a Coastal Zone Management (CZM) certification would be required for work conducted within a coastal county, including King County. This certifies the project is consistent with the CZM program. If a NWP 38 is required, the CZM is already certified.

2.3 King County

2.3.1 Clearing and Grading Permit

A King County Clearing Permit is ordinarily required for the removal of trees or vegetation from a critical area; clearing over 7,000 square feet in a rural (RA) zoned property; or the removal of 5,000 board feet of timber.

A King County Grading Permit is ordinarily required for any amount of grading in a critical area or when grading 100 cubic yards or more of soils will be excavated and filled. King County identifies the need for a SEPA checklist for the disturbance of more than 500 cubic yards.

The Cleanup Action is procedurally exempt from both of these local permitting requirements. However, the PLPs will consult with Ecology and King County to ensure compliance with the substantive regulatory requirements.

2.3.2 Critical Areas Ordinances

Compliance with King County's Critical Areas Ordinance (Chapter 21A.24) is required for project activities within or near critical areas (i.e. critical area and/or in protective buffer area). King County has identified the following critical areas: Critical aquifer recharge area, Coal mine hazard area; Erosion hazard area; Flood hazard area except in the severe channel migration hazard area; Landslide hazard area under forty percent slope; Seismic hazard area; Volcanic hazard areas; Severe channel migration hazard area;

Landslide hazard area over forty percent slope; Steep slope hazard area; Wetland; Aquatic area; Wildlife habitat conservation area; and Wildlife habitat network.

Prior to any clearing, grading, or site preparation, King County would conduct a critical area review to identify any critical area, active breeding site of a protected species or of a critical area or active breeding site that has been mapped or identified within 300 feet of the site. A critical areas report (e.g. wetland delineation report) would need to be prepared. A mitigation and monitoring plan would also be required. Wetlands within the Mine trenches will be buried or receive less surface water after construction of the cap and diversion ditches. A Wetland Mitigation Plan needs to be approved by King County.

The Cleanup Action is procedurally exempt from King County critical areas permitting requirements. However, the PLPs will consult with Ecology and King County to ensure compliance with the substantive regulatory requirements.

2.3.3 Shoreline Management Act

A Shoreline Management Act Permit will not be required from King County, because the project does not involve work within 200 feet of any watercourse that falls under jurisdiction of the county shoreline management program. Such waters include lakes 20 acres in size or greater, and rivers averaging 20 cubic feet per second (cfs) or more.

3.0 CONTINGENT GROUNDWATER TREATMENT SYSTEM, IF IMPLEMENTED

3.1 Federal

Permits from the Federal government are the same as those described above for the first phase remedial actions. Below are additional requirements for the installation and operation of the Contingent Groundwater Treatment System.

3.2 State of Washington

Permits or substantive requirements of permits for the State of Washington are the same as those described above for the first phase remedial actions. Below are additional requirements for the installation and operation of the Contingent Groundwater Treatment System.

3.2.1 Hazardous Waste Management Act

A Dangerous Waste Generator Identification under WAC 173-303 could potentially be needed if the treatment system generates dangerous wastes. Remedial actions under MTCA consent decrees are exempt from the procedural requirements of RCW 70.105 (Hazardous Waste Management Act) that relate to state-only designated dangerous waste. Remedial actions are not exempt from the procedural requirements of RCW 70.105 that relate to federally-designated hazardous waste. Until the Contingent Groundwater Treatment System is designed, however, it is too soon to determine whether all of these procedural requirements will apply. If the System is exempt from the procedural requirements that relate to state-only designated dangerous waste, the PLPs will consult with Ecology to ensure compliance with all substantive regulatory requirements of the Hazardous Waste Management Act.

3.2.2 Clean Air Act

A Quality Notice of Construction (NOC) Permit might ordinarily be needed if there are emissions of air contaminants to the atmosphere that are generated during treatment. The NOC permits are issued by the Puget Sound Clean Air Agency. An Air Operating Permit would ordinarily be required by Ecology if the treatment system emissions exceed certain thresholds of hazardous air pollutants specified by this permit.

Remedial actions under MTCA consent decrees are also exempt from the procedural requirements of RCW 70.94 (Washington Clean Air Act), except in certain circumstances that have been identified by Ecology Publication No. 15-09-339. Until the Contingent Groundwater Treatment System is designed, however, it is too soon to determine whether these procedural requirements will apply. If the System is exempt from these procedural requirements, the PLPs will consult with Ecology to ensure compliance with all substantive regulatory requirements of the Washington Clean Air Act.

3.2.3 National Pollutant Discharge Elimination System Under Clean Water Act

The current plan is to discharge any treated or untreated groundwater effluents to the King County Metro Publically Owned Treatment Works (POTW). If this were to change for some reason, an NPDES Permit may be required once the treatment system is operational. Until the Contingent Groundwater Treatment System is designed, however, it is too soon to determine whether an NPDES Permit will be required.

3.2.4 Water Rights Act

A Groundwater Extraction/Water Right is not required for remedial actions under MTCA, but potential impacts or influences from groundwater extraction will need to be identified.

3.3 King County

Permits or substantive requirements of permits from King County are the same as those described above for the first phase remedial actions. Below are additional requirements for the installation and operation of the Contingent Groundwater Treatment System. The Cleanup Action is procedurally exempt from these local permitting requirements. However, the PLPs will consult with Ecology and King County to ensure compliance with the substantive regulatory requirements.

Department of Development and Environmental Services Ordinances

Clearing Permit is required for the removal of trees or vegetation from a critical area; clearing over 7,000 square feet in a rural (RA) zoned property; or the removal of 5,000 board feet of timber.

Grading Permit will be required because 100 cubic yards of soils will be excavated and filled for connecting the pipeline to the King County sanitary sewer.

Building Permit will be necessary form King County for the treatment system installation. This permit will also include the extension of the discharge pipeline under the County road and to the sanitary sewer.

A Plumbing Permit and a Backflow Prevention Assemblies Permit may be required for the installation of the discharge pipeline. These permits can be obtained through Public Health of Seattle & King County.

Industrial Waste Program Wastewater Discharge Permit will be required from King County to discharge captured and or treated groundwater to King County's Metro POTW.

Electrical Permit is required for the electrical design and its installation for the treatment system. In unincorporated King County, Electrical Permits are issued by the Washington Department of Labor and Industries.