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7	STATE OF WA KING COUNTY SU	
8	STATE OF WASHINGTON,	
9	DEPARTMENT OF ECOLOGY,	NO
10	Plaintiff,	CONSENT DECREE
11	v.	
12	PALMER COKING COAL COMPANY, LLP; PACCAR INC; PLUM CREEK	
13	TIMBERLANDS , L.P.; BROWNING- FERRIS INDUSTRIES OF ILLINOIS,	
14	INC.; TOC HOLDINGS CO.; THE BNSF RAILWAY COMPANY,	
15	Defendants.	
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I. INTRODUCTION

A. The mutual objective of the State of Washington, Department of Ecology (Ecology) and Palmer Coking Coal Company, LLP; PACCAR Inc; Plum Creek Timberlands Company, L.P.; Browning-Ferris Industries of Illinois, Inc.; TOC Holdings Co.; and the BNSF Railway Company (collectively, Defendants) under this Decree is to provide for remedial action at a facility where there has been a release or threatened release of hazardous substances. This Decree requires Defendants to undertake the following remedial actions:

Backfill a portion of the trenches as required for capping (*See* CAP, Exhibit B);

2. Allow the backfill to consolidate;

Place a low-permeability soil cap over the backfill of the trenches (areas
 7, 8, and 9), including grading and surface water management (*See* CAP, Exhibit B);

4. Maintain the soil cap until residual hazardous substance concentrations no longer exceed cleanup or remediation levels under the Model Toxics Control Act (MTCA) as described in the Cleanup Action Plan (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 (*See* CAP, Exhibit B).

Ecology has determined that these actions are necessary to protect human health and the environment.

B. The Complaint in this action is being filed simultaneously with this Decree. AnAnswer has not been filed, and there has not been a trial on any issue of fact or law in this case.However, the Parties wish to resolve the issues raised by Ecology's Complaint. In addition, the

Parties agree that settlement of these matters without litigation is reasonable and in the public interest, and that entry of this Decree is the most appropriate means of resolving these matters.

C. By signing this Decree, the Parties agree to its entry and agree to be bound by its terms.

D. By entering into this Decree, the Parties do not intend to discharge non-settling parties from any liability they may have with respect to matters alleged in the Complaint. The Parties retain the right to seek reimbursement, in whole or in part, from any liable persons for sums expended under this Decree.

E. This Decree shall not be construed as proof of liability or responsibility for any releases of hazardous substances or cost for remedial action nor an admission of any facts; provided, however, that Defendants shall not challenge the authority of the Attorney General and Ecology to enforce this Decree.

F. The Court is fully advised of the reasons for entry of this Decree, and good cause having been shown:

Now, therefore, it is HEREBY ORDERED, ADJUDGED, AND DECREED as follows:

II. JURISDICTION

A. This Court has jurisdiction over the subject matter and over the Parties pursuant to the Model Toxics Control Act (MTCA), Chapter 70.105D RCW.

B. Authority is conferred upon the Washington State Attorney General by RCW 70.105D.040(4)(a) to agree to a settlement with any potentially liable person (PLP) if, after public notice and any required hearing, Ecology finds the proposed settlement would lead to a more expeditious cleanup of hazardous substances. RCW 70.105D.040(4)(b) requires that such a settlement be entered as a consent decree issued by a court of competent jurisdiction.

C. Ecology has determined that a release or threatened release of hazardous substances has occurred at the Site that is the subject of this Decree.

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D. Ecology has given notice to Defendants of Ecology's determination that Defendants are PLPs for the Site, as required by RCW 70.105D.020(21) and WAC 173-340-500.

E. The actions to be taken pursuant to this Decree are necessary to protect public health and the environment.

F.

This Decree has been subject to public notice and comment.

G. Ecology finds that this Decree will lead to a more expeditious cleanup of hazardous substances at the Site in compliance with the cleanup standards established under RCW 70.105D.030(2)(e) and chapter 173-340 WAC.

H. Defendants have agreed to undertake the actions specified in this Decree and consent to the entry of this Decree under MTCA.

III. PARTIES BOUND

This Decree shall apply to and be binding upon the Parties to this Decree, their successors and assigns. The undersigned representative of each Party hereby certifies that he or she is fully authorized to enter into this Decree and to execute and legally bind such Party to comply with this Decree. Defendants agree to undertake all actions required by the terms and conditions of this Decree. No change in ownership or corporate status shall alter Defendants' responsibility under this Decree. Defendants shall provide a copy of this Decree to all agents, contractors, and subcontractors retained to perform the Work required by this Decree, and shall ensure that all work undertaken by such agents, contractors, and subcontractors complies with this Decree.

IV. DEFINITIONS

Unless otherwise specified herein, all definitions in RCW 70.105D.020 and WAC 173-340-200 shall control the meanings of the terms in this Decree.

A. <u>Site</u>: The Site is referred to as the Landsburg Mine Site, and is generally located approximately 1.5 miles northwest of Ravensdale, Washington, in a rural area of southeast King County. The Site is more particularly described in the Site Diagram (Exhibit A). For purposes of the Covenant Not to Sue (Section XVIII), Contribution Protection (Section XIX), and Land Use Restrictions (Section XX) only, the Site shall include the Groundwater and Portal Protection Area as depicted in Exhibit A to this Decree. The Site constitutes a Facility under RCW 70.105D.020(5).

B. <u>Groundwater and Portal Protection Area</u>: The Groundwater and Portal Protection Area is the area in which institutional controls will be implemented to prevent withdrawal of groundwater for purposes other than remediation, and to prevent access to the north and south portals.

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Parties or Party: Refers to Ecology and Defendants.

D. <u>Defendants</u>: Refers to Palmer Coking Coal Company, LLP; PACCAR Inc; Plum Creek Timberlands Company, L.P.; Browning-Ferris Industries of Illinois, Inc.; TOC Holdings Co.; and the BNSF Railway Company.

E. <u>Consent Decree or Decree</u>: Refers to this Consent Decree and each of the exhibits to this Decree. All exhibits are integral and enforceable parts of this Consent Decree. The terms "Consent Decree" or "Decree" shall include all exhibits to this Consent Decree.

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Work or Work to be Performed: Refers to work described in Section VI.

V. FINDINGS OF FACT

Ecology makes the following findings of fact without any express or implied admissions of such facts by Defendants.

A. The Site consists of portions of a former underground coal mine located approximately 1.5 miles northwest of Ravensdale in a rural area of southeast King County,

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Washington. The Site is situated directly south and east of SE Summit-Landsburg Road, and north of SE Kent-Kangley Road.

B. The Site is located within Sections 24 and 25, Township 22 North, Range 6 East, W.M. King County, Washington. The Site is more particularly defined in Exhibit A of this Consent Decree.

C. The Site occupies a parcel of land owned or formerly owned by Palmer Coking Coal Company, LLP (PCC) and by Plum Creek Timber Company, L.P., the predecessor in interest to Plum Creek Timberlands Company, L.P. The BNSF Railway Company also owned property within the Site. These parties are "owners" as defined by RCW 70.105D.020(17) and are therefore liable.

D. PACCAR Inc; Browning-Ferris Industries of Illinois, Inc.; and TOC Holdings Co. are liable parties for generating or transporting "hazardous wastes disposed of or treated at the facility." RCW 70.105D.040(c).

E. PCC and several earlier coal companies operated underground coal mines, known first as the Danville Mine and later collectively called the Landsburg Mine. The various Danville-Landsburg mines consisted of several coal seams known as the Frasier seam (furthest west), the Landsburg seam (furthest east), and the Rogers seam (middle coal seam). The Rogers seam was mined from 1959 until 1975. The northern half of the subsidence trenches above the Rogers seam is the area of the site (or waste disposal).

F. 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. Extraction was accomplished by causing the coal seam to cave into mine workings (locally called "booming") from which it 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

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from about 60 to 100 feet wide, 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 comprised of a series of separate subsided trench segments. Each trench section is separated by a wall of intact rock and coal (called a pillar wall).

G. Based on available information, these trenches 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 the northern portion of the 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. Disposal of land clearing debris continued until the early 1980s after which all disposal activities ceased. Currently, the Site is secured by a fence and locked gates, which encloses the northern portion of the trenches.

H. The Site and most of the immediate surrounding area is used for forestry today. Apart from the Site, developments in the immediate surrounding area include a new junior high school, King County-owned open space lands, and approximately 130 rural residential dwellings. The school is located about 0.65 miles northwest of the Site. The nearest residences to the Site 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 immediate surrounding area is provided by residential septic systems.

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I. A number of gravel roads access the Site from public thoroughfares and 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. The Site is also accessed from S.E. Kent-Kangley Road and from S.E. 256th Street. 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 six-foot-tall chain link security fence. Dense vegetation covers the Site. Electrical transmission lines and a Bonneville Power Administration easement cross the southern portion of the Site in an east-west direction.

J. Several preliminary environmental investigations were performed at the Site. These have included a limited soil gas survey, sampling of area private wells, sampling surface water emanating from mine portals, and limited sampling of ponded surface water, drum contents and soils for a site hazard assessment. These investigations have 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.

K. In 1991, Ecology designated the Site a high priority for cleanup, and in late 1991 at Ecology's request, four of the Defendants or their predecessors 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 one hundred 55-gallon drums.

L. Following the removal of the drums, Ecology and the Defendants or their predecessors negotiated and entered into an Agreed Order (Ecology 1993) which directed the Defendants or their predecessors to conduct a Remedial Investigation/Feasibility Study (RI/FS) to evaluate the need for remedial action. This Agreed Order was amended on two separate occasions, in 1995 and again in 2005. On September 5, 2013, Ecology advised the PLPs that

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they had completed all actions required under the Agreed Order. 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 Agreed Order. The RI/FS, which consisted of a comprehensive investigation of the Site's environmental conditions and evaluation of potential remedial alternatives for Site cleanup, was conducted by the Defendants or their predecessors over the period of mid-1993 to early-1996. The RI/FS described contamination at the Site as follows: within the trenches, chromium, lead, PCBs, bis-(2ethylhexyl)phthalate, methylene chloride, trichloroethylene (TCE) and total petroleum hydrocarbons (TPH) exceeded Method B standards during the early 1990s in an area confined to the northern portion of the trenches 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. 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 Site do not exhibit concentrations of chemical constituents above naturally occurring background levels.

M. Interim groundwater monitoring of Site compliance wells (LMW-2 through LMW-11) was conducted periodically from 1994 to 2003, quarterly in 2004, and semiannually 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 method reporting limits and method detection limits for all analytes are at or below acceptable concentrations under the MTCA, with the exception of some metals which have a natural background level that is in excess of the MTCA due to the geochemical condition of the groundwater within the coal mine.

N. Ecology provided all stakeholders an opportunity to participate in its evaluation of the remedial alternatives proposed under the RI/FS, completed in 1996, in full compliance with applicable MTCA criteria. Stakeholders commented on the preferred remedial alternative in the RI/FS. Ecology took all stakeholders' comments into consideration and concluded that the preferred remedial alternative identified in the RI/FS and more fully described in the CAP (Exhibit B) is the most appropriate remedial alternative to address hazardous substances at the Site and protect human health and the environment in the areas surrounding the Site.

VI. WORK TO BE PERFORMED

This Decree contains a program designed to protect human health and the environment from the known release, or threatened release, of hazardous substances or contaminants at, on, or from the Site.

A. The Defendants shall perform the work specified in detail in the CAP (Exhibit B) and the Schedule (Exhibit C). The remedy selected for the Site is to place a low-permeability soil cap over backfilled soils in the northern portion of the trenches. That portion of the trenches would be backfilled to approximate grade before capping. The most economical local source of suitable fill will be used; the selection of the source(s) of backfill for the trenches will be made during final design. The permeability of the capping soil shall be no higher than 10⁻⁶ cm/sec, thereby meeting the Minimum Functional Standard specifications in chapter 173-304 WAC. The work to be performed under the CAP generally includes: Backfill a portion of the trenches (areas 7, 8 and 9) as required for capping (*See* CAP, Exhibit B);

Allow the backfill to consolidate;

• Place a low-permeability soil cap over the backfill of the trenches (areas 7, 8, and 9), including grading and surface water management (*See* CAP, Exhibit B);

• Maintain the cap until residual hazardous substance concentrations no longer exceed cleanup or remediation levels under MTCA 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; and

• Implement and maintain institutional controls, groundwater monitoring and any instituted contingency plan (*See* CAP, Exhibit B).

1. The area that would be capped (areas 7, 8, and 9) is shown on Figure 15 of the CAP. This delineation is based on the areas of documented and suspected waste disposal identified in the RI/FS. The cap would 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.

2. Surface water runoff from the cap will be collected in drainage ditches and directed away from the cap. The cap will be sloped to optimize stability and encourage rainwater runoff so as to minimize rainwater infiltration to the maximum extent possible.

3. The cap design is shown as Option B on Figure 14 of the CAP and will include a top layer of vegetated soil to promote evapotranspiration and decrease the potential for erosion. No moisture conditioning is expected, and this soil would not be compacted, in order to provide a loose medium for establishing the vegetative cover. To establish vegetation, the topsoil would be seeded with grasses suitable for the local climate. The low-permeability soil cap will consist of 24 inches of compacted lowpermeability soil beneath 6 inches of vegetated topsoil. The suitability of potential sources of cap material, in terms of both quality and quantity, will be identified in the

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engineering design report. Final haul road location and source material specifications will also be detailed in the engineering design report.

4. Installation of this cap will be performed using standard earth-moving equipment. Construction Quality Assurance will primarily consist of verifying the soil cap meets the permeability specification, as well as verifying cap thickness and grading. (*See* CAP, Exhibit B). Any settling after cap installation shall be repaired by filling, compacting and regrading in the same manner as in initial installation. The thickness of the cap will provide long-term protection against erosion. The planted vegetative cover will be mowed as needed.

5. Deed restrictions compliant with chapter 64.70 RCW will be instituted as provided in Section XX of this Decree to ensure that indefinite Site use restrictions remain in force regardless of the property owner, and to notify any prospective purchasers of the Site that there is the presence of subsurface waste. (*See* Environmental Covenants, Exhibits F-1 and F-2). Site use restrictions will prohibit using the Site for purposes 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. A locked fence surrounds areas of the Site (see Figure 4 of the CAP) and warning signs shall be posted to provide notice of the presence of a waste site to trespassers and recreational visitors. Groundwater use restrictions will be employed, as provided in Section XX of this Decree, to prevent exposure to groundwater near the Site and within and near the compliance boundary shown in Figure 11 of the CAP.

6. The CAP is attached to this Consent Decree as Exhibit B and describes the Work to be Performed in more detail and outlines the anticipated schedule for completion of the construction phase.

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7. Compliance Monitoring will be conducted as specified in the Compliance Monitoring Plan, attached as Exhibit E, Part A, and in accordance with WAC 173-340-410. Compliance Monitoring consists of Protection Monitoring, Performance Monitoring, and Confirmational Monitoring.

8. The CAP also requires ongoing Operations and Maintenance (O&M) for completion of the remedial action, in accordance with WAC 173-340-400(4)(c). The O&M plan is attached to this Consent Decree as Exhibit E, Part B.

9. The Contingent Groundwater Extraction and Treatment System Plan (Exhibit E, Part C) will be implemented in the event concentrations of mine waste contaminants at compliance monitoring wells exceed remediation levels established in the Compliance Monitoring Plan (Exhibit E, Part A). This plan details the circumstances under which the groundwater extraction and treatment system for the Site must be installed and operated. If required, the groundwater extraction and treatment system's goal is to contain, treat, and safely dispose of impacted groundwater in a timely manner to prevent migration beyond the conditional compliance boundary for groundwater.

B. In order to implement the CAP, Defendants will prepare and submit for Ecology's review and approval all documents necessary to conduct the final clean up action. All deliverables identified in the CAP (Exhibit B) and Schedule (Exhibit C), once approved by Ecology, are hereby incorporated by reference and become an integral and enforceable part of this Decree.

C. If there is an inconsistency between the Decree and any of the exhibits to the Decree regarding the Work to be performed, the terms and conditions of the exhibits shall apply. If there is an inconsistency between the CAP (Exhibit B) and any of the other exhibits to the Decree, the terms and conditions of the CAP shall apply.

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1	D. Defendants agree not to perform any remedial actions at the Site outside the		
2	scope of this Decree unless the Parties agree to modify the CAP (Exhibit B) to cover these		
3	actions. All work conducted by Defendants under this Decree shall be done in accordance wit		
4	Chapter 173-340 WAC unless otherwise provided herein.		
5	VII. DESIGNATED PROJECT COORDINATORS		
6	The project coordinator for Ecology is:		
7			
8	Jerome Cruz, Site Manager Northwest Regional Office		
9	Toxics Cleanup Program 3190 160 th Avenue SE		
10	Bellevue, WA 98008 425-649-7094		
11	jerome.cruz@ecy.wa.gov		
12	The project coordinator for Defendants is:		
13	Douglas Morell Golder Associates Inc.		
14	18300 NE Union Hill Road, Suite 200 Redmond, WA 98052-3333		
15	425-883-0777 425-882-5498 (fax)		
16	dmorell@golder.com		
17	Each project coordinator shall be responsible for overseeing the implementation of this		
18	Decree. Ecology's project coordinator will be Ecology's designated representative for the Site.		
19	To the maximum extent possible, communications between Ecology and Defendants and all		
20	documents, including reports, approvals, and other correspondence concerning the activities		
21	performed pursuant to the terms and conditions of this Decree shall be directed through the		
22	project coordinators. The project coordinators may designate, in writing, working level staff		
23	contacts for all or portions of the implementation of the Work to be Performed required by this		
24	Decree.		
25	Any of the Parties may change its respective project coordinator. Written notification		
26	shall be given to the other Party at least ten (10) calendar days prior to the change.		
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VIII. PERFORMANCE

All geologic and hydrogeologic work performed pursuant to this Decree shall be under the supervision and direction of a geologist licensed in the State of Washington or under the direct supervision of an engineer registered in the State of Washington, except as otherwise provided for by chapters 18.220 and 18.43 RCW.

All engineering work performed pursuant to this Decree shall be under the direct supervision of a professional engineer registered in the State of Washington, except as otherwise provided for by RCW 18.43.130.

All construction work performed pursuant to this Decree shall be under the direct supervision of a professional engineer or a qualified technician under the direct supervision of a professional engineer. The professional engineer must be registered in the State of Washington, except as otherwise provided for by RCW 18.43.130.

Any documents submitted containing geologic, hydrologic or engineering work shall be under the seal of an appropriately licensed professional as required by chapter 18.220 RCW or RCW 18.43.130.

Defendants shall notify Ecology in writing of the identity of any supervising engineer(s) and geologist(s), contractor(s) and subcontractor(s), and others to be used in carrying out the terms of this Decree, in advance of their involvement at the Site.

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IX. ACCESS

19 Ecology, or any Ecology authorized representative, shall have full authority to enter 20 and freely move about all property at the Site that Defendants either own, control, or have 21 access rights to at all reasonable times for the purposes of, *inter alia*: inspecting records, operation logs, and contracts related to the Work being performed pursuant to this Decree; 22 reviewing Defendants' progress in carrying out the terms of this Decree; conducting such tests 23 or collecting such samples as Ecology may deem necessary; using a camera, sound recording, 24 25 or other documentary type equipment to record work done pursuant to this Decree; and 26 verifying the data submitted to Ecology by Defendants. Defendants shall make all reasonable

efforts to secure access rights for those properties within the Site not owned or controlled by Defendants where remedial activities or investigations will be performed pursuant to this Decree. Ecology, or any Ecology authorized representative, shall give Defendants' project coordinator reasonable notice before entering any Site property owned or controlled by Defendants unless an emergency prevents such notice. All Parties who access the Site pursuant to this Section IX shall comply with any applicable Health and Safety Plan(s). Ecology employees and their representatives shall not be required to sign any liability release or waiver as a condition of Site property access.

X. SAMPLING, DATA SUBMITTAL, AND AVAILABILITY

With respect to the implementation of this Decree, Defendants shall make the results of all sampling, laboratory reports, and/or test results generated by it or on its behalf available to Ecology. Pursuant to WAC 173-340-840(5), all sampling data shall be submitted to Ecology in both printed and electronic formats in accordance with Section XI (Progress Reports), Ecology's Toxics Cleanup Program Policy 840 (Data Submittal Requirements), and/or any subsequent procedures specified by Ecology for data submittal.

If requested by Ecology, Defendants shall allow Ecology and/or its authorized representative to take split or duplicate samples of any samples collected by Defendants pursuant to the implementation of this Decree. Defendants shall notify Ecology seven (7) days in advance of any sample collection or work activity at the Site. Ecology shall, upon request, allow Defendants and/or its authorized representative to take split or duplicate samples of any samples collected by Ecology pursuant to the implementation of this Decree, provided that doing so does not interfere with Ecology's sampling. Without limitation on Ecology's rights under Section IX (Access), Ecology shall notify Defendants prior to any sample collection activity unless an emergency prevents such notice.

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In accordance with WAC 173-340-830(2)(a), all hazardous substance analyses shall be conducted by a laboratory accredited under Chapter 173-50 WAC for the specific analyses to be conducted, unless otherwise approved by Ecology.

XI. PROGRESS REPORTS

Defendants shall submit to Ecology written monthly Progress Reports during the construction phase of the Work to be Performed described in Section VI of this Decree that describe the actions taken during the previous month to implement the requirements of this Decree. After completion of the construction phase of the Work to be Performed described in Section VI of this Decree, the frequency of Defendants' submittal of Progress Reports shall be in compliance with Exhibit E, Part A (Compliance Monitoring Plan) attached to this Decree. The Progress Reports shall include the following:

A.

A list of on-site activities that have taken place during the month;

B. Detailed description of any deviations from required tasks not otherwise documented in project plans or amendment requests;

C. Description of all deviations from the Schedule (Exhibit C) during the current month and any planned deviations in the upcoming month;

D. For any deviations in schedule, a plan for recovering lost time and maintaining compliance with the schedule;

E. All raw data (including laboratory analyses) received by Defendants during the past month and an identification of the source of the sample; and

A list of deliverables for the upcoming month if different from the schedule.

All Progress Reports shall be submitted by the tenth (10th) day of the month in which they are due after the effective date of this Decree. Unless otherwise specified, Progress Reports and any other documents submitted pursuant to this Decree shall be sent by certified mail, return receipt requested, to Ecology's project coordinator.

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XII. RETENTION OF RECORDS

During the pendency of this Decree, and for ten (10) years from the date this Decree is no longer in effect as provided in Section XXVIII (Duration of Decree), Defendants shall preserve at least one (1) copy of records, final reports, documents, and underlying data in their possession relevant to the implementation of this Decree and shall insert a similar record retention requirement into all contracts with project contractors and subcontractors. The record retention requirements for contractors and subcontractors shall be satisfied by the retention of at least one (1) copy of the last draft or final version of any record, document or report prepared by such contractor(s) or subcontractor(s). Any records, reports or documents retained in accordance with this Section XII shall be retained in either hard copy or electronic form. Upon request of Ecology, Defendants shall make all non-privileged records available to Ecology and allow access for review within a reasonable time.

XIII. TRANSFER OF INTEREST IN PROPERTY

No voluntary conveyance or relinquishment of title, easement, leasehold, or other interest in any portion of the Site shall be consummated by Defendants without provision for continued operation and maintenance of any containment system, treatment system, and/or monitoring system installed or implemented pursuant to this Decree.

Prior to Defendants' transfer of any interest in all or any portion of the Site, and during the duration of this Decree as provided in Section XXVIII (Duration of Decree), Defendants shall provide a copy of this Decree to any prospective purchaser, lessee, transferee, assignee, or other successor in said interest; and, at least thirty (30) days prior to any transfer, Defendants shall notify Ecology of said transfer. Upon transfer of any interest, Defendants shall restrict uses and activities to those consistent with this Consent Decree and notify all transferees of the restrictions on the use of the property. Additionally, notwithstanding any sale, transfer, assignment, hypothecation or other disposition of any interest in all or any portion of the Site,

CONSENT DECREE

during the duration of this Decree as provided in Section XXVIII (Duration of Decree), Defendants shall retain a right to access all or any portion of the Site, at all reasonable times, sufficient to enable such Defendants to effectively comply with the requirements of this Consent Decree.

XIV. RESOLUTION OF DISPUTES

A. In the event a dispute arises as to an approval, disapproval, proposed change, or other decision or action by Ecology's project coordinator, or an itemized billing statement under Section XXIV (Remedial Action Costs), the Parties shall utilize the dispute resolution procedure set forth below.

1. Upon receipt of Ecology's project coordinator's written decision, or the itemized billing statement, Defendants have fourteen (14) days within which to notify Ecology's project coordinator in writing of their objection to the decision or itemized statement.

 The Parties' project coordinators shall then confer in an effort to resolve the dispute. If the project coordinators cannot resolve the dispute within fourteen (14) days, Ecology's project coordinator shall issue a written decision.

3. Defendants may then request regional management review of the decision. This request shall be submitted in writing to the Northwest Region Toxics Cleanup Program Section Manager within seven (7) days of receipt of Ecology's project coordinator's written decision.

4. Ecology's Regional Section Manager or the Regional Section Manager's delegatee shall conduct a review of the dispute and shall endeavor to issue a written decision regarding the dispute within thirty (30) days of Defendants' request for review.

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5. If Defendants find Ecology's Regional Section Manager's decision unacceptable, Defendants may then request final management review of the decision. This request shall be submitted in writing to the Toxics Cleanup Program Manager within seven (7) days of receipt of the Regional Section Manager's decision.

6. Ecology's Toxics Cleanup Program Manager shall conduct a review of the dispute and shall endeavor to issue a written decision regarding the dispute within thirty (30) days of Defendants' request for review of the Regional Section Manager's decision. The Toxics Cleanup Program Manager's decision shall be Ecology's final decision on the disputed matter.

B. If Ecology's final written decision is unacceptable to Defendants, Defendants have the right to submit the dispute to the Court for resolution. The Parties agree that one judge should retain jurisdiction over this case and shall, as necessary, resolve any dispute arising under this Decree. In the event Defendants present an issue to the Court for review, the Court shall review the action or decision of Ecology on the basis of whether such action or decision was arbitrary and capricious, and render a decision based on such standard of review.

C. The Parties agree to only utilize the dispute resolution process in good faith and agree to expedite, to the extent possible, the dispute resolution process whenever it is used. Where either Party utilizes the dispute resolution process in bad faith or for purposes of delay, the other Party may seek sanctions.

D. Implementation of these dispute resolution procedures shall not provide a basis for delay of any activities required in this Decree, unless Ecology agrees in writing to a schedule extension or the Court so orders.

CONSENT DECREE

XV. AMENDMENT OF DECREE

The project coordinators may agree to minor changes to the Work to be Performed without formally amending this Decree. Minor changes will be documented in writing by Ecology and one (1) copy shall be provided to each Defendant.

Substantial changes to the Work to be Performed shall require formal amendment of this Decree. This Decree may only be formally amended by a written stipulation among the Parties that is entered by the Court, or by order of the Court. Such amendment shall become effective upon entry by the Court. Agreement to amend the Decree shall not be unreasonably withheld by any Party.

Defendants shall submit a written request for amendment to Ecology for approval. Ecology shall indicate its approval or disapproval in writing and in a timely manner after the written request for amendment is received. If the amendment to the Decree is a substantial change, Ecology will provide public notice and opportunity for comment. Reasons for the disapproval of a proposed amendment to the Decree shall be stated in writing. If Ecology does not agree to a proposed amendment, the disagreement may be addressed through the dispute resolution procedures described in Section XIV (Resolution of Disputes).

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XVI. EXTENSION OF SCHEDULE

A. An extension of schedule shall be granted only when a request for an extension is submitted in a timely fashion, generally at least thirty (30) days prior to expiration of the deadline for which the extension is requested, and good cause exists for granting the extension. All extensions shall be requested in writing. The request shall specify:

- 1. The deadline that is sought to be extended;
- 2. The length of the extension sought;
- 3. The reason(s) for the extension; and

4. Any related deadline or schedule that would be affected if the extension were granted.

B. The burden shall be on Defendants to demonstrate to the satisfaction of Ecology that the request for such extension has been submitted in a timely fashion and that good cause exists for granting the extension. Good cause may include, but may not be limited to:

1. Circumstances beyond the reasonable control and despite the due diligence of Defendants including delays caused by unrelated third parties or Ecology, such as (but not limited to) delays by Ecology in reviewing, approving, or modifying documents submitted by Defendants;

2. Acts of God, including fire, flood, blizzard, extreme temperatures, storm, or other unavoidable casualty such as an act of war or act of terrorism; or

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3. Endangerment as described in Section XVII (Endangerment).

However, neither increased costs of performance of the terms of this Decree nor changed economic circumstances shall be considered circumstances beyond the reasonable control of Defendants.

C. Ecology shall act upon any written request for extension in a timely fashion. Ecology shall give Defendants written notification of any extensions granted pursuant to this Decree. A requested extension shall not be effective until approved by Ecology or, if required, by the Court. Unless the extension is a substantial change, it shall not be necessary to amend this Decree pursuant to Section XV (Amendment of Decree) when a schedule extension is granted.

D. An extension shall only be granted for such period of time as Ecology determines is reasonable under the circumstances. Ecology may grant schedule extensions exceeding ninety (90) days only as a result of:

1. Delays in the issuance of a necessary permit which was applied for in a timely manner;

2. Other circumstances deemed exceptional or extraordinary by Ecology; or

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3. Endangerment as described in Section XVII (Endangerment).

XVII. ENDANGERMENT

In the event Ecology determines that any activity being performed at the Site is creating or has the potential to create a danger to human health or the environment, Ecology may direct Defendants to cease such activities for such period of time as it deems necessary to abate the danger. Defendants shall immediately comply with such direction.

In the event Defendants determine that any activity being performed at the Site is creating or has the potential to create a danger to human health or the environment, Defendants may cease such activities. Defendants shall notify Ecology's project coordinator as soon as possible, but no later than twenty-four (24) hours after making such determination or ceasing such activities. Upon Ecology's direction, Defendants shall provide Ecology with documentation of the basis for the determination or cessation of such activities. If Ecology disagrees with Defendants' cessation of activities, it may direct Defendants to resume such activities.

If Ecology concurs with or orders a work stoppage pursuant to this Section, Defendants' obligations with respect to the ceased activities shall be suspended until Ecology determines the danger is abated, and the time for performance of such activities, as well as the time for any other work dependent upon such activities, shall be extended, in accordance with Section XVI (Extension of Schedule), for such period of time as Ecology determines is reasonable under the circumstances.

Nothing in this Decree shall limit the authority of Ecology, its employees, agents, or contractors to take or require appropriate action in the event of an emergency.

XVIII. COVENANT NOT TO SUE

A. Covenant Not to Sue: In consideration of Defendants' compliance with the terms and conditions of this Decree, Ecology covenants not to institute legal or administrative actions against Defendants regarding the release or threatened release of hazardous substances covered by this Decree. This covenant shall be effective on the date this Decree is entered by the Court.

This Decree covers only the Site, as defined in Section IV.A, and those hazardous substances, as described in the RI, FS, subsequent supplemental investigations and CAP, that Ecology knows or suspects are located at the Site as of the date of entry of this Decree. This Decree does not cover any other hazardous substance or area. Ecology retains all of its authority relative to any substance or area not covered by this Decree.

This Covenant Not to Sue shall have no applicability whatsoever to:

1. Criminal liability;

- 2. Liability for damages to natural resources; and
- 3. Any Ecology action, including cost recovery, against PLPs not a party to this Decree.

If factors not known at the time of entry of the settlement agreement are discovered and present a previously unknown threat to human health or the environment, Ecology may petition the Court to amend this Covenant Not to Sue.

Β. Reopeners: Ecology specifically reserves the right to institute legal or administrative action against Defendants to require them to perform additional remedial actions at the Site and to pursue appropriate cost recovery, pursuant to RCW 70.105D.050 under the following circumstances:

1. Upon Defendants' failure to meet the requirements of this Decree, including, but not limited to, failure of the remedial action to meet the cleanup standards identified in the CAP (Exhibit B);

2. Upon Ecology's determination that remedial action beyond the terms of this Decree is necessary to abate an imminent and substantial endangerment to human health or the environment; or

3. Upon the availability of new information regarding factors previously unknown to Ecology, including the nature or quantity of hazardous substances at the Site, and Ecology's determination, in light of this information, that further remedial action is necessary at the Site to protect human health or the environment.

4. Upon Ecology's determination that additional remedial actions are necessary to achieve cleanup standards within the reasonable restoration time frame set forth in the CAP.

C. Except in the case of an emergency, prior to instituting legal or administrative action against Defendants pursuant to this Section, Ecology shall provide Defendants with thirty (30) calendar days notice of such action.

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XIX. CONTRIBUTION PROTECTION

With regard to claims for contribution against Defendants, the Parties agree that Defendants are entitled to protection against claims for contribution for matters addressed in this Decree as provided by RCW 70.105D.040(4)(d). The matters addressed in this Decree are all remedial actions taken or to be taken and all remedial costs, including Ecology's oversight costs, incurred or to be incurred by Ecology or any other person with respect to the Site, as defined in Section IV.A and with respect to those hazardous substances, as described in the RI, FS, subsequent supplemental investigations and CAP, that Ecology knows or suspects are located at the Site as of the date of entry of this Decree.

1	XX. LAND USE RESTRICTIONS		
2	Defendants shall record an Environmental Covenant substantially in the form of		
3	Exhibit F-1 with the office of the King County Auditor within ten (10) days of Ecology's		
4	written approval of the As-Built Drawings for the low-permeability soil cap. The		
5	Environmental Covenant shall:		
6	• include a legal description of the final locations of the "Cap Protection Area,"		
7	the "Groundwater and Portal Protection Area," and, to the extent not already		
8	encompassed by the Groundwater and Portal Protection Area, the No-Build		
9	Buffer Areas, depicted in Figures 1, 2, 3, and 4 attached to the Environmental		
10	Covenant (Exhibit F-1); and		
11	• restrict future uses of the Site (as defined in Section IV.A) within the "Cap		
12	Protection Area," the "Groundwater and Portal Protection Area," and, to the		
13	extent not already encompassed by use restrictions for the Groundwater and		
14	Portal Protection Are, restrict future uses within the No-Build Buffer Areas,		
15	according to the terms of the Environmental Covenant (Exhibit F-1).		
16	Defendants shall provide Ecology with a copy of the recorded Environmental Covenant within		
17	thirty (30) days of the recording date.		
18	Defendants shall also make good faith efforts to cause an Environmental Covenant		
19	substantially in the form of Exhibit F-2 to be recorded concurrent with the recording of the		
20	covenant substantially in the form of Exhibit F-1. The Environmental Covenant shall restrict		
21	future uses of the property designated in Exhibit F-2 according to the terms of Exhibit F-2.		
22	Defendants shall provide Ecology with a copy of the recorded Environmental Covenant within		
23	thirty (30) days of the recording date. If Defendants are unable to secure such covenant,		
24	Defendants shall provide notice to Ecology of their inability to secure such covenant within ten		
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(10) days of Ecology's written approval of the As-Built Drawings for the low-permeability soil cap, together with a description of their good faith efforts to secure such covenant.

XXI. FINANCIAL ASSURANCES

Pursuant to WAC 173-340-440(11), Defendants shall maintain sufficient and adequate financial assurance mechanisms 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.

Defendants have submitted to Ecology for review and approval an estimate of the costs that they will incur in carrying out the terms of this Decree, including operation and maintenance, and compliance monitoring. Ecology approves the initial estimate dated September 17, 2012, which is in the amount of \$775,000 for purposes of establishing an initial financial assurance amount. Within sixty (60) days of the effective date of this Decree, Defendants shall provide proof of financial assurances sufficient to cover all such costs in a form reasonably acceptable to Ecology.

Defendants shall adjust the financial assurance coverage and provide Ecology's project coordinator with documentation of the updated financial assurance for:

A. Inflation, annually, within thirty (30) days of the close of the calendar year; or if applicable, ninety (90) days after the close of Defendants' fiscal year if the financial test or corporate guarantee is used; and

B. Changes in cost estimates, within thirty (30) days of issuance of Ecology's approval of a modification or revision to the CAP that result in increases to the cost or expected duration of this Decree as provided in Section XXVIII (Duration of Decree). Any adjustments for inflation since the most recent preceding close of the calendar year shall be made concurrent with adjustments for changes in cost estimates.

XXII. INDEMNIFICATION

Defendants agree to indemnify and save and hold the State of Washington, its employees, and agents harmless from any and all claims or causes of action for death or injuries to persons or for loss or damage to property to the extent arising from or on account of acts or omissions of Defendants, their officers, employees, agents, or contractors in entering into and implementing this Decree. However, Defendants shall not indemnify the State of Washington nor save nor hold its employees and agents harmless from any claims or causes of action to the extent arising out of the negligent acts or omissions of the State of Washington, or the employees or agents of the State, in entering into or implementing this Decree.

XXIII. COMPLIANCE WITH APPLICABLE LAWS

A. All actions carried out by Defendants pursuant to this Decree shall be done in compliance with all applicable federal, state, and local requirements, including requirements to obtain necessary permits, except as provided in RCW 70.105D.090. The permits or other federal, state or local requirements that the agency has determined may be applicable and that are known at the time of entry of this Decree are identified in the Technical Memorandum dated August 4, 2010 prepared by Golder Associates attached to this Decree as Exhibit G.

B. Pursuant to RCW 70.105D.090(1), Defendants are exempt from the procedural requirements of Chapters 70.94, 70.95, 70.105, 77.55, 90.48, and 90.58 RCW and of any laws requiring or authorizing local government permits or approvals. However, Defendants shall comply with the substantive requirements of such permits or approvals. The exempt permits or approvals and the applicable substantive requirements of those permits or approvals, as they are known at the time of entry of this Decree, have been identified in the Technical Memorandum dated August 4, 2010, prepared by Golder & Associates, Inc. attached to this Decree as Exhibit G.

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CONSENT DECREE

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ATTORNEY GENERAL OF WASHINGTON Ecology Division PO Box 40117 Olympia, WA 98504-0117 FAX (360) 586-6760

approvals addressed in RCW 70.105D.090(1) would otherwise be required for the remedial action under this Decree. In the event either Ecology or Defendants determine that additional permits or approvals addressed in RCW 70.105D.090(1) would otherwise be required for the remedial action under this Decree, it/they shall promptly notify the other Party/ies of this determination. Ecology shall determine whether Ecology or Defendants shall be responsible to contact the appropriate state and/or local agencies. If Ecology so requires, Defendants shall promptly consult with the appropriate state and/or local agencies and provide Ecology with written documentation from those agencies of the substantive requirements those agencies believe are applicable to the remedial action. Ecology shall make the final determination on the additional substantive requirements that must be met by Defendants and on how Defendants must meet those requirements. Ecology shall inform Defendants in writing of these requirements. Once established by Ecology, the additional requirements shall be enforceable requirements of this Decree. Defendants shall not begin or continue the remedial action potentially subject to the additional requirements until Ecology makes its final determination. C. Pursuant to RCW 70.105D.090(2), in the event Ecology determines that the

Defendants have a continuing obligation to determine whether additional permits or

C. Pursuant to RCW 70.105D.090(2), in the event Ecology determines that the exemption from complying with the procedural requirements of the laws referenced in RCW 70.105D.090(1) would result in the loss of approval from a federal agency that is necessary for the State to administer any federal law, the exemption shall not apply and Defendants shall comply with both the procedural and substantive requirements of the laws referenced in RCW 70.105D.090(1), including any requirements to obtain permits.

XXIV. REMEDIAL ACTION COSTS

Defendants shall pay to Ecology costs incurred by Ecology pursuant to this Decree and consistent with WAC 173-340-550(2). These costs shall include work performed by Ecology

or its contractors for, or on, the Site under Chapter 70.105D RCW, including remedial actions and Decree preparation, negotiation, oversight and administration. These costs shall include work performed both prior to and subsequent to the entry of this Decree. Ecology's costs shall include costs of direct activities and support costs of direct activities as defined in WAC 173-340-550(2). Ecology has accumulated \$27,333.78 in remedial action costs related to this Site as of December 31, 2012. Payment for this amount shall be submitted within thirty (30) days of the effective date of this Decree. For all costs incurred subsequent to December 31, 2012, Defendants shall pay the required amount within thirty (30) days of receiving from Ecology an itemized statement of costs that includes a summary of costs incurred, an identification of involved staff, and the amount of time spent by involved staff members on the project. A general statement of work performed will be provided with each statement. Itemized statements shall be prepared quarterly. Pursuant to WAC 173-340-550(4), failure to pay Ecology's costs within ninety (90) days of receipt of the itemized statement of costs will result in interest charges at the rate of twelve percent (12%) per annum, compounded monthly.

In addition to other available relief, pursuant to RCW 70.105D.055, Ecology has authority to recover unreimbursed remedial action costs by filing a lien against real property subject to the remedial actions.

XXV. IMPLEMENTATION OF REMEDIAL ACTION

If Ecology determines that Defendants have failed without good cause to implement the remedial action, in whole or in part, Ecology may, after notice to Defendants, perform any or all portions of the remedial action that remain incomplete. If Ecology performs all or portions of the remedial action because of Defendants' failure to comply with their obligations under this Decree, Defendants shall reimburse Ecology for the costs of doing such work in accordance with Section XXIV (Remedial Action Costs), provided that Defendants are not

obligated under this Section to reimburse Ecology for costs incurred for work inconsistent with or beyond the scope of this Decree.

Except where necessary to abate an emergency situation, Defendant shall not perform any remedial actions at the Site outside those remedial actions required by this Decree, unless Ecology concurs, in writing, with such additional remedial actions pursuant to Section XV. (Amendment of Decree).

XXVI. PERIODIC REVIEW

As remedial action, including groundwater monitoring, continues at the Site, the Parties agree to review the progress of remedial action at the Site, and to review the data accumulated as a result of monitoring the Site as often as is necessary and appropriate under the circumstances. At least every five (5) years after the initiation of remedial action at the Site the Parties shall meet to discuss the status of the Site and the need, if any, for further remedial action at the Site. At least ninety (90) days prior to each periodic review, Defendants shall submit a report to Ecology that documents whether human health and the environment are being protected based on the factors set forth in WAC 173-340-420(4). Ecology reserves the right to require further remedial action at the Site under appropriate circumstances by following the provisions of Section XV (Amendment of Decree). This provision shall remain in effect for the duration of this Decree as provided in Section XXVIII (Duration of Decree).

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XXVII. **PUBLIC PARTICIPATION**

A Public Participation Plan (Exhibit D) is required for this Site. Ecology shall review any existing Public Participation Plan to determine its continued appropriateness and whether it requires amendment, or if no plan exists, Ecology shall develop a Public Participation Plan alone or in conjunction with Defendants.

Ecology shall maintain the responsibility for public participation at the Site. However, Defendants shall cooperate with Ecology, and shall:

A. If agreed to by Ecology, develop appropriate mailing list, prepare drafts of public notices and fact sheets at important stages of the remedial action, such as the submission of work plans, remedial investigation/feasibility study reports, cleanup action plans, and engineering design reports. As appropriate, Ecology will edit, submit to Defendants for comment, finalize, and distribute such fact sheets and prepare and distribute public notices of Ecology's presentations and meetings.

B. Notify Ecology's project coordinator prior to the preparation of all press releases and fact sheets, and before major meetings with the interested public and local governments. Likewise, Ecology shall notify Defendants prior to the issuance of all press releases and fact sheets, and before major meetings with the interested public and local governments. For all press releases, fact sheets, meetings, and other outreach efforts by Defendants that do not receive prior Ecology approval, Defendants shall clearly indicate to its audience that the press release, fact sheet, meeting, or other outreach effort was not sponsored or endorsed by Ecology.

C. When requested by Ecology, participate in public presentations on the progress of the remedial action at the Site. Participation may be through attendance at public meetings to assist in answering questions, or as a presenter.

D. When requested by Ecology, arrange and/or continue information repositories at the following locations:

1. Black Diamond Library, 24301 Roberts Drive, Black Diamond, Washington 98010

 Ecology's Northwest Regional Office, 3190 160th Avenue SE, Bellevue, Washington 98008

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At a minimum, copies of all public notices and fact sheets shall be promptly placed in these repositories. A copy of all documents related to this Site shall be maintained in the repository at Ecology's Northwest Regional Office in Bellevue, Washington.

XXVIII. DURATION OF DECREE

The remedial program required pursuant to this Decree shall be maintained and continued until Defendants have received written notification from Ecology that the requirements of this Decree have been satisfactorily completed. This Decree shall remain in effect until dismissed by the Court. When dismissed, Section XVIII (Covenant Not to Sue) and Section XIX (Contribution Protection) shall survive.

XXIX. CLAIMS AGAINST THE STATE

Defendants hereby agree that they will not seek to recover any costs accrued in implementing the remedial action required by this Decree from the State of Washington; and further, that Defendants will make no claim against the State Toxics Control Account or any local Toxics Control Account for any costs incurred in implementing this Decree. Except as provided above, however, Defendants expressly reserve their right to seek to recover any costs incurred in implementing this Decree from any other PLP. This Section does not limit or address funding that may be provided under Chapter 173-322 WAC.

XXX. EFFECTIVE DATE

This Decree is effective upon the date it is entered by the Court.

XXXI. WITHDRAWAL OF CONSENT

If the Court withholds or withdraws its consent to this Decree, it shall be null and void at the option of any Party and the accompanying Complaint shall be dismissed without costs and without prejudice. In such an event, no Party shall be bound by the requirements of this Decree.

CONSENT DECREE

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4	JAMES J. PENDOWSKI Program Manager	DOROTHY H. JAFFE, W Assistant Attorney General	VSBA #34148
5	Program Manager Toxics Cleanup Program (360) 407-7177	(360) 586-4637	
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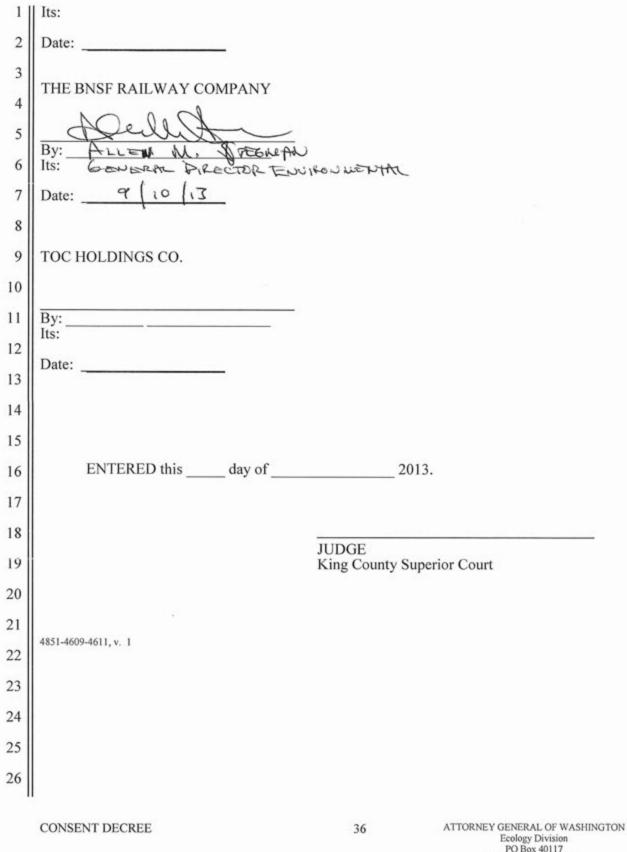
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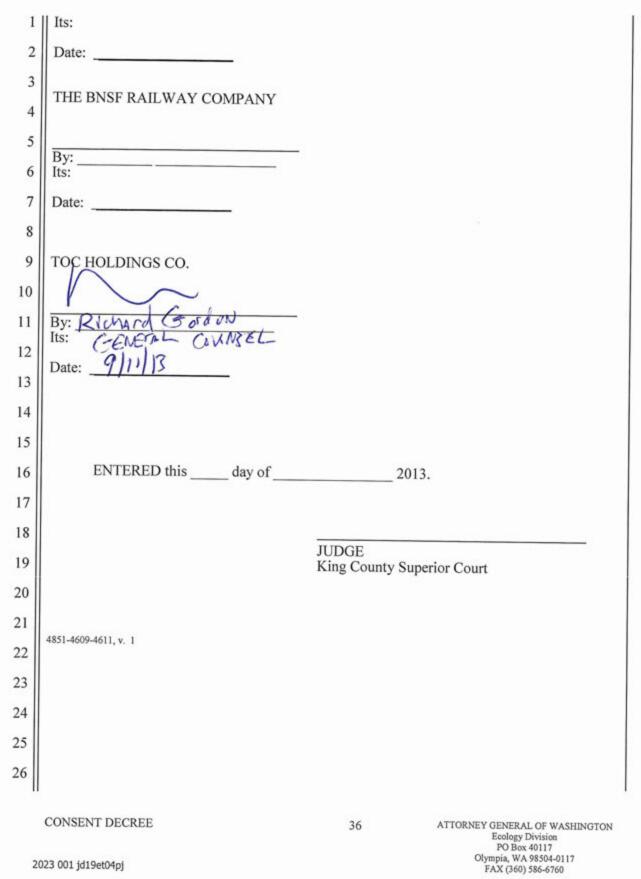
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1	Its: Vice President		
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	CONSENT DECREE	36	ATTORNEY GENERAL OF WASHINGTON Ecology Division PO Box 40117
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2023 001 jd19et04pj

EXHIBIT A

SITE DESCRIPTION

Lot X

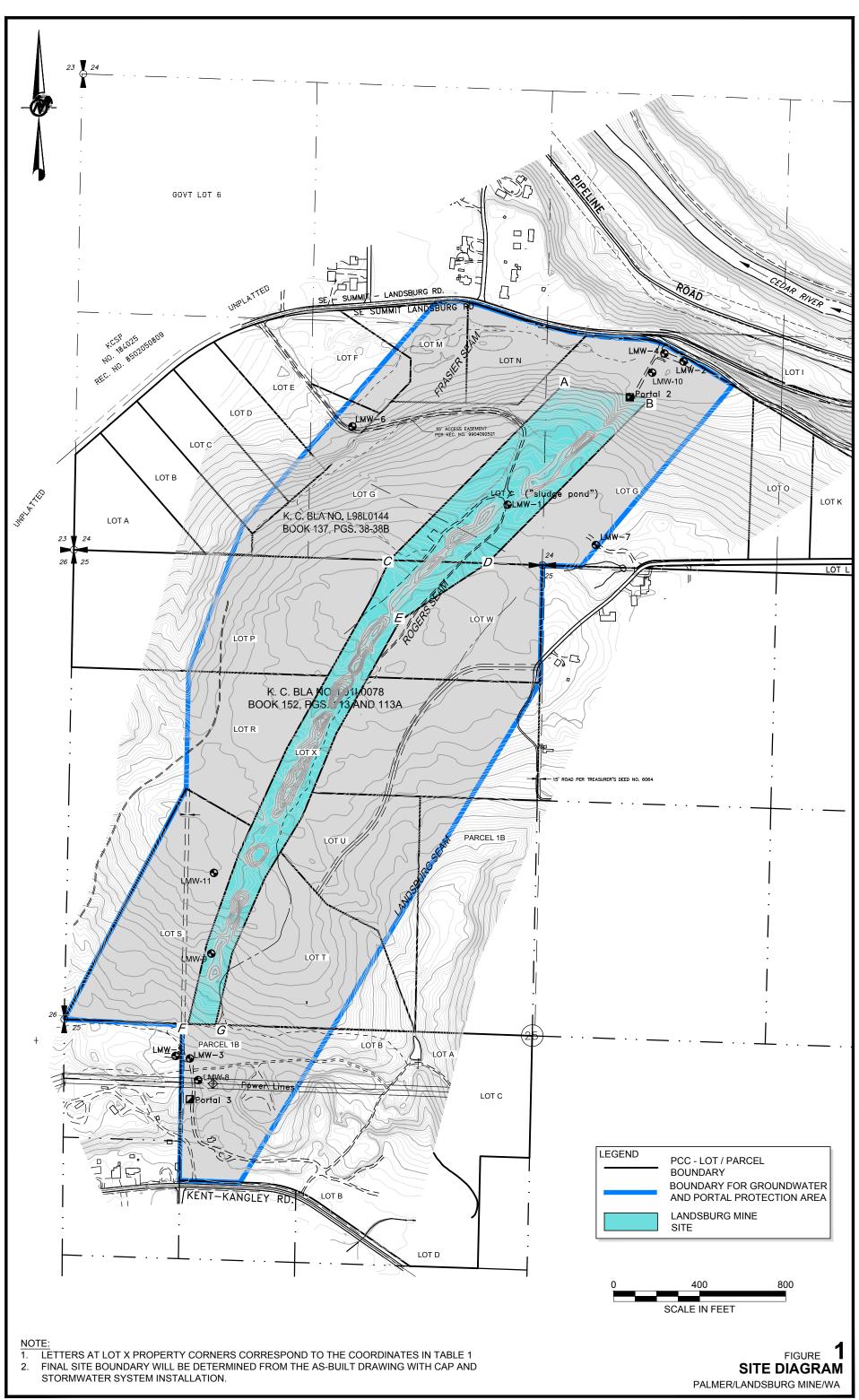
Landsburg Mine Site

(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
В	1715665.858	138929.9459
С	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.



K:\CAD\Projects\1992\9231000\x002\R154\Exhibit A\923_1000_002_1.dwg | 1 SITE DIAGRAM | Mod: 07/31/2013, 08:29 | Plotted: 07/31/2013, 15:45 | aforcier

Golder Associates

EXHIBIT B

CLEANUP ACTION PLAN

Appendix A – Complete listing of Landsburg Mine Site ARARs Appendix B – SEPA Checklist and Determination Appendix C – Responsiveness Summary **(to be completed)**



FINAL DRAFT

CLEANUP ACTION PLAN

Landsburg Mine Site MTCA Remediation Project Ravensdale, Washington

July 31, 2013 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 RCW as implemented by the Model Toxics Control Act Cleanup Regulation, Chapter 173-340 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, Ph.D. Site Manager Toxics Cleanup Program Northwest Regional Office Date

Robert W. Warren, P.Hg., MBA Regional Section Manager Toxics Cleanup Program Northwest Regional Office Date

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LIST OF ACRONYMS AND ABBREVIATIONS

ARAR bgs CAP cm/sec CQA DCAP DNR DNS Ecology EDR EPA ERA FCAP FID FML FS GCL LMW MCL	applicable or relevant and appropriate requirement below ground surface Cleanup Action Plan centimeters per second construction quality assurance Draft Cleanup Action Plan Washington State Department of Natural Resources Determination of Non-significance Washington State Department of Ecology Environmental Data Resources United States Environmental Protection Agency Expedited Response Action Final Cleanup Action Plan flame ionization detector flexible membrane liner feasibility study geosynthetic clay liner Landsburg Monitoring Well Maximum Contaminant Level
MFS	Minimum Functional Standards millions of gallons per day
mgd 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
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of the State of Washington
RI	remedial investigation
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
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. A CAP is required as part of the Site cleanup process under Chapter 173-340 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, Cleanup Action Plan, 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;
- Site cleanup levels and points of compliance for each hazardous substance and for each media of concern;
- The schedule for implementation of the cleanup action including, if known, restoration time frame;
- Required institutional controls and site use restrictions, if any, for the proposed cleanup action;
- Justification for selecting a cleanup action that uses cleanup technologies having a lower preference than higher representative cleanup technologies;
- 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 Ecology that the proposed cleanup action will comply with sections 173-340-360 and -370; and
- 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 contact with 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 Work Plan (Golder Associates 1992a), the Conceptual Model of the Landsburg Mine Site (Golder Associates 1992b), and the Remedial Investigation and Feasibility Study for the Landsburg Mine Site (Golder Associates Inc. 1996). Portions of the DCAP 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 Remedial Investigation/Feasibility Study (RI/FS) Report presents results of investigations into the geology and hydrogeology of a site, the nature and extent of contamination, the risks posed by that

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contamination, and evaluates the feasibility and alternative methods of remediating a 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 consist of Palmer Coking Coal Company, LLP; PACCAR Inc; Plum Creek Timberlands Company, L.P.; Browning-Ferris Industries of Illinois, Inc.; TOC Holdings Co.; and the BNSF Railway Company. The PLP Group completed the RI/FS and submitted the report to Ecology on February 1, 1996 for public review and comment.

Under the terms of the Agreed Order, the RI/FS was to be conducted. The RI/FS document that has been prepared for the Site, therefore, 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, the 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. A Draft CAP was submitted to Ecology in 2002. This CAP is a revision that incorporates Ecology comments on the 2002 Draft CAP.

The CAP identifies the proposed cleanup action for the Site based on the site investigation results and remedial alternative evaluations presented in the RI/FS. Upon completion of a public comment period for the CAP, Ecology, after review and consideration of the comments received, will issue a Final Cleanup Action Plan. The Final CAP will then be incorporated as an exhibit into a Consent Decree , which is a legal agreement negotiated between Ecology and the PLP Group for implementing the remedial actions outlined in the Final CAP. The public will have an opportunity to comment on the Consent Decree before cleanup work begins.

The Compliance Monitoring Plan (Exhibit E, Part A to the Consent Decree) includes a program for protection monitoring to confirm that human health and the environment are adequately protected during construction and operation and maintenance periods of the cleanup action; performance monitoring to confirm cleanup standards or other performance standards have been attained; and confirmational monitoring to confirm the long-term effectiveness of the cleanup action. The Compliance Monitoring Plan document also contains a contingency treatment plan in the unlikely event that groundwater treatment may be required at a future date at the Site.

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

After the Final CAP is issued and 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 the Final CAP for remediating the Site.

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

1.3.1 Additional Investigations Since 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 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 investigate 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.

In order to provide a conservative remedy that is protective of human health and the environment, this DCAP includes a contingency for groundwater treatment in the event that concentrations of hazardous substances exceed applicable regulatory thresholds at the points of compliance identified in the DCAP. In the summer of 2008, the infrastructure components for the contingent groundwater treatment system were installed at the Site. The infrastructure was constructed ahead of time when it would be needed because it is considered 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, if groundwater treatment becomes necessary at some future time, an appropriate modular treatment system can be efficiently installed at the Site and brought into operation in a relatively short time. The infrastructure that was constructed 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 the MTCA Cleanup Levels at the established points of compliance.

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 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 the MTCA, with the exception of some metals that are naturally elevated due to the location of the groundwater within the coal mine.

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. Figure 2 depicts the Site location. 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 site 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 used for forestry today. 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 to the Site 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 access the Site from public thoroughfares and 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. Another 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 allows 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.

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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 toward 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 it 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 wide, 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 section is separated by a wall of intact rock (called a pillar wall).

Based on available information, these trenches 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 the northern portion of the trenches from the Summit-Landsburg Road shown in Figure 4. 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 into 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 one hundred 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 an Agreed Order. The RI/FS, which consisted of a comprehensive investigation of site environmental conditions and evaluations of potential remedial alternatives for site cleanup, was conducted by the PLP Group over the period of mid-1993 to early 1996. The performance of the RI/FS and results 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 itself. 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 down 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 support the selection (in consultation with the State Departments of Health 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 consisted of nested well pairs installed within the coal 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 seven 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. Fourth round sampling was conducted on a reduced set of wells.
- Interim Groundwater Monitoring. Groundwater from ten 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

Site stratigraphy consists of a thick sequence of folded Tertiary bedrock of the Puget Group mantled by glacial drift of the Vashon (and possibly Pre-Vashon) glacial stage. Puget Group strata dip steeply with dip angles of the Rogers Seam and adjacent strata near 90° on the north end of the Site and 63° at the south end of the mine. Figure 6 illustrates the map view for subsurface cross-sections. A typical cross-section through the Study Area and Rogers Seam is shown in Figure 7. Cross-sections along strike of the coal seam are depicted in Figures 8, 9, and 10.

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. 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 four to seven 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, 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 below ground surface (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 water is all generally less than 20 feet bgs.

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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 was 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 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 lower 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%. 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 appropriate regulatory criteria (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 15). 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 the MTCA, with the exception of some metals which have a natural background level that is in excess of MTCA due to the condition of the groundwater within the coal mine.

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As indicated in Section 5.3.2.1 of the RI/FS, arsenic has been detected sporadically throughout the Study Area, while iron and manganese are very prevalent throughout the Study Area, including private wells and 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 (USEPA) has established numeric secondary drinking water standards (Maximum Contaminant Levels (MCLs)) for iron and manganese. However, these secondary drinking water standards are based on aesthetics (taste, color, and odor) and are not enforceable standards. The USEPA 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 of Washington 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 is slightly over the MTCA groundwater cleanup level (maximum concentrations 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 of Washington drinking water MCLs.

Although a few organic compounds were detected in 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 occurred slightly above the MTCA Method B standard in a single privately-owned well, but was not detected in either of the other three monitoring periods from this well. Therefore, 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 indicate 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 of Washington 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, there are no contaminants in the groundwater 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, no 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 total petroleum hydrocarbons (TPH) exceeded Method B standards during the early 1990s in an area confined to the northern portion of the trenches 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 are designated as mine waste contaminants for soil inside the trenches. On the basis of trench sampling conducted to date, however, 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, and
- TPH.

3.6 Risks to Human Health and the Environment

As noted above, the only locations where chemicals were observed at concentrations above MTCA Method B are within the trenches in the vicinity of where waste disposal occurred in the past. MTCA Method B cleanup levels, which are the most restrictive regulatory limits under MTCA, 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 of Washington

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 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 conditions.

3.7 Potential Contaminant Transport

No contaminant migration is occurring from the Site. 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, which overlie the coal. No drinking water wells are currently located along this primary pathway of groundwater flow. The two on-site monitoring wells (LMW-2 and -4) located along this pathway have not shown any evidence of contamination during the RI and similarly subsequent monitoring events. Sampling of monitoring well LMW-10 did not show any evidence of contamination either.

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 the Summit-Landsburg Road. Well PW-4 is the closest well and is approximately 1,500 feet away from Rogers Seam. It is not considered likely, however, that groundwater flow would occur 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 the Kent-Kangley Road just southwest of Portal #3, and the Clark Springs facility. The Clark Springs facility is approximately 2,500 feet from Portal #3. It is not likely that these wells would be impacted; however, there is a slight potential for contaminant migration from the southern end of the trenches.

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 small wetland area 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, support wildlife, and 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 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, was reviewed by geologists at King County Department of Development and Environmental Services in September 2005, and 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. An infiltration gallery adjacent to Rock Creek has been used by the City of Kent since 1957 as a supplement to their municipal water sources. The existing diversion, referred to as the Clark Springs facility, located adjacent to Kent-Kangley Road, consists of a lateral gravity drainage collection system installed approximately 13 to 15 feet below ground surface in the creek alluvium. This facility was sampled as part of this RI and was referred to as well PW-13 (Figure 5).

Groundwater: Groundwater at the Study Area is used for domestic supply, small community water supply systems and for a municipal water supply (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 have been installed since 1998), excluding the Clark Springs facility, which serves the City of Kent. These 76 wells serve approximately 130 homes in the Study Area and more than 200 people. At the time of the RI/FS, the available information indicated 46 of the wells were domestic service wells providing water to a single residence. Two wells provide water to two residences, and one services four homes (PW-2). 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 homes around the Study Area. All of the community supply wells were sampled during the RI. Information on 23 wells was not available and is not known whether these wells still exist or are in use.

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. The City of Kent's Clark Springs well (PW-13) is a branched lateral gravity drainage system installed in the Rock Creek alluvium.

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, RCW 70.105D, and MTCA Cleanup Regulations, WAC 173-340; and
- Minimum Functional Standards 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 (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 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 x 10⁻⁶ or lower. Alternately, a synthetic liner material may be substituted for the soil layer. The MFS standards 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 and Ecology's declaration that the Site qualities for a Determination of Non-Significance (DNS) are 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.

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 is not applicable to this 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 one hundred thousand (1 x 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 in the future, Method C Cleanup Levels for groundwater are not appropriate for the Site.

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. Again, because groundwater may be used 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 x 10^{-6}). Total excess cancer risk under Method B for multiple substances and pathways cannot exceed one in one hundred thousand (1 x 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.

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 feet 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. Conditional points of compliance will be established for groundwater and surface water 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 E, Part A). The Compliance Monitoring Plan is 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 were established that 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. 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

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, and
- 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, and
- Address public concerns.

Consideration of public concerns is performed by Ecology after the FS is completed and is based on public comments on the DCAP. Public concerns may result in modifications to the remedial action proposed in the DCAP. Any modifications would be incorporated into the FCAP.

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. The institutional controls and monitoring alternative by itself does not meet threshold requirements of MTCA and was eliminated.

Alternative 3: Trench Backfill. This alternative would consist of filling the trenches in the area where waste disposal occurred, combined with grading to provide proper stormwater drainage and 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 prevent stormwater

collection in the trenches. The backfill would 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 provided. 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 infiltration through the cap, thus decreasing the potential for affecting groundwater (see Figure 14). Institutional controls and periodic maintenance and monitoring would also be provided.

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 provided.

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 provide additional reliability for long-term protection (see Figure 14). Institutional controls and periodic maintenance and monitoring would also be provided.

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 minimum functional standards under WAC 173-304 would be placed over the trenches. Institutional controls and periodic maintenance and monitoring would also be provided.

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, and
- Provision for compliance monitoring.

Alternatives 1, 2, 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.

The remediation alternatives summarized above were then evaluated based on effectiveness, implementability, and cost. Alternatives 3 and 8 were eliminated during the screening evaluation. Alternative 3 provides less groundwater protection because rainfall infiltration through disposed wastes would be greater than infiltration occurring with the other alternatives. Alternative 8 would provide marginal benefits to groundwater protection with only surficial trench soils removed, but at a higher cost then several alternatives. 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, and
- 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, and
- 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 remedial action objectives 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), and
- 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 release of excavated waste during 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 FCAP.

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 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. Technical feasibility addresses 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 considered.

5.3.1.6 Cost

This criterion was used to consider the costs of performing each alternative, including capital, operation, and 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.

5.3.1.7 Community Acceptance

After the FS was finalized in 1996, an alternative was selected as the proposed remedial action in this DCAP. Determination of community concerns is based on public comments on this DCAP. Ecology evaluates community acceptance after DCAP comments are received. The public comments will be addressed in the Responsiveness Summary (Appendix C). The proposed remedial action may be modified to address community concerns based on public comments and 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 (that satisfy the threshold criteria) using five of the permanence 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 permanence 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 scores, is given 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 permanent 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 benefit (i.e., lack of reliability). The lack of

reliability on 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 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, 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 recommended.

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. 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; and
- 8. Toxicity of the hazardous substances at the site; and
- 9. Natural processes that reduce concentrations of hazardous substances at the site.

The evaluation of reasonable restoration time frame identifies 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 is successful. Alternative 9 was evaluated 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 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.

5.5 **Proposed Cleanup Action Plan**

The remedy proposed 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 would be no higher than 10⁻⁶ cm/sec, and the cap would 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 would 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. The cap would 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 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) does not provide additional protection. Capping or in-filling the southern trenches do 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 in 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; and
- 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 and reduce the amount of groundwater flowing through the Rogers Seam workings, and maintaining 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.

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The cap will need periodic inspection and maintenance and if damage did occur, repair of a soil cap would be relatively easy, requiring only removal of the vegetative soil and adding additional lowpermeability 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 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 would not be compacted, in order to provide a loose medium for establishing the vegetative cover. To establish vegetation, the topsoil would 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, would need confirmation during final design. Final haul road location and source material specifications will 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, little 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 would also provide a thick physical barrier that would greatly enhance the effectiveness and reliability of the cap.

The trenches also present physical hazards, which are the result of coal mining and not the result of 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 would 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. The topsoil would be stockpiled for use in the vegetative cover layer of the cap. In the trenches, trees and large brush would be removed to prevent vertical transmissive zones through the backfill, when the trees eventually decay. This would 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 Engineering Design Report (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 inches to a foot. 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 would be 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.

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 would 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 would 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. A period of one month of monitoring after completion of backfill has been included in the short-term (protection) groundwater monitoring program to address the possibility of intact drum collapse leading to significant release of chemicals to groundwater.

5.5.2 Grading and Surface Water Management

The area to be backfilled and capped (see Figure 15) would 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 would 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 would 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 would be determined using standard hydraulic design methods as part of final design.

5.5.3 Contingent Groundwater Infrastructure Components

Groundwater currently meets cleanup levels. Therefore, no groundwater containment or treatment is necessary. In the event that mine waste contaminants are detected in groundwater at the compliance boundary above remediation levels (one-half of MTCA Method B cleanup levels), a contingency groundwater treatment system will be implemented and will withdraw groundwater at a rate that will prevent the off-site migration of contaminants and will 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, risks from groundwater to public health and the environment are avoided. The contingency groundwater treatment system is presented in the Contingency Groundwater Treatment Plan (Exhibit E, Part C). Contingency groundwater extraction and treatment will continue until groundwater, at the points of compliance, meets cleanup levels. 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 E, 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 speed 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 premature 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 eventually tied into the local Metro POTW sewer. 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 are detected in groundwater from the north compliance boundary wells that exceed 50 percent of MTCA Cleanup Levels upon confirmation, the groundwater extraction well, necessary pumps, piping and storage (surge tanks) will be installed. However, groundwater extraction

will not begin unless MTCA Cleanup Levels are exceeded 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, and 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 when and if Site groundwater exceeds a confirmed concentration of 0.5 MTCA Cleanup Levels at the south compliance boundary wells. Groundwater extraction will not begin until MTCA Cleanup Levels are exceeded 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 prior to the completion of the remedial action. Two will be in the north and two in the south. 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 new sentinel well will be located near LMW-11 (estimated to be about 150 feet deep). This sentinel well will be installed after the CAP is finalized and remedial actions are completed. 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 sentinel well location will serve two purposes:

1. Early 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.

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.

5.5.4.2 North Sentinel Well System

The north compliance boundary 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 after the CAP is finalized and remedial action construction is complete. 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 200 foot depth within the mine. These two additional sentinel wells, together with monitoring of LMW-10 as a sentinel well, provide full vertical coverage of groundwater flowing within and away from the mine before reaching the north compliance boundary.

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 E, Part A of the Consent Decree). In addition, the Compliance Monitoring Plan will contain a Contingency Groundwater Treatment Plan (Exhibit E, Part C of the Consent Decree) that will discuss procedures for capture and treatment of groundwater in the unlikely 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 E, Part A of the Consent Decree), specifically in the Health and Safety Plan (Appendix HASP of Part A).

5.5.5.2 Performance Monitoring

Performance monitoring is to confirm that the cleanup action has attained cleanup standards or remediation levels or other performance standards such as construction quality control or demonstrate compliance with permits. Performance monitoring for the Site will involve construction quality assurance 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 construction quality assurance plan will be prepared with the EDR, since its details are dependent with 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 Alternative 5 in the FS. Periodic Site inspections and surveys will be sufficient for determining maintenance needs and monitoring cap performance. Cap performance is also monitored by groundwater 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 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 may be performed on a quarterly basis and would 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 (preearthquake) 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 E). Contingency actions will be implemented in accordance with this plan. Groundwater Monitoring: Groundwater monitoring would 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. Site groundwater 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 would 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), and 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 is complete, 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.

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 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 E, Part A). The groundwater monitoring program will include the following elements:

Monitoring will be performed using the existing monitoring wells, at the north and south portals (e.g., existing wells LMW-2, LMW-3, LMW-4, LMW-5, LMW-8, LMW-9, LMW-10, and LMW-11) and within the Frasier and Landsburg Seams (e.g., existing wells LMW-6 and LMW-7, respectively) for confirmational monitoring. Because the hydraulic conductivity within the mine is much greater than laterally through the adjacent bedrock, monitoring these two locations would detect a release of contaminants directly attributable to disposal of waste in the trenches. If constituents were detected at levels of concern in these monitoring wells, then additional wells could be sampled and analyzed to detected in above-listed monitoring wells, then it is probable that no other wells would be impacted by contaminants, and monitoring additional wells would not be conducted.

- Frequent monitoring of these 10 existing monitoring 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 total petroleum hydrocarbons and VOCs. A VOC screening analysis 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 effected well(s) would also be analyzed for priority pollutant metals and organic compounds using United States Environmental Protection Agency (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, total petroleum hydrocarbons, 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 least 50 percent of the respective 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 confirmational monitoring will decrease in frequency again, but the frequency 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 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.

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, remedial actions are triggered. Remedial actions are summarized below, but additional details are provided in Exhibit E - Part A Compliance Monitoring Plan:

Sentinel Well Detections:

If following validation of a laboratory detection greater than 0.5 times the MTCA Cleanup Level at a sentinel well, the Group will inform Ecology and confirm the detection by resampling the compliance well and will analyze for the analyte that was detected over 0.5 times the MTCA Cleanup Level. If the detection in a sentinel well is confirmed by resampling, the Group will notify Ecology and will conduct an "alternative source evaluation" to understand if the detection is caused by another source other than the waste disposed in the Roger's mine trenches. The detection at a sentinel well does not trigger a remedial response action other than to evaluate whether the detection could be from a source other than the waste disposed in the Roger's subsidence trenches. The sequence of steps for detections at sentinel wells is shown in Figure A-8 in Exhibit E – Part A.

Compliance Well Detections Over 0.25 MTCA Cleanup Levels:

- If following validation of the laboratory data (QA/QC) the detection at a compliance well is over 0.25 of the MTCA Cleanup Level, the Group will inform Ecology within seven (7) days and then confirm the detection by re-sampling the compliance well. The sample will be analyzed for the analyte that was detected over 0.25 MTCA Cleanup Level.
- If the analytical validation and confirmation re-sampling results confirms that the analyte is present within groundwater from the compliance well at a concentration that is 0.25 of the MTCA Cleanup Level, the Group will notify Ecology within seven (7) days and then conduct an "alternative source evaluation" to evaluate if the detection is caused by another source other than the waste disposed in the Roger's mine trenches.
- If an alternative source of the detected analyte is not identified, the 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 compliance 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 compliance wells is shown in Figure A-9 in Exhibit E Part A.

Compliance Well Detections above 0.5 MTCA Cleanup Level:

- If following validation of the laboratory data (QA/QC), the detection is determined valid and the detected concentration is over 0.5 of the MTCA Cleanup Level at a compliance well, the Group will inform Ecology of the detection within seven (7) days and then confirm the detection by re-sampling the compliance well and analyzing for the analyte that was detected over 0.5 MTCA Cleanup Level.
- If confirmation re-sampling does not confirm the contaminant at a concentration 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 Treatment System (see Figure A-9 in Exhibit E – Part A).
- If the confirmation re-sampling confirms the concentration of the contaminant above 0.5 of the MTCA Cleanup Level in a compliance well, Ecology will be informed within seven (7) days and then the Contingent Groundwater Treatment System presented in Exhibit E Part C will be implemented and installed as the corrective remedial action for containment and treatment of impacted groundwater. The anticipated time frames for the installation of the Contingent Groundwater Treatment System are presented in Exhibit C Part C.
- Groundwater containment (pumping and treatment) will not be initiated unless groundwater concentrations of contaminants exceed MTCA Cleanup Levels at a

compliance boundary well(s). Treated groundwater will be discharged to the local POTW sewer (see Exhibit E - Part C for more details).

Because a detection at a compliance well may never increase to the MTCA Cleanup Level, the increased frequency of groundwater monitoring at specific compliance well(s) (as specified in Table A-3 in Exhibit E – Part A) can end and return to the regular long-term monitoring schedule in accordance with Table A-2 in Exhibit E – Part A 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 a rate of increase would not result in concentrations reaching 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 E – 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 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 MTCA Cleanup Levels for four consecutive monitoring periods or a minimum of one (year). When the contingency groundwater extraction and treatment system is implemented, the compliance monitoring frequency of treatment system inflow and outflow will be determined by the Metro discharge permit.

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 alternatives for maintaining long-term 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 Site that there is the presence of subsurface waste. Site use restrictions will prohibit using the Site for purposes 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 allowable in the cap area, unless they are part of the remedial action. Warning signs will be posted to provide notice of the presence of a waste site to trespassers and recreational visitors. Site deed restrictions will include the waste filled subsidence trenches and a buffer zone around the installed remedial system cap and components. Such 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 such development would be inconsistent with the installation and operation of such systems. Site use restrictions will remain in force indefinitely.

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 for capping alternatives (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 could be removed with Ecology's approval.

During construction of the remedial action, means of restricting access to the waters discharging from Portal's #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.

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 will be established, as appropriate, in the Agreed Order or Consent Decree for potential future remedial actions at the Site.

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.

Groundwater at the Site's 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 provides good cost-effectiveness [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 Palmer Coking Coal Company, 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. Cleanup levels 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 5.3 of this DCAP;
- 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;
- 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. Site deed will have 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 that inspect and maintain the long-term integrity of the containment system; and
- 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 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 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) may be undertaken to verify the exceedance of surface water standards.

6.0 IMPLEMENTATION SCHEDULE

The preliminary CAP implementation schedule is in Exhibit C to the Consent Decree. The final implementation schedule will be defined in the Final Consent Decree between Ecology and the Site PLP Group.

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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

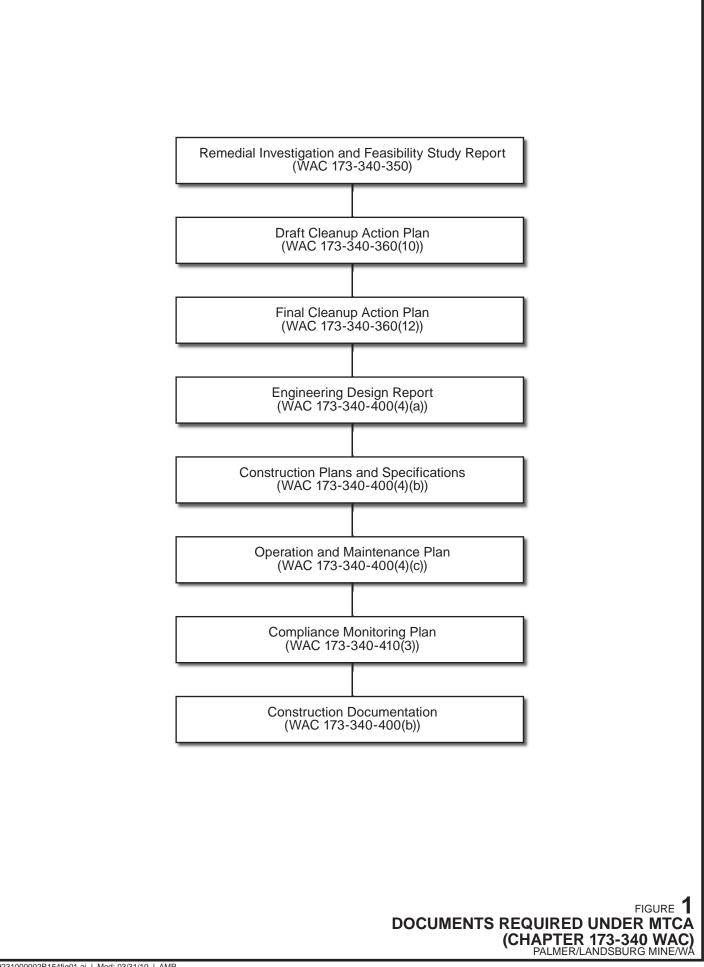
^a See text for criteria definitions.

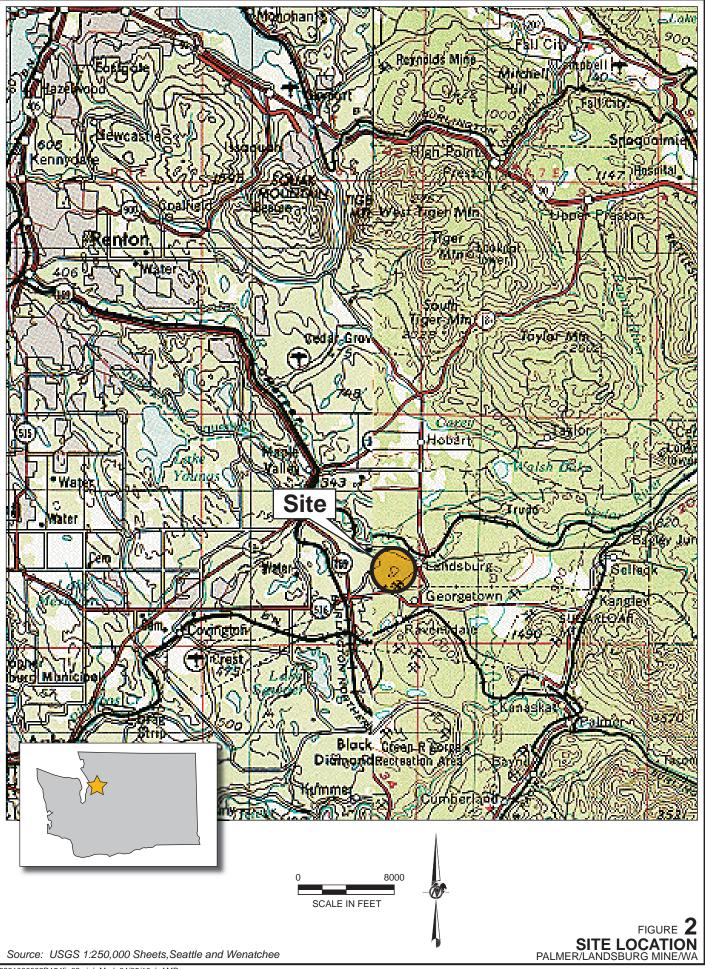
^b The numeric value of one scoring unit of the criterion relative to one scoring unit of the

long-term effectiveness and reliability criterion.

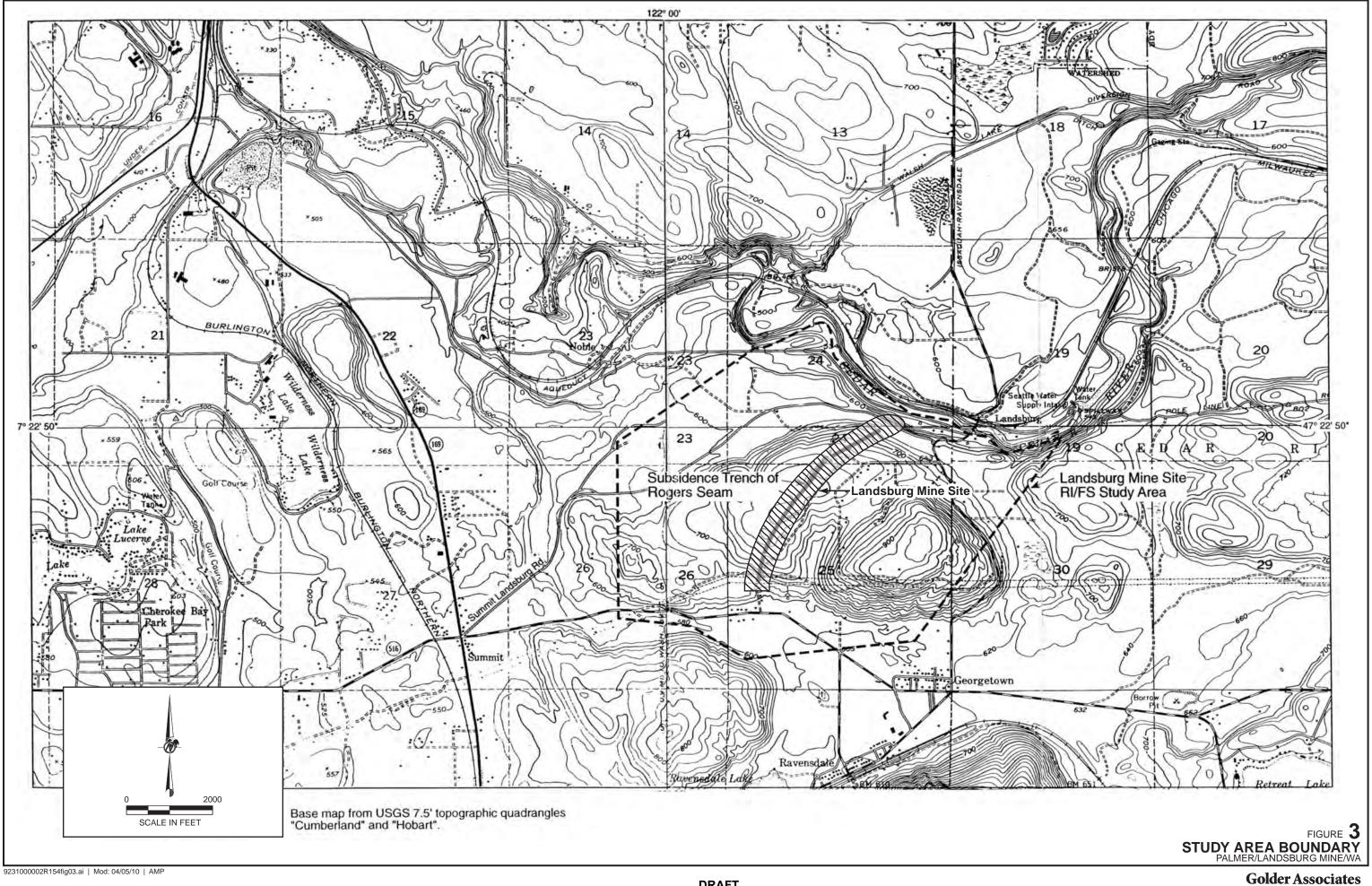
^c See text for score basis.

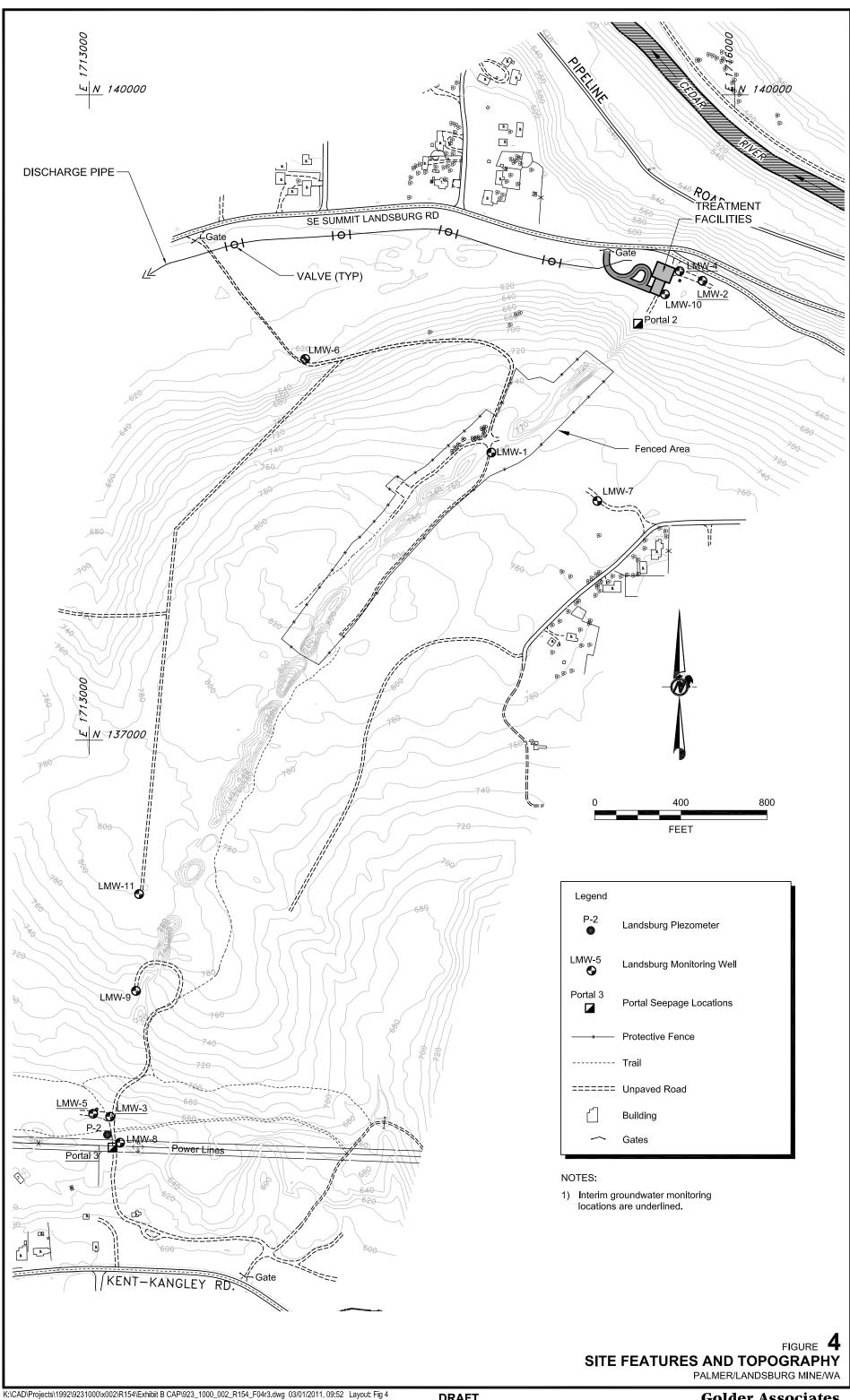
FIGURES



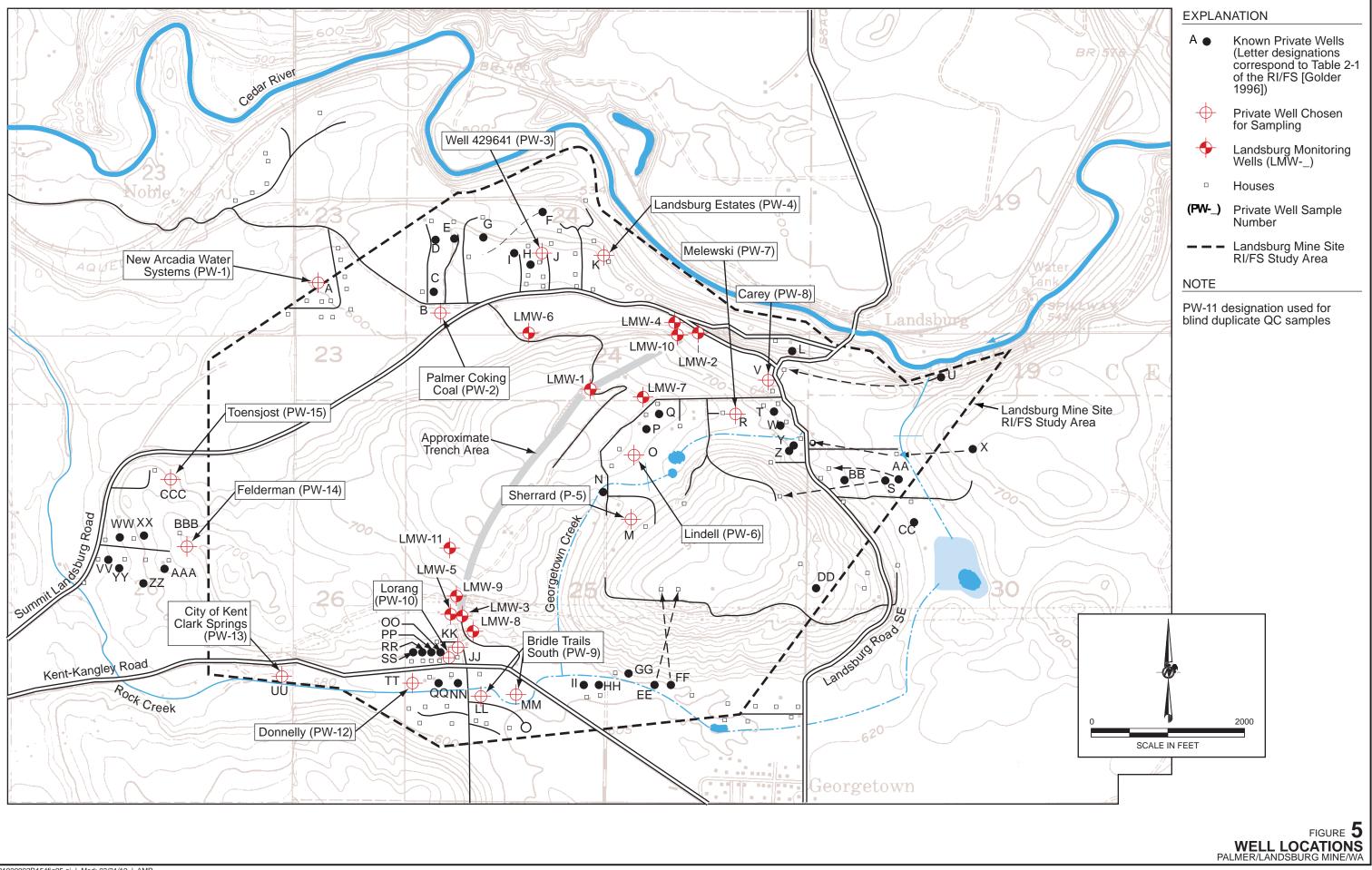


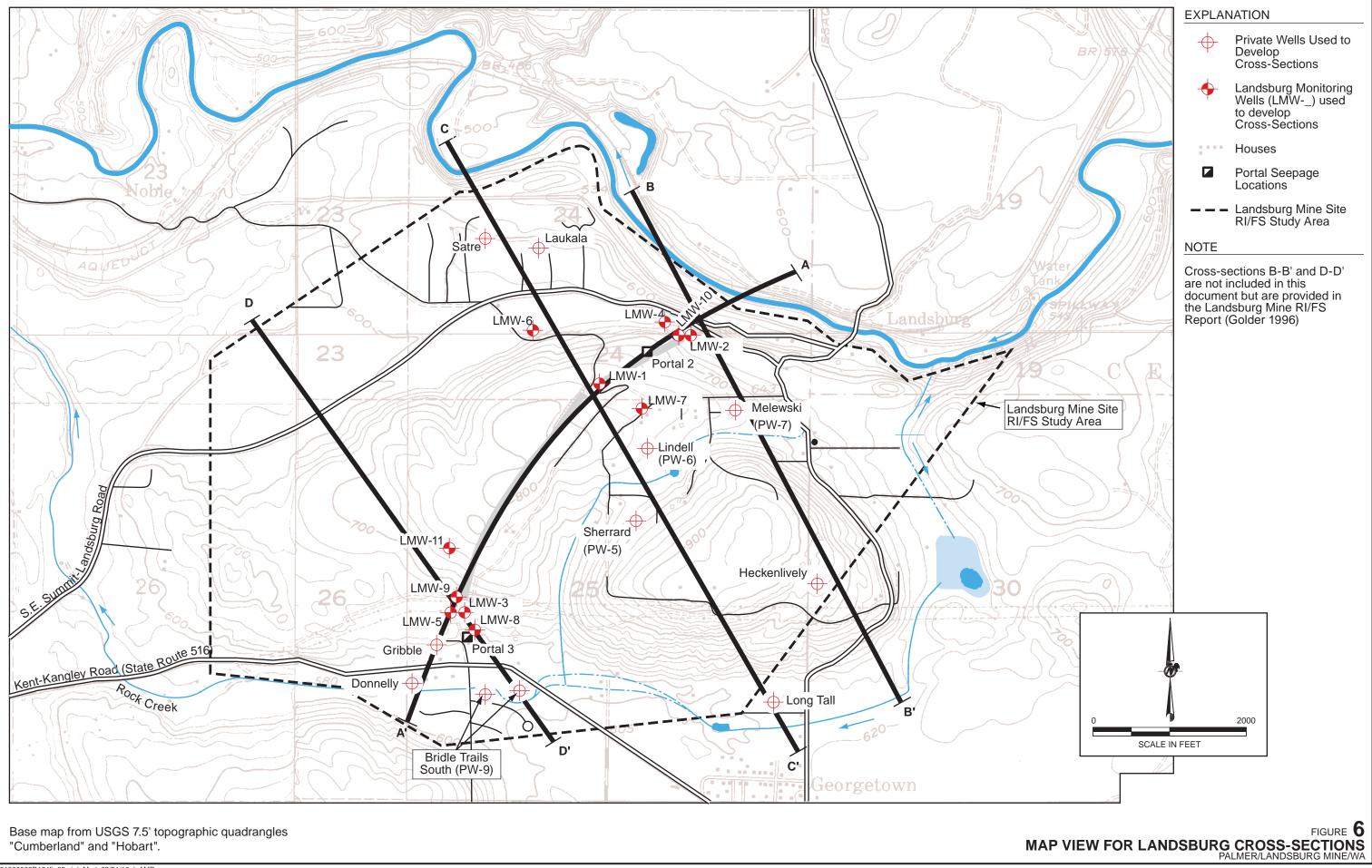
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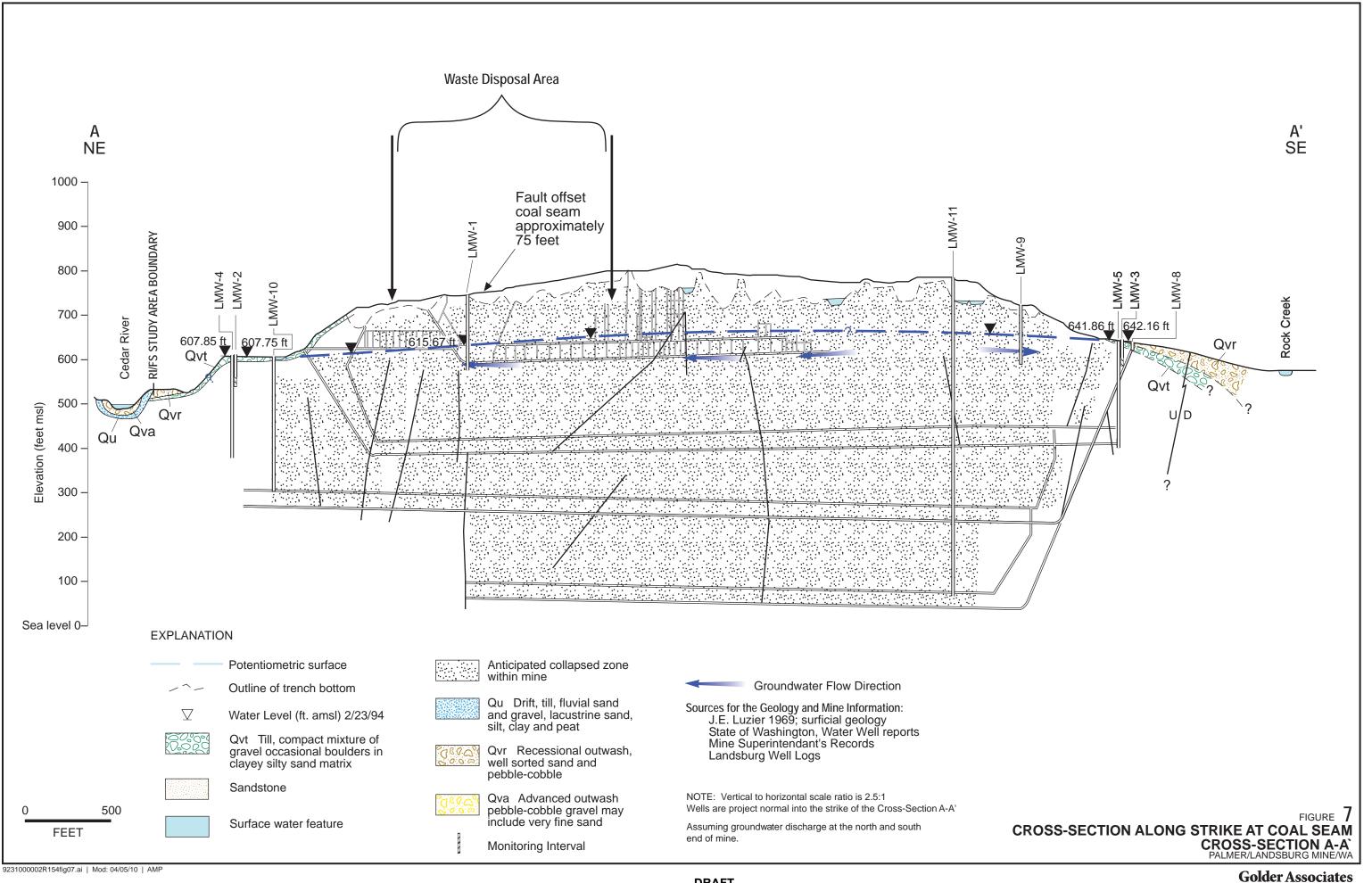


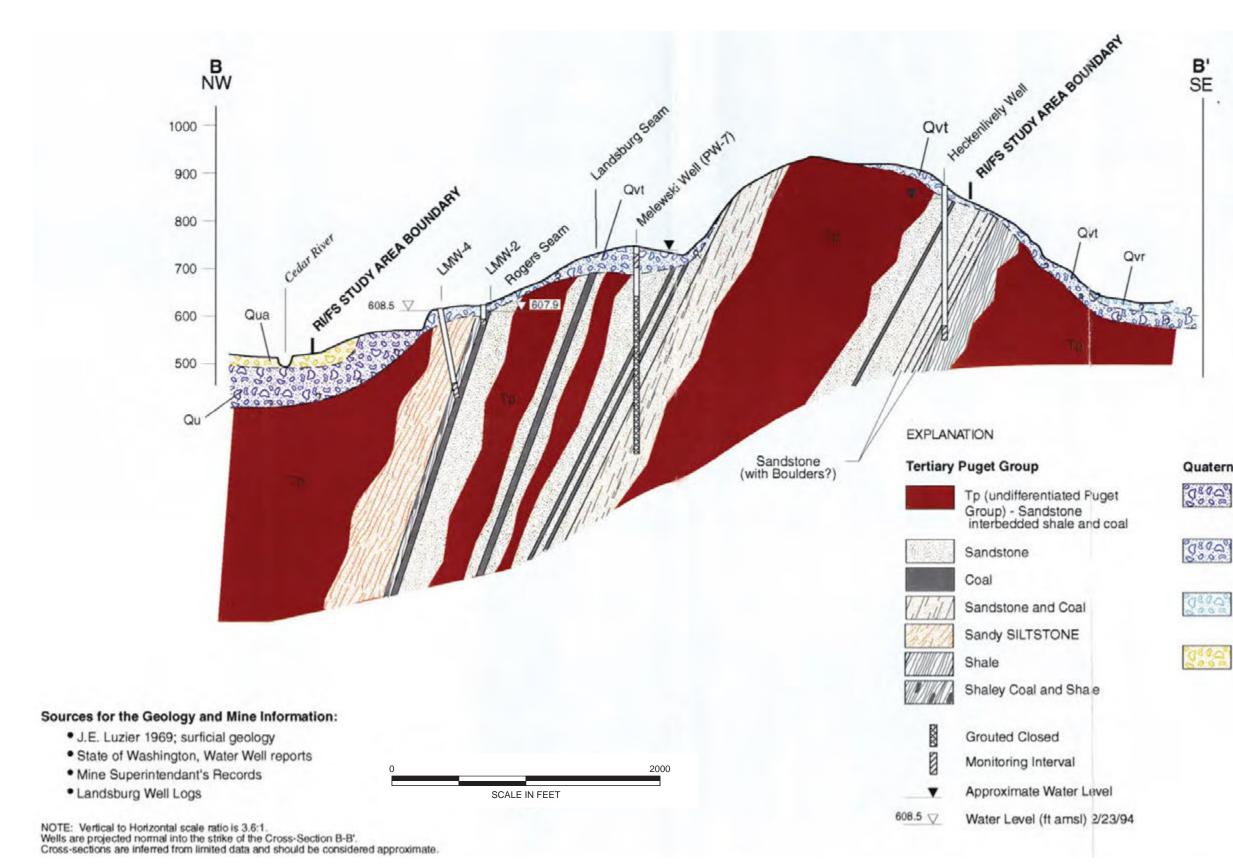


	Trail	
======	Unpaved Road	
	Building	
\sim	Gates	









Quaternary Deposits

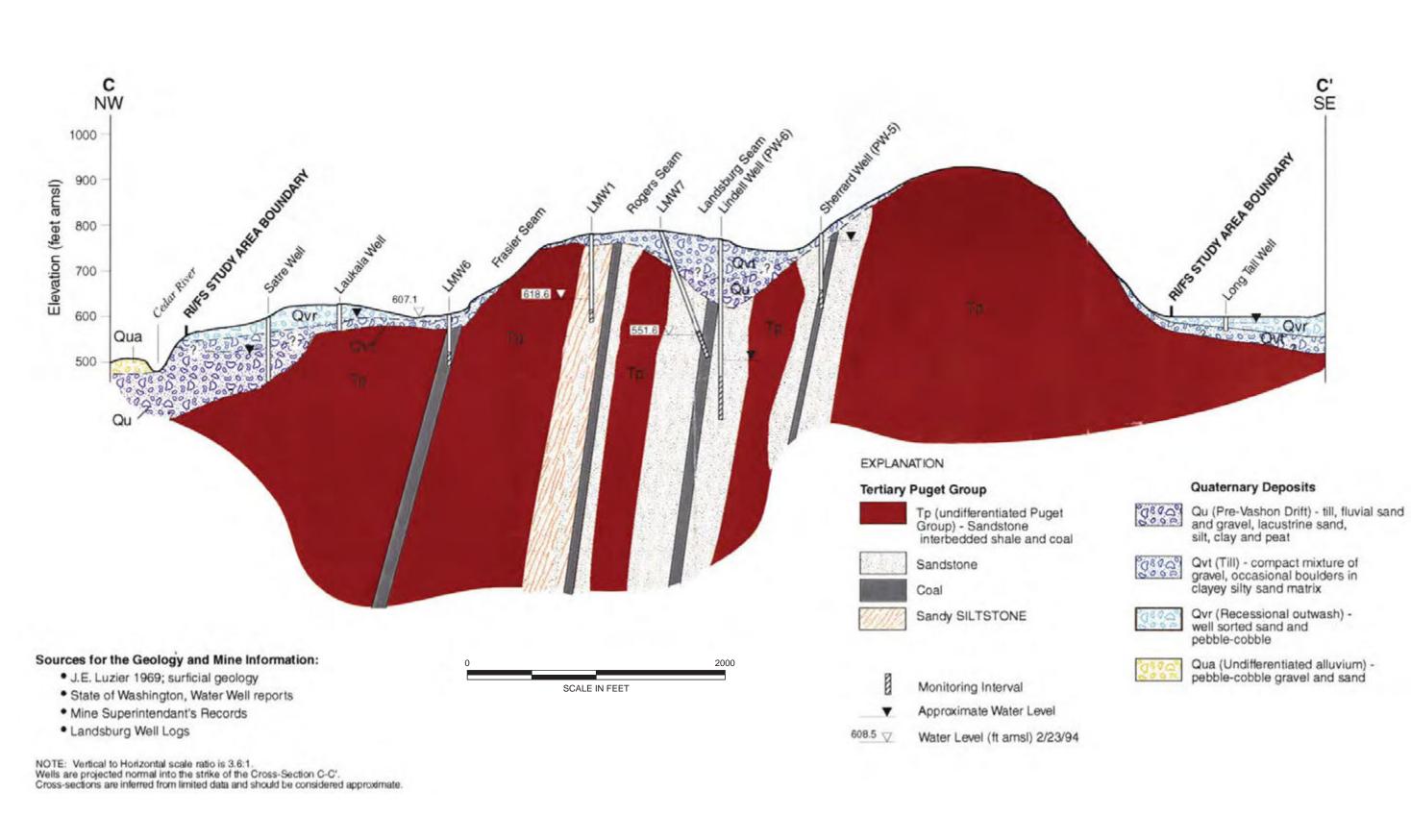
Qu (Pre-Vashon Drift) - till, fluvial sand and gravel, lacustrine sand, silt, clay and peat

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

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

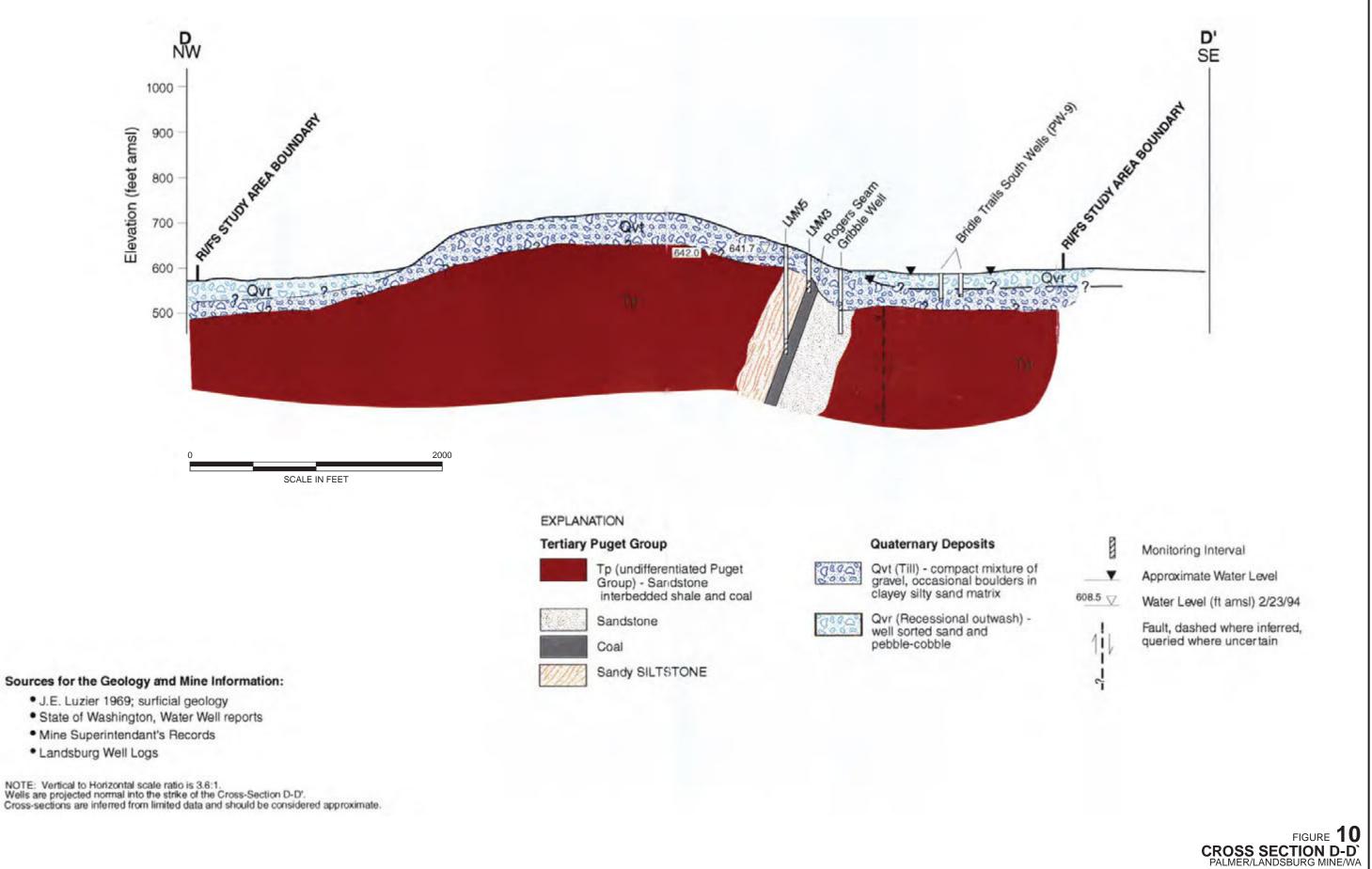
Qua (Undifferentiated alluvium) - pebble-cobble gravel and sand





Qua (Undifferentiated alluvium) -pebble-cobble gravel and sand

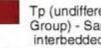




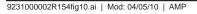


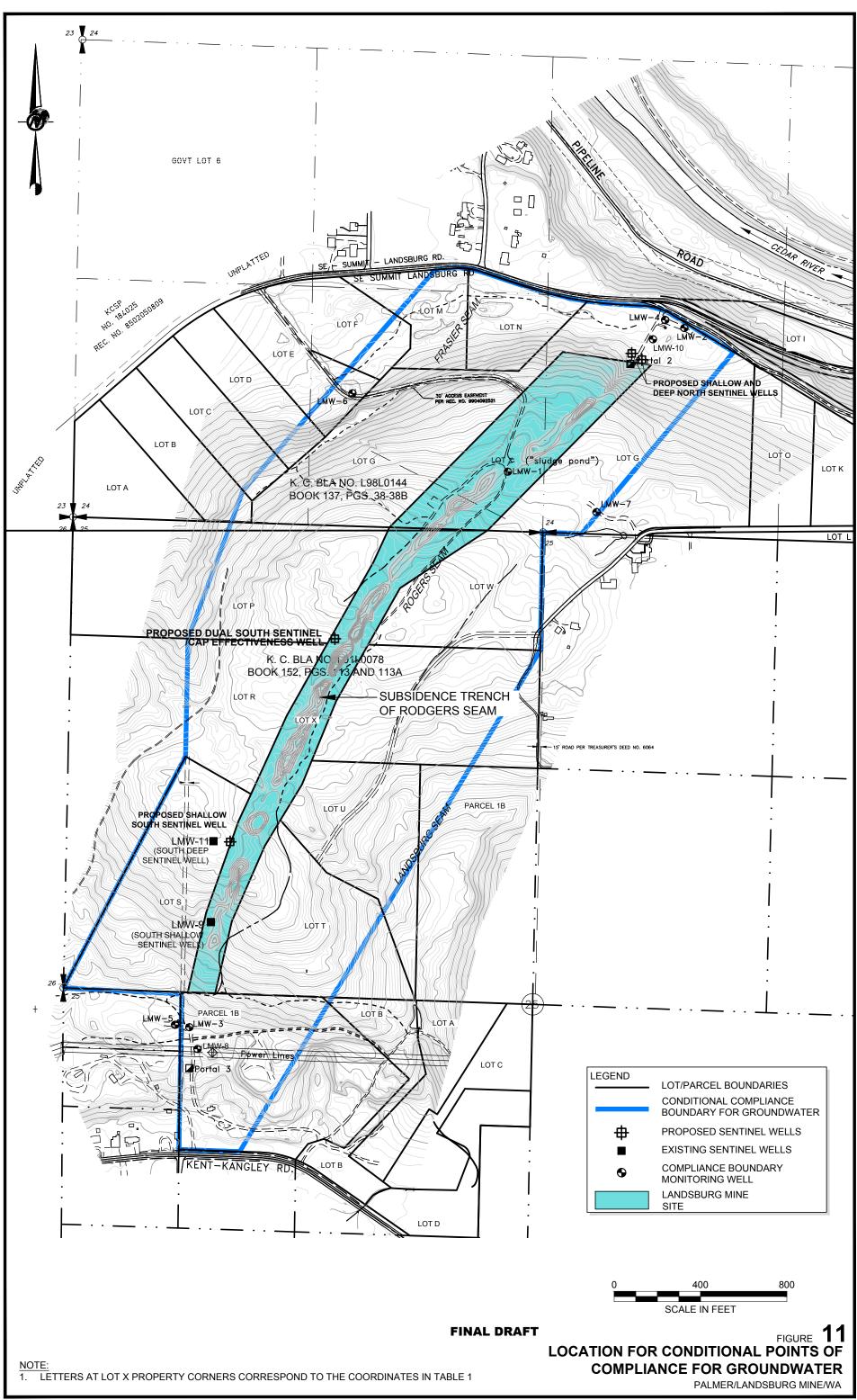
- Mine Superintendant's Records
- Landsburg Well Logs

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.

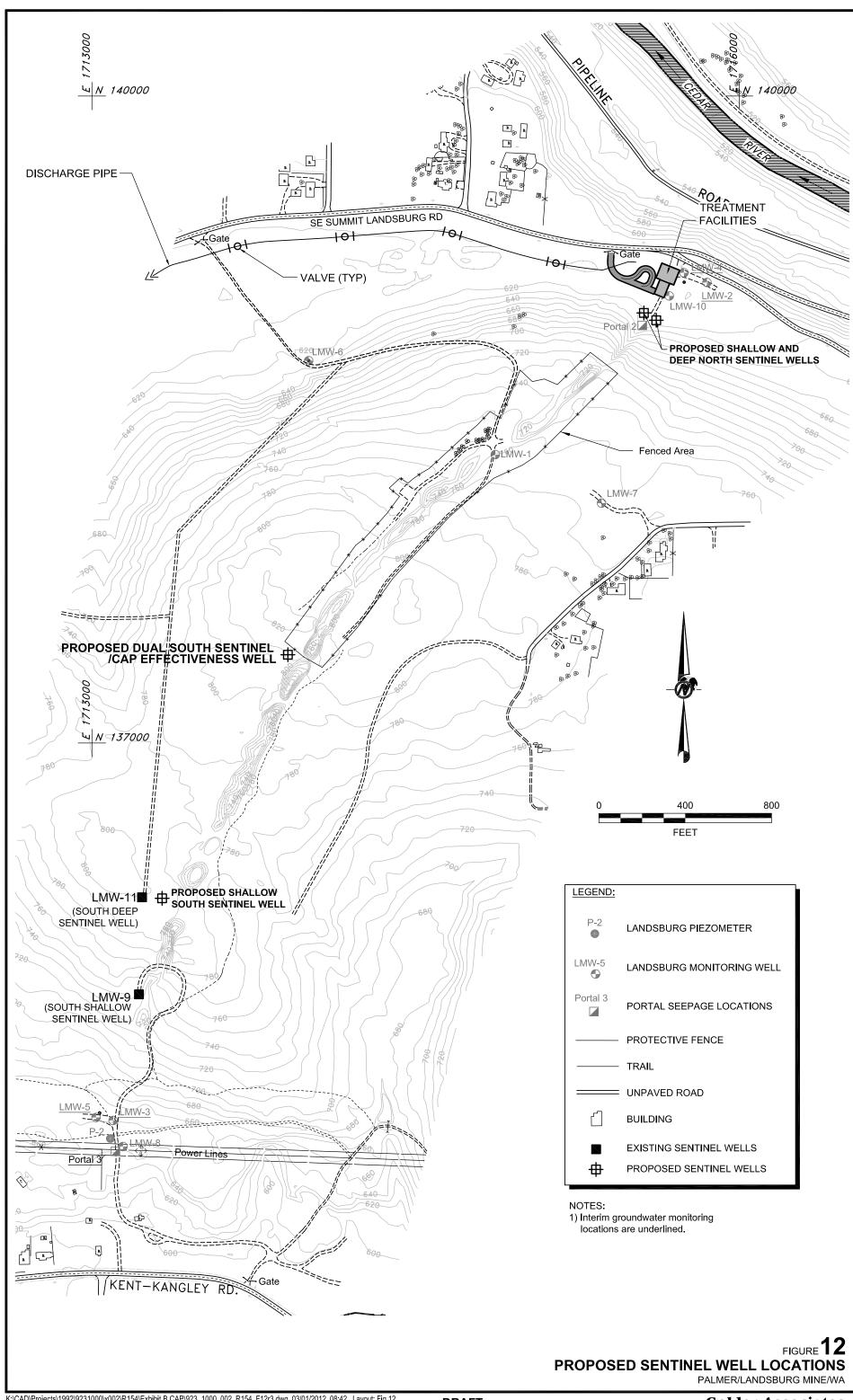




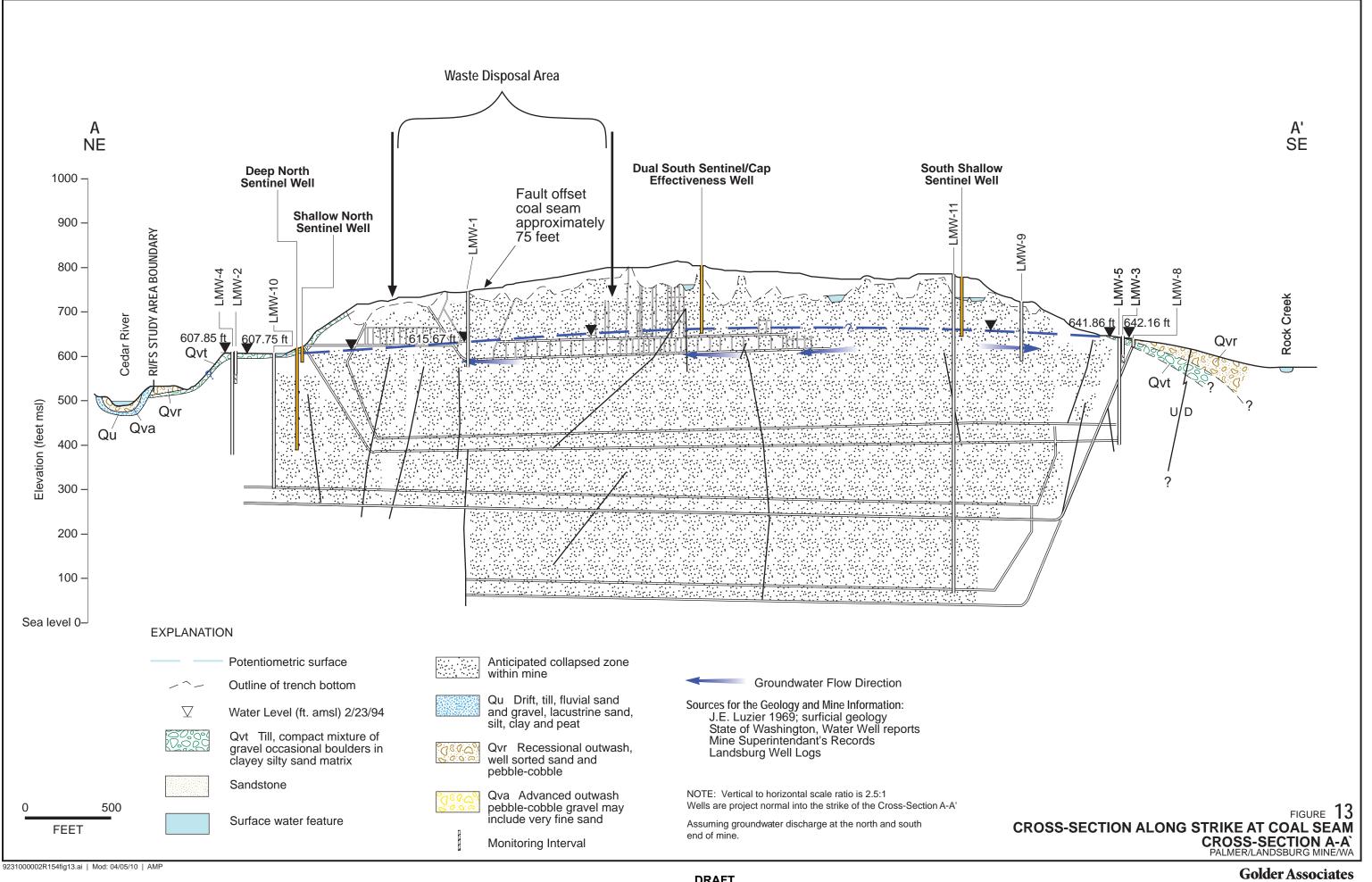


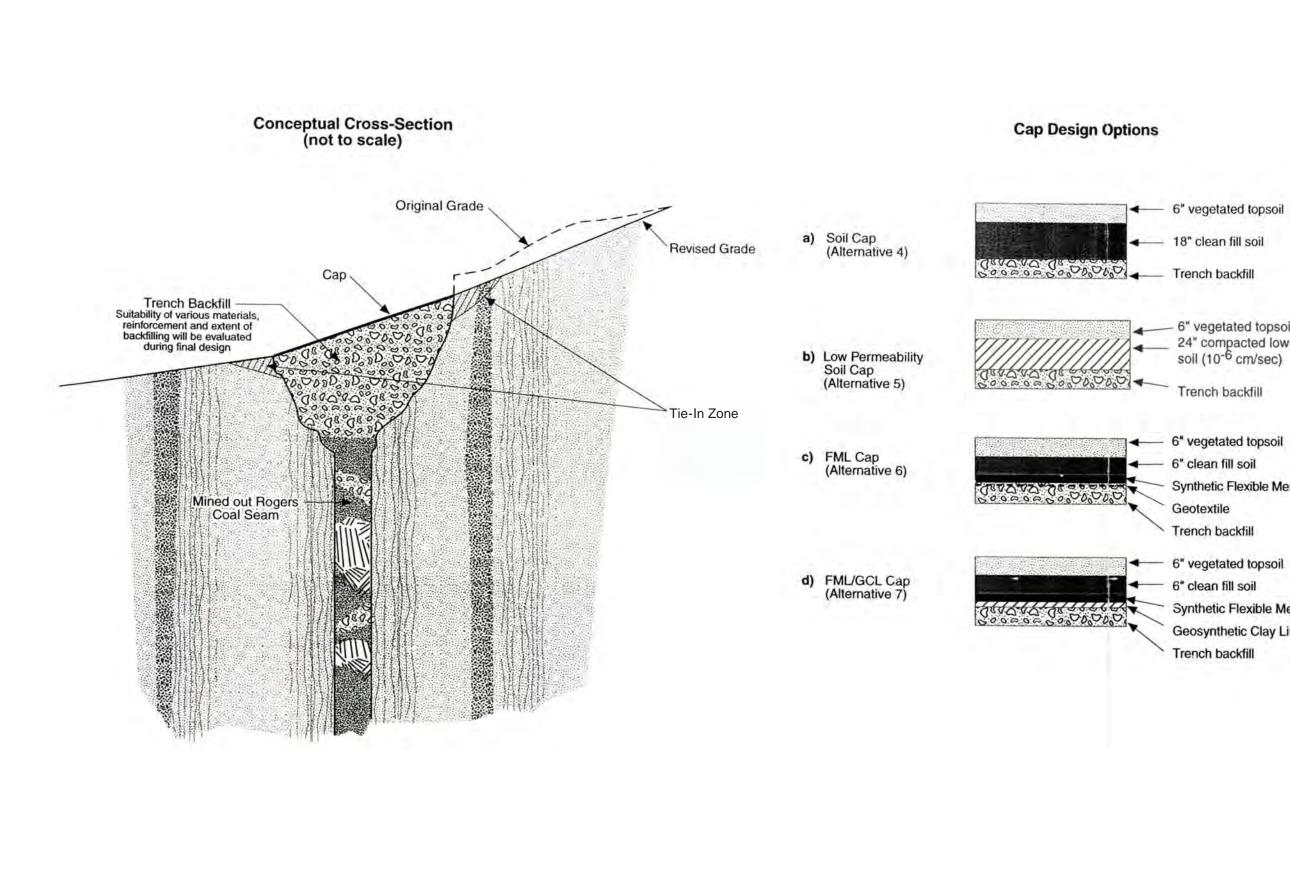


K:(CAD\Projects)1992\9231000\x002\R154\Exhibit B CAP\923_1000_002_R154_F11r5.dwg | Fig 11 Locations for Conditional Points of.. | Mod: 08/02/2013, 15:58 | Plotted: 08/05/2013, 08:02 | JAsprinio



		PROTECTIVE FENCE			
		TRAIL			
	====	UNPAVED ROAD			
		BUILDING			
		EXISTING SENTINEL WELLS			
	₽	PROPOSED SENTINEL WELLS			
	NOTES: 1) Interim groundwater monitoring locations are underlined.				
Ρ	ROPOSE	ED SENTINEL WELL LOCA			
		PALMER/LANDSBUR			





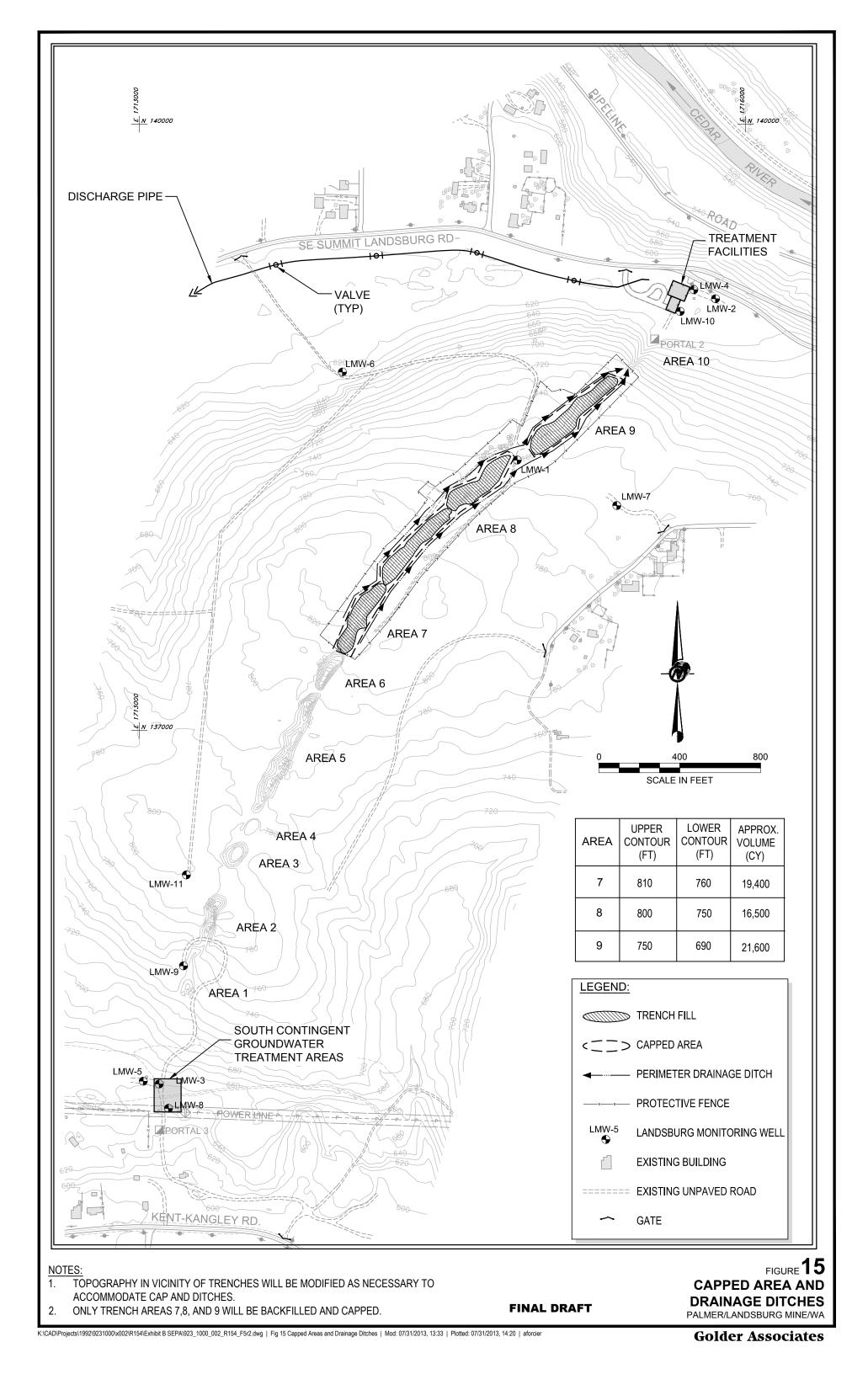
- 6" vegetated topsoil
 24" compacted low-permeability
 soil (10⁻⁶ cm/sec)

Synthetic Flexible Membrane Liner (FML)

Synthetic Flexible Membrane Liner (FML)

Geosynthetic Clay Liner (GCL)





APPENDIX A LANDSBURG MINE SITE ARARS APPENDIX B SEPA CHECKLIST APPENDIX C RESPONSIVENESS SUMMARY (TO BE COMPLETED AFTER PUBLIC REVIEW PERIOD)

APPENDIX A LANDSBURG MINE SITE ARARS

TABLE A-1
IDENTIFICATION OF FEDERAL ARARS FOR THE LANDSBURG MINE SITE

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.

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TABLE A-1 IDENTIFICATION OF FEDERAL ARARS FOR THE LANDSBURG MINE SITE

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.

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TABLE A-1 IDENTIFICATION OF FEDERAL ARARS FOR THE LANDSBURG MINE SITE

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	Applicabl e	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.

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TABLE A-2 IDENTIFICATION OF STATE AND LOCAL ARARS FOR THE LANDSBURG MINE SITE 923-1000-002.R154 Page 3

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 Requirements for Generators of Dangerous Waste WAC 173-303- 170 Closure and Post Closure WAC 173-303-610 Releases from Regulated Units WAC 173-303-645	Applicable Applicable Potentially relevant and appropriate	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. Substantive requirements for generators of dangerous waste established under this chapter may be applicable to remedial actions performance standards for dangerous waste is generated. 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 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.
		The relevance and appropriateness of these sections will be considered in the

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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	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	 "Minimum requirements" for landfill closure conducted as a MTCA cleanup action. WAC 173-304-460 capping requirements include a minimum 2 ft. thick clay layer having a permeability of 1 x 10[°] 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 173-304 "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		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.
Surface Water Quality Standards WAC 173-201A	Applicable	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	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).
System Permit Program WAC 173-220		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.

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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.
Regulation 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."

TABLE A-2 IDENTIFICATION OF STATE AND LOCAL ARARS FOR THE LANDSBURG MINE SITE

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 c	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.

King County Grading Requirements

APPENDIX B SEPA CHECKLIST



FINAL DRAFT

STATE ENVIRONMENTAL POLICY ACT (SEPA) ENVIRONMENTAL CHECKLIST

Landsburg Mine Site MTCA Remediation Project Ravensdale, Washington

REPORT

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

July 31, 2013

Project No. 923-1000-002.R154



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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.

I 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

Signature:

Jui Address: 3190 - 160th SE Bellevue, WA 98008

Date: October 11, 2013

The State Environmental Policy Act (SEPA) Environmental Checklist For The Landsburg Mine Site MTCA Remediation Project Ravensdale, Washington

INTRODUCTION

The State Environmental Policy Act (SEPA), chapter 43.21C RCW, requires all governmental agencies to consider the environmental impacts of a proposal before making decisions. This checklist has been prepared based on the checklist (*indicated in italics below*) contained in WAC 197-11-960.

However, the reader must be aware that the proposed project is the remediation of the former Landsburg Mine Site (Site), a State of Washington Priority Listed site under the auspices of the Model Toxics Control Act (MTCA), and this Remediation Project (defined below) is intended to increase the protection of the environment and human health. The Site is being remediated by the Landsburg Mine Site Potentially Liable Parties (PLPs) under the oversight of the Washington Department of Ecology (Ecology). The PLPs for the Landsburg Site consist of Palmer Coking Coal Company, LLP; PACCAR Inc; Plum Creek Timberlands Company, L.P.; Browning-Ferris Industries of Illinois, Inc.; TOC Holdings Co.; and the BNSF Railway Company. Significant environmental information has previously been collected and reviewed as part of the multi-year Remedial Investigation and Feasibility Study (Golder Associates Inc., 1996). Additional associated engineering reports and studies are currently being prepared for the Site. Consideration of environmental impacts including impacts to the local communities has been an integral part of the investigative and remedial design and selection process for the preferred remedial alternative.

BACKGROUND

The Site consists of a former underground coal mine located approximately 1.5 miles northwest of Ravensdale in southeast King County, Washington. The Site is located directly south and east of the S.E. Summit-Landsburg Road and north of the Kent-Kangley Road. The location of the Site in the Seattle, Washington area is shown in Figure 1. Figures 2 and 3 depict the immediate Site vicinity. The 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. The actual areas of impact due to remedial construction are referred to as the Remediation Project Site throughout the SEPA checklist and are shown on Figure 6.

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 coal seam has a near vertical dip and consists of coal and interbedded shale approximately 16 ft wide. The mined section is about a mile in length. Mining occurred at depths of up to 750 feet below the ground surface using a mining method locally termed "booming" which followed the coal seam vertically. As a result of underground mining of the Rogers Seam, a series of subsidence trenches developed on the land surface above the mine workings. The dimensions of these trenches vary, from about 60 to 100 feet wide, between 20 to 60 feet in depth and about 3/4 mile in length.

A portion of the trenches was used in the late 1960s to the late 1970s for disposal of various industrial wastes, construction materials, and land-clearing debris. Drums, liquid from tanker trucks and other industrial materials were disposed of in the northern portion of the trenches. Disposal of land clearing debris continued until the early 1980s when all waste disposal at the Site stopped.

The Landsburg Mine Site PLPs, under the oversight of Ecology, conducted a remedial investigation 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 prior waste disposal activities at the Site. The remedial investigation determined that the contamination at the Site was confined to within the northern portion of the subsistence trenches in the area of known prior waste disposal activities. No hazardous compounds related to prior disposal activities at the Site above background levels were detected in soil outside of the trenches, or in groundwater and surface water emanating from the Site. Currently, the northern portion of the trenches where disposal occurred is secured by a fence and locked gate .

This SEPA checklist has been prepared for remedial construction activities selected for the Site. The remedy selected for the Site is a low permeability soil cap installed over backfilled material (Remediation Project). The goal of the overall Remediation Project is to backfill the northern portion of the mine subsidence trenches which were used for past waste disposal with clean fill material. Once the trenches have been backfilled to the engineered level, a low permeability cover and surface water diversion system will be constructed over the backfill. The area will be reseeded and replanted following the construction operations. The Remediation Project will provide an increased level of protection for the environment and humans. Ecology is the lead agency and will provide oversight of the remediation program and long-term compliance-monitoring program for the life of the Remediation Project.



The State Environmental Policy Act (SEPA) Environmental Checklist

A. BACKGROUND

1. Name of proposed project, if applicable:

Landsburg Mine Site MTCA Remediation Project

2. Name of applicant:

Landsburg Mine Site Potentially Liable Parties (PLPs) . The PLPs for the Landsburg Site consist of Palmer Coking Coal Company, LLP; PACCAR Inc; Plum Creek Timberlands Company, L.P.; Browning-Ferris Industries of Illinois, Inc.; TOC Holdings Co.; and the BNSF Railway Company.

3. Address and phone number of applicant and contact person:

Landsburg Mine Site PLP Contact:

Doug Morell, Golder Associates for the Landsburg Mine Site PLP Group 18300 NE Union Hill Road, Suite 200 Redmond, WA 98052-3333 (425) 883-0777fax: (425) 882-5498 e-mail: doug_morell@golder.com

4. Date checklist prepared:

February 2002

Revised August 22, 2013

5. Agency requesting checklist:

The Washington Department of Ecology (Ecology) is the lead agency providing oversight of the remediation of the Landsburg Mine MTCA site (Site). Information concerning the Site should be directed to the Ecology contact.

Ecology Contact:

Jerome Cruz, Ph.D. Washington Department of Ecology Toxics Cleanup Program, Northwest Regional Office 3190 160th Ave SE Bellevue, WA 98008-5452 (425) 649-7094 fax: (425) 649-7098 e-mail: JCRU461@ecy.wa.gov



6. Proposed timing or schedule (including phasing, if applicable):

Initial construction activities associated with backfilling the subsidence trench areas 7, 8 and 9 (Figure 5) on the Site are currently scheduled to begin in the summer of 2012 and be completed by late 2013. The final implementation schedule will be defined in the Consent Decree. The construction activities will be conducted in two primary phases (described in Item 7 below). Several minor ongoing activities will occur prior to actual construction. These activities will involve interim monitoring of groundwater, geotechnical testing, surveying, source material testing and evaluation, general maintenance and monitoring of the Site. Post-construction activities will consist of general maintenance and compliance groundwater monitoring of the Site for as long as MTCA cleanup or remediation levels are exceeded, and as prescribed in the Cleanup Action Plan.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

The Remediation Project is currently designed to be completed in two primary phases. The first phase would consist of backfilling the subsidence trench areas 7, 8 and 9 (Figure 5). A limited second phase will be required for final grading of the low permeability soil cap, if significant settlement has occurred in the backfilled material. 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 a risk to human health or the environment. *8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.*

A significant amount of environmental information has been generated and prepared for the Site. A Bibliography is attached to this report that provides a list of environmental related reports that have been prepared during the multi-year investigative and remedial design phases of the MTCA process. Several significant sources of information the reader is referred to are: the Remedial Investigation and Feasibility Study for the Landsburg Mine Site (Golder Associates Inc., 1996), the Draft Cleanup Action Plan (CAP) (Golder Associates Inc., 2002) and the Compliance Groundwater Monitoring Plan (Golder Associates Inc., 2002).

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

No other proposals are currently known to be pending affecting the Remediation Project Site (defined in Item 12 below) covered by the MTCA remediation program at the Site.



10. List any government approvals or permits that will be needed for your proposal, if known.

Ecology is providing oversight of the Site Model Toxics Control Act (MTCA) project. 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.

WAC 173-340-700 establishes three cleanup levels for environmental media, including groundwater, soil, surface water: Method A (routine, using tables), Method B (standard), and Method C (conditional, primarily for industrial sites).

SEPA is applicable to remedial actions at the 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 requires the submission of a SEPA checklist which provides information regarding how the proposal will affect elements of the environment, such as air, water, etc. A public comment period is required for the SEPA determination. In order to expedite and streamline public input, the SEPA public comment period is combined with the comment period associated with the Cleanup Action Plan.

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

Landsburg Mine Site MTCA Remediation Project

The remedy selected for the Site is a low permeability soil cap installed over backfilled material. A conceptual design of this alternative is shown in Figure 4. The goal of the overall Remediation Project is



backfilling the northern portion of the subsidence trenches which were used for disposal of industrial waste in the past with suitable clean fill material.

Once the trenches have been backfilled to the engineered level, a low permeability cover and surface water diversion system will be constructed over the backfill.

The area will be reseeded and replanted following the construction operations. No additional structures are proposed. The major steps in the Remediation Project involve:

- 1. Backfilling 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. Prepare a Contingent Groundwater Treatment Plan incase groundwater contamination is detected in Site compliance wells.
- 5. Maintain the cap 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.
- 6. Implement and maintain institutional controls and monitoring programs 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 portion of the subsidence trenches that will be capped (areas 7, 8 and 9) is shown on Figure 5. This capped area is based on the areas of suspected waste disposal activities identified in the remediation investigations. The cap would extend slightly beyond the trenches on both sides to provide anchor zones and "overhang". Fill material may be extended into area 6 if necessary and as appropriate to provide a buttress to the narrow pillar wall separating areas 6 and 7. Surface water runoff from the cap would be collected in drainage ditches.

The major benefit of capping this Site would be to reduce infiltration through any waste remaining on-Site. Another common benefit of capping, prevention of direct human contact and off-Site migration in stormwater or dust, is also provided by the backfill of the trenches.

The cap will need periodic inspection and maintenance and, if damage did occur, repair of a soil cap would be relatively easy, requiring only removal of the vegetative soil, addition of more low-permeability soil and regrading to the proper contour.



The cap design will include a top layer of vegetated topsoil to promote evapotranspiration and decrease the potential for erosion. Root zones of the vegetation will not compromise the cap. While it is still to be determined during 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 would not be compacted, in order to provide a loose medium for establishing the vegetative cover. To establish vegetation, the topsoil would be seeded with vegetation suitable for the local climate. The low-permeability soil cap consists of 24 inches of compacted low-permeability soil (permeability of 1 x 10^{-6} cm/sec) beneath 6 inches of vegetated topsoil. The suitability of potential sources of cap material, in terms of both quality and quantity, will need to be confirmed in the final design. Installation of this cap contractors are available.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

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 Kent-Kangley Rd (State Highway 516). Downtown Seattle is approximately 20 miles to the northwest. The Cedar River passes within approximately 700 ft. of the Site to the north. The location of the Site is shown in Figures 1, 2 and 3. The topography of the Site and general Site features are depicted in Figure 3.

The Site occupies property owned by PCC and is located within sections 24 and 25, Township 22 N., Range 6 E. The Site is located in the northwest corner of the Cumberland 7.5 minute quadrangle along the boundary with the Hobart quadrangle.

The Landsburg Mine site was defined in the Work Plan (Golder 1992a) and Remedial Investigation (RI) and Feasibility Study (FS) (Golder Associates Inc., 1996) as land extending 400 feet on either side of the mine trench lineation and bounded by the S.E. Summit-Landsburg Rd. to the north and the Bonneville Power Administration electrical transmission line easement to the south (Study Area). The actual area impacted by the Remediation Project is referred to herein as the Remediation Project Site and is much smaller than the Study Area (depicted in DCAP Figure 5 of Exhibit B). The Study Area is shown on Figure 2. Since the production of the RI/FS, the PCC owned land in this area was readjusted through a boundary line adjustment, such that the Site lies within one parcel of land. The Remediation Project occurs in three areas depicted on Figure 6 (Remediation Project Site): The South Contingent Groundwater Treatment Areas, the haul roads (constructed over existing roads and trails) and the trenches where activities associated with the actual backfilling and cap construction occur.



Apart from the Site, the only developments in the Study Area are a junior high school and residential dwellings with approximately 130 residences contained within the Study Area. The school is located about 0.65 miles northwest of the Site. The nearest residences to the Site are to the southwest approximately 800 ft. 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.

Several gravel roads access the Site from public thoroughfares and 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 trenches. A locked gate secures the Site at the access road entrance, and the portion of the trenches where disposal occurred is currently enclosed by a locked 6 ft. tall chain link security fence. Dense vegetation covers the Site and includes blackberry, alder, cedar, hemlock, cottonwood, maple and fir.

Electrical transmission lines and a Bonneville Power Administration property easement cross the southern portion of the Site in an east-west direction. Approximately 3/4 mile upstream of the Site along the Cedar River at Landsburg, the City of Seattle Water Department maintains a drinking water supply intake known as the Landsburg Diversion. Water is conveyed from the intake through a 96-in diameter pipeline to the Lake Youngs Reservoir, located some 5 miles to the northwest of Landsburg (Brown and Caldwell 1978a). The pipeline passes just to the north of the Site and is located near the bottom of the slope between the S.E. Summit-Landsburg Rd. and the Cedar River. An unpaved service road (Pipeline Road) parallels the pipeline right-of-way. A meteorologic data collection and river gauging station, operated by the City of Seattle, are located at the water intake structure. The location of the supply intake is shown in Figure 2. Approximately 1 mile upstream from the Landsburg Diversion on the Cedar River, a river gauging station is maintained by the USGS (Landsburg Gauging Station).

The City of Kent Clark Springs Facility is located approximately a 3/4 mile to the southwest of the south portal of the Landsburg Mine. The Clark Springs Facility was built in the 1950s and consists of a lateral gravity drainage collection system installed approximately 13 to 15 ft. below the ground surface in the Rock Creek alluvium.

B. ENVIRONMENTAL ELEMENTS

1. Earth

a. General description of the site (circle one): Flat, rolling, <u>hilly</u>, steep slopes, mountainous, other.

The property owned by PCC sits atop a gently sloping hill which reaches a maximum elevation of approximately 800 ft. mean sea level (MSL) near the central portion of the Site. At the Site's northern end (Figure 3), this hill slopes steeply downwards towards the S.E. Summit-Landsburg Rd. (elevation of approximately 615 ft.) and continuing to the Cedar River (elevation approximately 500 ft.). The southern



portion of the Site slopes more gradually downwards to the south toward the Kent-Kangley Rd. and Rock Creek drainage located at an elevation of approximately 600 ft. The Site is bounded to the east by a somewhat larger hill which rises to a maximum elevation of approximately 940 ft.

b. What is the steepest slope on the site (approximate percent slope)?

Slopes range from vertical (>90 percent) in the side walls of the subsidence trenches to very gently sloping at the base of the hill in the northern portion of the property owned by PCC. Geotechnical engineering evaluations of the slopes and subsidence trenches' stability have been considered in the design of the Remediation Project.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any prime farmland.

The soils at the Site are derived from glacial drift materials primarily consisting of till and recessional outwash. The till which mantles the hills in the Remediation Project Site consists of a compact mixture of gravel and occasional boulders in a clayey, silty sand matrix. Isolated swamp deposits consisting of peat and lacustrine deposits are scattered around the perimeter of the Study Area but do not occur in the specific Remediation Project Site. No prime farmland will be affected by the Remediation Project. A 1972 soil survey by the U.S. Department of Agriculture lists the soils on Site as Everett and Alderwood series.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

Coal extraction in this near vertical coal seam (Rogers), and associated caving at the outcrop, has produced intermittent subsidence trenches up to 100 feet wide and 70 feet deep. The walls of the trenches are typically steep sided and composed of massive sandstone. However, in some areas the sandstone bed forming the eastern side of the trenches (mine footwall) has failed exposing the shale material behind. Areas where the shale has been exposed are not as steep as those where the sandstone is still intact because the shale is weaker and less able to support steep slopes. In most areas, the sandstone-hanging wall forming the western side of the trenches remains intact.

The strata forming the sidewalls of the trenches were mapped in trenches that were excavated perpendicular to the rim of the trenches in areas 8 and 9. The mapped sequence 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 bottom of the trenches or if further subsidence occurs.

Areas outside of the immediate trenches appear to be stable, are mantled with a cover of glacial till and gravels. Geotechnical engineering evaluations of the slopes have been considered in the design of the Remediation Project.



e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate source of fill.

The Remediation Project involves the backfilling of a portion of the subsidence trenches and the construction of a low permeability cap over the constructed backfill. Suitable clean on-Site and off-Site sources of material may be used to backfill the trenches and construct the low permeability cap. The potential on-Site source materials consist of waste rock and coal refuse that were produced from the portals and mine operations at the southern end of the Rogers and Landsburg coal seams The total quantity of fill required is currently estimated at 60,000 cubic yards, for areas 7, 8, and 9. The suitability or potential sources of cap and fill material, in terms of both quality and quantity, would need confirmation during final design.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

Engineering and operational practices will be utilized to minimize the impacts of the limited erosion that will occur during the actual construction of the Remediation Project. Construction is currently scheduled for the driest part of the season and regrading and reseeding will be performed once the construction is completed. Following construction and establishment of the vegetation, the erosion will actually be reduced from pre-Remediation Project conditions.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

The Remediation Project includes the construction of a vegetated low permeability cap that will cover about 132,000 square feet (approximately 3.03 acres). Some existing gravel roads will be widened and improved with a gravel surface. There are no paved roads or buildings planned for the cleanup action; therefore, the cleanup action has 0 percent of the Site covered with impervious surfaces after construction.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

Water runoff and erosion control is a primary engineering design element in the construction of the cap and containment structure. Earthwork and diversion structures will be used to divert surface water runoff away from the capped trenches. Water control structures, ditches and piping may be used to control surface water and allow infiltration with minimal erosion. Routine periodic maintenance and monitoring will be performed looking for signs of erosion. Corrective actions will be quickly implemented to prevent further erosion. Specific surface water flow design drawings are being prepared as part of the CAP engineering design reports for the Remediation Project.

Cap monitoring would consist primarily of visual inspections for erosion, damage and subsidence. The cap would be periodically examined for the presence of offsets, settlement or subsidence scarps, low-points, ponded water, odd changes in grade, excessive erosion, and the condition of the vegetative layer.



Additionally, the cap will be monitored for the growth of deeply rooted vegetation that may harm the integrity of the cap. If deeply rooted vegetation is observed during cap monitoring, it will be removed as per the Operations and Maintenance Plan (Exhibit E, Part B). For the first year, such inspections may be performed on a quarterly basis and would eventually be reduced to once a year.

The chain-link fence currently surrounding the northern portion of the trenches will be kept in place for five years after the Remediation Project. The fence will protect the soil cap from trespassers and will allow time for the vegetative cover to be established.

2. Air

a. What types of emissions to the air would result from the proposal (i.e., dust, automobile, odors, industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known.

Short-term emissions to the air may result during the construction of the backfill and cap. These emissions would be from uncontaminated materials and would be similar to those associated with any earth moving/ construction project which would primarily consist of dust emissions that were produced during dry summer periods by excavation and haulage of the backfill and capping materials. Standard engineering and operational practices will be used as needed to control fugitive dust from excavation and hauling the clean backfill and cap materials and during placement of the materials within the trenches. An Air Monitoring Program will provide monitoring and documentation of air emissions from the Site. No long-term emissions would result from the Remediation Project.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

There are no off-Site sources of emissions or odor that would affect the Remediation Project.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

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. An Air Monitoring Program will provide monitoring and documentation of air emissions from the Site. The air-monitoring program will monitor volatile organics as well as dust and particulates. Specific guidelines will be established in the Health and Safety Plan for the Remediation Project.

3. Water

a. Surface:

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.



The major surface water features at the Study Area are the Cedar River along the Study Area's northern boundary and Rock Creek along the southern boundary. A tributary of Rock Creek, Upper Georgetown Creek, is located to the east of the Site within the Study Area. The Study Area is situated along a drainage divide separating the Cedar River mainstem and the Rock Creek Sub-basins. Drainage from the northern half of the Site eventually enters the Cedar River mainstem, while drainage from the southern half of the Site eventually enters into the Rock Creek sub-basin. Rock Creek ultimately drains into the Cedar River approximately 2 miles downstream of the Site. In addition to these major features, the Site itself contains a number of small minor unnamed and primarily ephemeral drainages and shallow depressions. However, no surface water from the Site directly flows into either the Cedar River or Rock Creek. These features of the Study Area are discussed below. Figure 7 depicts the primary surface water flow pattern and surface water features of the Study Area.

Cedar River

The major surface water in the Study Area vicinity is the Cedar River which is located approximately 900 feet from the northern end of the trenches. The Cedar River valley drainage system extends from the south end of Lake Washington to the crest of the Cascade Range. Major features of the system include Lake Washington, the Rock Creek tributary (City of Kent Clark Springs Facility), and the City of Seattle water intake structure at Landsburg.

The largest lake in the system is Lake Washington which is presently the endpoint for water flowing westward from the Cedar River. The Cedar River supplies approximately 54% of Lake Washington's supply. The river is considered a significant regional water supply providing 70% of the water needs for the City of Seattle and surrounding areas (King County Dept. of Public Works 1993).

The Cedar River is of A (excellent) quality from Lake Washington to the State Highway 169 overpass in Renton, Washington. Nearer to the Site, the river has been rated AA (extraordinary) which is described as "markedly and uniformly exceeding the requirements for all or substantially all beneficial uses." Water quality in the Cedar River mainstem is considered excellent (King County Dept. of Public Works, 1993).

Flow data for the river are available for two gauging stations located in the Study Area vicinity (Hydrosphere Data Products, 1993b). The USGS maintains a gauging station approximately 1 mile upriver of the diversion. Data for this station are available for the period 1895 to 1994. Below the diversion structure, a gauging station is operated by the City of Seattle. Data for this period are available only for 1992 to 1994. Table 3-7 summarizes the daily average flows in the river by month for each of these two stations. As seen in the table, above the diversion structure the daily average flow varies from a low of approximately 322 cubic feet per second (cfs) in September to a maximum of about 975 cfs in January. A long, relatively wet season is indicated from November through June where average daily



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flows vary between approximately 700 and 975 cfs. The dry season is July to September with average daily flows of about 300 to 500 cfs. Below the diversion, data compiled from 1992 to 1994 indicate the daily average flow in the river varies from a high of only 591 cfs in December to a low of 160 cfs in September. The difference between daily average flows at the two gauging points is generally in the 150 to 450 cfs range. This presumably represents the approximate diversion taking place at the City of Seattle diversion structure.

Rock Creek

Rock Creek is located in the southern portion of the Study Area and is tributary to the Cedar River. The creek represents the only perennial creek or stream within the Study Area boundaries. The creek becomes ephemeral in the south-central portion of the Study Area approximately where one branch crosses under the Kent-Kangley Rd. (Figure 7). The relatively high flow rate which is generated within several hundred ft. of this point indicates the creek is gaining in the portion located within the Study Area (i.e. sustained by groundwater discharge). Presumably the source of flow in the creek is groundwater inflow from the east through the permeable glacial outwash deposits.

The Rock Creek sub-basin drains over 7,000 acres and is considered to be the least disturbed and most pristine of the five tributary sub-basins of the Cedar River (King Co. Dept. of Public Works 1993). Based on the pristine, rural nature of the area, the water quality in the creek is thought to be very good although few data are available.

Flow data for Rock Creek near the City of Kent diversion was available for the years 1945 through 1948. The average daily flow for this time was 29 cfs. Daily averages for the creek over this period varied from a minimum of 6.3 cfs in August to 56 cfs in December (Hydrosphere Data Products 1993b).

Rock Creek has been diverted by the City of Kent since the 1950s for use as a municipal water source. The diversion by the City of Kent represents approximately 26% of the mean annual flow of the Creek and the majority of the creek's flow during the low-flow months of September and October (King County Department of Public Works 1993). The existing diversion structure, referred to as the Clark Springs Facility, was built in the 1950s and consists of a lateral gravity drainage collection system installed 13 to 15 ft. below ground surface in the Rock Creek alluvium.

Site Drainage Features

The Site itself has only ephemeral drainages which discharge during prolonged or intense periods of rainfall. The southern portion of the Site drains towards Rock Creek and the northern half drains to the Cedar River. The generalized surface water flow patterns at the Site and the locations of major features are shown in Figure 7.



The lower elevations around the perimeter of the Study Area are covered by relatively permeable outwash sands and gravels at the land surface without defined drainage patterns. Rainfall is expected to readily infiltrate these materials. The elevated portions of the Site either have surface outcrops of bedrock or a thin veneer of glacial drift (till) which will inhibit infiltration relative to the permeable outwash deposits. In general then, surface water flow at the Site is expected to run-off the hills, collect in ephemeral drainages and flow to the lower elevations where it infiltrates into the outwash deposits and drains as groundwater towards Rock Creek or the Cedar River. Some run-off also flows into the trenches, depending on the local topography and drainage patterns. Run-off flowing into the trenches collects in several ephemeral pools where it infiltrates or evaporates.

Field reconnaissance by Golder Associates personnel confirmed ten wet areas within the trenches or immediate vicinity (Figures 7 and 8). Two of these consist of the mine portals #2 and #3. Water occurrence at these locations is expected to represent natural groundwater discharge. Another, pond within trench area #5 that is located just to the north of well LMW-1, had water present every time it was inspected. The other areas consist of localized pools which are ephemeral and have been observed to go dry during the months of June through November. These pools are not believed to represent groundwater, but rather are more accurately characterized as ephemeral pools of surface run-off which flows into the trenches and into low areas due to local topography and is then temporarily retained.

The water present at portal #2 sometimes occurs as a pool that is completely retained and enclosed as a shallow depression. Drainage from portal #2 at the north end of the mine was reported during earlier investigations by Ecology and Environment in February 1991, but was not observed by Golder Associates at any time during the RI. Portal #3 occurs as seepage where water emanates along a sloping seepage face, flows along the ground surface for a short distance, and gradually re-infiltrates back into surficial soils. Surface water run-off from portal #3 was never observed to extend beyond the Kent-Kangley Rd. Flow rates measured at the portal during this RI varied from about 2 gpm to 100 gpm with the minimum flow occurring in late summer and the maximum flow occurring in winter.

Other localized pools or shallow ponds also occur in the Study Area. These are shown in Figures 7 and 8. One is located along the southwest side of the hill located to the east of the trenches. This pond is perennial and is located along one of the major ephemeral drainages at the Site. Discharge from the pond occurs through a culvert which passes beneath the adjacent gravel road. Discharge through the culvert apparently ceases during the summer months. Two other shallow ponds, which are also associated with the major ephemeral drainages at the Site are present along the north side of this hill. Miscellaneous occurrences of standing water at the higher elevations are common in the wetter months.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.



The Remediation Project will not require any work over, in or adjacent (within 200 feet) to either the Cedar River or Rock Creek and as such a Shoreline Permit is not anticipated.

During construction of the remedial action, means of restricting access to the waters discharging from Portal's #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.

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

The Remediation Project involves the backfilling of the subsidence trenches and the construction of a low permeability cap over the constructed backfill. Although sources for the backfill and low permeability cap are not finalized, suitable clean on-Site and off-Site sources of material may be used to backfill the trenches and construct the low permeability cap. The potential on-Site source materials consist of waste rock and coal refuse that was produced from the portals and mine operations at the Frasier, Rogers and Landsburg coal seams. Approximately 60,000 cubic yards of fill material may be required for areas 7, 8, and 9 of the Remediation Project. Several small wetland areas created by past mining operations occur within the potentially contaminated portion of the subsidence trenches and in several cases are small wetland areas sitting on top of landfill waste. These small wetlands within the waste disposal trenches are isolated from surface waters and infiltrate only into the groundwater or evaporate into the atmosphere. These small wetland areas will be backfilled as part of the Remediation Project. These areas are shown on Figure 8. No other surface water or wetland areas would be affected by placement or removal of fill material. The major wetland area identified by the King County Sensitive Area map (Figure 10) is south of the Remediation Project Site is outside the cleanup action and support areas and will not be impacted by remediation construction activities.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

No surface water withdrawals or diversions will be required for the Remediation Project.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

The Remediation Project Site occurs above the 100-year flood plain.

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

No waste materials will be discharged to surface waters.



b. Ground:

1) Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities if known.

It is currently anticipated that groundwater will not be withdrawn as part of the Remediation Project. Water used for dust suppression/control will be from off-Site sources. However routine groundwater monitoring will be performed and in the unlikely event that groundwater contamination should be detected at levels above MTCA Method B cleanup levels, a contingency groundwater treatment system would be implemented that would withdraw groundwater at a rate that would prevent off-Site migration of contaminants and would treat (as necessary) the groundwater prior to discharge to an existing Metro sewer. The contingency groundwater treatment system is presented in the Contingency Groundwater Treatment Plan (Exhibit E, Part C). The anticipated withdrawal rate varies from 10 gpm to approximately 40 gpm. Treated groundwater would be sampled prior to discharge to the Metro sewer system. Contingency groundwater extraction and treatment would continue until groundwater at the points of compliance meets MTCA Method B cleanup levels. The compliance monitoring frequency of treatment system inflow and outflow, in the event that the contingency groundwater extraction and treatment system is implemented, will be determined by the Metro discharge permit.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals...; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

No waste material will be discharged from septic tanks.

Areas 7, 8, and 9 of the subsidence trenches will be filled with approximately 60,000 yd³ of clean fill soils/materials. These clean fill soils/materials may be obtained from off-Site imported sources or from borrow areas on the Site that currently contain fill soils/materials from the former coal mining operations.

c. Water runoff (including stormwater):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

All surface runoff is from precipitation events and/or groundwater seeps and springs in the area affected by the Remediation Project. The trench areas 7, 8 and 9 to be backfilled and capped (see Figure 5) would be graded to provide proper stormwater drainage. At the present time, runoff from the area surrounding the trenches flows into the trenches. Thus, backfill of the trenches and grading would decrease the stormwater flow into the trenches, and thereby significantly decrease the infiltration even without a cap.



Final ditch configurations, locations, and details would be determined using standard hydraulic design methods as part of final engineering design. It is anticipated that drainage ditches will discharge to engineered stormwater retention/detention and/or infiltration facilities.

If on-Site materials are used for trench backfill or cap materials, the borrow areas will be disturbed during excavation and removal of the fill soils/materials. Excavation will be bermed to control water runoff and erosion during the excavation. After the subsidence trenches are filled in accordance with the Landsburg Mine Cleanup Action Plan, any on-Site borrow areas will be graded and blended to conform with the natural topography and stabilized with revegetation.

2) Could waste materials enter ground or surface waters? If so, generally describe.

Backfilling the trenches could increase the load on the buried drums in the bottom of the trenches and thus creates the potential for collapse of any intact drums that may be in the trenches. However, because the drums have now been in place for over 40 years, significant stable bridging has possibly occurred that would prevent rapid loading collapse. Drum rupture induced by such loading, if it were to occur, would be expected to occur quickly. Drum rupture, should it occur, would not impact surface waters because a chemical release from the drums would be within the mine trenches, but could migrate vertically to underlying groundwater. As an additional precautionary measure, a period of groundwater "Protection Monitoring" during and after completion of backfill has been included in the short-term groundwater-monitoring program to address the possibility of intact drum collapse leading to release of chemicals to groundwater. In addition, surrounding soil would provide containment and some adsorption of any released liquid. Therefore, drum failure would not necessarily lead to groundwater impacts.

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). Monitoring wells included in the short-term protection groundwater monitoring program consist of the 10 existing wells LMW-2 through LMW-11. 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 confirmation sampling test parameters will be expanded on a monthly basis to include total petroleum hydrocarbons (TPH) and volatile organic compounds (VOCs). Other 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.

Long-term confirmational groundwater monitoring 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.

d. Proposed measures to reduce or control surface, ground, and runoff water impacts, if any:

Surface water controls, in particular, controls to reduce surface runoff into the subsidence trenches are an integral part of the remedial design for the Site. As described above, drainage ditches would be constructed at the margins of the cap to intercept surface runoff and convey it away from the backfilled trenches. Surface water diversion structures will discharge to the permeable recessional outwash sands and gravels at the north portal areas or into a newly constructed stormwater pond in the same area.

Long-term compliance monitoring is proposed for the Remediation Project to evaluate groundwater impacts that are attributable to contamination by waste materials. As prescribed in the Cleanup Action Plan, if groundwater emanating from the Site becomes impacted, the contingent groundwater extraction and treatment system will be installed and operated to eliminate impacted groundwater from migrating off-site.

4. Plants

a. Check or circle types of vegetation found on the site: deciduous tree: <u>alder</u>, <u>maple</u>, aspen, other: evergreen tree: <u>fir</u>, <u>cedar</u>, pine, other: shrubs, <u>grass</u> pasture: crop or grain: <u>None</u> wet soil plants: <u>cattail</u>, buttercup, bullrush, skunk cabbage, other water plants: water lily, eelgrass, milfoil, other other types of vegetation

Dense vegetation covers a majority of the Site and includes blackberry, alder, cedar, hemlock, cottonwood, maple and fir. Vegetation is sparse in certain areas, primarily associated with areas of recent activity, and roads and coal mine waste rock piles where the rocky conditions and poor soil development retards plant development.

b. What kind and amount of vegetation will be removed or altered?

Outside the trenches, the ground surface would be cleared and grubbed to remove organic debris for vehicle/equipment access during the Remediation Project. The topsoil would be stockpiled for use in the vegetative cover layer of the cap. In the trenches, trees and large brush would be removed to prevent vertical transmissive zones through the backfill, when the trees eventually decay. Removal would also prevent excessive settlement of the backfill, which might occur if backfill is placed on a "mat" of trees and brush. Vegetation will also be removed for removal of borrow source materials (if on-Site materials are used for backfill and cap), construction of the haul road and at a staging area adjacent to the trenches for



placement of the materials. All areas affected by the construction operation will be reseeded and replanted following the construction operations. Once the vegetation has been reestablished by seeding and replanting, the total percentage of vegetative covered area should not be decreased from pre-Remediation Project conditions.

c. List threatened or endangered species known to be on or near the site.

The United States Fish and Wildlife Service (USFWS) did not identify any plant species as threatened or endangered near the Study Area. The USFWS of Western Washington identified golden paintbrush as a listed threatened/endangered plant species for King County, however it is unknown whether this plant is located within the Study Area. The search area for this determination represented an approximately one mile search radius extending from the Study Area and included Sections 23 to 26 of Township 22 North, Range 06 East, and Sections 19 and 20 of Township 22 North, Range 07 East.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

Vegetative cover is an integral part of the engineering design for the low permeability cap that will be constructed over the subsidence trenches. The vegetative cover on the trench cap will, not jeopardize the integrity of the cap. Reseeding and replanting will also be completed as appropriate on all areas affected by the construction activities following the construction of the backfill and cap. The lower, flatter portions of the hill including potential on-Site material source areas and the cap will be reseeded as appropriate with suitable vegetation. Affected areas on the hillside as well as areas adjacent to the capped trenches will also be replanted.

5. Animals

a. Circle any birds and animals that have been observed on or near the site or are known to be on or near the site:

birds: <u>hawk</u>, heron, <u>eagle</u>, <u>songbirds</u>, other: mammals: <u>deer</u>, bear, <u>elk</u>, beaver, other: fish: bass, <u>salmon</u>, <u>trout</u>, herring, shellfish, other:

b. List any threatened or endangered species known to be on or near the site.

Endangered and threatened species are categorized as listed, proposed, and candidate. Listed endangered species are defined as those species known to be experiencing or that have experienced failing or declining populations due to factors such as limited numbers, disease, predation, exploitation, or loss of suitable habitat. Proposed endangered species are under consideration for protection. Candidate species are species that may be proposed and listed in the future.

The USFWS did not identify any listed endangered or threatened species sighted near the Study Area. The search area for this determination represented an approximately one mile search radius extending



from the Study Area and included Sections 23 to 26 of Township 22 North, Range 06 East, and Sections 19 and 20 of Township 22 North, Range 07 East. Listed threatened and endangered species in King County include bull trout, Canada lynx, gray wolf, grizzly bear, marbled murrelet, and northern spotted owl. It is believed that none of these species are present in the Study Area; however some species (spotted owl and bull trout) may be located nearby the Study Area in the Cedar River watershed.

The USFWS did not identify any proposed species in the Study Area vicinity; however, the Washington Department of Fish and Wildlife has the bald eagle listed as a sensitive species of concern. Several candidate species were also identified by the USFWS as potentially occurring in the Study Area. These include the Oregon spotted frog and the yellow-billed cuckoo. A number of species of concern reside in King County, some of which may be located within the Study Area. The list of species of concern can be obtained from the USFWS (http://www.fws.gov/wafwo/speciesmap/KING.html).

c. Is the site part of a migration route? If so, explain.

No evidence of the Site being part of a migration route was noted during the multi-year investigations that have been carried out at the Site. Salmonids are known to migrate up the Cedar River for spawning, but this does not occur on the Site.

d. Proposed measures to preserve or enhance wildlife, if any:

The long-term conditions at the Site for wildlife should remain similar to current conditions at the Site. Short-term impacts to wildlife (primarily temporary displacement) will result during the actual construction of the Remediation Project. Again, the Remediation Project provides an overall, long-term net benefit to wildlife due to the removal of potential exposure pathways for hazardous chemicals and by eliminating a portion of the subsidence trenches that may currently impact migration in and around the local area.

6. Energy and natural resources

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

A source of energy is currently not anticipated once construction at the Site has been completed. Portable generators and equipment will be used during construction and subsequently during routine maintenance and monitoring activities.

Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.
 The Remediation Project will not affect the potential use of solar energy by adjacent properties.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

Not applicable. No energy impacts are currently anticipated.



7. Environmental health

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.

The selected remedial option for the Site is inherently designed to reduce the possibility of long-term human and environmental exposure to toxic and hazardous substances. The selected remedy of backfill and capping provides an additional benefit of lower potential short-term exposure for workers and surrounding communities over other remedial options such as excavation and off-Site haulage of the hazardous waste.

1) Describe special emergency services that might be required.

Potential emergency services required for the Remediation Project are consistent with those required for other construction and remediation projects. No special emergency services are anticipated for the Remediation Project. Local hospital medical personnel will be contacted and briefed prior to the Remediation Project. Work will be conducted in accordance with a Site Health and Safety Plan which will be established prior to construction activities. All personnel on Site will be briefed on the location of medical services and will be required to participate in on-Site health and safety meetings that are designed to emphasize worker and environmental safety.

2) Proposed measures to reduce or control environmental health hazards, if any:

The Remediation Project will be performed under a Health and Safety Plan by workers that are properly trained for hazardous waste work. A specific worker and environmental monitoring program will be implemented during the construction activities. Specific actions levels will be established in the Health and Safety Plan that will require protective clothing and respiratory protection for workers once these levels are reached.

b. Noise

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

Current noise levels in the area are consistent with a rural relatively undeveloped area. Local traffic and other currently existing noises will not affect the Remediation Project.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.

No additional noise will be created by the Remediation Project on a long-term basis. Short-term construction activities will produce noise similar to that of most earth excavation/ construction activities. These construction activities are not anticipated to occur for a period in excess of 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 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.

3) Proposed measures to reduce or control noise impacts, if any:

A specific work schedule will be maintained that will confine any noise impacts to surrounding properties to daylight hours. All equipment will be properly maintained and equipped with suitable mufflers and other sound suppression equipment. Off-Site noise impacts will be routinely evaluated during the Remediation Project.

8. Land and shoreline use

a. What is the current use of the site and adjacent properties?

A portion of the Site has been used for forestry practices; however the majority of the Site including the subsidence trenches is a closed coal mining operation that was partially used for waste disposal for a brief period of time in the past, but has not had active use for several decades. Adjacent properties are used for forestry and low-density rural housing.

b. Has the site been used for agriculture? If so, describe.

The Site has not been used for agriculture. The Site has historically been used for mineral extraction and forestry.

c. Describe any structures on the site.

The only remaining structure left on the Site is a wood frame structure that was used as a changing/shower room for the miners as they came on and off their shifts. The building is located to the south of the Rogers Seam south portal (Portal #3).

d. Will any structures be demolished? If so, what?

The structure will not be demolished or impacted by the remediation activities.

e. What is the current zoning classification of the site?

The Study Area zoning was determined by reviewing zoning maps at the King County Department of Development and Land Services. The zoning codes from the maps were updated to reflect the new Title 21A Zoning Code adopted in June 1993 and revised in 2009. The Site zoning is shown on Figure 9. In



general, zoning in the Study Area vicinity is intended to protect the forest resources of the area, to encourage moderate rural development and to protect water quality in the Cedar River and Rock Creek watersheds.

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, Rural Area Zone classification. This zoning, formerly classified as G-5 under KCC Title 21, indicates that land use will maintain an area-wide rural character, will prevent urban developments in areas without adequate urban services, preserve environmentally sensitive areas, and minimize land use conflicts with nearby agricultural, forest, or mineral extraction production districts. In addition, permitted uses will limit residential density to be compatible with rural character and which can be supported by rural service levels.

In addition, to these zoning classifications, the City of Kent and City of Seattle maintain municipal watershed lands along the western and eastern boundaries of the Study Area, respectively, for the protection of drinking water supplies associated with Rock Creek and the Cedar River.

f. What is the current comprehensive plan designation of the site?

The current comprehensive plan for the Site is RA-5, Rural Area Zone classification.

g. If applicable, what is the current shoreline master program designation of the site?

Under the Shoreline Management Plan of King County, the Cedar River shoreline throughout the Study Area vicinity has been designated a "Conservancy" environment. The Conservancy designation objective is to conserve, protect and manage existing areas of irreplaceable natural or aesthetic features in their native state while providing for limited shoreline use at public sites (King County Dept. of Public Works 1993). The Conservancy designation for the Cedar River extends from river mile 3.4 to the river's headwaters. The Remediation Project Site is located approximately 1,000 ft. south of the Cedar River.

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.

Sensitive areas as defined by the King County Sensitive Areas Ordinance (Ordinance 9614) consist of land areas described as environmentally sensitive or that are subject to natural hazards, and lands that support unique, fragile, or valuable natural features. These areas include wetlands, areas prone to stream and flood hazards, erosion hazards, seismic hazards, and coal mine hazards. The purpose of the Sensitive Areas Ordinance was to implement the goals and policies of the Washington State Environmental Policy Act and the King County Comprehensive Plan which call for protection of the natural environment and the public health and safety by establishing development standards to protect defined sensitive areas.



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.

Sensitive Areas Maps based on the ordinance from King County were reviewed to determine what sensitive areas exist within the Study Area. These areas are shown on Figure 10.

A wetland area is defined as being inundated or saturated by ground or surface water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Small isolated wetlands have developed within the trenches. The area of all wetlands within the trenches is less than 0.1 acre. Water from wetlands within the trenches either evaporates or infiltrates to groundwater. Several small potential wetland areas exist adjacent to the trenches outside of the fenced trench area (Figure 8). Construction activities will avoid and not impact these potential wetland areas outside the security fence. There is a wetland area within the southern Study Area boundary identified in the King County Sensitive Areas map. This wetland is shown on Figure 10 and is a potential tributary of Rock Creek. This area is also depicted on the Washington WDW priority habitat and species map as a palustrine (swampy) environment that is part of the Cedar River wetlands. Currently, a number of residences are situated within this area. This wetland is located over 1,000 ft. from the trenches.

Streams are considered sensitive areas because of their esthetic values, their ability to provide recreation, support wildlife, and moderate 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 under the King County Management Plan. Portions of the Cedar River Basin are designated as Regionally Significant Resource Areas (RSRA) by the Watershed Management Committee - Proposed Lower Cedar River Basin (King County Code Title 20.14.070).

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. The creek is ephemeral to the east of where it crosses beneath the S.E. Kent-Kangley Road. The King County Department of Transportation replaced the old pipe culverts with a large box culvert under S.E. Kent-Kangley Road during the summer of 2012.

Erosion hazards areas are described as areas where soils are susceptible to erosion as a result of development. Factors affecting erosion include the physical and chemical characteristics of the soil, the presence or absence of vegetative cover, slope length and gradient, the intensity of rainfall and velocity of runoff. Two large areas of the Site are described as susceptible to erosion. The first 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 eastern Study Area boundary. These areas are shown in Figure 10.



Landslide hazard maps delineate areas where the topographic and geologic conditions indicate a potential for hill-slope failure. There are no landslide hazard areas identified for the Site. Seismic hazards are defined as areas subject to severe risk of earthquake damage as a result of seismically induced settlement or soil liquefaction. There are no such potential areas identified at the Site.

Coal mine hazard areas are mapped because of their potential for gradual or sudden collapse of underground mine workings leading to surface ground failure. Surficial ground collapse can cause damage to structures, as well as personal injury. Additional risk may be posed by the presence of unstable mine spoils piles that are subject to failure. As expected, the portions of the Site where coal removal occurred are mapped as coal mine hazard areas. These are shown in Figure 10.

i. Approximately how many people would reside or work in the completed project?

No new residences are proposed as a part of the Remediation Project. Following completion of the Remediation Project, workers would only visit the Site on an infrequent basis for routine maintenance and monitoring.

j. Approximately how many people would the completed project displace?

No one would be displaced by the Remediation Project at the Site.

k. Proposed measures to avoid or reduce displacement impacts, if any:

No displacement impacts are anticipated from this Remediation Project.

I. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

Under the selected remedy, contaminated material will remain on-Site. Under WAC 173-340-440(1)(a) institutional controls are therefore required. Institutional controls are a key component of the alternatives for maintaining long-term effectiveness of the Remediation Project.

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. Site use restrictions will prohibit using the Site for purposes incompatible with a waste disposal site. For the selected remedy, these restrictions will prohibit penetrating the cap and Site use that could damage the cap or significantly reduce its effectiveness. Warning signs would be used to provide notice of the presence of a waste site. Site use restrictions would remain in force indefinitely.

9. Housing



July 31, 2013

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

No housing units will be provided as a result of the Remediation Project.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

No housing units will be eliminated.

c. Proposed measures to reduce or control housing impacts, if any:

Under the selected remedy, contaminated material will remain on-Site. Under WAC 173-340-440(1)(a) institutional controls are therefore required. Institutional controls are a key component of the alternatives for maintaining long-term effectiveness of the Remediation Project.

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. Site use restrictions will prohibit using the Site for purposes incompatible with a waste disposal site. For the selected remedy, these restrictions will prohibit penetrating the cap and Site uses that could damage the cap or significantly reduce its effectiveness. Warning signs would be used to provide notice of the presence of a waste site. Site use restrictions would remain in force indefinitely.

Permanent fencing is not needed for capping alternatives because the trench backfill would 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.

Periodic Site inspections and maintenance of a cap, fencing, signs, and any other physical components of the institutional controls will be conducted until residual hazardous substance concentrations that are attributable to contamination by waste materials no longer exceed cleanup or remediation levels under MTCA.

10. Aesthetics

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

No structures will be constructed at the Site. The constructed backfill and cap will be constructed at approximate ground surface.

b. What views in the immediate vicinity would be altered or obstructed? No views will be altered.

c. Proposed measures to reduce or control aesthetic impacts, if any:



Construction activities associated with the placement of the backfill and construction of the lowpermeability cap might be visible from some parts of the property boundary for the duration of the construction phase. However, following construction and revegetation, the completed Remediation Project will not be visible from the property boundary.

11. Light and glare

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

No light or glare will be produced by the completed Remediation Project. Construction activities will be conducted during daylight hours and light augmentation is not anticipated.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

No light or glare will be produced by the completed Remediation Project.

c. What existing off-site sources of light or glare may affect your proposal?

No off-Site sources of light or glare have been identified that would affect the Remediation Project.

d. Proposed measures to reduce or control light and glare impacts, if any:

No light or glare impacts are anticipated for the Remediation Project . Construction operations will be conducted during daylight hours.

12. Recreation

a. What designated and informal recreational opportunities are in the immediate vicinity?

The Remediation Project Site is located on a fairly rural hilltop. Recreational opportunities in the immediate vicinity include activities on or along the Cedar River such as fishing as well as hunting, horseback riding and hiking.

b. Would the proposed project displace any existing recreational uses? If so, describe.

The completed Remediation Project should not displace any existing recreational users who obtain property owner permission to use the private property. The portion of the subsidence trenches used for past waste disposal is currently secured by a locked chain-link security fence and not made available for recreational use. During the period of construction activities at the trenches, access to the Site will be limited to authorized, health and safety-trained personnel. The locked fence surrounding the backfilled trenches would remain for a period of five years after construction of the cap.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:



The Site is private property owned by PCC and public recreational facilities do not currently exist and are not anticipated at the Site following completion of the Remediation Project.

13. Historic and cultural preservation

a. Are there any places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site? If so, generally describe.

There are no known places or objects listed on or proposed for national, state or local preservation registers on or adjacent to the Site.

b. Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site.

No landmarks or evidence of historic, archaeological, scientific or cultural importance were noted during the remedial investigation of the Site. The Site is primarily occupied by the remnants of mining (subsurface and surface) activities that occurred on three coal seams. A monument is erected on the southern end of the Landsburg seam to miners that perished in an underground mine disaster. The monument will not be disturbed by the Remediation Project.

c. Proposed measures to reduce or control impacts, if any:

No landmarks of historic, archaeological, scientific or cultural importance will be disturbed by the Remediation Project.

14. Transportation

a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any.

Public roads in the vicinity of the Site are shown on Figure 11. The Remediation Project will only require limited short-term access for construction workers during the limited remediation construction period. If off-Site fill material is imported to the Site, 50 to 60 trucks per day may be needed for delivery along public roads for a period of 100 to 120 days. Access to the Site is provided by the Summit-Landsburg Rd. on the northern side of the Remediation Project Site, by the Kent-Kangley Rd. on the southern side of the Remediation Project Site and SE 256th Street to the eastern side of the Remediation Project Site. Existing private, gravel roads will be used for access throughout the Site. These private roads will be improved as necessary to facilitate truck haulage.

b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?

Limited public transportation is available in some of the neighboring communities. The Remediation Project Site itself is not served by public transportation. Public transportation is not a requirement for the Remediation Project.



c. How many parking spaces would the completed project have? How many would the project eliminate?

Not applicable to this Remediation Project. No additional parking spaces will be required for the Remediation Project.

d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private).

Access to the Site is provided by the Summit-Landsburg Rd. on the northern side of the Remediation Project Site, by the S.E. Kent-Kangley Rd. on the southern side of the Remediation Project Site and SE 256th Street to the eastern side of the Remediation Project Site. Existing private, gravel roads will be used for access within the Site. These private gravel roads will be improved as necessary to facilitate truck haulage for either on-Site or off-Site sources of fill materials.

e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

Water, rail or air transportation does not occur in the immediate vicinity of the Remediation Project and is not required for the Remediation Project.

f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.

Not applicable to the Remediation Project. The completed Remediation Project will not generate any additional vehicular trips per day. The Site will only be routinely maintained and monitored.

g. Proposed measures to reduce or control transportation impacts, if any:

Short-term minimal impacts will occur for mobilization to and demobilization from the Remediation Project Site and for limited, short-term worker access. Carpooling of workers is anticipated and will be encouraged. Operations will primarily be carried out within the boundaries of the Remediation Project Site with only very limited truck haulage on public roads. There will be no long-term transportation impacts once the construction is completed.

15. Public services

a. Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe.

Not applicable to the Remediation Project. There will be no increased need for public services.

b. Proposed measures to reduce or control direct impacts on public services, if any.

Not applicable to the Remediation Project.



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16. Utilities

a. Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other.

Not applicable to the Remediation Project. The Site is rural undeveloped land with limited utilities (telephone, electricity) available at the northern and southern property boundaries.

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

Not applicable to the Remediation Project. No utilities are proposed at this time. The contingency groundwater treatment plan (if implementation is ever required) may require a minimal electric service (similar to a residential electric service) for operation of pumps and the treatment system.

C. SIGNATURE

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature:

Date Submitted:

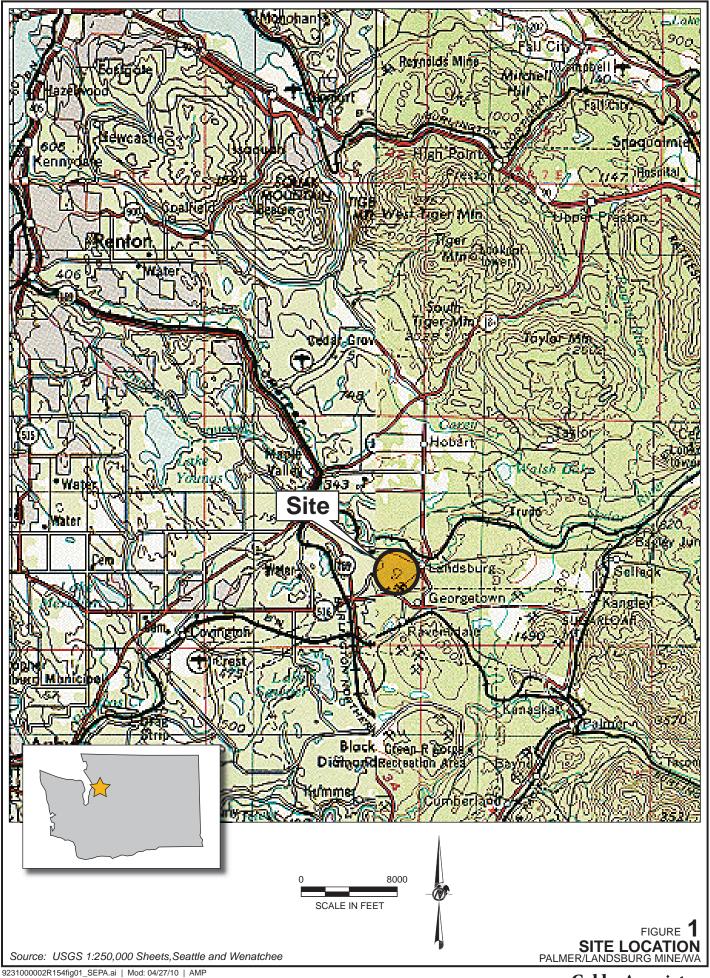


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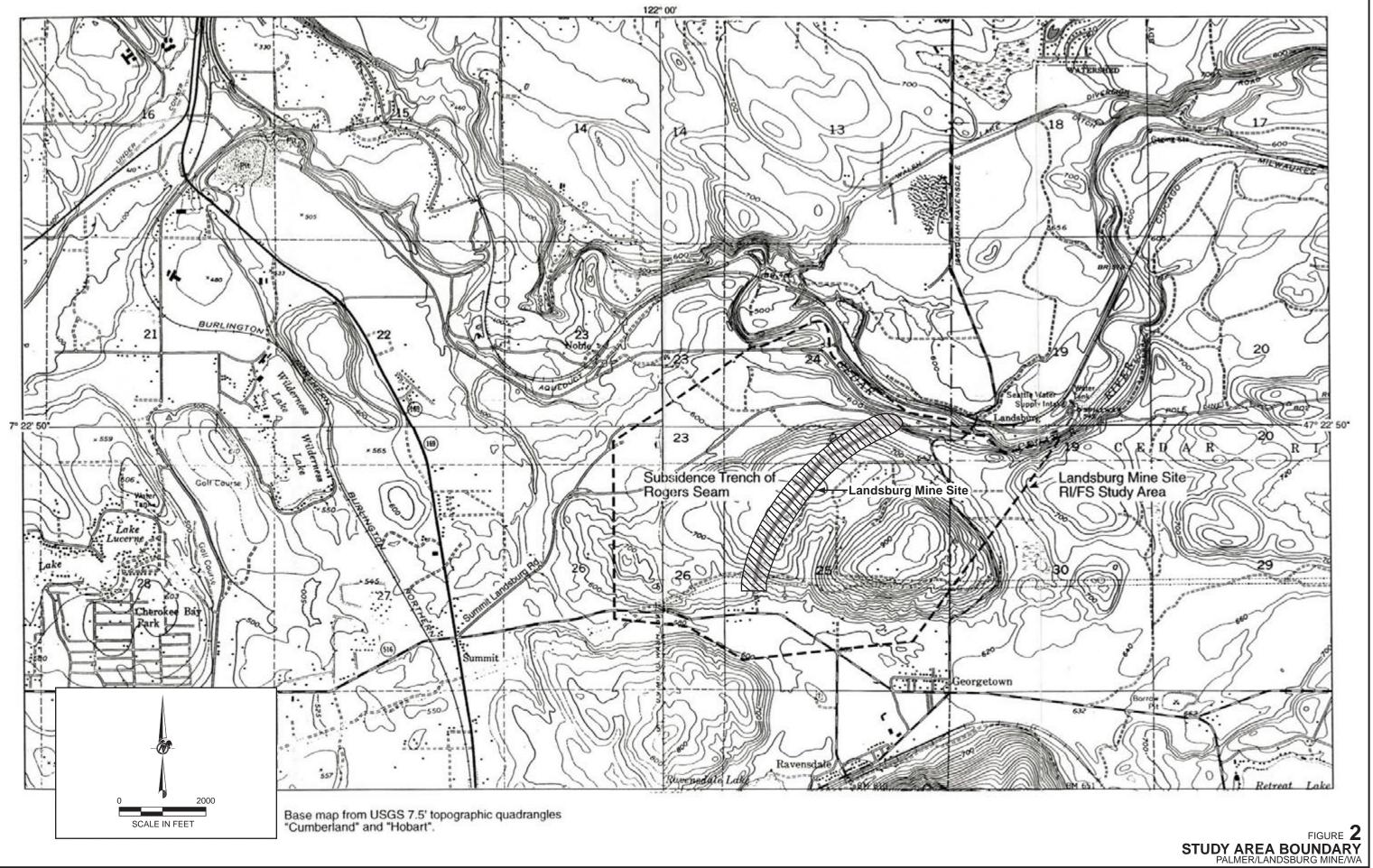
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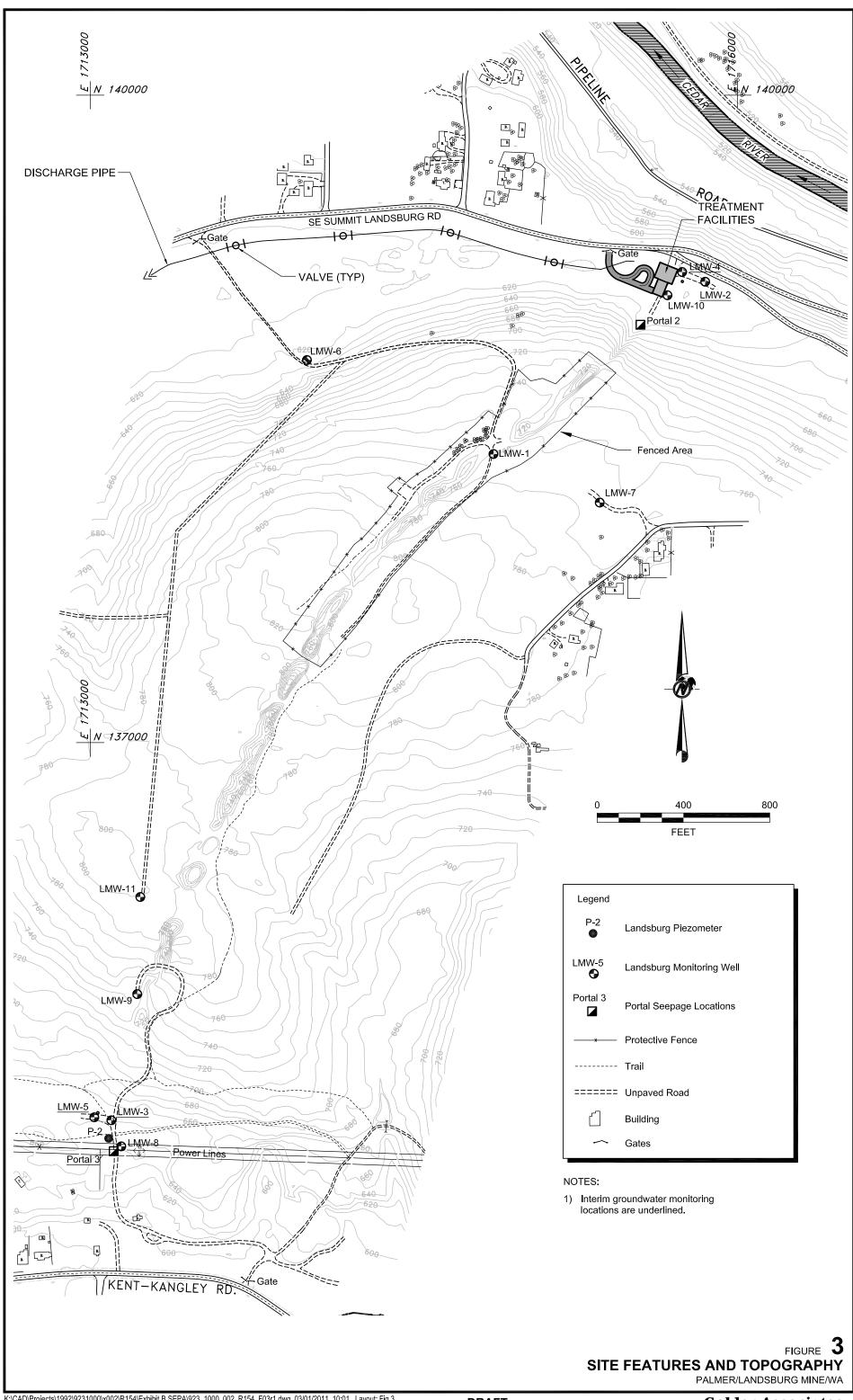


FIGURES

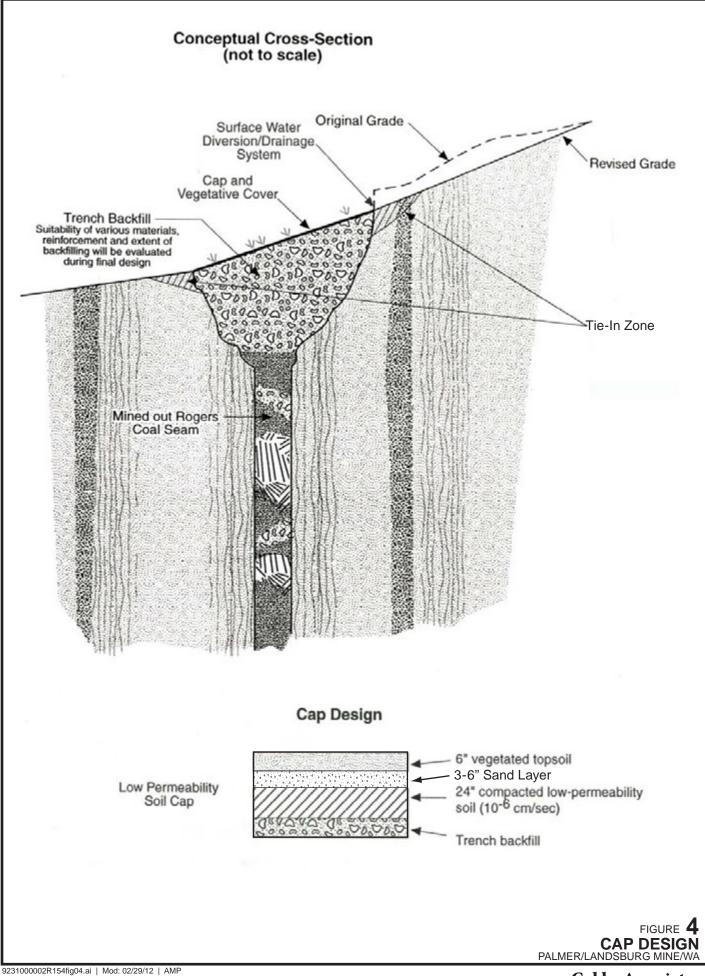


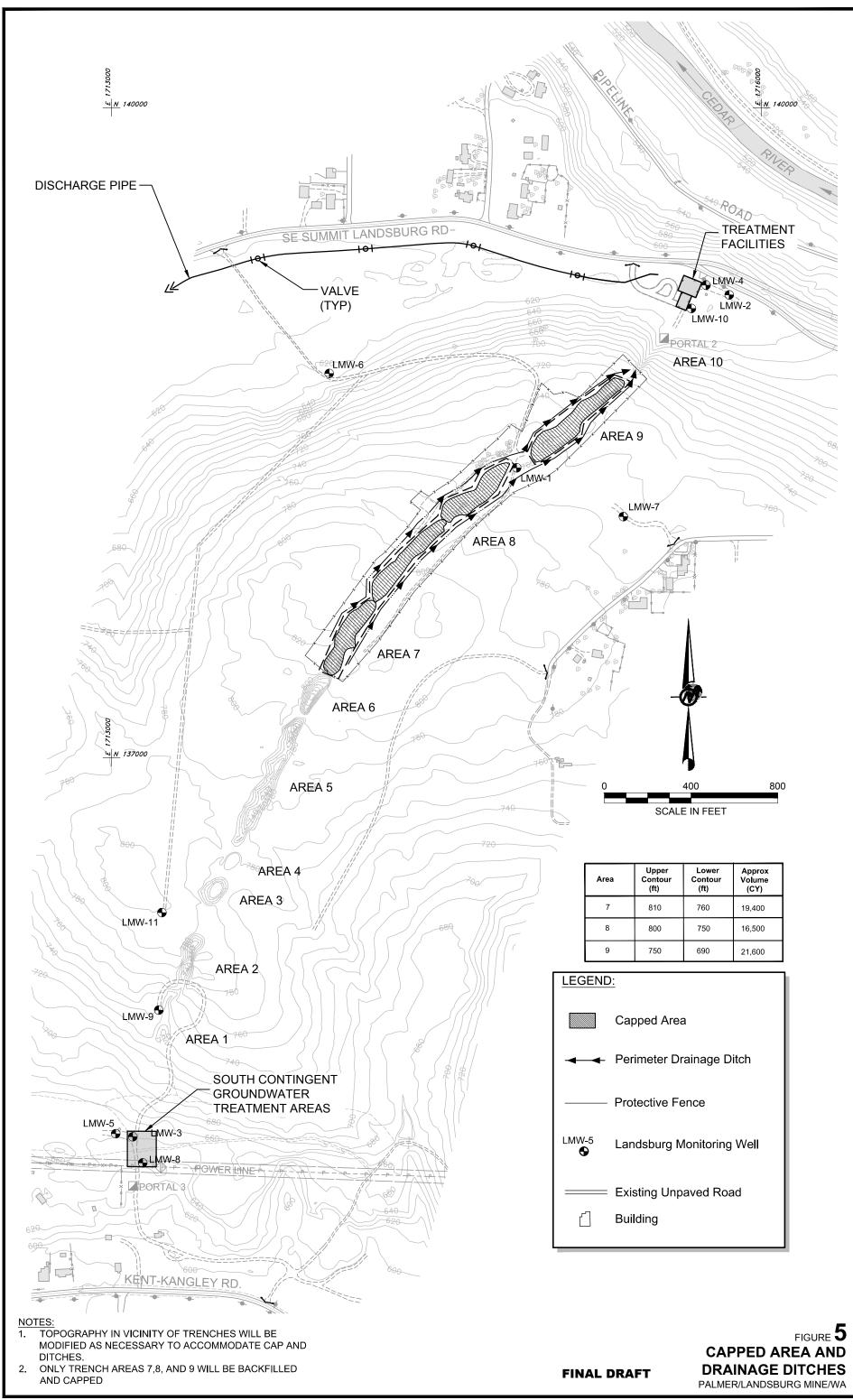
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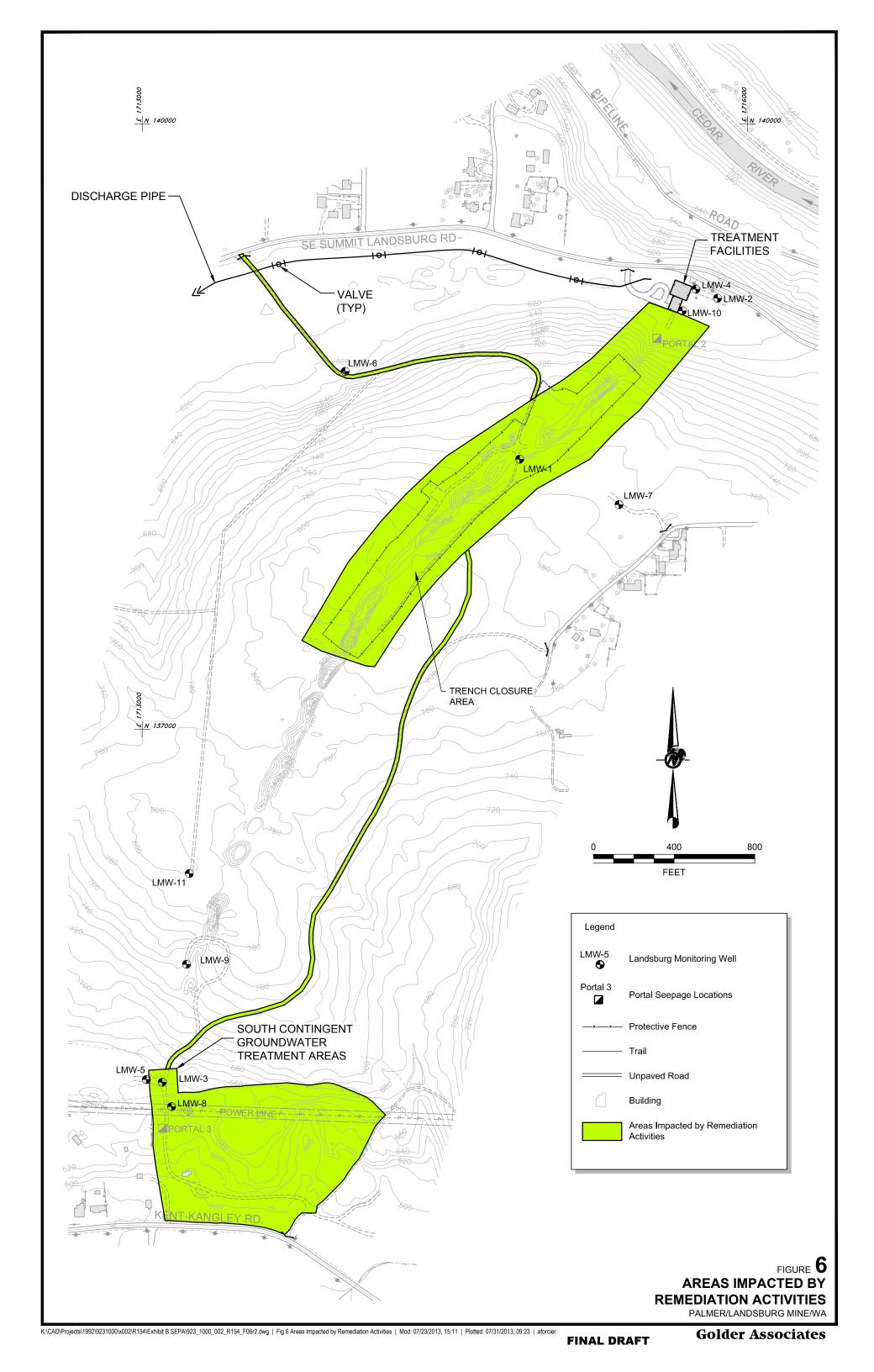


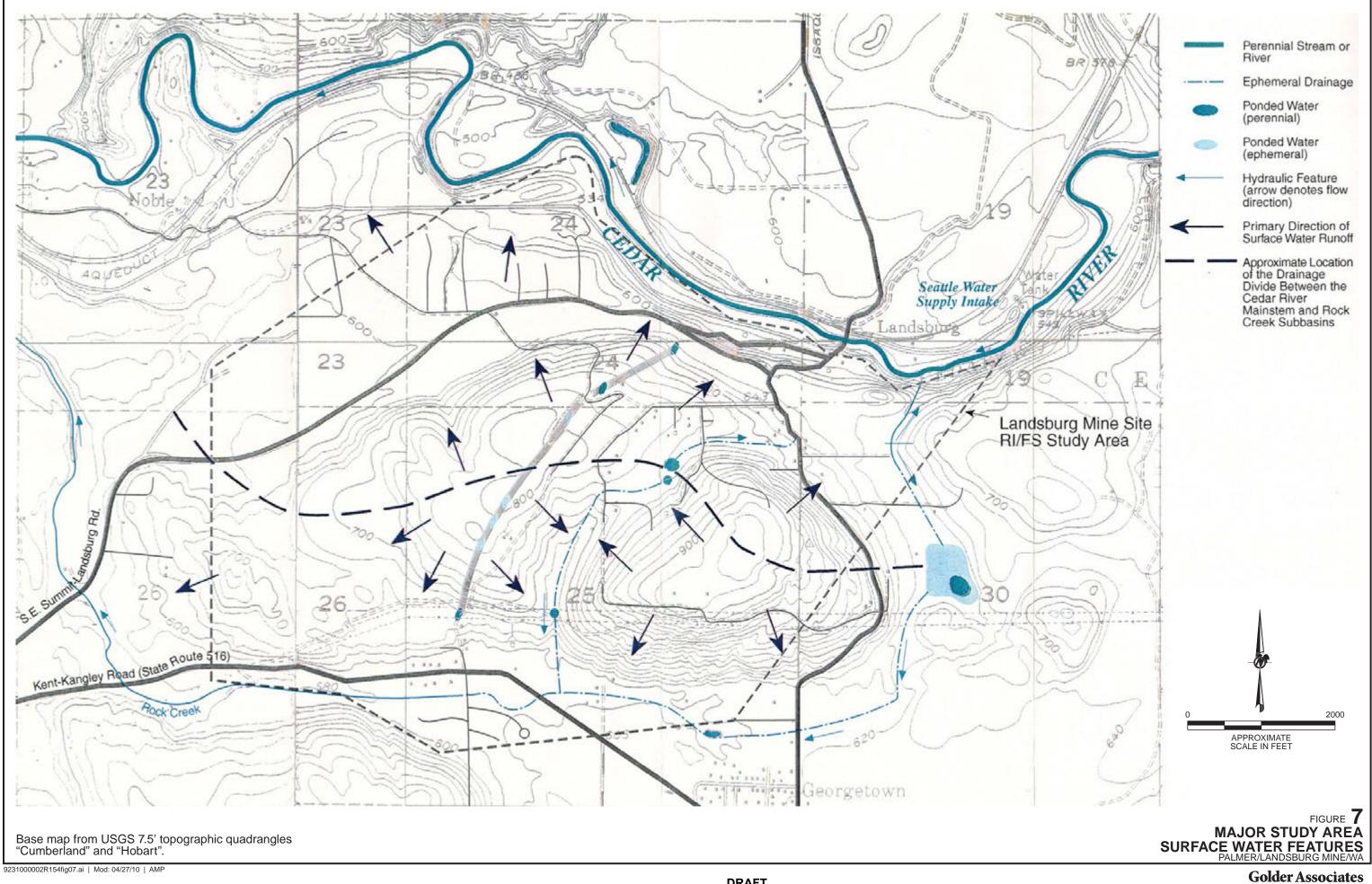
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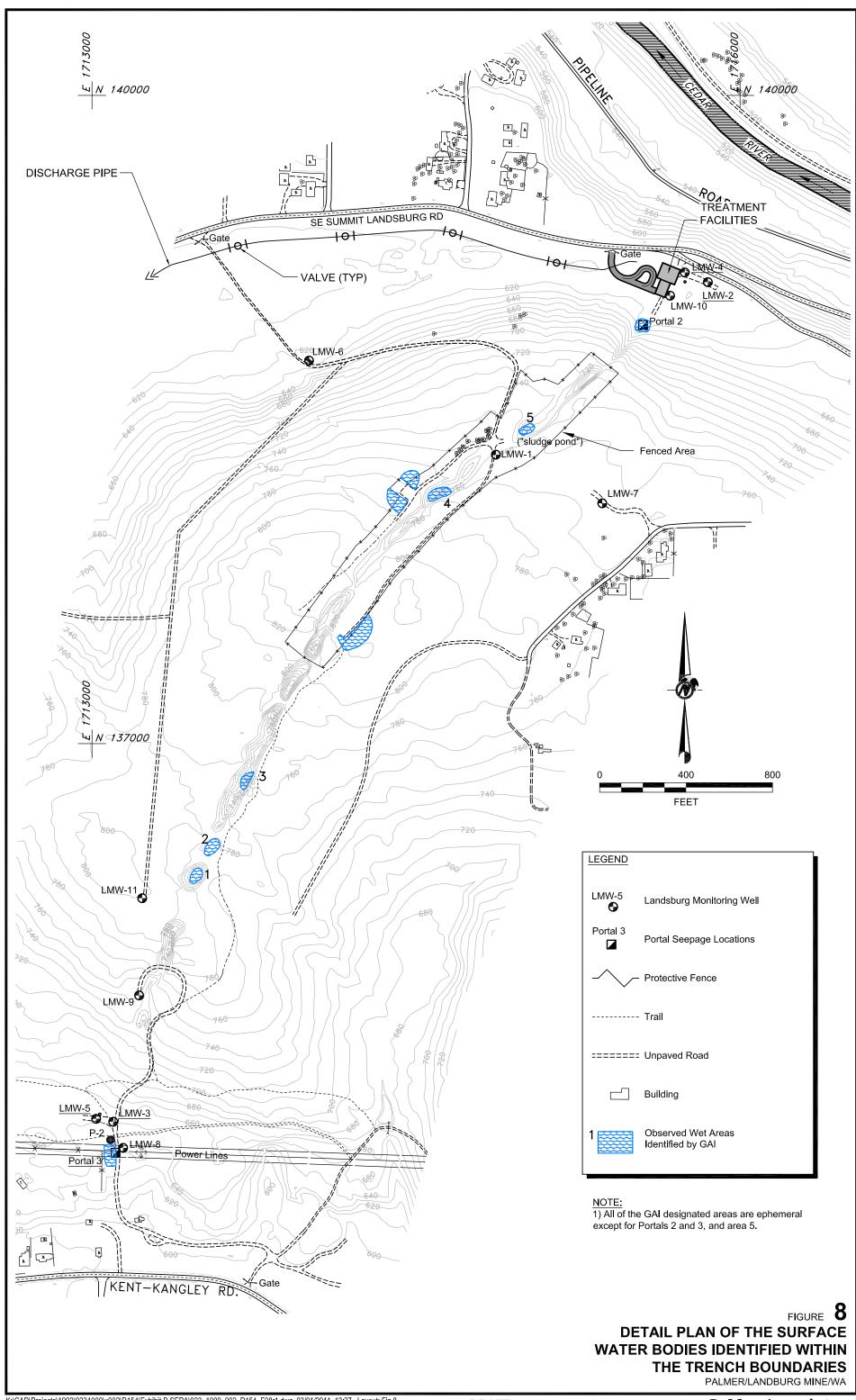




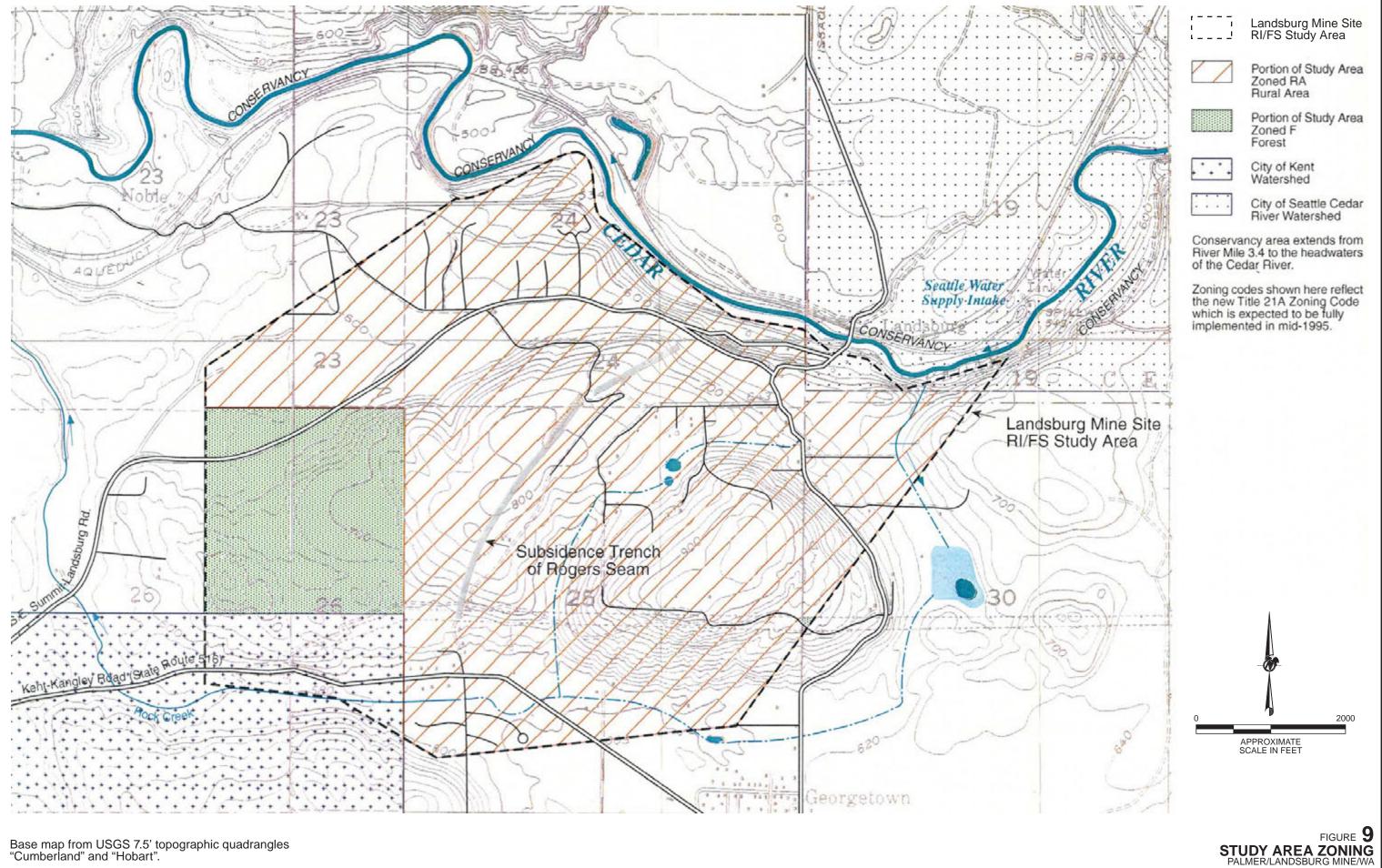
K:\CAD\Projects\1992\9231000\x002\R154\Exhibit E Introduction\923_1000_002_R154_F5r3.dwg | Fig 5 Capped Area and Drainage Ditches | Mod: 07/31/2013, 13:37 | Plotted: 07/31/2013, 14:25 | aforcier





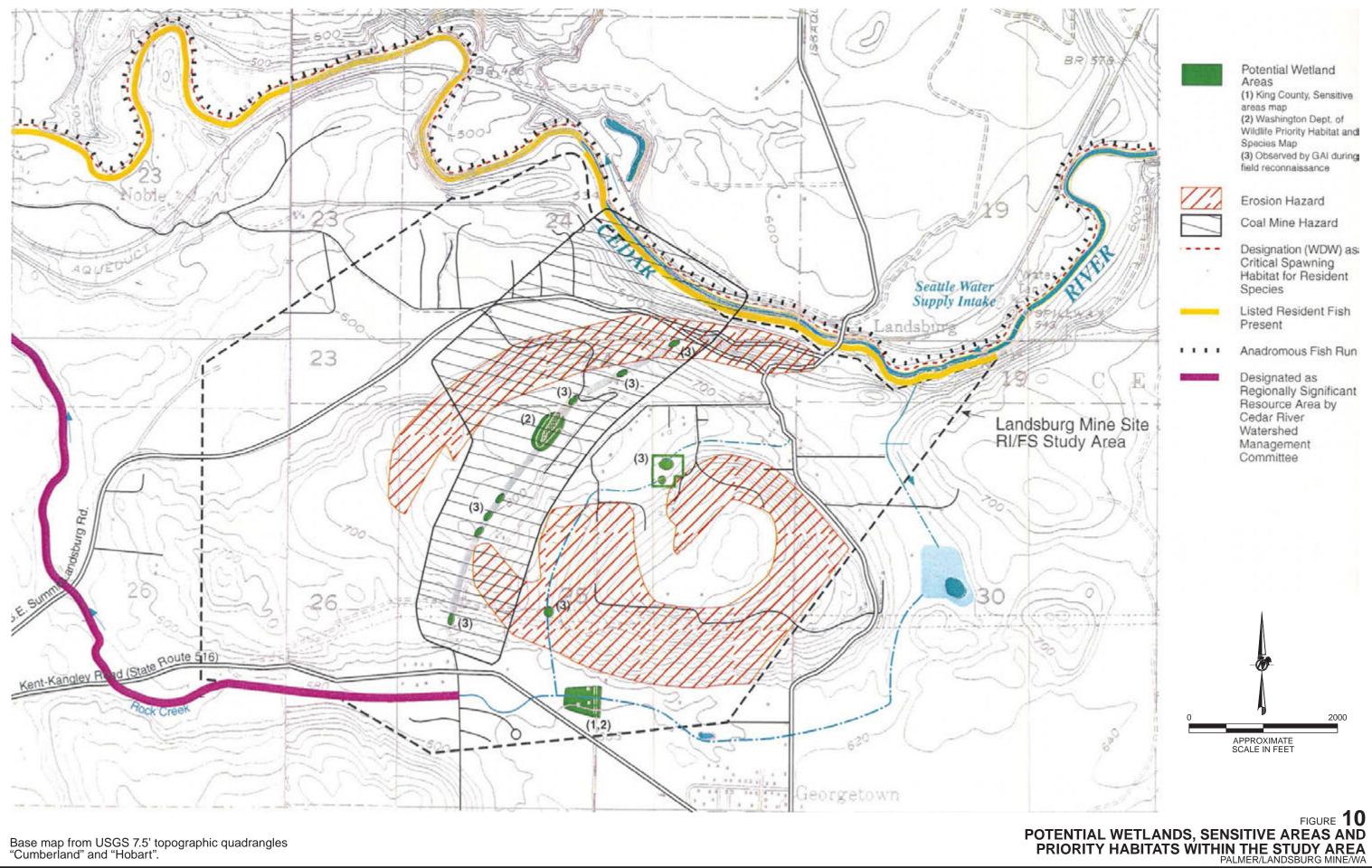


======= Unpaved Road	
E Building	
1 Observed Wet Areas Identified by GAI	
<u>NOTE:</u> 1) All of the GAI designated areas are ephemeral except for Portals 2 and 3, and area 5.	
FIGURE DETAIL PLAN OF THE SURFA WATER BODIES IDENTIFIED WIT THE TRENCH BOUNDAR PAI MER/LANDBURG MINI	ACE HIN IES



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

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

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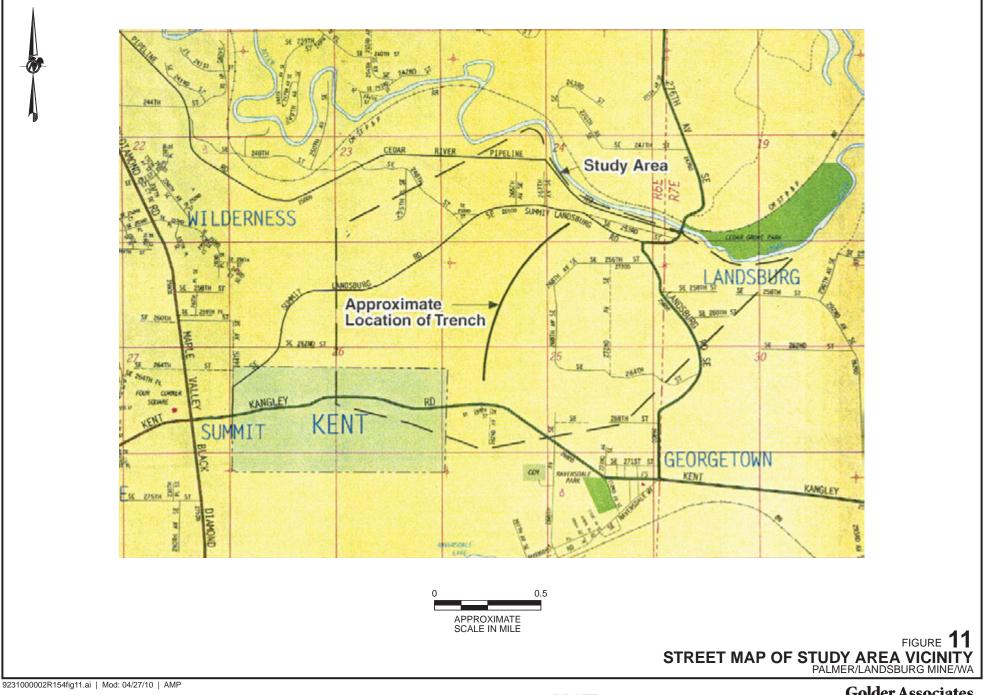


EXHIBIT C

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 Ecology approval of 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 approval of the Draft Cleanup Action Report.	
Record Environmental Covenant (Exhibit F to the Consent Decree)	Within 10 days of Ecology's approval of As-Built Drawings	

Exhibit C – Schedule

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 E - Part A to the Consent Decree)	
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 E – Part B to the Consent Decree)	
Install and operate Contingent Groundwater Extraction and Treatment System (Exhibit E – Part C to the Consent Decree)	If contingent treatment system is deemed necessary under Compliance Monitoring Plan (Exhibit E – 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 E – Part A to the Consent Decree)
Progress Reports	As provided in Section XI of Consent Decree (monthly during construction, then as provided in Exhibit E, Part A (Compliance Monitoring Program)	

EXHIBIT D

PUBLIC PARTICIPATION PLAN



PUBLIC PARTICIPATION PLAN

LANDSBURG MINE SITE

RAVENSDALE, WASHINGTON

Prepared by Harris and Smith Public Affairs 3820 S. Ferdinand Street Seattle Washington 98118

for the

Washington State Department of Ecology 3190 160th Avenue SE Bellevue, WA 98008-5452

February 2013

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I. Introduction

The Washington State Department of Ecology (Ecology) has developed this Public Participation Plan in cooperation with the currently identified potentially liable parties (PLPs), according to the Model Toxics Control Act (MTCA) to promote meaningful community involvement during the cleanup action phase of the Landsburg mine site in Ravensdale, Washington. The PLPs for the Landsburg Site are: Palmer Coking Coal Company, LLP; PACCAR Inc; Plum Creek Timberlands Company, L.P.; Browning-Ferris Industries of Illinois, Inc.; TOC Holdings Co.; and the BNSF Railway Company.

The Public Participation Plan outlines and describes the tools that Ecology uses to inform the public about cleanup activities and identifies opportunities for the community to become involved as the cleanup is implemented.

In 1993, Ecology and the PLPs prepared a Public Participation Plan for the Landsburg Mine site that addressed public participation for remedial investigation and feasibility study phase of the cleanup project. In 2010, we have prepared this Public Participation Plan to address public participation during cleanup activities at the site.

II. Goals and Objectives of the Public Participation Plan

The goal of this plan is to identify communication channels and ways to solicit community involvement in order to allow the community to participate in a meaningful way in the decision-making processes during investigation and cleanup of the site.

The main objectives of this plan are to:

- Provide information and promote public understanding of the cleanup process.
- To facilitate and encourage open communication between the community, Ecology, other agencies and the potentially liable persons (PLPs).
- Invite and encourage interaction and collaboration among representatives of the community, Ecology and the PLPs.
- Solicit and respond to community concerns, questions and comments.

Roles and Responsibilities

Public participation activities for the Landsburg Mine site are being coordinated among Ecology and the PLPs. Ecology maintains overall responsibility and approval authority in accordance with MTCA requirements. Ecology, with participation of the PLPs, conducts public outreach activities, including soliciting, receiving and considering comments, making final decisions, and preparing responsiveness summaries.

III. Model Toxic Control Act (MTCA) Cleanup Process

1. **Site Discovery and Initial Investigation:** Sites may be discovered in a variety of ways, including reports from the owner, an employee or concerned citizens. Following discovery,

an initial investigation is conducted to determine whether or not a site warrants further investigation.

- 2. **Site Hazard Assessment and Hazard Ranking:** This assessment is conducted to confirm the presence of hazardous substances and to determine the relative threat the site poses to human health and the environment. Sites then are ranked from 1 (highest) to 5 (lowest).
- 3. **Remedial Investigation:** A Remedial Investigation is a study to define the nature, extent and magnitude of contamination at a site. Before a remedial investigation can be conducted, a detailed work plan must be prepared which describes how the investigation work will be done.
- 4. **Feasibility Study:** The Feasibility Study takes the information from the Remedial Investigation and identifies and analyzes the cleanup alternatives available. As with the Remedial Investigation, a work plan will be prepared which describes how the study will be done.
- 5. **Cleanup Action Plan:** A Cleanup Action Plan is developed using information gathered in the Remedial Investigations and Feasibility Study. The plan specifies cleanup standards and identifies cleanup methods. It will describe the steps to be taken, including any additional environmental monitoring required during and after the cleanup, and will describe the schedule for cleanup activities.

WE ARE IN STEP 5 OF THE PROCESS

6. **Cleanup:** Implementation of the Cleanup Action Plan, includes design, construction, operations and monitoring.

IV. <u>Proposed Consent Decree for Cleanup</u>

Ecology and the PLPs have negotiated a consent decree (a legal document filed in court which formalizes an agreement between Ecology and the PLPs) to implement cleanup actions at the Landsburg Mine site. The consent decree outlines the work to be done to cleanup contamination at the site. The consent decree contains the following:

1. Site Description

The document presents the property and site boundaries.

2. Cleanup Action Plan

This plan describes the cleanup alternatives investigated and then selected in the Feasibility Study and the cleanup levels, points of compliance and compliance monitoring program for the site. The Cleanup Action Plan also presents the proposed remedy for cleanup of the site.

3. Environmental Covenant

An environmental covenant (also called a restrictive covenant or deed restriction or notices on the deed) are agreements between Ecology and a landowner that are filed with the county register of deeds, along with property deeds, and may place restrictions on uses of property. These restrictions are designed to keep people from coming into contact with

hazardous substances left behind after the cleanup is completed, thereby protecting human and environmental health.

4. State Environmental Policy Act (SEPA) Checklist:

The State Environmental Policy Act (SEPA) requires evaluation of the likely significant adverse environmental impacts of a proposal, reasonable alternatives, and possible measures for reducing impacts. The SEPA environmental checklist asks a series of questions designed to assist Ecology in making a determination of whether the proposal will likely have a significant adverse impact on the environment.

5. Cleanup Schedule

The schedule for the implementation of remedial action and cleanup is presented.

6. Operation and Maintenance (O&M) Plan

An Operation and Maintenance (O&M) Plan presents technical guidance to assure effective operations and maintenance under both normal and emergency conditions.

7. Compliance Monitoring Plan

The Compliance Monitoring Plan includes a program for protection monitoring to confirm that human health and the environment are adequately protected during construction and operation and maintenance periods of the cleanup action; performance monitoring to confirm the cleanup standards or other performance standards have been attained; and monitoring to confirm the long-term effectiveness of the cleanup action. The Compliance Monitoring Plan document will also contain a contingency treatment plan in the unlikely event that groundwater treatment may be required at a future date at the Landsburg Mine Site.

V. Location and Site Background

Location

The Landsburg Mine site contains an abandoned coal mine located east of the city of Kent in Ravensdale, Washington – roughly 25 miles southeast of the city of Seattle. This site is located approximately 1.5 miles northwest of Ravensdale in southeast King County. The site is located directly south of the S.E. Summit-Landsburg Road and north of S.E Kent-Kangley Road. It is a quarter mile northwest of the City of Kent's municipal watershed and roughly 700 feet south of the Cedar River.

Site Background

The Landsburg Mine site contains a former underground coal mine. The mine site occupies property currently owned by Palmer Coking Coal Company, LLP and formerly by the Plum Creek Timber Company, L.P. Coal mining began along the Landsburg coal seam in the 1930s. In 1959, when the Landsburg seam was exhausted, mining shifted to the Rogers seam and continued there until 1975.

Underground mining methods were used to extract the coal from the Rogers seam. These methods resulted in the ground surface above the abandoned mine sinking down and forming a subsidence trench. This trench is roughly three-quarters of a mile long, 20 to 60 feet deep and 60 to 100 feet wide.

During the late 1960s and early 1970s, the northern part of the trench was used as a disposal site for a variety of industrial wastes. The wastes either were contained in drums or were drained from tanker trucks. Records indicate that about 4,500 drums and 200,000 gallons of oily waste water and sludge were disposed of in this portion of the trench. A portion of the waste may have been burned during several large fires in the early 1970s.

Samples taken from recovered drums indicate that this material consisted of a wide range of organic and inorganic industrial waste, including paint waste, polychlorinated biphenyls (PCBs), cyanide, metals, and oily sludge. Disposal of land-clearing debris and construction debris in the trench continued until the early 1980s.

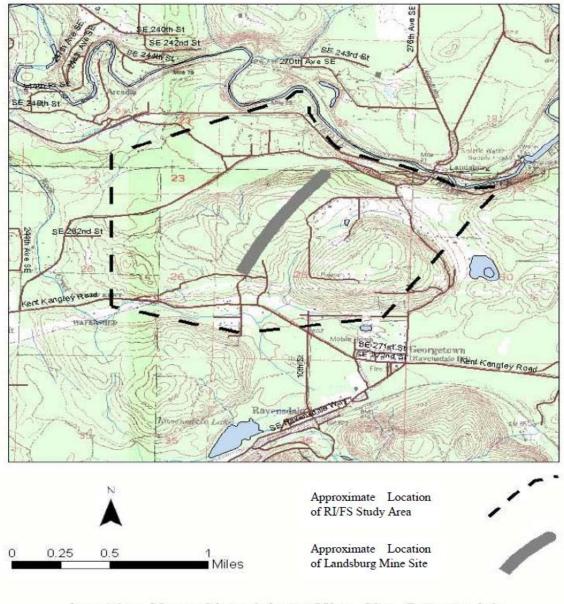
In late 1991, at Ecology's request, four of the PLPs removed the most accessible drums from the trench and constructed a fence to restrict access to the site. After the drums were removed, Ecology and the PLPs began negotiations for a Remedial Investigation and Feasibility Study RIFS). The results of this study were available for public review and comment in March 1996. The first Draft Cleanup Action Plan (DCAP) was completed and submitted to Ecology in 2002.

In May of 2004, a hydrogeologic investigation was completed at the south end of the mine site. Two monitoring wells and a deep well (700 feet) were installed in 2005. In the summer of 2008, the infrastructure components for a contingent groundwater treatment system were installed at the site.

The infrastructure that was constructed in 2008 included a treatment facility area pad surrounded by a security fence, underground power 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 MTCA cleanup levels at the established points of compliance.

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 conditions from those observed during the RI.

Site Location Map



Location Map of Landsburg Mine Site, Ravensdale

Contaminants of Concern

Contaminants were observed at levels of concern only within certain surface areas within the trenches in the northern portion of site which was where waste disposal is known to have occurred in the past. State cleanup levels are exceeded in these trench soils. The northern portion of the trench is currently fenced. Also, no contamination has been observed exiting the mine in the air, surface water, or groundwater, nor has soil outside of the trench been impacted.

The contaminants of concern from waste sampled in the trench soil containing disposed wastes (northern trenches) include:

- Chromium
- Lead
- Polychlorinated biphenyls (PCBs)
- Bis (2-ethylhexyl) phthalate
- TCE (trichloroethene)
- TPH (total petroleum hydrocarbons)

VI. <u>Current Activity – Consent Decree and Cleanup Action Plan</u>

Cleanup at the Landsburg Mine site will be conducted under a consent decree. This is a legal agreement negotiated between Ecology and the PLPs for implementing the cleanup actions. The cleanup action plan identifies proposed cleanup actions for the site based on the investigation results and an evaluation of remedial alternatives presented in the Remedial Investigation/Feasibility Study (RI/FS) that was conducted in 1996.

During the Remedial Investigation phase of this cleanup, nine potential cleanup options were evaluated for this site. The options ranged from no action to excavating and removing all remaining waste and contaminated soil at the site.

The selection of the preferred cleanup alternative was based on the following five criteria:

- Long-term effectiveness and reliability
- Short-term effectiveness
- Reduction in toxicity, mobility and volume
- Implement ability and cost
- Community acceptance

Proposed Cleanup Action Plan

After several screenings based on criteria specified in MTCA, the preferred remedy proposed for the site consists of a low-permeability soil cap over the trench that will be backfilled. The remedy will leave the existing buried materials in the trench so that direct contact with contaminants cannot occur.

The cap design will minimize the amount of water infiltrating the waste and thus minimize the potential for future impacts to groundwater. It would extend slightly beyond the trench on both sides. The cap will be sloped to optimize stability and encourage runoff so as to minimize rainwater infiltration to the maximum extent possible. Surface water runoff from the cap and the length of the trench would be collected in drainage ditches and conveyed to on-site

stormwater ponds. This alternative also includes continued groundwater monitoring, institutional controls to limit access to the site, periodic maintenance and contingency plans.

The cleanup actions to be conducted for this preferred alternative include the following steps:

- Backfill the trench with acceptable fill materials
- Allow the backfill to consolidate
- Place a low-permeability soil cap over the trench backfill, including grading, surface water diversion, and surface water management conveyance ditches and ponds
- Maintain the cap
- Monitor groundwater
- Implement and maintain institutional controls (restrictive covenants)
- Maintain contingency plans and infrastructure

VII. <u>Community Profile</u>

The Landsburg Mine site is located in Ravensdale, Washington. Ravensdale is located 15 miles east of the city of Kent in southeast King County. It is primarily a rural community. Southeast King County has been the fastest growing area in the state in recent years and due to this growth, the Ravensdale area has become a growing and changing demographic, with a mix of old and new residents.

Mining and logging provided the economic foundation of the Ravensdale area in years past. Older Ravensdale residents remember the active mine – some were even employed by the mine or by companies affiliated with it. Now, mining has mostly stopped and logging continues on a much smaller scale. Many residents now work outside of the immediate area. The owners and operators of the mine and their families still live in the area and continue to be prominent members of the community.

VIII. Key Community Concerns and Issues

Concerns and opinions expressed by community members include concerns about how contamination from the site may affect their health and the environment, the need to expedite site cleanup, the quality of their water wells, environmental health of the Cedar River and Rock Creek; and the need to improve community involvement through increased communication. Additional concerns have focused on economic issues, such as property values.

IX. <u>Public Participation Activities and Responsibilities</u>

The purpose of this Public Participation Plan is to promote public understanding and participation in the MTCA activities planned for this site. This section of the plan addresses how Ecology will share information and receive public comments and community input on the site cleanup.

Public Involvement Activities

Ecology uses a variety of activities to facilitate public participation in the investigation and cleanup of MTCA sites. Ecology will implement input provided by the community whenever possible.

The following is a list of the public involvement activities that Ecology will use, their purposes, and descriptions of when and how they will be used during this site cleanup.

1. Formal Public Comment Periods

Comment periods are the primary method Ecology uses to get feedback from the public on proposed cleanup decisions. Comment periods usually last 30 days and are required at key points during the investigation and cleanup process before final decisions are made.

During a comment period, the public can comment in writing. Verbal comments are taken if a public hearing is held. After the formal comment periods, Ecology reviews all comments received and may respond in a document called a Responsiveness Summary.

Ecology will consider the need for changes or revisions based on input from the public. If significant changes are made, then a second comment period may be held. If no significant changes are made, then the draft document(s) will be finalized.

2. Public Meetings and Hearings

Public meetings may be held at key points during the cleanup process. Ecology may also offer public meetings for actions expected to be of particular interest to the community. Also, if ten or more people request a public meeting during the 30-day comment period, Ecology will hold a public meeting for the purpose of taking written comments on draft documents.

3. Responsiveness Summaries

After the public comment period ends, Ecology will review the comments, make final decisions and prepare a responsiveness summary, which is a compilation of public comments and Ecology's responses to them. Copies will be mailed to all those who commented and all those who request copies.

Information Repositories

Information repositories are places where the public may read and review site information, including documents that are the subject of public comment.

Ecology has established the following repositories for the Landsburg Mine site cleanup project.

- Maple Valley Public Library 21844 SE 248th Street, Maple Valley, WA 98038 (425) 432-4620
- Washington State Department of Ecology 3190 160th Avenue SE, Bellevue, WA 98008 (425) 649-7190. Please call for an appointment.
- Some site information will also be posted on Ecology's web site at http://www.ecy.wa.gov/programs/tcp/sites/landsburg_mine_hp.html

Site Register

Ecology's Toxics Cleanup Program uses the Site Register to announce all of its public meetings and comment periods, as well as many other activities. To receive the Site Register in electronic or hard copy format, contact Linda Thompson at 360-407-6069 or by e-mail at Ltho461@ecy.wa.gov. It is also available on Ecology's web site at: http://www.ecy.wa.gov/programs/tcp/pub_inv/pub_inv2.html

Mailing List

Ecology has compiled a mailing list for the site. The list includes individuals, groups, public agencies, elected officials, private businesses, potentially affected parties, and other known interested parties. The list will be maintained at Ecology's Northwest Regional Office and will be updated as needed. Please contact **Nancy Lui at (425) 649-7117 or nlui461@ECY.WA.GOV** if you would like to be involved or have your address added to or deleted from this mailing list.

Fact Sheets

Ecology will mail fact sheets to persons and organizations interested in the Landsburg Mine site cleanup project to inform them of public meetings, comment opportunities and important site activities. Ecology may also mail fact sheets to the interested persons about the progress of the site cleanup.

Newspaper Display Ads

Ecology may place ads or press releases in the Maple Valley-Covington Reporter, Seattle Times and the Voice Of The Valley to announce public comment periods and public meetings or hearings for the site.

Plan Update

This Public Participation Plan is meant to be a dynamic guide for informing and involving the community in the decision-making process at the site. This Public Participation Plan may be updated as the project proceeds. If an update is necessary, the revised plan will be submitted to the public for comment.

Points of Contact

If you have questions or need more information about this plan or the Landsburg Mine cleanup project, please contact the following:

Jerome Cruz, Site Manager Washington State Department of Ecology 3190 160th Avenue SE Bellevue, WA 98008 Tel: (425) 649-7094 Email: jcru461@ecy.wa.gov

Nancy Lui, Public Involvement Coordinator Washington State Department of Ecology 3190 160th Avenue SE Bellevue, WA 98008 Tel: (425) 649-7117 Email: <u>nlui461@ECY.WA.GOV</u>

Potentially Liable Persons Contact:

Barbara J. Smith, Public Affairs Contact Landsburg Mine Site PLP Group Harris and Smith Public Affairs 3820 S. Ferdinand Street Seattle, WA 98118 Tel: 206-343-4118 Email: barbara@harrisandsmith.com

EXHIBIT E

INTRODUCTION

Part A – COMPLIANCE MONITORING PLAN

Part B – OPERATION AND MAINTENANCE PLAN

Part C – CONTINGENT GROUNDWATER EXTRACTION AND TREATMENT SYSTEM PLAN



COMPLIANCE MONITORING PLAN

OPERATION AND MAINTENANCE PLAN

CONTINGENCY GROUNDWATER EXTRACTION AND TREATMENT PLAN

Landsburg Mine Site MTCA Remediation Project Ravensdale, Washington

REPORT

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

July 31, 2013

A world of capabilities delivered locally Project No. 923-1000-002.R154



Exhibit E-Intro_07-31-2013.doc

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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 Contingency Groundwater Extraction and Treatment System Plan for the Landsburg Mine Site located near Ravensdale, Washington. These plans are required as part of the site cleanup and monitoring process under the Model Toxic 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 Department of Ecology and the City of Kent.

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. The Compliance Monitoring Plan is presented in Part A. The Sampling and Analysis Plan, Quality Assurance Project Plan (QAPP), Data Management Plan (DMP), and the Health and Safety Plan (HSP) associated with the Compliance Monitoring Plan are also presented in this section. The cleanup action O&M Plan is presented in Part B. The Contingency Groundwater Extraction and Treatment System Plan is presented in Part C.

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 & safety monitoring, and groundwater monitoring during actual 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 design and specifications. Confirmational monitoring under the Compliance Monitoring Plan consists of long-term groundwater monitoring and maintenance of the cap and drainage system is described in the O&M Plan (Part B).

Under WAC 173-340-410, compliance monitoring consists of protection monitoring, performance monitoring, and confirmational monitoring, as described below. Figure 1 illustrates these three aspects of compliance monitoring and the required plans and activities.

1.1.1.1 Protection Monitoring

Protection monitoring is conducted to confirm that human health and the environment are adequately protected during construction of the cleanup action as described in the Health and Safety Plan [see WAC 173-340-410(1)(a)]. Monitoring for protection of human health will be addressed in the site Construction



Health and Safety Plan, which will be prepared following development of engineering designs and specifications, but before construction begins. Monitoring for protection of the environment will be provided by short-term groundwater monitoring, as described in Part A of this document.

1.1.1.2 Performance Monitoring

Performance monitoring confirms that the cleanup standards or other performance standards have been attained during the construction of the cleanup action [see WAC 173-340-410(1)(b)]. Because removal is not part of the selected remedy, and no media are exposed above cleanup levels, performance monitoring will consist of CQA for the cap and associated drainage features. 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.

1.1.1.3 Confirmational Monitoring

Confirmational monitoring is performed to confirm the long-term effectiveness of the remedy, following completion of remedial action [see WAC 173-340-410(c)]. Long-term maintenance and monitoring of the cap and associated cleanup action components are provided and described in the O&M Plan (Part B). The Compliance Monitoring Plan (Part A) describes long-term confirmational monitoring of groundwater. In the event of future groundwater contamination, an additional plan, the Contingency Groundwater Extraction and Treatment System Plan (Part C) has been prepared to facilitate rapid installations.

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 will also be maintained of the cap elevations 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 compliance boundary at the remediation levels (half of applicable MTCA Method B cleanup 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 ft 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 access the property from public thoroughfares and 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. Another 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 allows 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 ft 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 to the site are to the southwest approximately 800 ft 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 ft. In addition to these two seams, mining has also been conducted at the nearby Frasier seam. This seam, located some 800 ft 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 ft 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 landclearing 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 (WDOE 1990). Based on invoice records from Palmer Coking Coal Company (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 Washington Department of Ecology (Ecology) (WDOE 1993) which directed the PLPs to conduct an RI/FS to evaluate the need for remedial action. The PLPs for the Landsburg Site consist of Palmer Coking Coal Company, LLP; PACCAR Inc; Plum Creek Timberlands Company, L.P.; Browning-Ferris Industries of Illinois, Inc.; TOC Holdings Co.; and the 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 an Agreed Order. The RI/FS, which consisted of a comprehensive investigation of site environmental conditions and evaluations of potential remedial alternatives for site cleanup, 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 (MC), trichloroethene (TCE) and total petroleum hydrocarbons (TPH) that exceed Method B standards (see Section 1.3.4 for additional information).



1.3.1 Air

Throughout the majority of the trench area, volatile organic compounds 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 the Trench 9 in the vicinity of the sludge pond. Air monitoring conducted during drilling did not detect significant levels of volatile organic compounds.

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 that Site for 15 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 the site itself or amongst any of the private wells sampled in the vicinity of the site, except for the MCL for arsenic in LMW-11, which is sampled at a depth of 700 feet below ground surface within the mine and represents naturally occurring background conditions. Arsenic has been detected in LMW-11 at concentrations meeting the federal MCL (10 µg/L). The MTCA Method A standard for arsenic (5 µg/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 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 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 fall within the range of reported values considered typical for coalmine 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 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 exceeded the MTCA Method B standard for surface water at portals #2 and #3. 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. There are, therefore, 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 exceed Method B standards 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. On the basis of trench sampling conducted to date, however, 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 inches to a foot. 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 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 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.

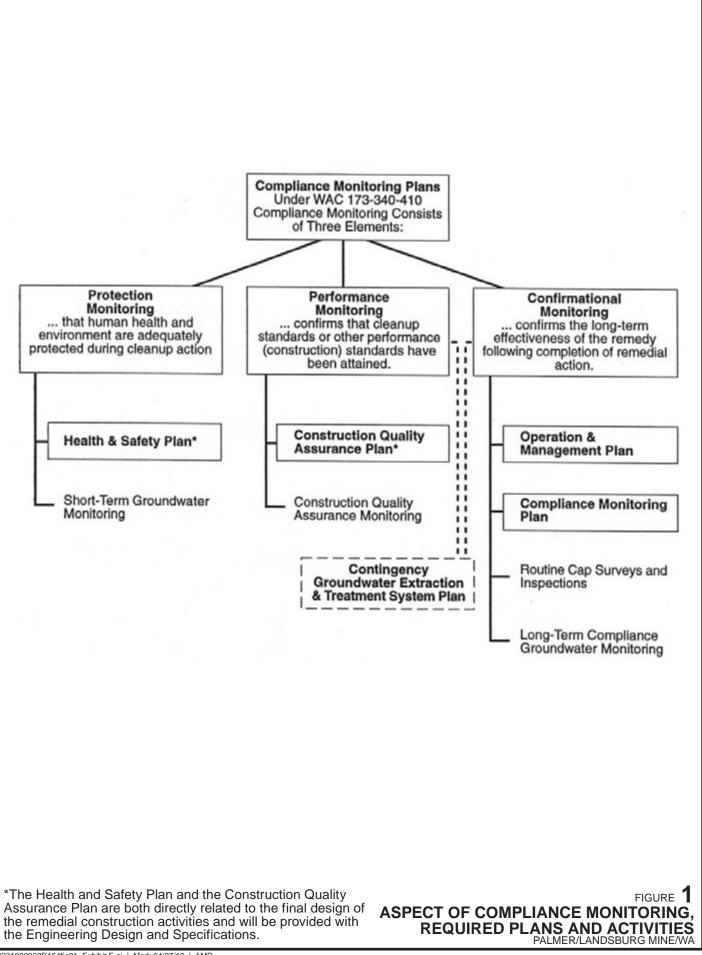
Warning signs will provide notice of the presence of a waste site. A 6 foot tall chain link security fence will be maintained around the low permeability cap (Trenches 7, 8, and 9) for five years after the remedial action to keep visitors and trespassers off of the cap to ensure that the cap is secured 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. Groundwater at the compliance boundaries currently meets cleanup levels, therefore, no groundwater containment or treatment is necessary. In the unlikely event that mine waste contaminants are detected in groundwater



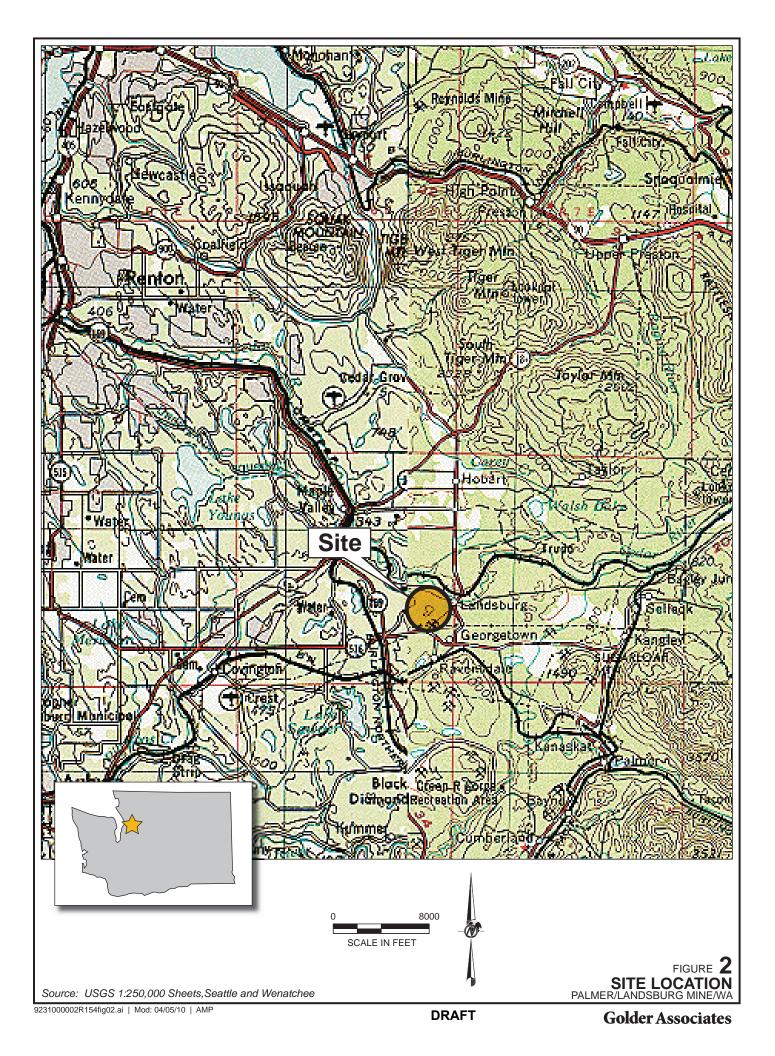
at the compliance boundary above remediation levels (one-half of MTCA Method B cleanup levels), a groundwater extraction and treatment system will be installed. With this contingency available, institutional controls and monitoring address the possibility of future groundwater concerns. A Contingent Groundwater Extraction and Treatment System Plan has been prepared (see Part C of this document) which could be installed quickly if needed. To speed up the installation of a contingent treatment system, some of the infrastructure was installed in 2008. The infrastructure that was selected for premature installation were the items that have a long lead 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 LMW-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 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.

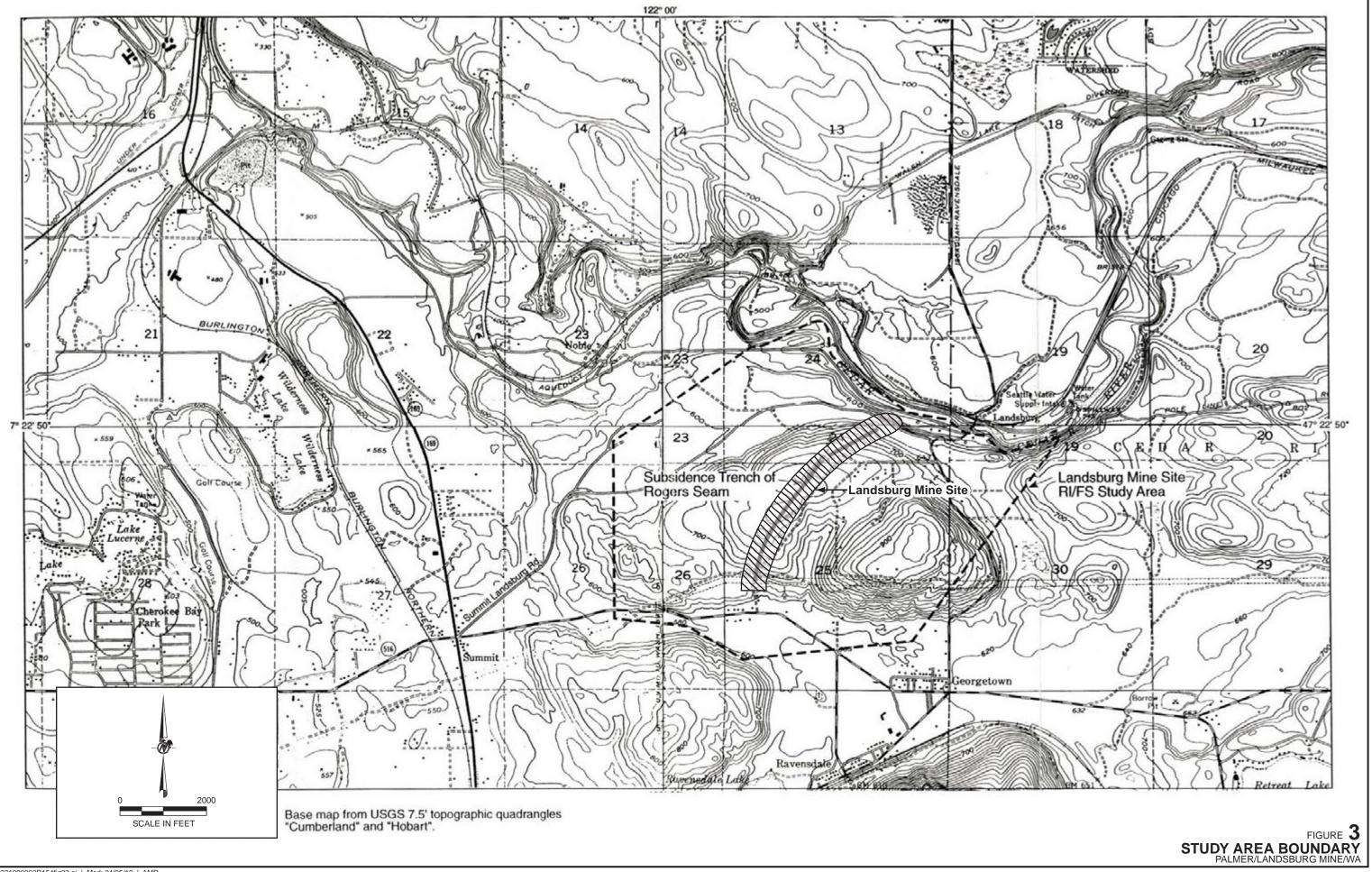


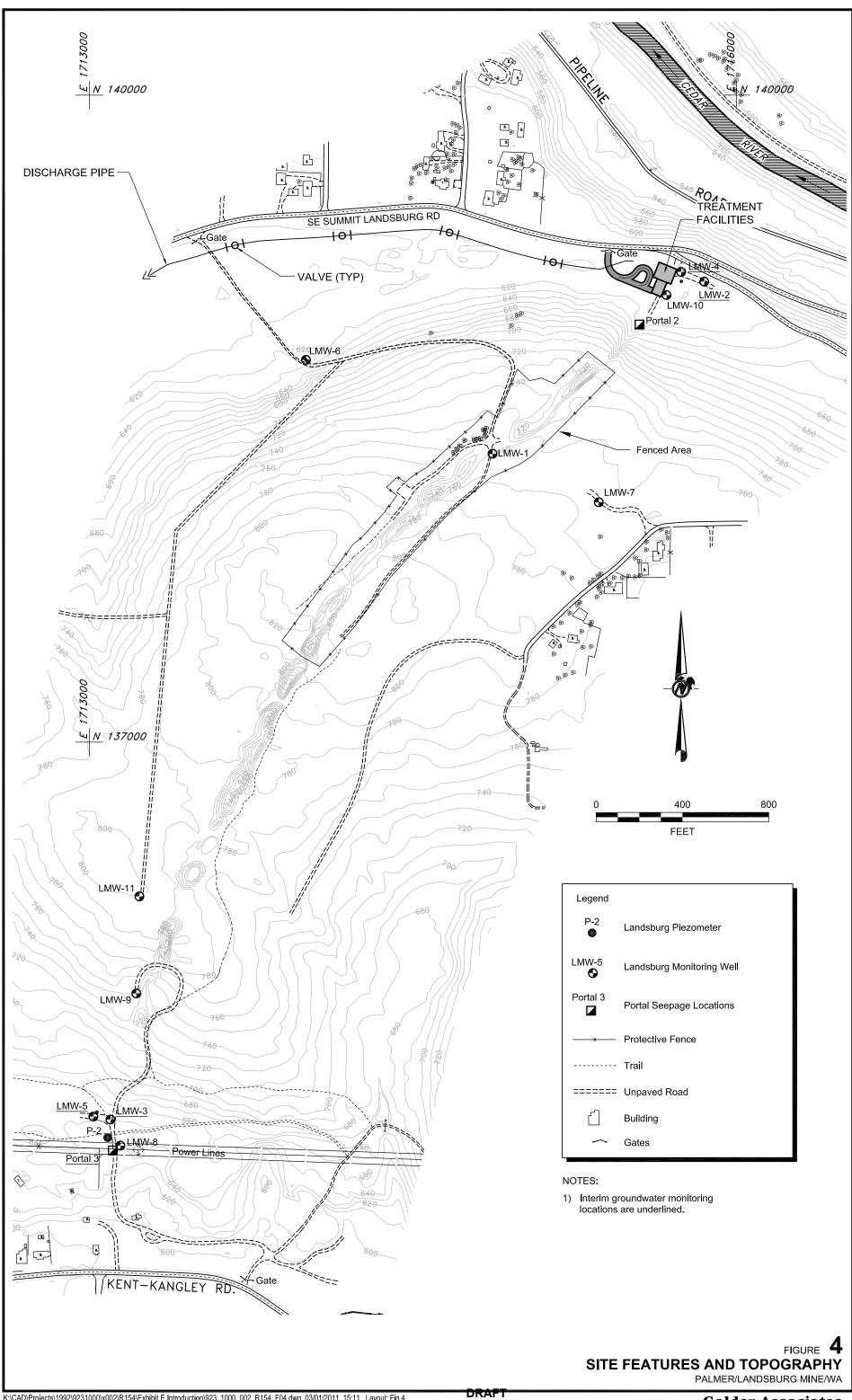
FIGURES



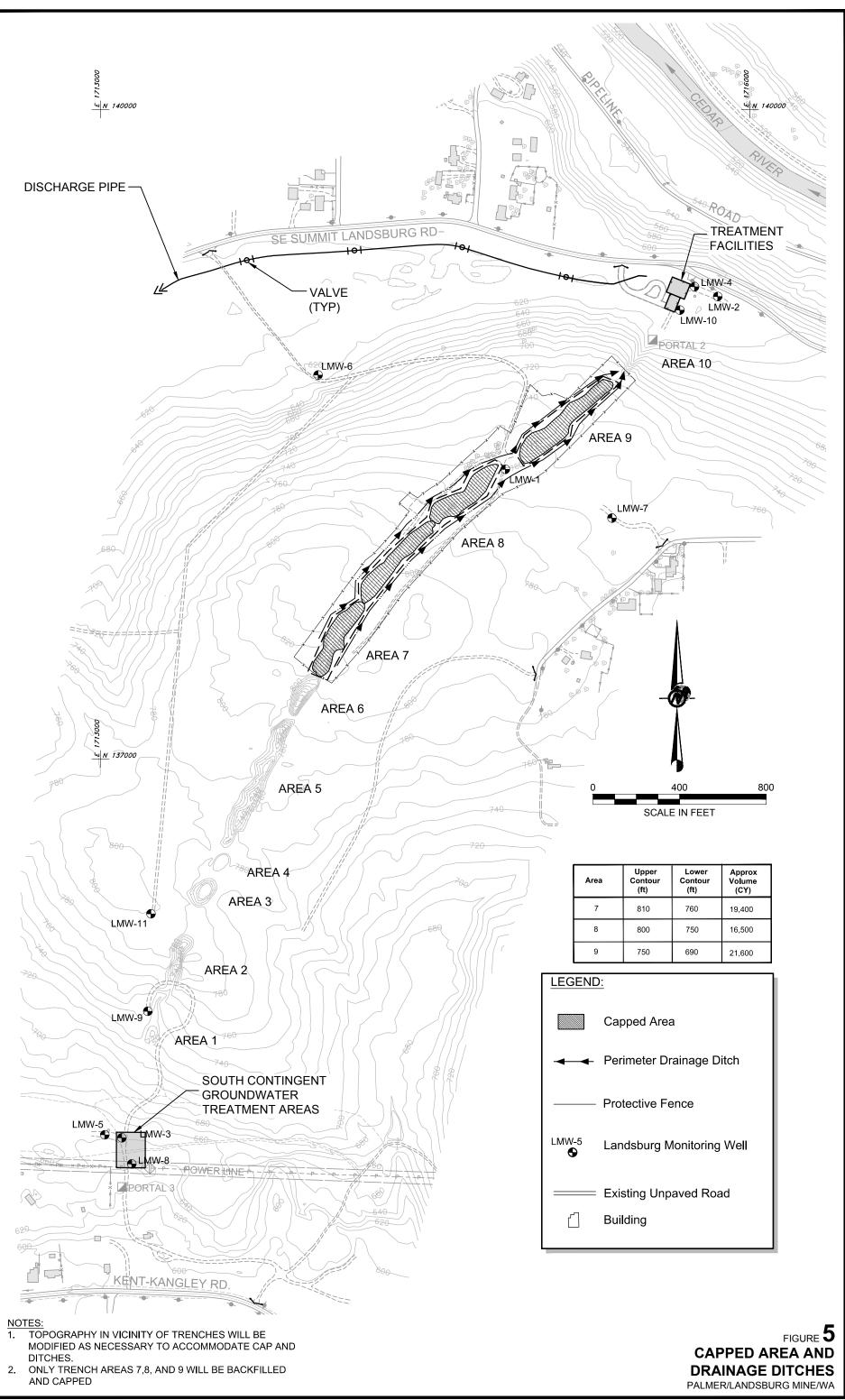
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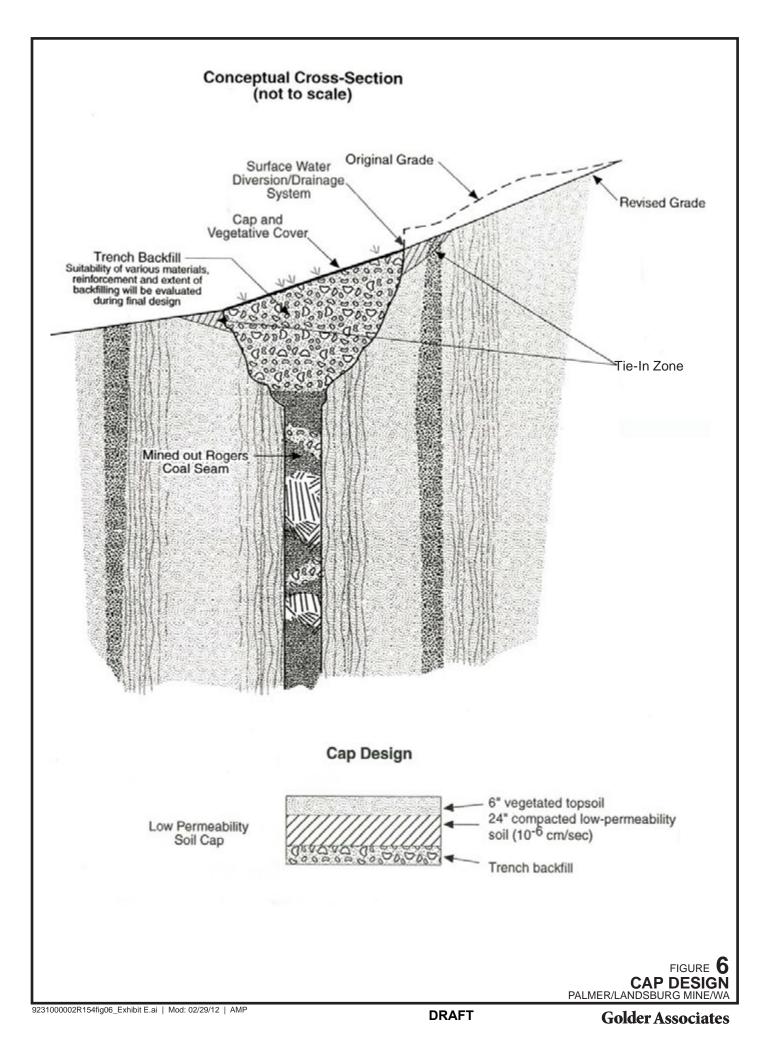




	Trail	
	Unpaved Road	
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Part A COMPLIANCE MONITORING PLAN



FINAL DRAFT

PART A

COMPLIANCE MONITORING PLAN

Landsburg Mine Site MTCA Remediation Project Ravensdale, Washington

REPORT

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Submitted On Behalf Of: The Landsburg Mine Site PLP Group

July 31, 2013

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 location of which is depicted in Figures A-1 and A-2 and 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 4.

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 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 are exposed above cleanup levels, performance monitoring will consist of construction quality assurance (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 detection in the event that mine waste contaminants exceed remediation levels in the future. In the event that remediation levels are exceeded in the future at compliance locations, the cause of the exceedance will be determined and appropriate action taken. A contingent groundwater extraction and treatment system has been designed (Part C) which could be installed quickly if needed.

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).

MTCA Method 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. 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 one. In addition, Method B levels must comply with applicable state and federal regulations or criteria (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. 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.



1.3 Sentinel Wells

Sentinel wells will be included in the 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 completion 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 and a deeper well that will be monitoring 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. The additional new 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 will be 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.



There are several wells at the north and south compliance boundaries because each well monitors a different groundwater zone. For example, shallow groundwater from the south portal (Portal 3) will be monitored by well LMW-8. Monitoring wells LMW-2 and LMW-4 were completed to monitor shallow and deeper zones within the Rogers coal mine (Rogers Seam), north of the subsidence trench. 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. Monitoring wells LMW-3 and LMW-5 were completed to monitor shallow and deeper zones within the Rogers seam south of the subsidence trench. LMW-10 was installed for monitoring deeper zones of the aquifer at the north end of the site. The monitoring well locations are shown on Figure A-3 and A-6. In the event that a release is detected in compliance wells, the affected compliance well would be immediately re-sampled and additional wells may be sampled to evaluate the potential migration of affected groundwater. If the release to compliance wells is confirmed and the measured concentration of mine waste contaminants is one-half or more of MTCA Method B cleanup levels, then the Contingency Groundwater Extraction and Treatment Plan (Exhibit E - Part C to the Consent Decree) will be implemented. Monitoring wells LMW-9 and LMW-11 and the four new proposed sentinel wells are not points of compliance. Rather, they are included in the compliance monitoring as "early detectors" of the migration of affected groundwater. If mine waste contaminants are detected above remediation levels (one-half of MTCA Method B cleanup level) in LMW-9, LMW-11, or one of the proposed sentinel wells, the contingency groundwater plan is not necessarily implemented because they are not considered points of compliance wells (see Sections 1.5 and 1.7 for details).

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 by the contractor (and ultimately approved by Ecology) for the hazardous substances and petroleum products 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.

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 throughout the trench backfilling and cap construction (estimated duration 16-20 weeks). 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. 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 confirmation sampling test parameters will be expanded on a monthly basis to include total petroleum hydrocarbons (TPH) and volatile organic compounds (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.

Short term monitoring will continue for an additional four weeks following completion of trench backfill and cap construction. The extended four-week monitoring will consist of bi-weekly (twice per month) sampling of the above listed wells and analysis for pH, conductivity, turbidity, dissolved oxygen, TPH, and VOCs.

If groundwater remediation levels (one-half of MTCA Method B cleanup level) are exceeded during shortterm monitoring, 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 analyses are below groundwater remediation levels (50 percent 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 50 percent 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, but construction does not have to be halted. If any analytes do not exceed the MTCA cleanup levels, but do exceed 50 percent of the MTCA level, groundwater from that well will be sampled for the analytes exceeding one-half 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 another source other than the waste disposed in the Roger's mine trenches.
- 6. If exceedance of groundwater MTCA cleanup levels is verified at a compliance 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 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 construction quality assurance (CQA) for the cap and associated drainage features. 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-11and 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 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. 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.

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) and priority pollutant metals (Table A-2). 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 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 concentrations of 50 percent 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 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 50 percent of the MTCA cleanup levels, will be reduced to annual sampling and 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 above 50 percent 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 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 and TPH; and every 10 years for 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). 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 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

The contingent groundwater treatment system will be installed after confirmed remediation levels (>0.5 MTCA cleanup levels at a compliance monitoring well) are exceeded, but before groundwater concentrations reach cleanup levels at the compliance boundary 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 treatment system cannot be designed or installed until the specific mine waste contaminants requiring treatment are identified. Therefore, a specific or detailed groundwater treatment system cannot be defined at this time. A response action will depend on information gained during groundwater monitoring and cap inspections. In the event that routine groundwater monitoring detects a mine waste contaminant in a sentinel well or a point of compliance well, the response actions illustrated in Figure A-8 and Figure A-9, respectively, will be followed. A summary of the response actions following detections are as follows:



Sentinel Well Detections (see Figure A-8):

- If following validation of a laboratory detection greater than 0.5 times the MTCA Cleanup Level at a sentinel well, the Group will inform Ecology and confirm the detection by resampling the compliance well and will analyze for the analyte that was detected over 0.5 times the MTCA Cleanup Level.
- If the detection in a sentinel well is confirmed by re-sampling, the Group will notify Ecology and will conduct an "alternative source evaluation" to understand if the detection is caused by another source other than the waste disposed in the Roger's mine trenches. The detection at a sentinel well does not trigger a remedial response action other than to evaluate whether the detection could be from a source other than the waste disposed in the Roger's subsidence trenches. The sequence of steps for detections at sentinel wells is shown on Figure A-8.

Compliance Well Detections Over 0.25 MTCA Cleanup Levels (see Figure A-9):

- If following validation of the laboratory data (QA/QC) the detection at a compliance well is over 0.25 of the MTCA Cleanup Level, the Group will inform Ecology within seven (7) days and then confirm the detection by re-sampling the compliance well. The sample will be analyzed for the analyte that was detected over 0.25 MTCA Cleanup Level.
- If the analytical validation and confirmation re-sampling results confirms that the analyte is present within groundwater from the compliance well at a concentration that exceeds 0.25 of the MTCA Cleanup Level, the Group will notify Ecology within seven (7) days and then conduct an "alternative source evaluation" to evaluate if the detection is caused by another source other than the waste disposed in the Roger's mine trenches.
- If an alternative source of the detected analyte is not identified, the 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 compliance 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 compliance wells is shown on Figure A-9.

Compliance Well Detections above 0.5 of the MTCA Cleanup Level:

- If following validation of the laboratory data (QA/QC), the detection is determined valid and the detected concentration is over 0.5 of the MTCA Cleanup Level at a compliance well, the Group will inform Ecology of the detection within seven (7) days and then confirm the detection by re-sampling the compliance well and analyzing for the analyte that was detected over 0.5 MTCA Cleanup Level.
- If confirmation re-sampling does not confirm the contaminant at a concentration 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 Treatment System (see Figure A-9).
- If the confirmation re-sampling confirms the concentration of the contaminant above 0.5 of the MTCA Cleanup Level in a compliance well, the Contingent Groundwater Treatment System presented in Exhibit E Part C will be implemented and installed as the corrective remedial action for containment and treatment of impacted groundwater.
- Groundwater containment (pumping and treatment) will not be initiated unless groundwater concentrations of contaminants reach MTCA Cleanup Levels at a



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compliance boundary well(s). Treated groundwater will be discharged to the local POTW sewer (see Exhibit E - Part C for more details).

Because a detection at a compliance well may never increase to the MTCA Cleanup Level, the increased frequency of groundwater monitoring at specific compliance well(s) (as specified in Table A-3 in Exhibit E - Part A) can end and return to the regular long-term monitoring in accordance with Table A-2 in Exhibit E - Part A 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 eight monitoring events for statistical representativeness) shows a steady or decreasing trend; or
- If the trend analysis indicates a rate of increase would not result in concentrations reaching the MTCA Cleanup Level in a time period that is less than the routine long-term monitoring specified in the CMP (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 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 MTCA Cleanup Levels for four consecutive monitoring periods or a minimum of one (year). When the contingency groundwater extraction and treatment system is implemented, the compliance monitoring frequency of treatment system inflow and outflow will be determined by the Metro discharge permit.

1.7.3 Reporting

The Landsburg Mine Potentially Liable Parties (PLPs) will submit a letter report to Ecology within 60 days of groundwater monitoring events. The PLPs for the Landsburg Site are: Palmer Coking Coal Company, LLP; PACCAR Inc; Plum Creek Timberlands Company, L.P.; Browning-Ferris Industries of Illinois, Inc.; TOC Holdings Co.; and the BNSF Railway Company. The report will summarize the sampling activity and provide a table 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 on page 1, with a checklist box that says:

- No parameters exceeded the Method B cleanup level.
- The following parameters exceeded the Method B cleanup level (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 completion of the remedy, and will be sampled as part of the 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 TP-1.4-6 "Water Level Measurements." Sample collection and handling will be performed as described in procedure TP-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 TP-1.2-23, "Sample Handling and 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, and LMW-5 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 discharge line volumes utilizing the "Low Flow Sampling Technique" with pumping rates not exceeding 200 ml/minute for sample collection. During purging, field parameters pH, conductivity, turbidity and temperature will be periodically measured. Purging will continue beyond the three discharge line volumes until the measured rate of change of the parameters is in accordance with TP-1.2-20 on consecutive readings. During purging of wells LMW-3, LMW-4, and LMW-5, the packer will be inflated prior to groundwater removal; hence a volume of well water represents entrained water below the packer. The instruments used in the field parameter measurements will be field calibrated per the manufacturers' specifications and as described in the QAPP. 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 4° C. 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 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.



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 DMS to this document, after the data has been quality reviewed with appropriate qualifiers.



3.0 **REFERENCES**

- Golder Associates Inc. (Golder). 1992. Landsburg Phase I, Remedial Investigation/ Feasibility Study (*RI/FS*) Work Plan. Landsburg PLP Steering Committee. Golder Associates Inc., Redmond, Washington.
- Golder 1996. *Remedial Investigation and Feasibility Study for the Landsburg Mine Site*. Prepared for the Landsburg PLP Steering Committee. Golder Associates Inc., Redmond, Washington.
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- 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.
- Landsburg PLP Steering Committee 1991. Landsburg Mine Drum Removal Project. Chemical Processing, Inc.; PACCAR Inc.; Palmer Coking Coal Company; Plum Creek Timber Company. Seattle, Washington.
- WDOE 1993. Agreed Order No. DE983TC-N273. Issued By the Washington State Department of Ecology to the Landsburg Potentially Liable Persons, July 26, 1993. Washington State Department of Ecology. Olympia, Washington.
- Ecology, Washington Department of. 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	200	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

	Short-Term Monitoring ^a		Long-Term Monitoring										
Analysis			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	1 every 10 years	
рН ^с	х	Х	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^d	X ^{d,e}	Xe	
Sp. Conductance ^c	Х	Х	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^d	X ^{d,e}	Xe	
Dissolved Oxygen ^c	Х	Х	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^d	X ^{d,e}	Xe	
Turbidity ^c	Х	Х	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^d	X ^{d,e}	Xe	
Method 418.1 Mod.		Х	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^d	Xe		
Priority Metals			X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}		X ^d	Xe	
VOC (Method 8260)		Х	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^d	Xe		
SemiVol. (Method 8270)			X ^{d,e}				X ^{d,e}		X ^{d,e}		X ^d	Xe	
OCP, PCB's (Method 8081)			X ^{d,e}				X ^{d,e}		X ^{d,e}		X ^d	X ^e	

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 caping at the same schedule as noted above.

^c The pH and Specific Conductance analysis will be performed in the field.

X - means the analysis will be conducted on all compliance monitoring wells. LMW-2 through LMW-11.

X^d - means the analysis will be conducted only on Northward wells: LMW-2, LMW-10, Deep North Senitinel Well (yet to be installed), Shallow North Senitinel Well (yet to be installed), LMW-6, and LMW-7.

X^e - means the analysis will be conducted only on Southward wells: LMW-3, LMW-5, LMW-8, LMW-9, LMW-11, South Shallow Sentinel Well (yet to be installed), and Dual South Sentinel/Cap Effectiveness Well (yet to be installed).

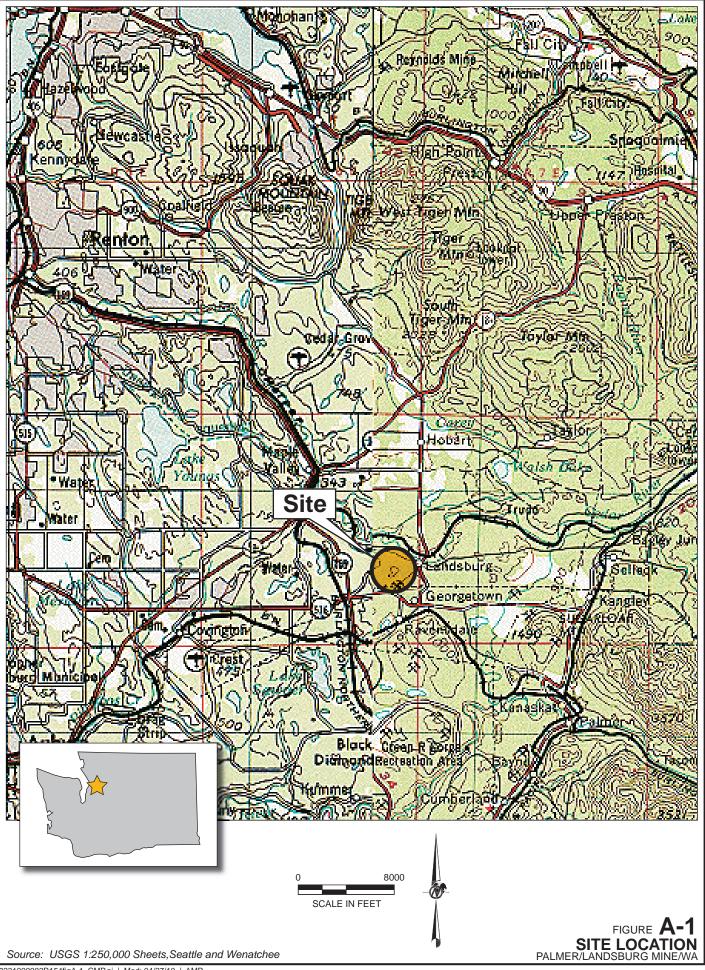


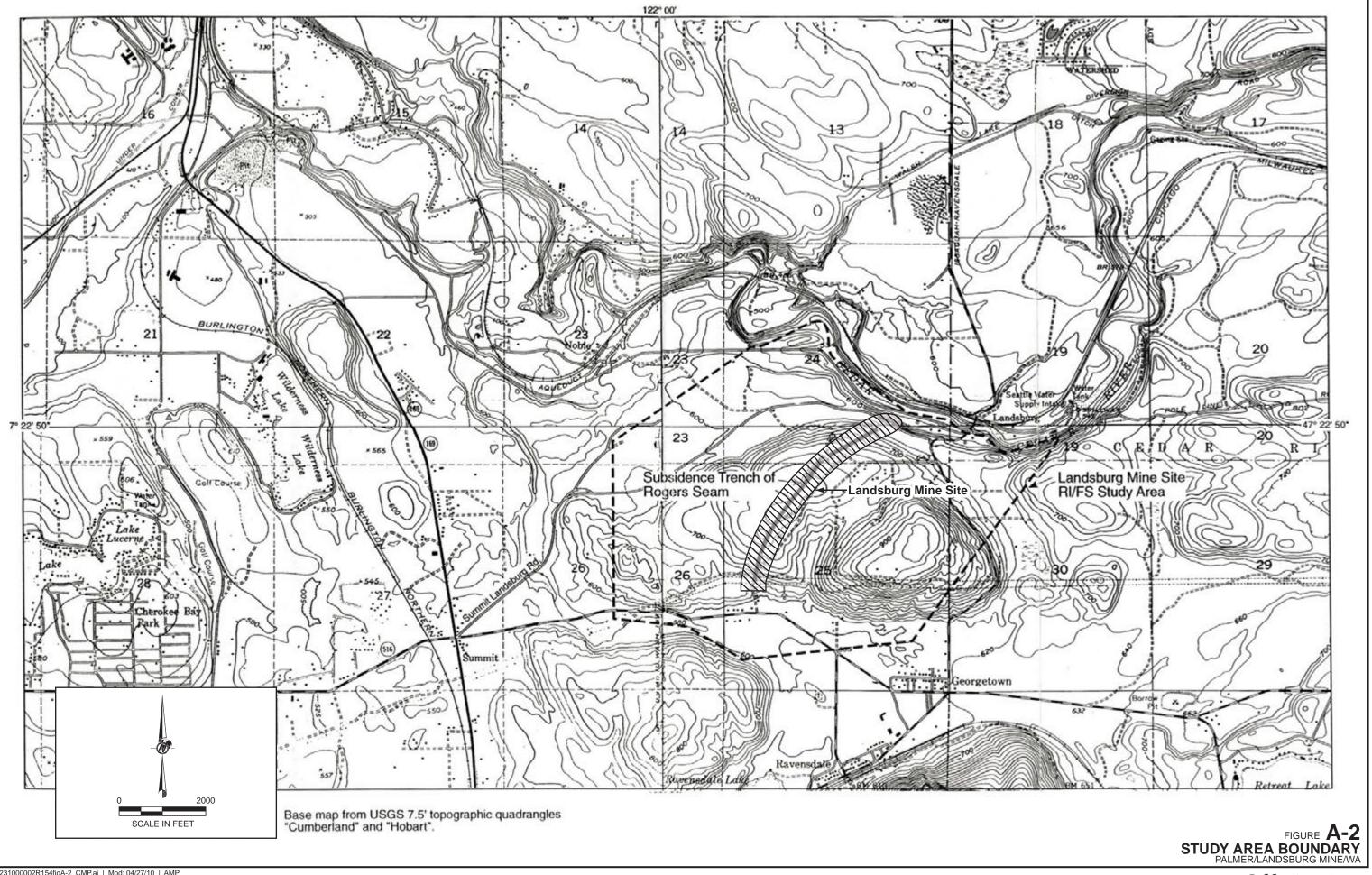
TABLE A-3 INCREASED MONITORING FREQUENCY AT COMPLIANCE WELLS IF DETECTION OCCURS ABOVE 0.25 MTCA CLEANUP LEVEL

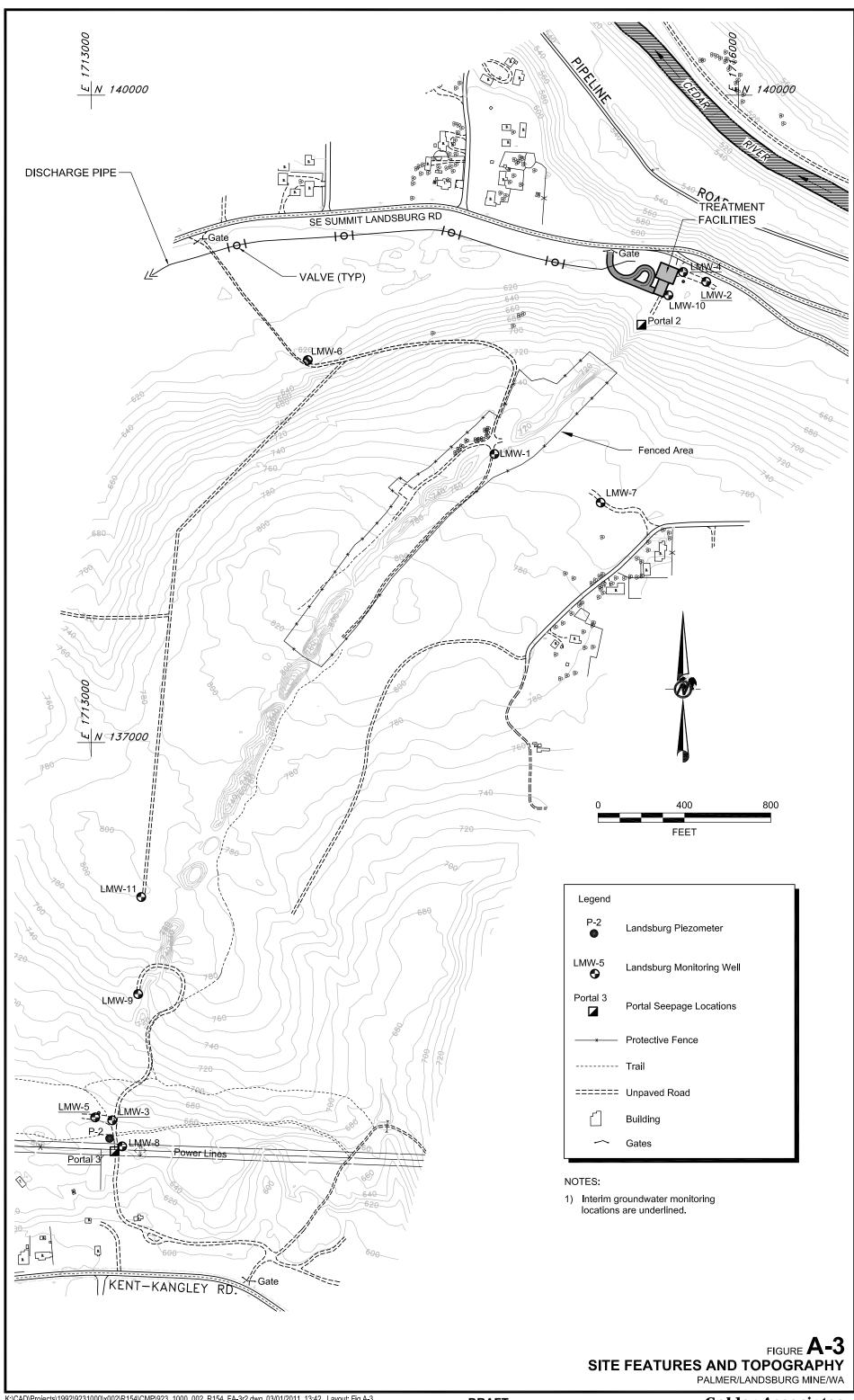
	Southern Pathway Compliance Boundary	Northern Pathway Compliance Boundary
VOCs, TPH	6 months	4 months
Metals, SVOCs, Pesticides	2 years	2 years



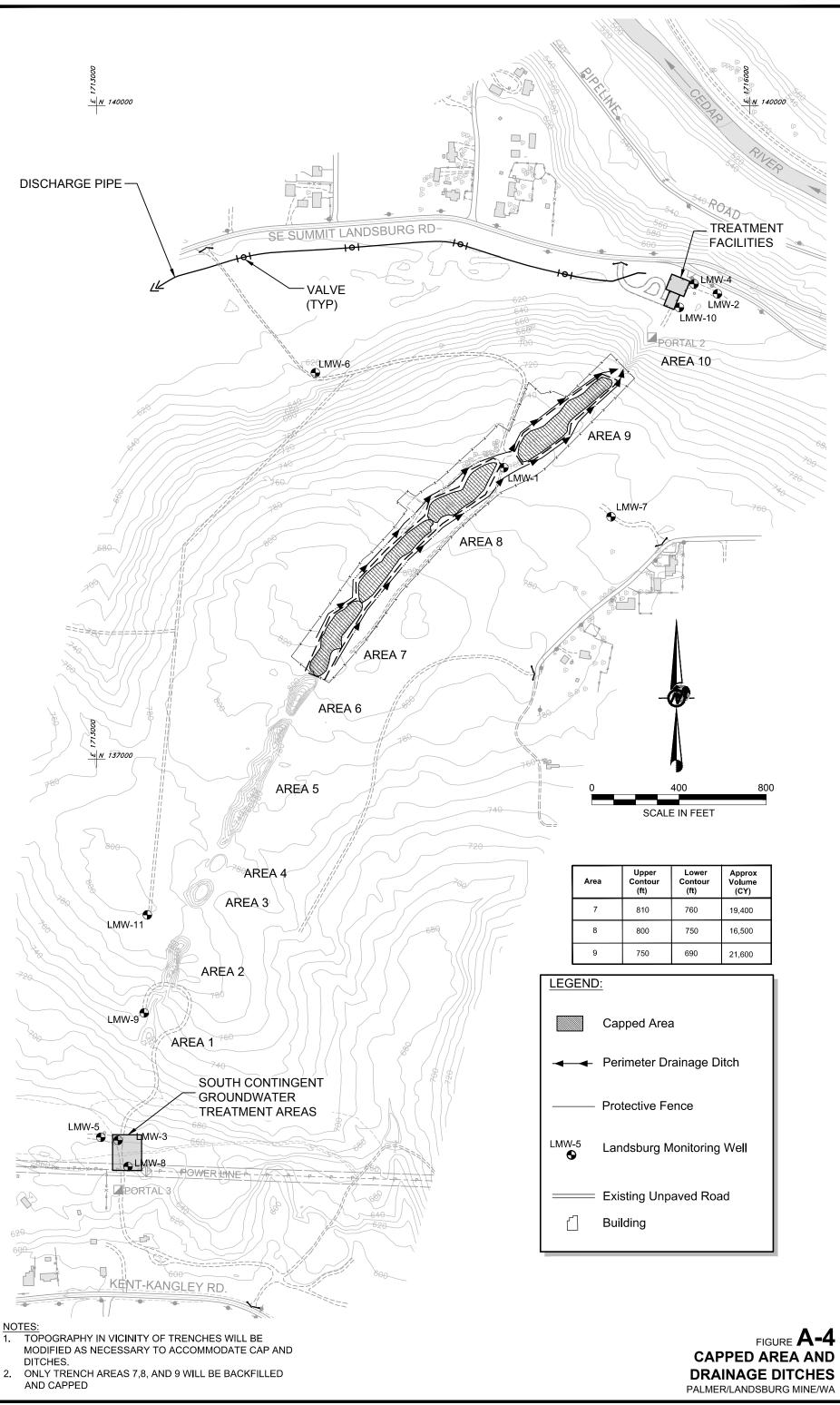
FIGURES







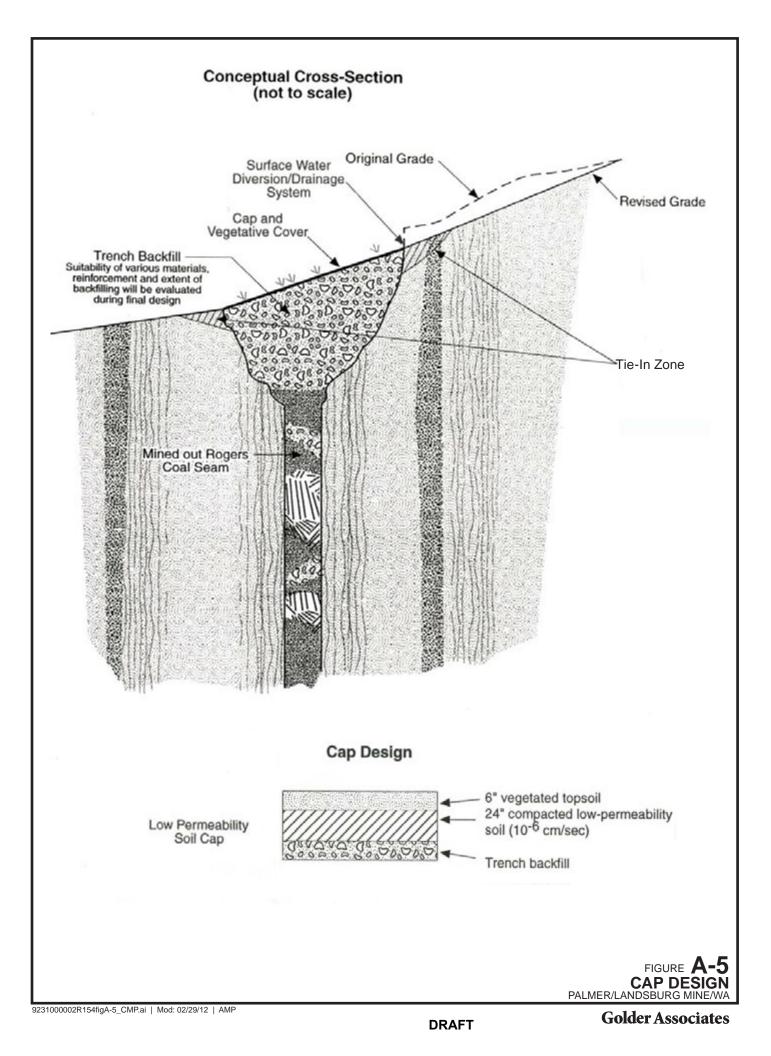
	Trail	
======	Unpaved Road	
	Building	
	Gates	

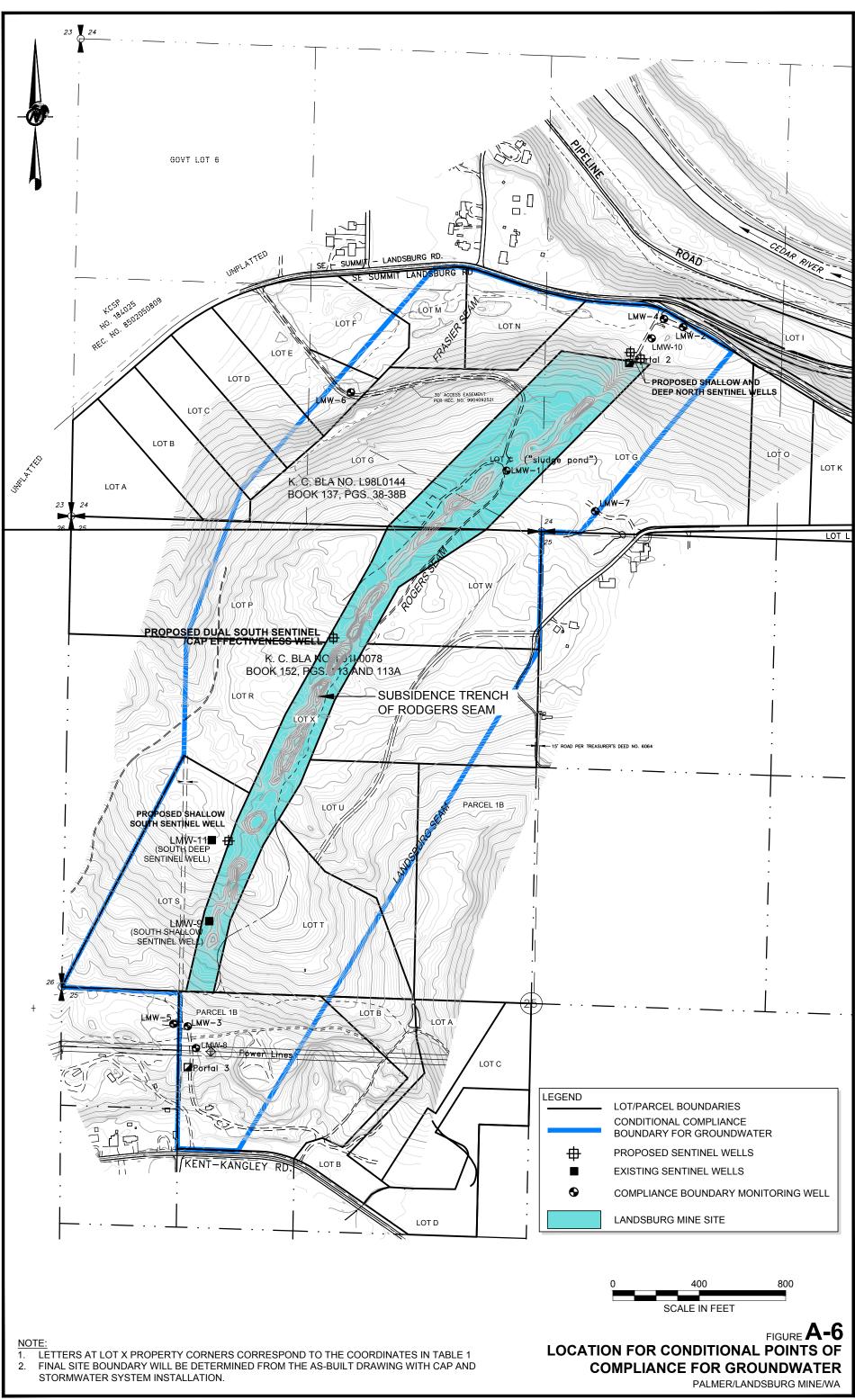


K:\CAD\Projects\1992\9231000\x002\R154\CMP\923_1000_x002\R154\FA-4r3.dwg | Fig A-4 Capped Area and Drainage Ditches | Mod: 07/31/2013, 13:36 | Plotted: 07/31/2013, 14:21 | aforcier

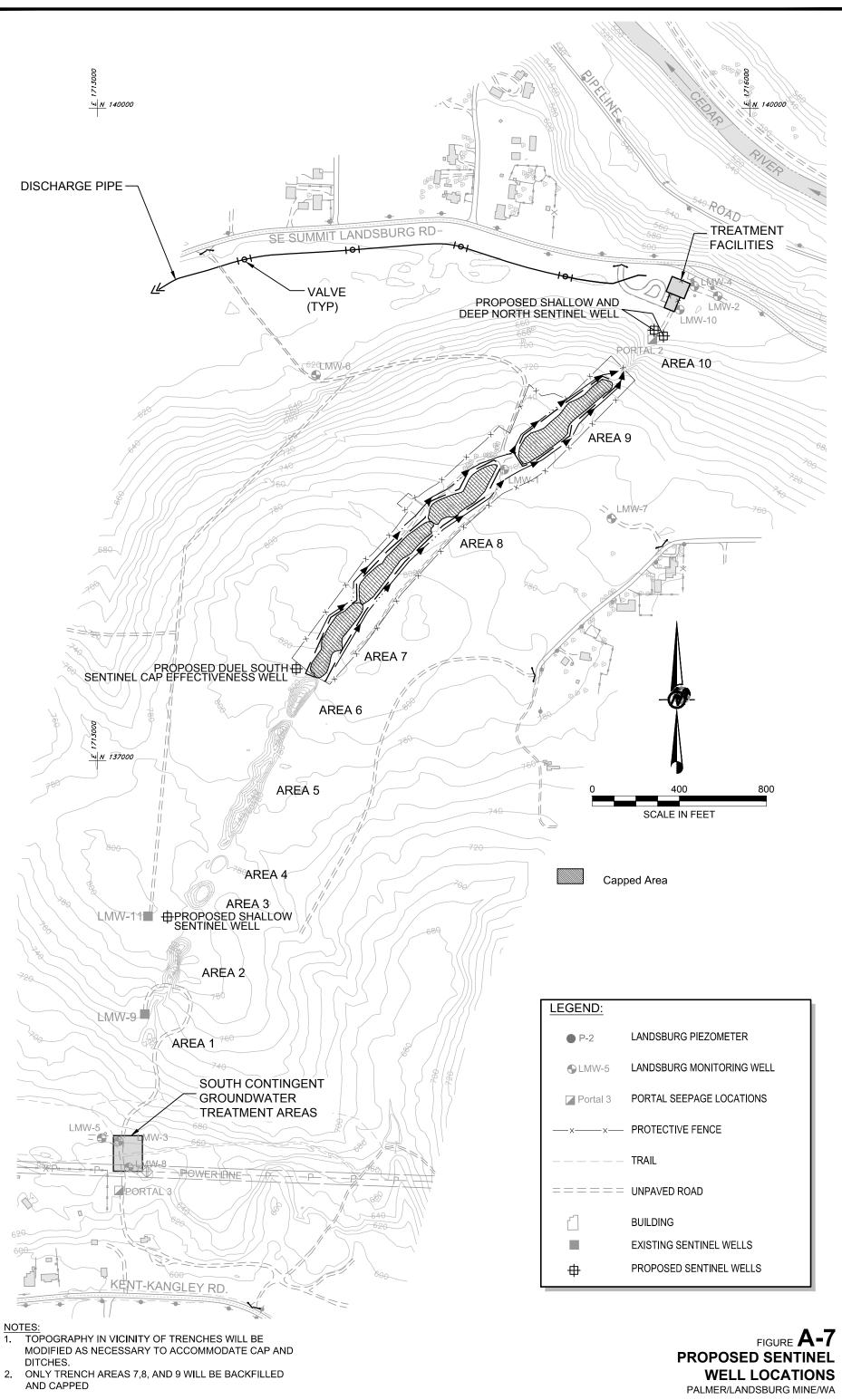
Golder Associates

FINAL DRAFT





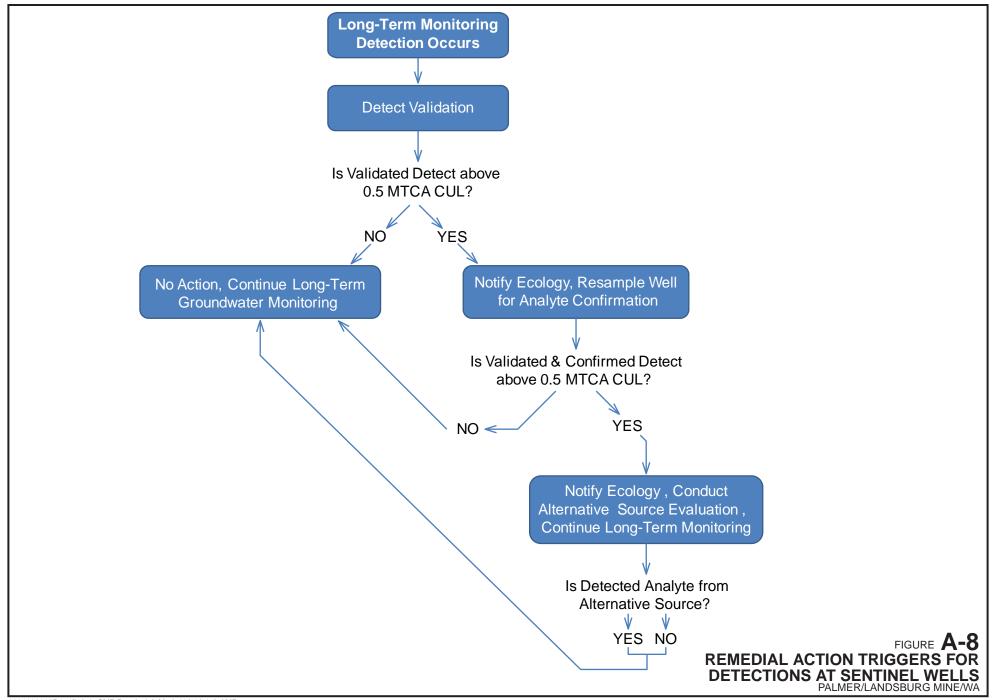
K:\CAD\Projects\1992\9231000\x002\R154\CMP\923_1000_002_R154_FA-6r5.dwg | Fig A-6 Location For Conditional Point of... | Mod: 07/31/2013, 08:33 | Plotted: 08/01/2013, 11:46 | aforcier



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

Golder Associates

FINAL DRAFT



DRAFT Golder Associates

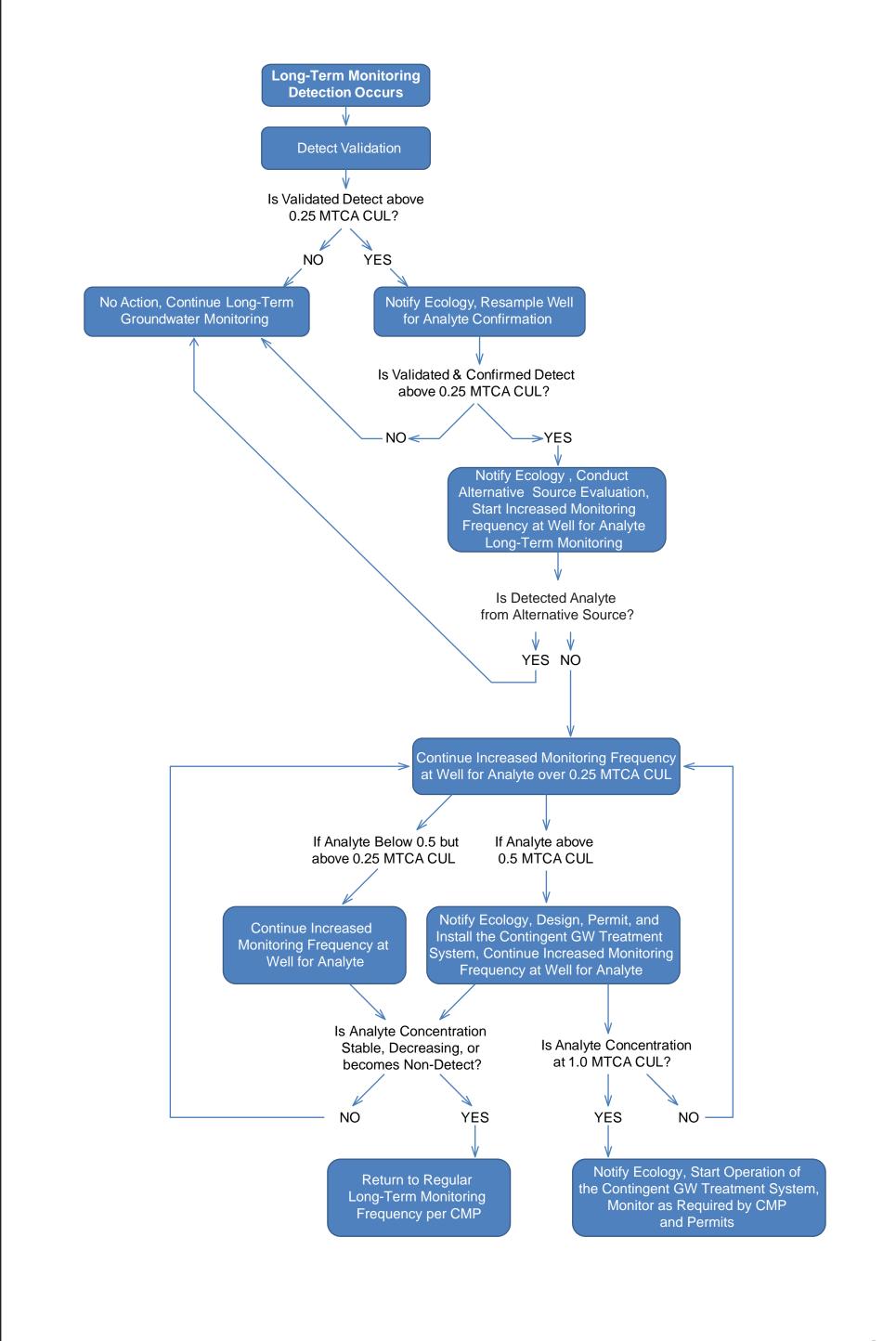
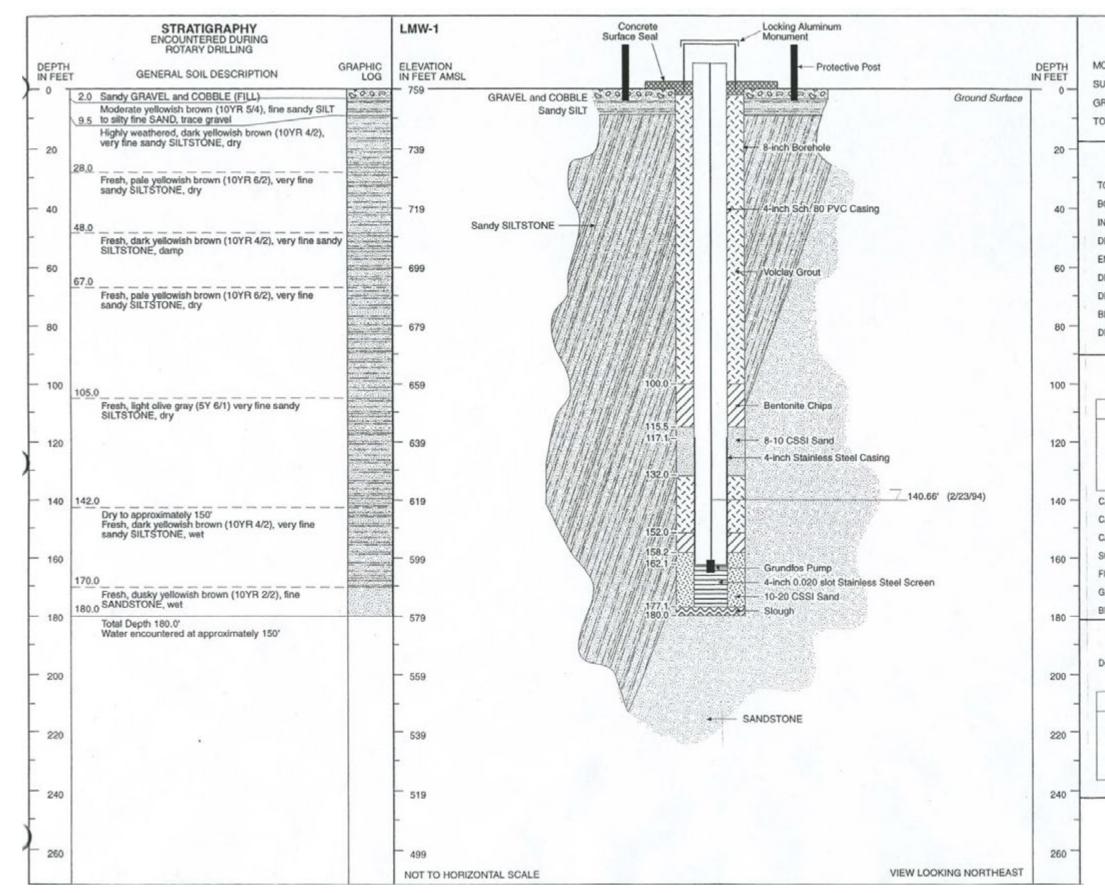


FIGURE A-9 REMEDIAL ACTION TRIGGERS FOR DETECTIONS AT COMPLIANCE WELLS PALMER/LANDSBURG MINE/WA

DRAFT Golder Associates

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APPENDIX LOGS APPENDIX QAPP APPENDIX DMP APPENIDX HASP APPENDIX LOGS



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	
NCLINATION:	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	

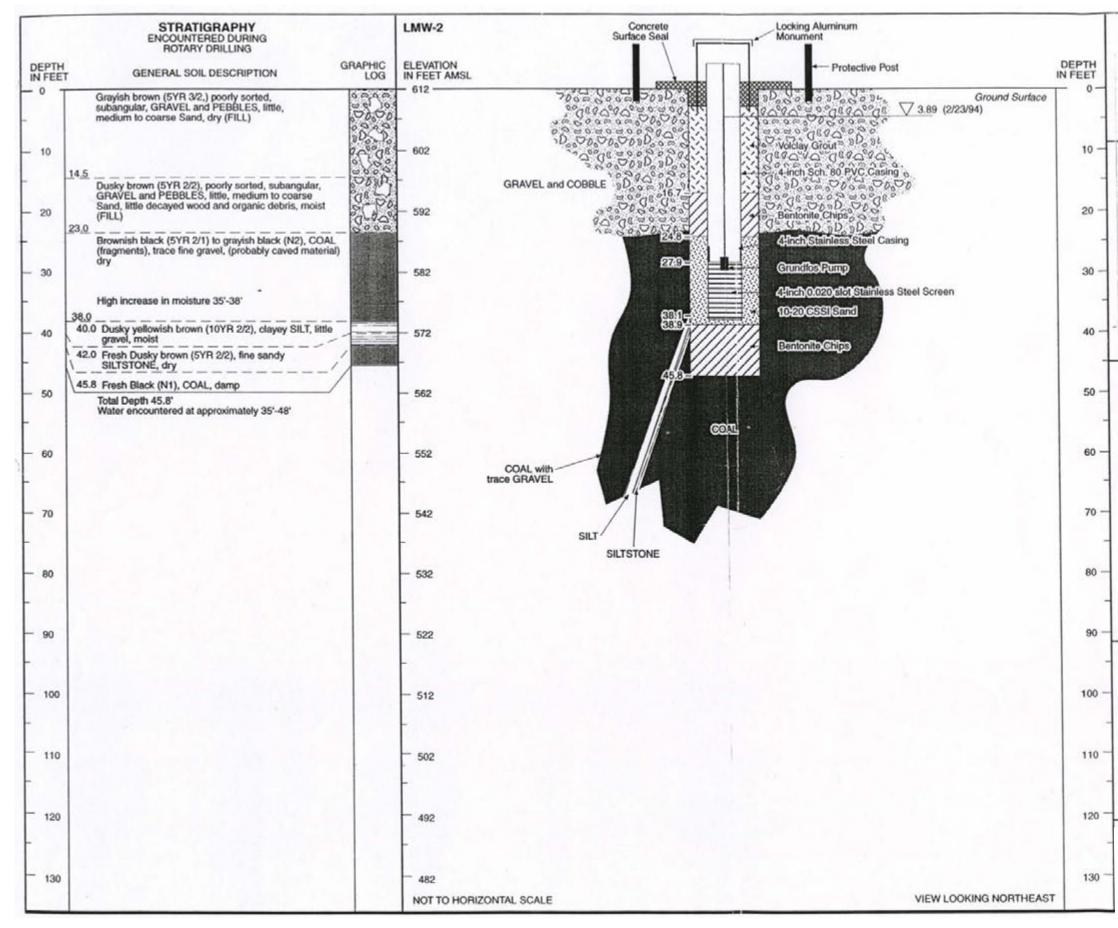
WELL DESIGN AND SPECIFICATIONS

CASING STRI	NG(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 0	Casing (removed)
CASING: C2	4-inch	Diameter PVC	
CASING: C3	4-inch	Diameter Stainles	s Steel Casing
SCREEN: S1	0.020-	inch Slotted 4-inch	Dia. Stainless Steel
FILTER PACK:	10-20	CSSI Sand	
GROUT SEAL:	Volclay	Grout	
BENTONITE:	Bentor	nite Chips	

PUMP AND PACKER SUMMARY

edicated Sampling Pu		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



- 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

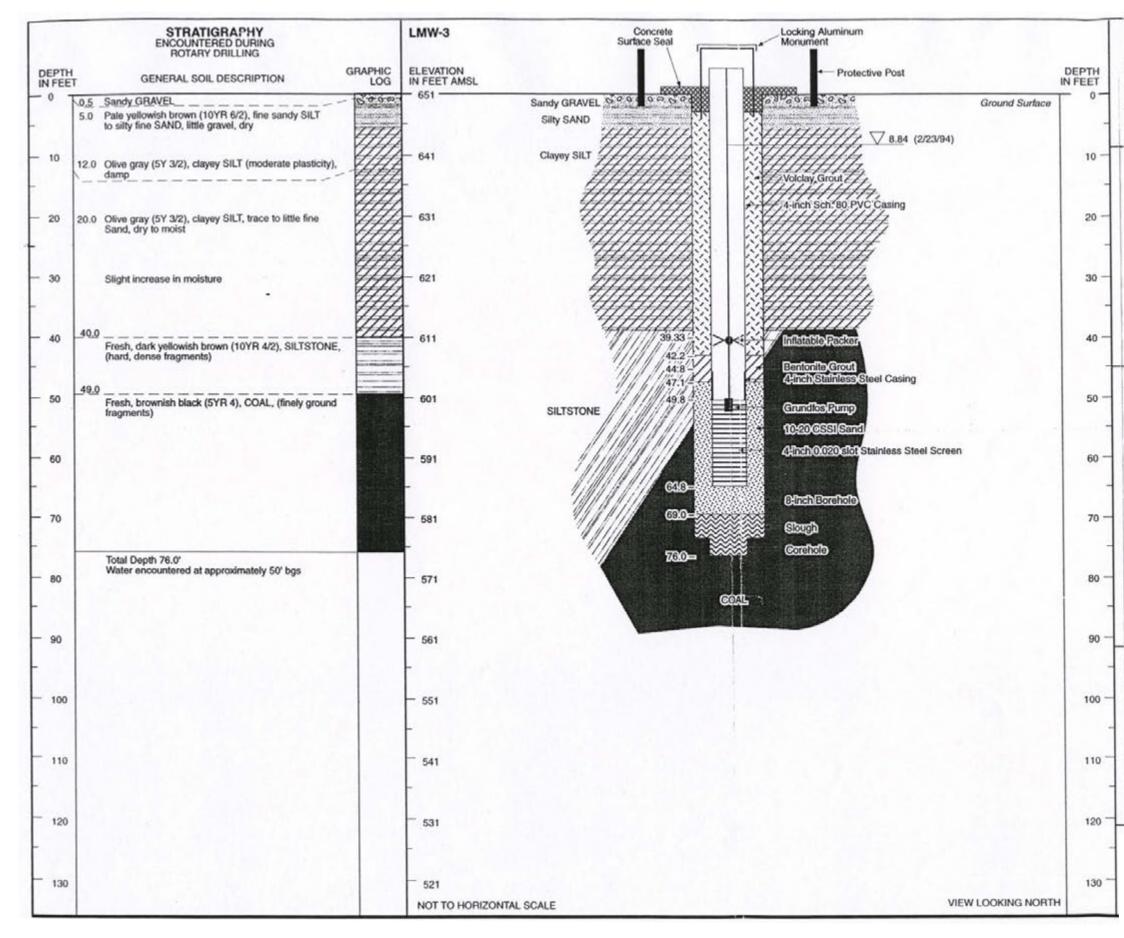
140(3)	0 = ONOING	0 - OOHLLIN	
	DEPTH (FT)	ELEVATION (MSL)	
-	(-2.5 - 40)	(614.29 - 571.79)	
1	-2.36 - 22.9	614.15 - 588.89	
	22.9 - 27.9	588.89 - 583.89	
	27.9-38.1	583.89 - 573.69	
8-inch	Temporary Steel	Casing (removed)	
4-inch	Diameter, Schedu	Je 80 PVC	
4-inch	Stainless Steel C	asing	
0.020	inch Slotted 4-incl	h Diameter Stainless Steel	
10-20	CSSI Sand		
Volcla	y Grout		
Bento	Bentonite Chips		
	8-inch 4-inch 0.020 10-20 Volcla	DEPTH (FT) (-2.5 - 40) -2.36 - 22.9 22.9 - 27.9 27.9 - 38.1 8-inch Temporary Steel 4 4-inch Diameter, Schedu 4-inch Stainless Steel C 0.020-inch Slotted 4-inch 10-20 CSSI Sand Volclay Grout	

PUMP AND PACKER SUMMARY

- Dedicated Sampling Pump: 2-horsepower Grundlos
 - 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



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

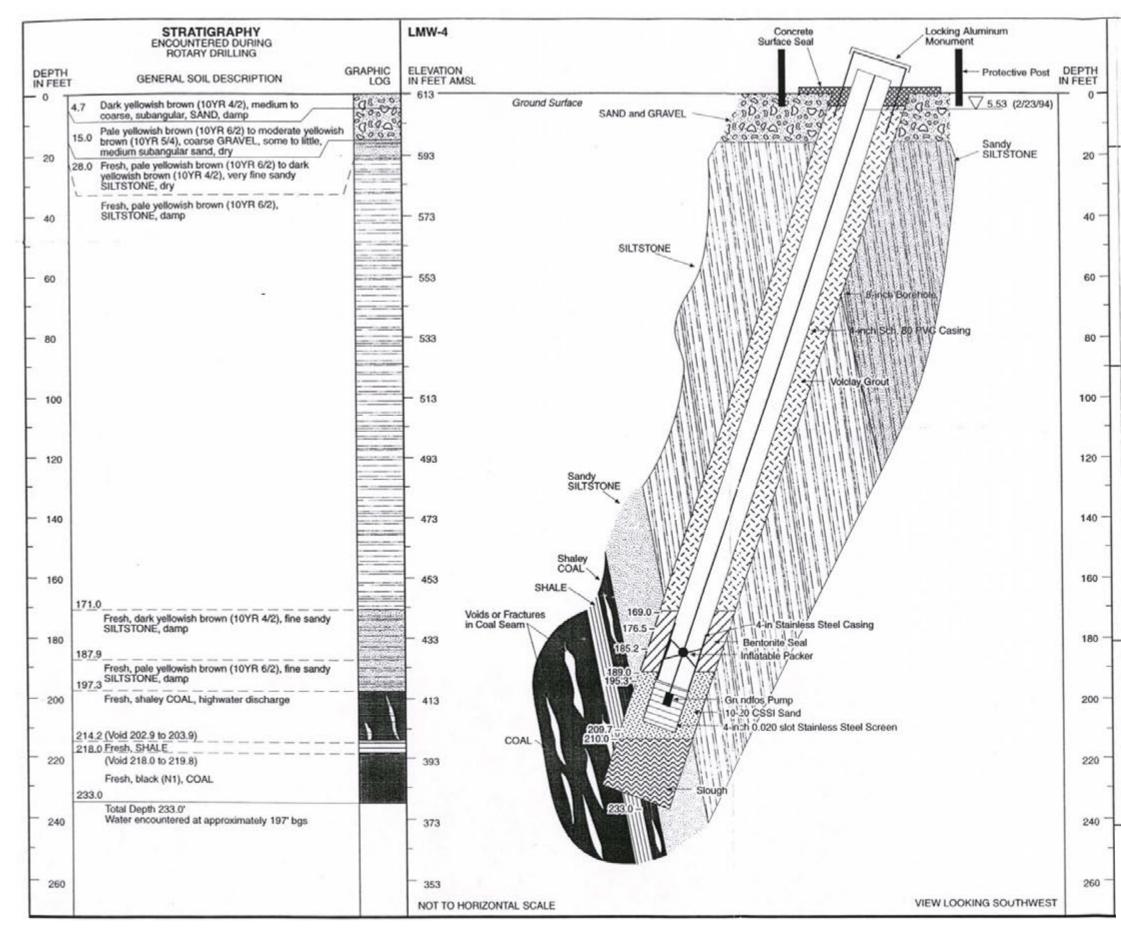
CASING STR	NG(S)	C = CASING	S = SCREEN	
STRINGS		DEPTH (FT)	ELEVATION (MSL)	
C1		(-2.0 - 6.0)	(652.84 - 646.84)	
C2		-2.67 - 44.8	653.51 - 606.04	
СЗ		44.8 - 49.8	606.04 - 601.04	
S1		49.8 - 64.8	601.04 - 586.04	
CASING: C1	8-inch	Temporary Steel C	Casing (removed)	
CASING: C2	4-inch	Diameter Schedul	e 80 PVC	
CASING: C3	4-inch	Stainless Steel Ca	asing	
SCREEN: S1	0.020-	inch slotted 4-inch	Diameter Stainless Stee	
FILTER PACK:	10-20 CSSI Sand			
GROUT SEAL:	Volciay	Grout		
BENTONITE:	Bentor	Bentonite Chips		

PUMP AND PACKER SUMMARY

Dedicated Sampling Pump:	Pump:	2-horsepower Grundfos
2.5	$\hat{I}\hat{v}$	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



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 STRI	NG(S)	C = CASING	S = SCREEN
STRINĠS		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 Schedul	e 80 PVC
CASING: C3	4-inch	Diameter 30 Stain	less Steel Casing
SCREEN: S1	0.020-i	inch slotted 4-inch	Diameter Stainless Ste
FILTER PACK:	10-20	CSSI Sand	
GROUT SEAL:	Volclay	Grout	
BENTONITE:	Bentor	nite Chips	

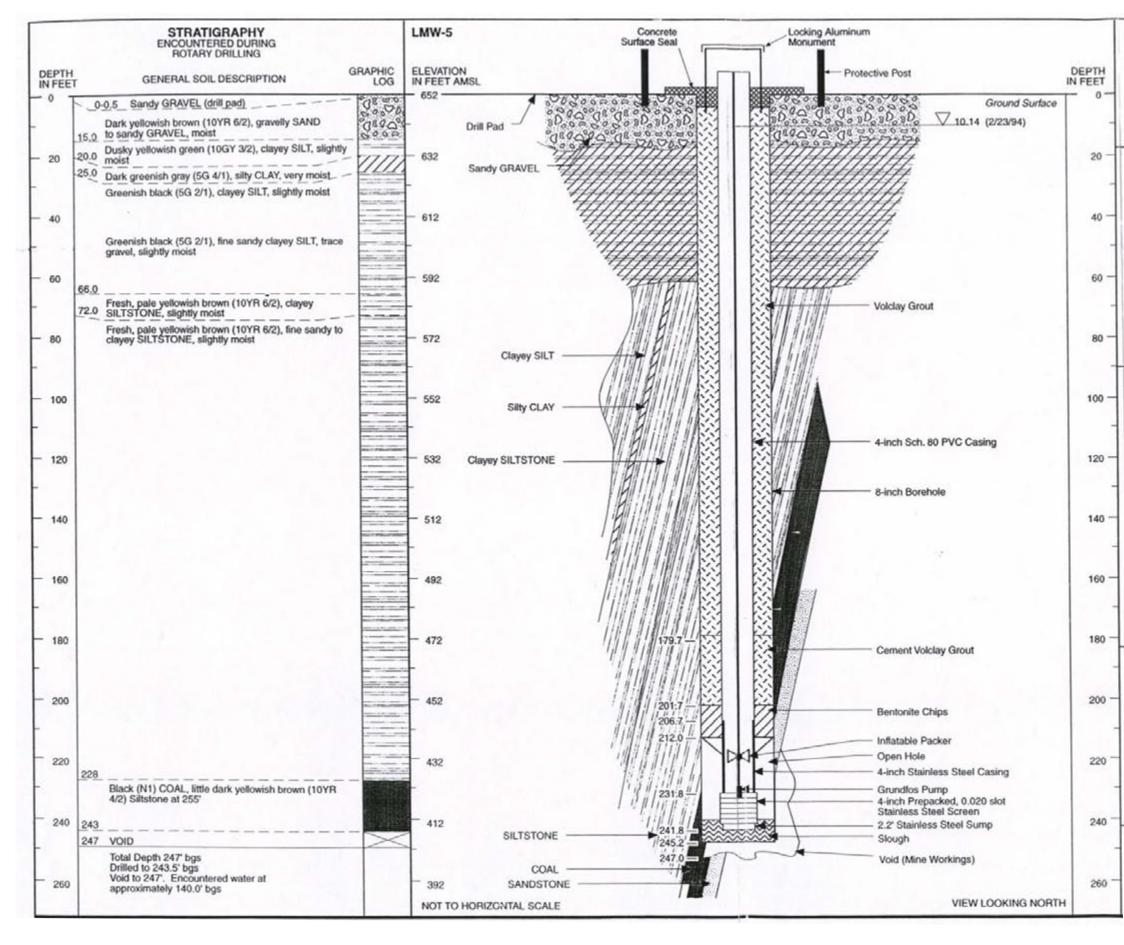
PUMP AND PACKER SUMMARY

Dedicated Sampling Pump: 2-horsepower Grundfos

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

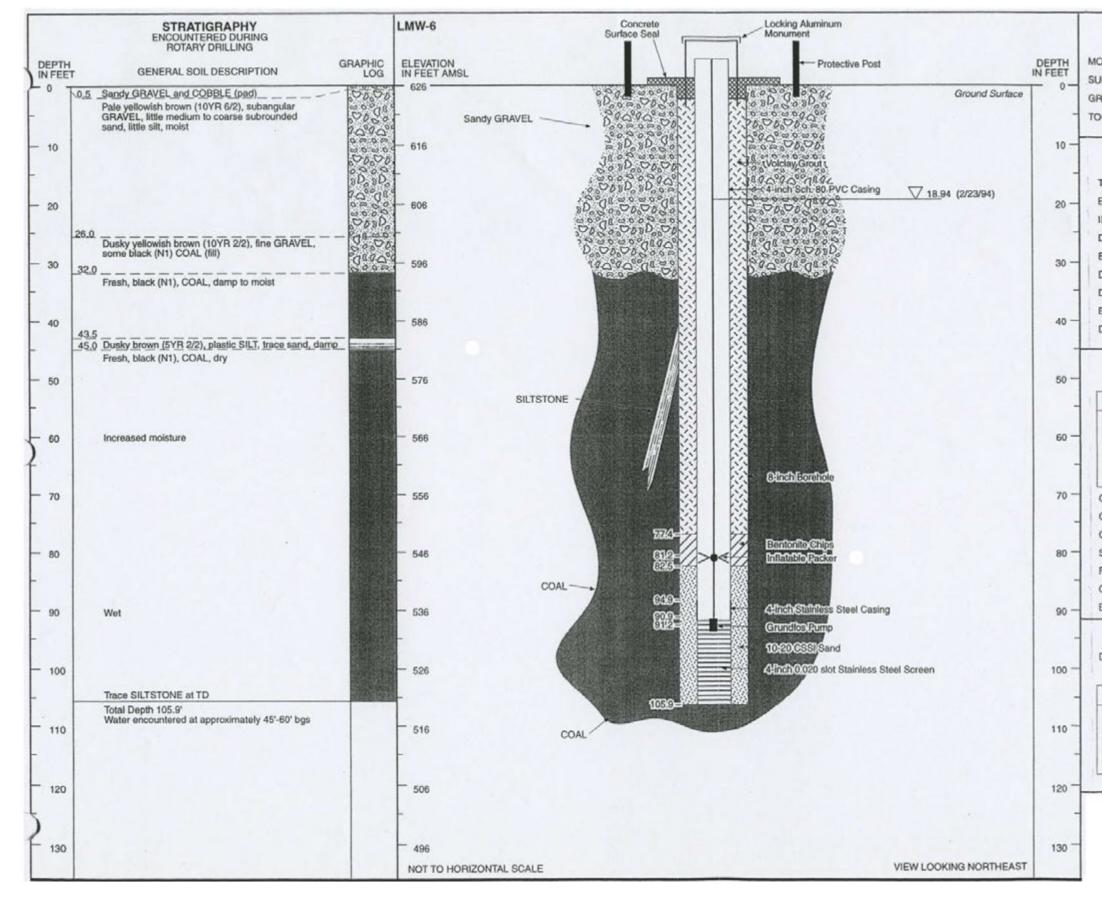
STRATIGRAPHY AND WELL COMPLETION LOG LMW-4 PALMER/LANDSBURG MINE/WA



9231000002R154cp04.ai | Mod: 04/07/10 | AMP

CONST	FRUCTION SUM	MARY
NITORING WELL: LI	MW-5	
VEY COORDINATE	S: N-135,263.6364,	E-1,713,019.1629
OUND SURFACE EL	EVATION (MSL): 65	1.89'
OF CASING (PVC)	ELEVATION: 654.7	8'
DR	ILLING SUMMA	RY
TAL DEPTH:	245.2' bgs	
REHOLE DIAMETER	R: 8-inch	
LINATION:	90°	
ILLER:	Burlington En	vironmental
GINEER:	G. Zimmerma	n
ILL METHOD(S):	Air Rotary	
ILL RIG	Schramm T-66	50
S:	7 7/8-Tricone	
ILLING FLUID:	Air	
WELL DES CASING STRING(S	IGN AND SPEC	
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
SING: C1 8-ir	hch Temporary Steel	Casing (removed)
SING: C2 4-ir	nch Diameter, Sched	ule 80 PVC
SING: C3 4-in	nch Stainless Steel F	liser
REEN: S1 0.0	20-inch Slotted 4-inc	h Diameter Stainless Ste
Pre	packed CSSI 10-20	Sand
PUMP A	ND PACKER S	JMMARY
dicated Sampling P		r Grundlos Pump Model MPI
STRINGS	DEPTH (FT)	ELEVATION (MSL)
Complian	232.11	419.78
Sampling Pump Intake		

STRATIGRAPHY AND WELL COMPLETION LOG LMW-5 PALMER/LANDSBURG MINE/WA



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

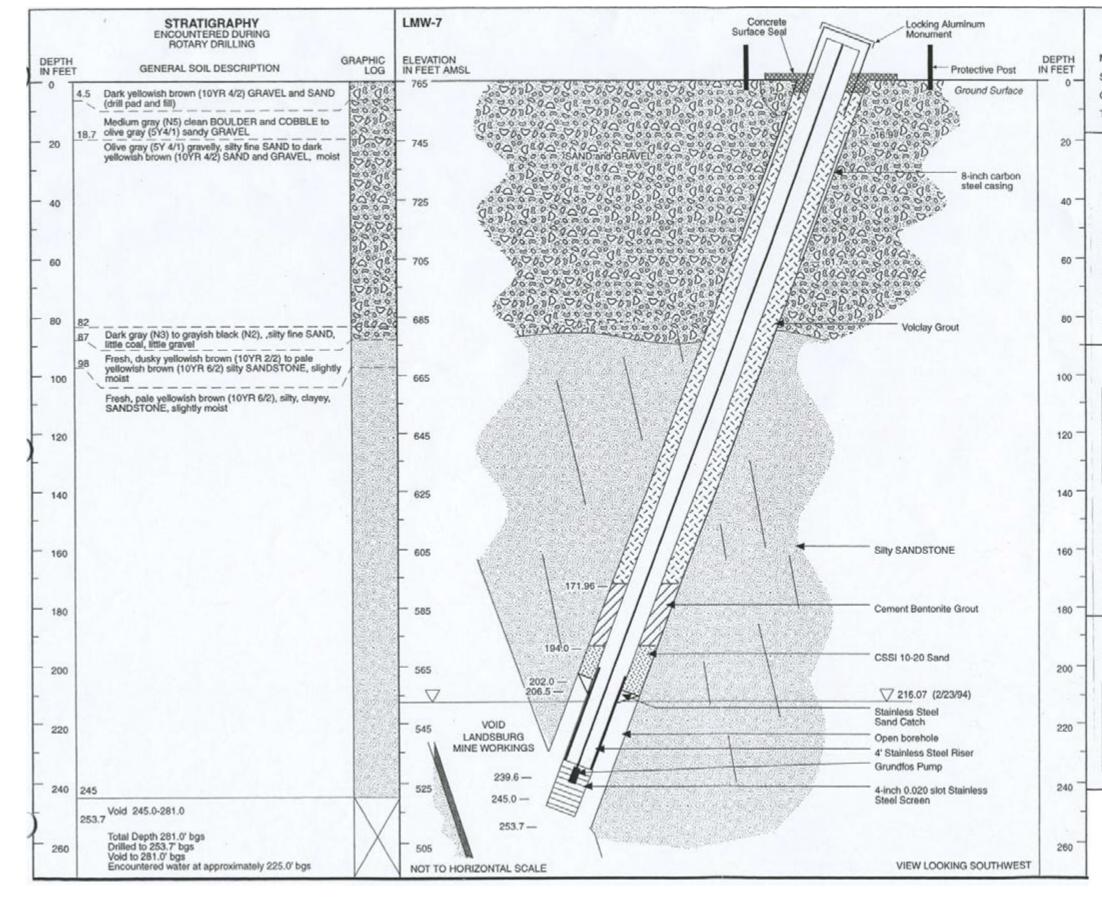
WELL DESIGN AND SPECIFICATIONS

CASING STRI	NG(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 C	asing (removed)
CASING: C2	4-inch Diameter Schedul	e 80 PVC
CASING: C3	4-inch Diameter Stainless	s 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

edicated Sampling Pu		r Grundfos 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



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 STR	NG(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 C	asing
CASING: C2	4-inch	Diameter, Schedul	le 80 PVC
CASING: C3	4-inch	Stainless Steel Ris	ser
SCREEN: S1	0.020-	inch Slotted 4-inch	Diameter Stainless Ste
FILTER PACK:	10-20	CSSI Sand	
GROUT SEAL:	Volcia	y Grout	
BENTONITE:	Bento	nite 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

	CATION	NUMBER: 923-1000.002.R280 DRILLI N: Ravensdale, Washington DRILL F SOIL PROFILE	RIG: Fo	remost	-04 AP-1000			AZIMUTH COORDIN SAMPLES	IATES	: <u>N:</u> 1			INCLINA 1,353,229.41 N RESISTANCE	TION: -90
o DEPTH (ft)	BORING METHOD	DESCRIPTION	uscs	GRAPHIC LOG	ELEV. DEPTH (ft)	NUMBER	ТҮРЕ	BŁOWS per 6 in 140 lb hammer 30 inch drop	N	REC / ATT	1	BLOW 0 20 R CONTI	2S / ft ■ 30 40 ENT (PERCENT) 0 ^W	l orvenio
- 10	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			2	GRAB							Portland Cement Type - I-II (0-1'bgs) Bentonite Grout Seal - (1-6'bgs) 20/40 Silica Sand - (6-7.5'bgs)
- 15 -		Boring completed at 15.0 ft.			<u>630.1</u> 15.0	3	GRAB							(7.5-13'bgs), Well Screen (8-13'bgs)
- 		CONTRACTOR: Layne Christense	20): J. Kenned D: D. More						Golder

Ŧ	ЕТНОD	SOIL PROFILE	<u></u>	1	AP-1000			COORDIN SAMPLES		T	PENETR	ATION RES BLOWS / ft		NOTES
DEPTH 0 DEPTH (ft)	BORING METHOD	DESCRIPTION	uscs	GRAPHIC LOG	ELEV. DEPTH (ft)	NUMBER	ТҮРЕ	BLOWS per 6 in 140 lb hammer 30 inch drop	N	REC / ATT	10 WATER (W, H	20 30 CONTENT (0		WATER LEV WELL GRAPHI
- 10 - 15 - 20		0.0 - 44.0 GP-GM-Poorly Graded Gravels with Silt, Dark Yellowish Brown, Some Medium Sub-angular Sand, Loose, Dry				1 2 3 4	grab grab grab grab							Portland Cement → (0-10 [°] bgs)
- 25			GP-GM			5	GRAB							
						6	GRAB							
35						7	GRAB							
- 40 45	ary	44.0 - 84.0			<u>697.2</u> 44.0		GRAB							
- 50	Becker Hamme/Air Rotary	Sandy Siltstone-Gray to Dark Brown, Hard, Dry. Sample was breakable with fingers.					GRAB							
- 55	Becker Ha					11	GRAB							
						12	GRAB							
65						13	GRAB							
							GRAB							
- 80							GRAB GRAB	ŕ					1	Grout Seal 0-143.5'bgs) -►
- 85		84.0 - 111.0 Sandy Sillstone-Gray to Dark Brown, Colors Mottled Throughout Sample, Hard, Dry. Sample was breakable with fingers.			657.2 84.0	17	GRAB							
- 90 - 95 - 95 							GRAB							

l 1

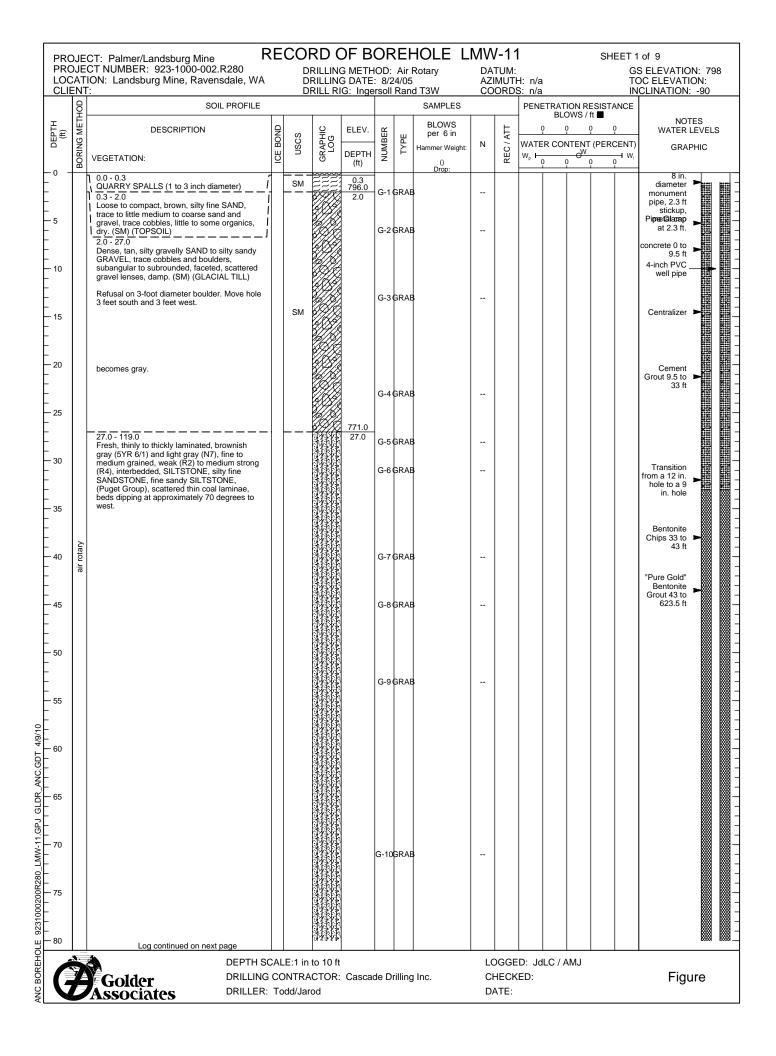
PROJE LOCAT	Landsburg Mine Site DRILLIN NUMBER: 923-1000.002.R280 DRILLIN Ravensdale, Washington DRILL R	G MET G DATI	HOD: E E: 4-07	Becker H -04 to 4-	amm 14-04	er		: N/A		35,727.33	E # E: 1,353,3	VCLINA 24.04	2 of 2 ION: 741.17 TION: -90
DEPTH (ft) ROBING METHOD	SOIL PROFILE	nscs	GRAPHIC LOG	ELEV. DEPTH (ft)	~	ТҮРЕ	BLOWS per 6 in 140 lb hammer 30 inch drop	N	REC / ATT		OWS / ft ■ 20 30	40	NOTES WATER LEV WELL GRAPHIC
- 105 - 105 - 105 - 105 - 105 - 110 - 1115 - 120 - 125 - 120 - 125 - 130 - 135 - 140 - 145 - 155 - 160 - 165 - 170 - 175 - 180 - 190 - 195 - 200	 94.0 - 111.0 Sandy Siltstone-Gray to Dark Brown, Colors Mottled Throughout Sample, Hard, Dry. Sample was breakable with fingers. (Continued) 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. 113.0 - 118.0 Sandy Siltstone-Gray to Dark Brown, Colors Mottled Throughout Sample, Hard, Dry. Sample was breakable with fingers. 118.0 - 150.0 Sandy Siltstone-Gray to Dark Brown, Colors Mottled Throughout Sample, Hard, Wet. Sample was breakable with fingers. 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. Boring completed at 159.0 ft. 			630.2 111.0 628.2 113.0 623.2 118.0 591.2 150.0 581.2 150.0	20 21 22 23 24 25 26 27 28 29 30 31 32 33 34	GRAB GRAB GRAB GRAB GRAB GRAB GRAB GRAB							20/40 Silica Sand → (143-146 ⁻ bgs) 10/20 Silica Sand → (146-159 ⁻ bgs) (149-159 ⁻ bgs)

B SOUL PROPER SOUL PROPER SOUL PROPER SOUL PROPER PENETRON REGISTION 0	PRC	DJECT	: Landsburg Mine Site DRILLIN NUMBER: 923-1000.002.R280 DRILLIN N: Ravensdale, Washington DRILL R	G DATI	E: 4-23-	-04 to 5-	amme 11-04 1	er 	DATUM: AZIMUTH: COORDIN		not			INC	LINA	0n: N/A '10n: -90
Cm. Sity Gravel. Gravel. Sand-Sin GM Cm. Sity Gravel. Gravel. Sand-Sin GM Cm. Sity Gravel. Gravel. Sand-Sin GM Cm. Sity Gravel. Sand-Sin File F	(tt)	BORING METHOD	DESCRIPTION	nscs	GRAPHIC LOG	DEPTH	NUMBER	TYPE	BLOWS per 6 in 140 lb hammer	N	REC / ATT	10 WATE	BLOWS 20 R CONTE	S / ft 🖬 30 4 NT (PERC	0 ENT)	WATER LEVELS WELL GRAPHIC
Sandy-Sillstone-Vellowsh Brown, Fine, Silf, 1 GRAB 1 SRAB 1 <td></td> <td></td> <td>Gm-Silty Gravels- Gravel-Sand-Silt Mixtures, Dark Yellowish Brown, Medium to</td> <td>GM</td> <td></td> <td>Cement Type</td>			Gm-Silty Gravels- Gravel-Sand-Silt Mixtures, Dark Yellowish Brown, Medium to	GM												Cement Type
1001-1700 1500 wif Engens), Dry X X X X X X 2 GRAB X X X)		Sandy-Siltstone-Yellowish Brown, Fine, Stiff,			6.5	1	GRAB								
Among)		Siltstone-Dark Brown/Gray, Hard(Breakable			15.0	2	GRAB								
K X					****		3	GRAB								
Drive x x x x x x x x x x x x x x x x x x x		ary			****		4	GRAB								
Image: state		ecker Hammer/Air Rot			*****		5	GRAB								
79.0 - 80.0 X X X 7 GRAB X X X X X X X 8 Siltstone-Dark Brown/Gray, Hard(Breakable X X X 80.0 W Fingers), Small Fracture Zone of Clayey X X X 80.0 X X X X X 80.0 Siltstone-Dark Brown/Gray, Hard(Breakable X X X 80.0 X X X X X 80.0 X X X X X 80.0 X X X X X 80.0 X X X X X X X X 80.0 X X X		B			*****		6	GRAB								
79.0 - 80.0 × × × × × Sillstone-Dark Brown/Gray, Hard(Breakable W Fingers), Small Fracture Zone of Clayey × × × 80.0 × Material, Wet × × × × × × × 80.0 - 105.0 × × × × × × Sillstone-Dark Brown/Gray, Hard(Breakable w/ Fingers), Dry × × × × × 80.0 - 105.0 × × × × × × × Sillstone-Dark Brown/Gray, Hard(Breakable w/ Fingers), Dry × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × × ×					****		7	GRAB								
x x			Siltstone-Dark Brown/Gray, Hard(Breakable w/ Fingers), Small Fracture Zone of Clayey Material, Wet 80.0 - 105.0 Siltstone-Dark Brown/Gray, Hard(Breakable		× × × × × × × × × × × × × × × × × × ×	80.0	8	GRAB								
D Log continued on next page					× × × × × × × × × × × × × × × × × × ×		9	GRAB								
in to 13 ft LOGGED: J. Kennedy	0				XXX											

PRC	DJECT	Landsburg Mine Site DRILLIN NUMBER: 923-1000.002.R280 DRILLIN I: Ravensdale, Washington DRILL R	G DATE	E: 4-23	-04 to 5-1			Datum: Azimuth: Coordin		: not	1		INCLIN/	TION: N/A ATION: -90
DEPTH (ft)	BORING METHOD	SOIL PROFILE	nscs	GRAPHIC LOG	ELEV. DEPTH (ft)	NUMBER	ТҮРЕ	BLOWS per 6 in 140 lb hammer 30 inch drop	N	REC / ATT	10	BLOWS	30 40 NT (PERCENT	NOTES WATER LEV WELL () GRAPHI
100 		80.0 - 105.0 Siltstone-Dark Brown/Gray, Hard(Breakable w/ Fingers), Dry (Continued)		× × × × × × × ×		10	GRAB							
- 105 - 110 - 110 - 115		105.0 - 106.0 Siltstone-Dark Brown/Gray, Hard(Breakable w/ Fingers), Small Fracture Zone of Clayey Material, Wet 106.0 - 153.0 Siltstone-Dark Brown/Gray, Hard(Breakable w/ Fingers), Dry		× × × × × × × × × × × × × × × × × × ×	106.0	11	GRAB							
- 120 - 120 - 125				****		12	GRAB							
130 130 130				****		13	GRAB							Grout Bentonite Seal (2-258'bgs)
- 140 - 140 - 145	Rotary			****		14	GRAB							
- - - - - - - - - - - - - - - - - - -	Becker Hammer/Air F	153.0 - 170.0 Siltstone-Dark Brown/Gray, Hard(Breakable w/ Fingers), Some Metallic Flecks in		****	153.0	15	GRAB							
- 160 - 160 - 165 - 165		Sample, Dry		****		16	GRAB							
- 170 - 170 - 175		170.0 - 181.0 Sillstone-Dark Brown/Gray, Hard(Not Breakable w/ Fingers), Dry		× × × × × × × × × × × × × × × × × × ×	170.0	17	GRAB							
		181.0 - 189.0 Sillstone-Motlled Dark Brown/Gray, Hard(Breakable w/ Fingers), Dry		****	181.0	18	GRAB							
- 190 - - - - 195 -		189.0 - 199.0 Sillstone-Mottled Dark Brown/Gray, Hard(Breakable w/ Fingers).Small Flecks of Coal in Sample, Dry		****	189.0	19	GRAB							
- 200		Log continued on next page		××	199.0				ł					
DRI		ft cONTRACTOR: Layne Christense Joe Macke	en			CH	IECK	D: J. Kenne ED: D. More 5/21/2004					(Golde

PRC		Landsburg Mine Site DRILLIN NUMBER: 923-1000.002.R280 DRILLIN Ravensdale, Washington DRILL R SOIL PROFILE	G DATI IG: <u>Fo</u> i	E: 4-23- remost /	-04 to 5-1 AP-1000	1-04		AZIMUTH: COORDIN SAMPLES		not		TRATION		IATION: -90 E
DEPTH (ft)	BORING METHOD	DESCRIPTION	nscs	GRAPHIC LOG	ELEV. DEPTH (ft)	R NUMBER	H H L GRAB	BLOWS per 6 in 140 lb hammer 30 inch drop	N	REC / ATT	11 WATE W, H-	D 20 R CONTE	S / ft E <u>30</u> <u>40</u> ENT (PERCEN	0.0.0
- 200 - - - 205 - -		199.0 - 211.0 Siltstone-Dark Brown/Gray, Hard(Breakable w/ Fingers), Dry (Continued)		× × × × × × × × × × × × × × × × × × ×		20	GRAB							
- 210 		211.0 - 259.0 Siltstone-Dark Brown/Gray, Hard(Breakable w/ Fingers), Dry		* * * * * * * * * * * * * * * * * * * *	× 211.0	21	GIVID							
- 220 - 225				****	****	22	GRAB							
230				****	***	23	GRAB							
- - - - - - - - - - - - - - - - - - -	ary			****	*****	24	GRAB							
- - - 250 -	Becker Hammer/Air Rotary			****	· · · · · · · · · · · ·	25	GRAB							
- 255 - - - 260 -	Bec	259.0 - 265.0 Siltstone-Light Brown/Gray, Hard(Not Breakable w/ Fingers), Dry		× × × × × × × × × × × × × × × × × × ×	3	26	GRAE							20/40 Silica Sand → (258-260'bgs)
265		265.0 - 266.0 Siltstone-Dark Brown/Gray, Hard(Breakable w/ Fingers), Fracture Zone of Clayey <u>Material, Wet</u> 266.0 - 283.0 Siltstone-Dark Brown/Gray, Hard(Breakable w/ Fingers),Small Pieces of Coal in Sample,		**** ************	266.0	27	GRAE	3						10/20 Silica Sand -►
		Wet		· × × × × × × × × × × × × × × × × × × ×	*****	28	GRAI	3						(260-287'bgs) Well Screen (267-287'bgs)
		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.)	 , 	× × × × × × × × × × × × × × × × × × ×	283.0 283.0		gra	в						20/40 Silica Sand - ► (287-289 ⁻ bgs)
		Workings.) 289.0 - 450.0 Sillstone-Dark Brown/Gray, Hard(Breakable w/ Fingers), Dry		*****										
	n to 1:	Log continued on next page 3 ft IG CONTRACTOR: Layne Christer				L C	OGGI HECI	ED: J. Ken KED: D. Me	nedy orell	<u> </u>		_!!		Gold

PROJ	ECT TION	NUMBER: 923-1000.002.R280 DRILLIN Ravensdale, Washington DRILL F	IG DATE	E: 4-23-	ecker Ha -04 to 5-1 \P-1000	1-04		AZIMUTH: COORDIN	N/A ATES	not			IATION: -90
DEPTH (ft)	BORING METHOD	SOIL PROFILE	nscs	GRAPHIC LOG	ELEV. DEPTH (ft)	NUMBER	ТҮРЕ	BLOWS per 6 in 140 lb hammer 30 inch drop	N	REC / ATT	BLO 10 20	ON RESISTANC WS / ft ■) 30 40 ITENT (PERCEN -0 ^W 1 V	NOTES WATER LE WELL T) GRAPH
- 300 - 305 - 310 - 315 - 320 - 325 - 320 - 325 - 320 - 325 - 330 - 335 - 340 - 345 - 355 - 355 - 360 - 365 - 365 - 365 - 365 - 365 - 365 - 360 - 375 - 360 - 365 - 360 - 365 - 360 - 375 - 360 - 365 - 360 - 375 - 370 - 390 - 390 - 395 - 3	Becker Hammer/Air Rotary	289.0 - 450.0 Siltstone-Dark Brown/Gray, Hard(Breakable w/ Fingers), Dry (Continued)		× × × × × × × × × × × × × × × × × × ×		31	GRAB GRAB GRAB GRAB GRAB GRAB GRAB						Portland Cement Type I-II (289-450'bgs)



F	PRO		CT: Palmer/Landsburg Mine CT NUMBER: 923-1000-002.R280	RE												SF	HEET 2	
L	.00		ION: Landsburg Mine, Ravensdale, WA		DF	RILLING	G METH G DATE G: Inge	: 8/2	24/05		AZI	TUM: MUTH ORDS					т	S ELEVATION: 798 DC ELEVATION: ICLINATION: -90
		-	SOIL PROFILE				<u> </u>			SAMPLES				NETR/	ATION F			
HTH	(H)	BORING METHOD	DESCRIPTION	QND	S	Ч Ч	ELEV.	ER	ш	BLOWS per 6 in		TT≜		0	0 0	0	0	NOTES WATER LEVELS
		RING	VEGETATION:	CE BOND	nscs	GRAPHIC LOG	DEPTH	NUMBER	ТҮРЕ	Hammer Weight:	N	REC / ATT	WAT W _P H				- w	GRAPHIC
— ε	80 -	B	27.0 - 119.0	Ĕ		ти	(ft)	~		() Drop:		~		<u> </u>	0 	0	0	
	35 90		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)					G-11	GRAE									
	95 00							G-12	GRAE									measured overnight
	05																	Percent duking in water gyptis measured during drilling.
-	10							G-13	GRAE									
	20 25	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), sitly fine to medium SANDSTONE, and, fine sandy SILTSTONE, with scattered thin laminae of coal (Puget Group).				679.0 119.0	G-14	GRAE	3								"Pure Gold" Bentonite F Grout
	30 35							G-15	GRAE	5								
	40		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).				<u>660.0</u> 138.0	G-16	GRAE									measured overnight di#iñ§ fr► di#iñ§ fr► 9/13/65 ft
	45 50		becomes very light gray (N8)					G-17	GRAE									9/6/05
	55 60		Log continued on next page															measured post drilling Static 12055 ft wate(20051 ft wate(20051 ft measure0 during well installation.
	Ĝ	Ì	Golder DEPTH S Golder DRILLING Associates DRILLER	G CC	NTRA	CTOR:		de D	rilling	Inc.	Cł	DGGE HECK ATE:		ldLC	/ AMJ			Figure

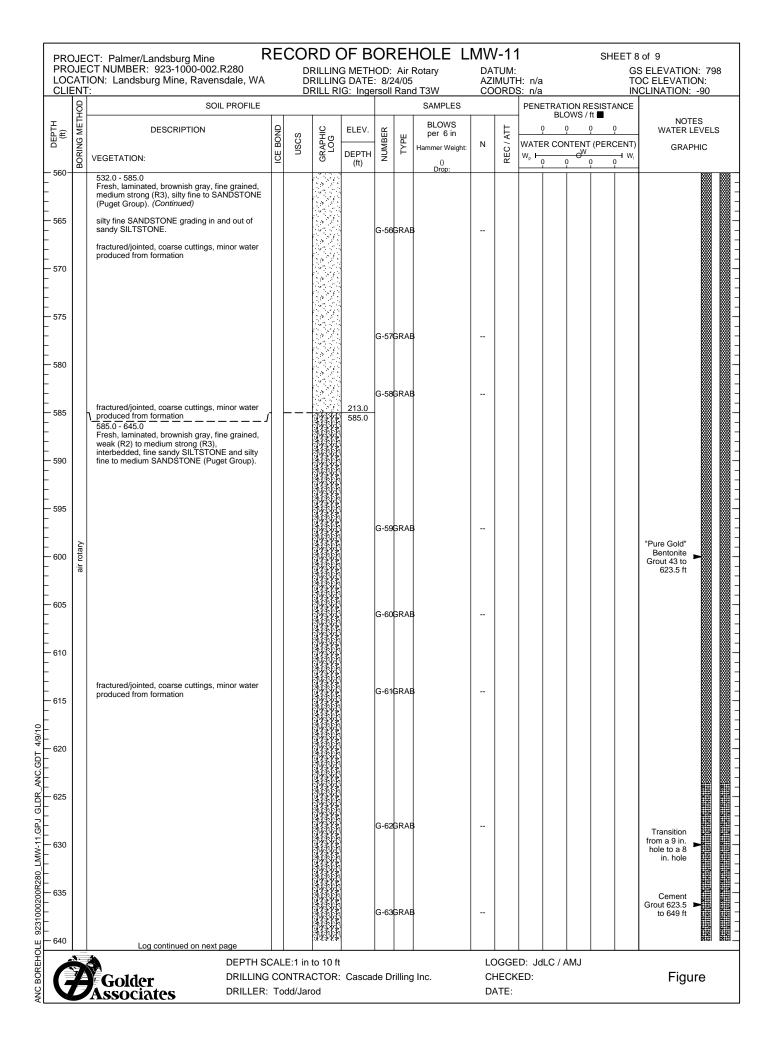
PRO	DJE	CT: Palmer/Landsburg Mine R CT NUMBER: 923-1000-002.R280	RE						HOLE L							SH	IEET 3		0
LOC	CAT	ION: Landsburg Mine, Ravensdale, WA		D	RILLIN	G METH G DATE G: Inge	: 8/2	24/05	-	AZ	TUM: IMUTI ORD	H: n					т	S ELEVATION: 798 DC ELEVATION: CLINATION: -90	8
		SOIL PROFILE		0		C. IIIgo		rtan	SAMPLES						ON RI		ANCE		
DEPTH (ft)	BORING METHOD	DESCRIPTION	Q	S	P ₽	ELEV.	ER		BLOWS per 6 in		ATT V		Ģ	00			0	NOTES WATER LEVELS	6
DE	RING	VEGETATION:	ICE BOND	nscs	GRAPHIC LOG	DEPTH	NUMBER	ТҮРЕ	Hammer Weight:	Ν	REC / ATT	WA ⁻ W _P				-		GRAPHIC	
- 160-	BO	138.0 - 172.0	Ľ			(ft)	2		() Drop:		~	P	• •	0	. (0 	0	8888	
F		Fresh, laminated, light brownish gray (5YR 6/1) and light gray, fine grained, medium					G-18												-
- 165		strong (R3), silty fine SANDSTONE (Puget Group). (Continued)					G-10	GRAD											
_		becomes light brownish gray																	-
-																			-
- 170 -						626.0	C 10												
_ _ _ 175		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				172.0	G-19	GRA	5										
E		(PUGET GROUP).																	-
- 180																			
F																		"Pure Gold"	-
185																		Bentonite Grout 43 to	
E		becomes very light gray, silty fine to medium SANDSTONE					G-20	GRAE	3									623.5 ft	-
- 190		SANDSTONE																	
F																			-
- 195																			
-		becomes light brownish gray, SILTSTONE																	-
-	rotary	becomes interbedded SILTSTONE AND SANDSTONE																	-
- 200	air ro						G-21	GRA	5										
- - - 205		becomes very light gray, silty fine to medium SANDSTONE																Pure Gold" Bentonite ► Grout 43 to 623.5 ft	
-		becomes light brownish gray, SILTSTONE			in h														-
210							G-22												
_							G-22												
F																			-
- 215 -																			
																			-
220		becomes very light gray, silty fine to medium SANDSTONE			hh		G-23	GRA	3										-
																			-
225							G-25	GRAF											
		becomes interbedded silty fine SANDSTONE and fine sandy SILTSTONE					0 20	[-
230																			-
							G-24	GRAE	3										
235																			
																			-
0.40					開作														-
		Log continued on next page		E:1 in	to 10 ft					10	DGGE	D.			M.I		1		
	Ŷ	Golder	со	NTRA	CTOR:		de D	rilling	j Inc.	CI	HECK			.,				Figure	
	D	Associates DRILLER:	То	dd/Jar	od					D	ATE:								

PR0	DJE CAT	CT NUMBER: 923-1000-002.R280 TON: Landsburg Mine, Ravensdale, WA	RE	DRI DRI		G METH G DATE	OD: : 8/2-	Air 4/05		DA AZ	TUM: IMUT	H: n/			SH	т	S ELEVATION: DC ELEVATION:	:
CLII		T: SOIL PROFILE		DRI	LL RI	G: Inge	rsoll	Ran	d T3W SAMPLES	CO	ORD						CLINATION: -9	0
	BORING METHOD	SUIL PROFILE										PEN		TION R .OWS /		ANCE	NOTES	
DEPTH (ft)	G ME	DESCRIPTION	DND	S	GRAPHIC LOG	ELEV.	BER	щ	BLOWS per 6 in		ATT		0 I			<u> </u>	WATER LEV	ELS
	RIN	VEGETATION:	ICE BOND	nscs	LO	DEPTH	NUMBER	ТҮРЕ	Hammer Weight:	N	REC / ,	W			·		GRAPHIC	2
- 240-	ß		Ľ		0	(ft)	2		() Drop:		2	P	0	0	0	o		000 100000
F		172.0 - 258.0 Fresh, thinly laminated, light brownish gray			猁徒													i 📓 📓
-		(5YR 6/1) and and light gray, fine grained, medium strong (R3), alternating fine sandy			44													i 📓 -
- 245		SILTSTONE and silty fine SANDSTONE (PUGET GROUP). (Continued)																
-		becomes very light gray, silty fine to medium		a carriera de la carr														88:
E		SANDSTONE																X X
- 250																		▓ ▓-
-				1	34													
-																		i 1988 -
- 255 -				and the second se														▓ ▓-
_						540.0												X 🗱 :
F		258.0 - 311.0 Fresh, laminated, very light gray and light			14	258.0												883
- 260 -		brownish gray, fine grained, strong (R4), interbedded silty fine to medium																▓ ▓-
E		SANDSTONE and fine sandy SILTSTONE (Puget Group).					G-260	GRAE	3									i 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997
- 265		(, -9		2002													"Pure Gold" Bentonite	× * -
- 200		becomes light brownish gray, SILTSTONE,															Grout 43 to 623.5 ft	i 🗱 -
F		trace fine organics (peat/coal)			制体													
- 270																		- - - - - - - - - - - - -
_																		. 100
E				200														X 🗱 1
- 275																		- 111 1
-					制体		G-270	GRAE	3									. 100
-	Σ																	× * *
- 280	ir rotary	becomes very light gray, strong (R4), silty fine to medium SANDSTONE																▓ ▓-
-	air																	i 🗱 -
F		becomes medium strong (R3)			11													
- 285 -				1														▓ ▓-
È				100			G-280	GRAE	3									× * *
- 290		becomes strong (R4)																▓ ▓_
- 230																		
-																		88.
- 295		harder drilling, coarse cuttings		1														
_		becomes weak (R2), crumbly SANDSTONE																i 🗱 🖁
10				and the second se														i 📓 -
₹ - 300							G-290	GRAE	3									
		becomes strong (R4), SILTSTONE																. 188
NA L																		× * *
H 305																		▓ ▓-
0 _																		i i -
19: -				1 and a			G-300	SRAE	5									
⊊ — 310 ≷ -					44	487.0												▓ ▓-
		Fresh, laminated, light olive gray and brownish gray, fine grained, medium strong (R2),				311.0												i 1998 -
824 24 215		interbedded, fine sandy SILTSTONE and silty		all														· 📖 🖉
2020		fine to medium SANDSTONE (Puget Group), trace thin laminae of shale and coal.					0.04											i 🗱 -
91231000200R280_LMW-11.GPJ_GLDR_ANC.GDT_49/10 0101 0110 010 0100 0100 0100 0100 0100 0100 0100 0100 0100 0100 0100 0100 0100 0100 0100 00		trace fine brown organics (peat) within			制体		G-310	SRAE	5									
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	3.	DEPTH S		E:1 in to	0 10 ft	1			1	10	JGGF	D: .I	dLC /	AMJ	1	1	I	
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F		SANDSTONE (Puget Group), trace siltstone laminae, mild reaction with HCI. (Continued)														
- 405 -																	
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410							G-41	GRAE	3								
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- 415																	
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420						377.0											
F		421.0 - 500.0 Fresh, laminated, light olive gray and brown	ish			421.0	G-42	GRAE	3								- 100 -
F		gray, fine grained, weak (R2) to medium strong (R3), interbedded, fine sandy															- 100 -
- 425 -		SILTŠTONE and silty fine to medium SANDSTONE (Puget Group).															
F		becomes weak (R2), silty fine SANDSTONE			的估												"Pure Gold"
- 430																	Bentonite Grout 43 to
F		becomes SILTSTONE															623.5 ft -
-		becomes weak (R2), interbedded silty fine					C 43	GRAE									
- 435		SANDSTONE and fine sandy SILTSTONE					G-43	GRAD									- 📓 🖉
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- 440	r rotary	becomes medium strong (R3), SILTSTONE															
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445							C 14	GRAE									
- 443		becomes weak (R2), silty fine to medium					0-44										
E		SANDSTONE with scattered SILTSTONE beds.															
450																	
F																	
- 455							G-45	GRAE	3								
							0.0										- 100 -
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		hannes madium atrana (D2) CANDSTON	_				G-46	GRAE	3								- 201
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480 421.0 - 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 -485 SANDSTONE (Puget Group). (Continued) - becomes interbedded SILTSTONE and SANDSTONE - becomes weak (R2), silty fine to medium	WATER LEVELS
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480 421.0 - 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 485 SANDSTONE (Puget Group). (Continued) becomes interbedded SILTSTONE and SANDSTONE becomes weak (R2), silty fine to medium	GRAPHIC
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-485 SANDSTONE (Puget Group). (Continued) G-47GRAB - becomes interbedded SILTSTONE and SANDSTONE G-47GRAB - becomes weak (R2), silty fine to medium G-47GRAB	
SANDSTONE becomes weak (R2), silty fine to medium	
becomes weak (R2), silty fine to medium	6000 6000 -
A 490 SANDSTONE with scattered thin coal laminae	- 🗱 👹 -
	- 100 -
- G-48GRAB	- 📖 🔛 -
L S00.0 - 520.0 - 520.0 - 520.0 - Fresh, laminated, light olive gray, brownish gray (5YR 4/1), and pale yellowish brown	- 100 -
 (10YR 6/2), fine grained, weak (R2), interbedded, silty fine to medium 	- 100 -
- 505 SANDSTONE and coaly SILTSTONE and - coaly SHALE (Puget Group).	
	ire Gold"
Grou	out 43 to 623.5 ft
hole producing minor water G-50GRAB	
- G-51GRAB G-51GRAB	- 100 -
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320 2 520.0 - 532.0 76 Fresh, laminated, brownish gray (5YR 4/1) 334.5 520.0 and pale yellowish brown (10 YR 6/2), weak 334.5 520.0	
and pale yellowish brown (10 YR 6/2), weak >>>> - (R2) to medium strong (R3), interbedded, >>>> - SILTSTONE, and sitty fine SANDSTONE >>>>	- 🗱 🕅 -
- 525 (Puget Group).	
hole producing minor water	
	- 100 -
<u>532.0 - 585.0</u> <u>532.0</u> 532.0	
Fresh, laminated, brownish gray, fine grained, medium strong (R3), silty fine to SANDSTONE	- 🐹 🕅 -
- 535 (Puget Group).	
	- 100 -
2- 5- - 540 G-54GRAB	
	- 100 -
	- 100 -
	- 200
	- 100 -
G-556GRAB	- 100 -
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DEPTH SCALE:1 in to 10 ft LOGGED: JdLC / AMJ	
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655						141.0	0.05						holē
660		657.0 - 700.0 Fresh, laminated, brownish gray to dark gray, fine grained, weak (R2) to medium strong (R3), interbedded, sithy fine to SANDSTONE and fine sandy SILTSTONE (Puget Group), scattered thin coal laminae.				657.0	-G-65	GRAE					Bentonite Pellets 651 ► to 665 ft
665		metal shavings in cuttings increase in water produced from formation					G-66	GRAE					10/20 silica sand used for sounding hole
670		scattered wood fragments, some painted											
675	air rotary						G-67	GRAE					
680		scattered wood fragments (to 1/2-inch diamter), and trace metal shavings					G-68	GRAE					Bentonite Pellets 667 ► to 688 ft Centralizer ►
685		680 to 690 feet-water produced from formation					G-69	GRAE					
690		metal shavings in cuttings					G-70	GRAE					20/40 Sand (Colorado Silica) 688 to 690 ft
695		becomes brownish gray to dark gray to light gray											Centralizer 10/20 Sand Pack (Colorado Silica) 690 to 707 ft
700	-	700.0 - 707.0 Fresh, laminated, black, very fine grained, very weak (R1), bituminous? COAL (Puget Group).				98.0 700.0	G-71	GRAE					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				91.0		GRAE GRAE					S.S. ring bit
710		rubbley zone (according to the driller) that represents the collapsed mine. Borehole completed at 707.0 ft.											
715													
720		DEPTH S										ED: JdLC / AMJ	

0 00 - 100 00 - 100 Ported -5 Mahure, Light 5 Dan Brown, Loads, Moist 0	DEPTH (ft)	BORING METHOD	SOIL PROFILE		1	ELEV.	BER	ц ц	SAMPLES BLOWS		r	PENETR E	E: 1,353,2 ATION RESIS 3LOWS / ft 20 30	STANCE 40	NOTES WATER LE' PIEZOME	VEL
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40 30.0 - 44.0 38.0 7 GRAB -45 44.0 - 68.0 804.7 8 GRAB -50 -45.0 -44.0 - 68.0 9 GRAB -50 -55 -60 -10 GRAB 9 GRAB -60 -60 -11 GRAB 11 GRAB 11 GRAB -60 -55 -56 -58.0 -58.0 -58.0 -58.0 -58.0 -58.0 -58.0 -59.0<	-															NONCAL
-40 30.0 - 44.0 38.0 7 GRAB -45 -44.0 - 68.0 -60.0 -44.0 8 GRAB -50 -55 -60 -60 -60 -66.0 -66.0 -66.0 -60 -66.0 <t< td=""><td>-</td><td></td><td>Mixtures with Silt, Light to Dark Brown,</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>Collapse Zone. Well was installed and casing was pulled back to allow borehole to collapse</td><td>XIONO ADADA</td></t<>	-		Mixtures with Silt, Light to Dark Brown,												Collapse Zone. Well was installed and casing was pulled back to allow borehole to collapse	XIONO ADADA
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45 CL-Inorganic Silty Clay of Medium Plasticity 8 GRAB -50 9 GRAB -50 9 GRAB -55 CL 10 -55 CL 10 -60 11 GRAB -60 580.7 68.0 -65 580.7 68.0 -65 580.7 68.0 -65 580.7 67.7 -65	- - 	Beck	Void	void		39.0 604.7	7	GRAB							Well Screen	
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APPENDIX QAPP



FINAL DRAFT

APPENDIX QAPP

QUALITY ASSURANCE PROJECT PLAN FOR COMPLIANCE GROUNDWATER MONITORING AT THE LANDSBURG MINE SITE

REPORT

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

July 31, 2013

Project No. 923-1000-002.R154



A world of capabilities delivered locally

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	Monitoring at the Landsburg Mine Site
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QAPP-1 Organizational Chart

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Attachment QAPP-A Laboratory QA Plan (to be included upon selection)



1.0 **PROJECT DESCRIPTION**

1.1 Project Objective and Historical Background

This Quality Assurance Project Plan (QAPP) was prepared for the Landsburg Mine Site 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 Quality Assurance Project Plan 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 Section 1.6 of the CMP.



2.0 PROJECT ORGANIZATION

2.1 Organizational Structure

The organizational structure for Long-Term 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 long-term monitoring and for preparation of analytical data reports, including submittals to WDOE. 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 Long-Term Groundwater Monitoring. Upon selection, the laboratory QA plan will be incorporated as Attachment QAPP-A of this QAPP.

2.3 Planning Structure

Long-Term Monitoring at the Landsburg Mine site is supported by several planning documents, which are briefly described as follows:

- Quality Assurance Project Plan: This Quality Assurance Project Plan (QAPP) is designed to support Long-Term Monitoring Activities involving field and/or laboratory investigations, and is prepared in compliance with the requirements of <u>Guidelines and</u> <u>Specifications for Preparing Quality Assurance Project Plans</u> (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 Long-Term Monitoring that are required pursuant to 20 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 all Target Analyte List (TAL) inorganic and Target Compound List (TCL) organic parameters from the current EPA Contract Laboratory Program (CLP) Statements of Work (EPA 1990a and 1990b), and other major groundwater constituents, as defined by Ecology for the purposes of this project. TAL and TCL constituents will be analyzed using EPA standard methods as defined in SW-846 (EPA 1986b).

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 3 of the CMP. The rationale behind the sampling schedule and the selection of sampling locations is also discussed in Section 3 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%. 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. 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 reperformed 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 3 of the CMP. Field quality control samples shall be included in the minimum quantities specified in Section 7 of this QAPP. Reference samples (AKA: 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 (see Exhibit C in TG-1.2-23) 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-1 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, then wiped with clean methanol-soaked rags or paper towels, and finally given a second rinse of 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-1 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-1 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 Contract Laboratory Program (EPA 2008). 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 Data Management Plan (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 "Test Methods for Evaluating Solid Waste" (SW-846) (EPA 1986b), as modified by the proposed rule changes included in the "Federal Register," Volume 54, No. 13 (EPA 1989b).

- 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 Contract Laboratory Program National Functional Guidelines (2007-2008).



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 investigation, performance audit requirements shall be met by the analysis of a minimum of one spiked performance audit sample per each 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. System audit requirements shall be implemented through the use of Procedure QP-10.1, "Surveillance Inspection."

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-14.1, "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-1 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 (USEPA 2007 and 2008), 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, as discussed in Section 3.6 of the CMP.



11.0 REFERENCES:

- QP 5.1.0 Document Preparation, Distribution, and Change Control, Golder Associates Quality Procedure, 1994.
- QP 10.1 Surveillance Inspection, Golder Associates Quality Procedure, 1994.
- QP 11.1 Calibration and Maintenance of Measuring and Test Equipment', Golder Associates Quality Procedure, 1994.
- QP 14.0-1 Control of Non-Conformances Incidents and Corrective Actions , Golder Associates Quality Procedure, 1994.
- Environmental Protection Agency. 2007-2008. National Functional Guidelines. http://www.epa.gov/superfund/programs/clp/guidance.htm



TABLES

TABLE QAPP-1 COMPLIANCE MONITORING FOR GROUNDWATER SAMPLING MATRIX

	Short-Term Perfor	mance Monitoring ^a					Lo	ng-Term Cor	nfirmational Mon	itoring		
Analysis				Ye	ar 1			rs 2 - 5	Years 6 - 10		Years 11+	
	Biweekly ^b	Monthly	1 st Quar	2 nd Quar	3 rd Quar	4 th Quar	1 st	2 nd	Annual	1 every 2.5 years	1 every 5 years	1 every 10 years
рН ^с	Х	Х	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	Xď	X ^{d,e}	Xe
Sp. Conductance ^c	Х	Х	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	Xď	X ^{d,e}	Xe
Dissolved Oxygen ^c	Х	Х	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	Xď	X ^{d,e}	Xe
Turbidity ^c	Х	Х	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	Xď	X ^{d,e}	Xe
Method 418.1 Mod.		Х	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	Xď	Xe	
Priority Metals			X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}		X ^{d,e}		X ^d	Xe
VOC (Method 8260)		Х	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	X ^{d,e}	Xď	Xe	
SemiVol. (Method 8270)			X ^{d,e}				X ^{d,e}		X ^{d,e}		X ^d	Xe
OCP, PCB's (Method 8081)			X ^{d,e}				X ^{d,e}		X ^{d,e}		X ^d	Xe
lotes:												

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 (twice per month) and monthly monitoring will be extended for four weeks following completion of trench backfill and caping at the same schedule as noted above.

² The pH and Specific Conductance analysis will be performed in the field.

X - means the analysis will be conducted on all compliance monitoring wells. LMW-2 through LMW-11.

X^d - means the analysis will be conducted only on Northward wells: LMW-2, LMW-4, LMW-10, Deep North Senitinel Well (yet to be installed), Shallow North Senitinel Well (yet to be installed), LMW-6, and LMW-7.

X^e - means the analysis will be conducted only on Southward wells: LMW-3, LMW-5, LMW-9, LMW-11, South Shallow Sentinel Well (yet to be installed), and Dual South Sentinel/Cap Effectiveness Well (yet to be installed).



		SW-846	Reporting Limit	Detection Limit
Category / ANALYTE	UNITS	Method ^b	(RL) ^a	(MDL) ^e
	UNITS	Method		
Field Parameter ^c				
		SM 4500H+		
рН	stnd		0.10	NA
Conductivity	uS/cm	SM 2510	20	NA
Dissolved Oxygen	mg/L	SM 4500-O	0.20	NA
Temperature	⊃°	SM 2550 B	0.5	NA
E _h	Rel mV		30.0	NA
Turbidity	NTU		0.50	NA
Metals				
Aluminum	mg/L	6010B	0.25	0.00757
Antimony	mg/L	6020	0.003	0.0003
Arsenic	mg/L	6020	0.003	0.0003
Barium	mg/L	6010B	0.01	0.0005
Beryllium	mg/L	6010B	0.01	0.00016
Cadmium	mg/L	6010B	0.001	0.00018
Calcium	mg/L	6010B	0.50	0.0112
Chromium	mg/L	6010B	0.01	0.0012
Cobalt	mg/L	6010B	0.01	0.00027
Copper	mg/L	6010B	0.003	0.0002
Iron	mg/L	6010B	0.050	0.0075
Lead	mg/L	6020	0.007	0.00155
Magnesium	mg/L	6010B	0.50	0.00961
Manganese	mg/L	6010B	0.01	0.0003
Mercury	mg/L	7470	0.001	0.0001
Nickel	mg/L	6010B	0.01	0.00386
Potassium	mg/L	6010B	0.50	0.0657
Selenium	mg/L	6020	0.025	0.00499
Silver	mg/L	6010B	0.005	0.00043
Sodium	mg/L	6010B	0.50	0.0113
Thallium	mg/L	6010B	0.025	0.0031
Vanadium	mg/L	6010B	0.0015	0.00027
Zinc	mg/L	6010B	0.02	0.00145
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



Category / ANALYTE	UNITS	SW-846 Method ^b	Reporting Limit (RL) ^a	Detection Limit (MDL) ^e
Volatile Organic Compounds (C	Continued)			
1,1-Dichloroethane	µg/L	8260C	1.0	0.053
1,1-Dichloroethene	μg/L	8260C	1.0	0.054
1,1-Dichloropropene	µg/L	8260C	0.1	0.034
1,2,3-Trichlorobenzene	µg/L	8260C	0.25	0.11
1,2,3-Trichloropropane	µg/L	8260C	0.25	0.131
1,2,4-Trichlorobenzene	µg/L	8260C	0.5	0.107
1,2,4-Trimethylbenzene	µg/L	8260C	1.0	0.024
1,2-Dibromo-3-Chloropropane	µg/L	8260C	0.5	0.366
1,2-Dibromoethane	µg/L	8260C	0.1	0.075
1,2-Dichlorobenzene	μg/L	8260C	1.0	0.036
1,2-Dichloroethane	µg/L	8260C	1.0	0.072
1,2-Dichloropropane	µg/L	8260C	1.0	0.035
1,3,5-Trimethylbenzene	µg/L	8260C	1.0	0.015
1,3-Dichlorobenzene	µg/L	8260C	1.0	0.036
1,3-Dichloropropane	µg/L	8260C	0.1	0.062
1,4-Dichlorobenzene	µg/L	8260C	1.0	0.04
2,2-Dichloropropane	µg/L	8260C	0.1	0.052
2-Butanone	µg/L	8260C	5.0	0.814
2-Chloroethyl vinyl ether	µg/L	8260C	0.5	0.25
2-Chlorotoluene	μg/L	8260C	0.1	0.024
2-Hexanone	µg/L	8260C	5.0	0.902
4-Chlorotoluene	µg/L	8260C	1.0	0.016
4-Isopropyltoluene	μg/L	8260C	0.1	0.026
4-Methyl-2-pentanone	μg/L	8260C	2.5	0.974
Acetone	μg/L	8260C	5.0	2.057
Acrolein	μg/L	8260C	2.5	2.476
Acrylonitrile	μg/L	8260C	1	0.604
Benzene	μg/L	8260C	1.0	0.027
Bromobenzene	μg/L	8260C	0.2	0.06
Bromochloromethane	µg/L	8260C	0.2	0.061
Bromodichloromethane	µg/L	8260C	0.2	0.051
Bromoform	µg/L	8260C	1.0	0.062
Bromomethane	µg/L	8260C	1.0	0.252
Carbon disulfide	µg/L	8260C	1.0	0.037
Carbon tetrachloride	µg/L	8260C	0.3	0.044
Chlorobenzene	µg/L	8260C	1.0	0.023
Chlorodibromomethane	µg/L	8260C	1.0	0.048
Chloroethane	µg/L	8260C	1.0	0.086
Chloroform	µg/L	8260C	1.0	0.027
Chloromethane	µg/L	8260C	1.0	0.095
cis-1,2-Dichloroethene	µg/L	8260C	1.0	0.043
cis-1,3-Dichloropropene	μg/L	8260C	0.2	0.061
Dibromomethane	μg/L	8260C	0.2	0.145



		SW-846	Reporting Limit	Detection Limit
Category / ANALYTE	UNITS	Method ^b	(RL) ^a	(MDL) ^e
Ethylbenzene	µg/L	8260C	1.0	0.037
Hexachloro-1,3-butadiene	µg/L	8260C	0.25	0.073
Iodomethane	µg/L	8260C	0.5	0.227
Isopropylbenzene	µg/L	8260C	1.0	0.021
Methylene Chloride	µg/L	8260C	1.0	0.485
m-Xylene & p-Xylene	µg/L	8260C	1.0	0.052
Naphthalene	µg/L	8260C	1.0	0.118
n-Butylbenzene	µg/L	8260C	1.0	0.025
N-Propylbenzene	µg/L	8260C	1.0	0.023
o-Xylene	µg/L	8260C	1.0	0.035
sec-Butylbenzene	µg/L	8260C	1.0	0.024
Styrene	µg/L	8260C	1.0	0.045
tert-Butylbenzene	µg/L	8260C	1.0	0.026
Tetrachloroethene	µg/L	8260C	1.0	0.047
Toluene	µg/L	8260C	1.0	0.04
trans-1,2-Dichloroethene	µg/L	8260C	1.0	0.048
trans-1,3-Dichloropropene	µg/L	8260C	0.2	0.081
trans-1,4-Dichloro-2-butene	µg/L	8260C	1.0	0.324
Trichloroethene	µg/L	8260C	1.0	0.049
Trichlorofluoromethane	µg/L	8260C	1.0	0.037
Vinyl Acetate	µg/L	8260C	1.0	0.069
Vinyl Chloride	µg/L	8260C	0.1	0.057
Semivolatile Organic Compound				
1,2,4-Trichlorobenzene	µg/L	8270C	0.5	0.495
1,2-Dichlorobenzene	µg/L	8270C	1.0	0.436
1,3-Dichlorobenzene	μg/L	8270C	1.0	0.499
1,4-Dichlorobenzene	µg/L	8270C	1.0	0.47
1-Methylnaphthalene	µg/L	8270C	1.0	0.241
2,4,5-Trichlorophenol	µg/L	8270C	3.0	1.706
2,4,6-Trichlorophenol	µg/L	8270C	1.5	1.235
2,4-Dichlorophenol	µg/L	8270C	3.0	1.109
2,4-Dimethylphenol	µg/L	8270C	3.0	0.627
2,4-Dinitrophenol	µg/L	8270C	10	5.474
2,4-Dinitrotoluene	µg/L	8270C	3.0	1.277
2,6-Dinitrotoluene	µg/L	8270C	3.0	1.3
2-Chloronaphthalene	µg/L	8270C	1.0	0.34
2-Chlorophenol	µg/L	8270C	1.0	0.246
2-Methylnaphthalene	µg/L	8270C	1.0	0.241
2-Methylphenol (o-Cresol)	µg/L	8270C	1.0	0.329
2-Nitroaniline	µg/L	8270C	3.0	0.784
2-Nitrophenol	µg/L	8270C	1.5	0.979
3 & 4-Methylphenol (m,p-Cresols)	µg/L	8270C	2.0	0.63
3,3'-Dichlorobenzidine	µg/L	8270C	2.5	1.553



		SW-846	Reporting Limit	Detection Limit
Category / ANALYTE	UNITS	Method ^b	(RL) ^a	(MDL) ^e
3-Nitroaniline	µg/L	8270C	3.0	1.14
4,6-Dinitro-2-methylphenol	µg/L	8270C	5	4.928
4-Bromophenyl phenyl ether	µg/L	8270C	0.5	0.262
4-Chloro-3-methylphenol	µg/L	8270C	1.5	0.919
4-Chloroaniline	µg/L	8270C	2.5	1.733
4-Chlorophenyl phenyl ether	µg/L	8270C	0.5	0.342
4-Nitroaniline	µg/L	8270C	1.5	1.366
4-Nitrophenol	µg/L	8270C	5	2.895
Acenaphthene	µg/L	8270C	1.0	0.347
Acenaphthylene	µg/L	8270C	1.0	0.274
Anthracene	µg/L	8270C	1.0	0.303
Benzo(a)anthracene	µg/L	8270C	0.5	0.373
Benzo(a)pyrene	µg/L	8270C	0.5	0.425
Benzo(b)fluoranthene	µg/L	8270C	0.5	0.298
Benzo(ghi)perylene	µg/L	8270C	0.5	0.464
Benzo(k)fluoranthene	µg/L	8270C	0.5	0.487
Benzoic Acid	µg/L	8270C	20	8.647
Benzyl Alcohol	µg/L	8270C	5.0	0.409
Bis(2-chloroethoxy)methane	µg/L	8270C	1.0	0.252
Bis(2-chloroethyl)ether	µg/L	8270C	0.5	0.5
Bis(2-chloroisopropyl)ether	µg/L	8270C	1.0	0.5
Bis(2-ethylhexyl)phthalate	µg/L	8270C	2.0	0.5
Butyl benzyl phthalate	µg/L	8270C	1.0	0.402
Carbazole	µg/L	8270C	3.0	0.251
Chrysene	µg/L	8270C	0.5	0.397
Dibenz(a,h)anthracene	µg/L	8270C	0.5	0.437
Dibenzofuran	μg/L	8270C	1.0	0.198
Diethyl phthalate	µg/L	8270C	1.0	0.407
Dimethyl phthalate	µg/L	8270C	1.0	0.264
Di-n-butyl phthalate	µg/L	8270C	1.0	0.304
Di-n-octyl phthalate	µg/L	8270C	1.0	0.331
Fluoranthene	µg/L	8270C	1.0	0.29
Fluorene	μg/L	8270C	1.0	0.266
Hexachlorobenzene	µg/L	8270C	0.5	0.335
Hexachlorobutadiene	µg/L	8270C	1.5	0.604
Hexachlorocyclopentadiene	μg/L	8270C	2.5	1.862
Hexachloroethane	μg/L	8270C	1	0.61
Indeno(1,2,3-cd)pyrene	μg/L	8270C	0.5	0.435
Isophorone	µg/L	8270C	1.0	0.258
Naphthalene	μg/L	8270C	1.0	0.326
Nitrobenzene	µg/L	8270C	1.0	0.49
N-Nitrosodi-n-propylamine	μg/L	8270C	3.0	0.365
N-Nitrosodiphenylamine	μg/L	8270C	3.0	1.209
Pentachlorophenol	μg/L	8270C	5	2.746
Phenanthrene	μg/L	8270C	1.0	0.283
Phenol	µg/L	8270C	3.0	0.445



		SW-846	Reporting Limit	Detection Limit
Category / ANALYTE	UNITS	Method ^b	(RL) ^a	(MDL) ^e
Pyrene	µg/L	8270C	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
Aroclor 1254	µg/L	8082B	0.05	0.0175
Aroclor 1260	µg/L	8082B	0.05	0.0174
Pesticides				
Aldrin	µg/L	8081	0.05	0.0103
alpha-BHC	µg/L	8081	0.05	0.0085
beta-BHC	µg/L	8081	0.05	0.0098
delta-BHC	µg/L	8081	0.05	0.0087
gamma-BHC	µg/L	8081	0.05	0.0159
alpha-Chloradine	µg/L	8081	0.05	0.0082
gamma-Chloradine	µg/L	8081	0.05	0.0082
4,4'-DDD	µg/L	8081	0.1	0.0186
4,4'-DDE	µg/L	8081	0.1	0.0184
4,4'-DDT	µg/L	8081	0.1	0.0169
Dieldrin	µg/L	8081	0.1	0.0168
Endosulfan I	µg/L	8081	0.05	0.0089
Endosulfan II	μg/L	8081	0.1	0.0139
Endosulfan sulfate	µg/L	8081	0.1	0.0235
Endrin	µg/L	8081	1.0	0.0167
Endrin aldehyde	µg/L	8081	0.1	0.0163
Endrin ketone	µg/L	8081	0.1	0.0151
Heptachlor	µg/L	8081	0.05	0.0113
Heptachlor epoxide	µg/L	8081	0.05	0.0079
Methoxychlor	µg/L	8081	1.0	0.0744
Toxaphene	µg/L	8081	5.0	0.22



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				
Diesel Range	mg/L	W-TPH- HCID	0.25	0.039
Gas Range	mg/L	W-TPH- HCID	0.4	0.087
Heavy Fuel Oil	mg/L	W-TPH- HCID	0.25	0.044

^{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, <u>Test Method for Evaluating Solid Waste</u> (EPA 1986b)

- ^{c-} from <u>Methods for the Chemical Analysis of Water and Waste (EPA-600/4-79-020)</u> (EPA 1979); 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.



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"



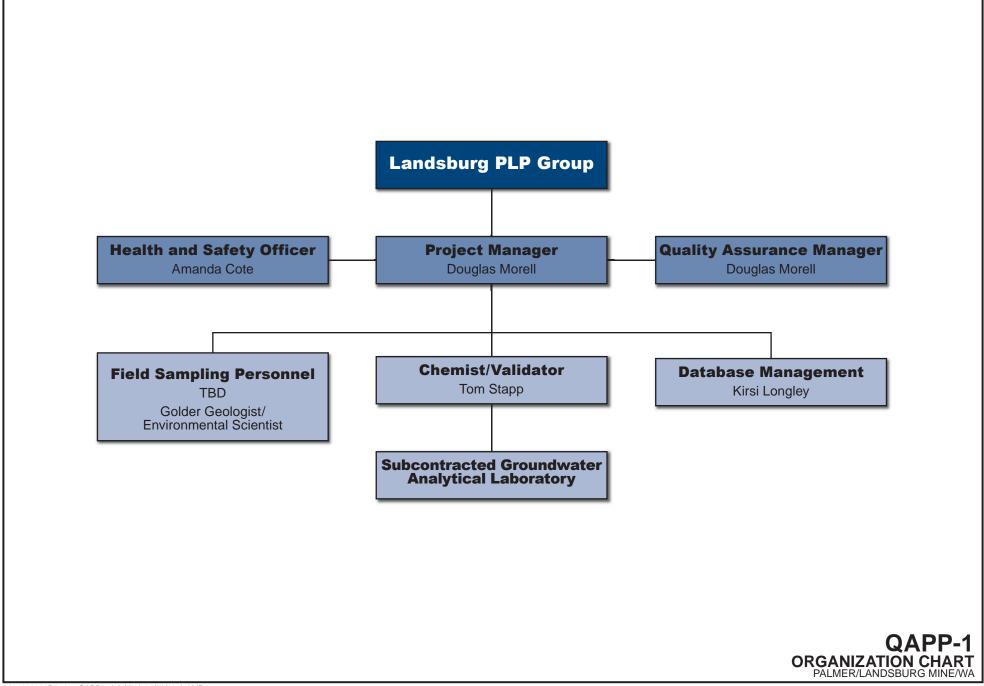
Sample Container Types, Volumes, Preparation, Handling Preservation, and Holding Times

Analytes of Concern	Container Type	Special Handling	Preservation	Maximum Holding Time
pH, Sp. Conductance, Total Dissolved Solids, Turbidity	1, 500 mL narrow mouth polyethylene bottle	Fill to neck	None, store at 4°C±2°C if necessary.	pH, analyze on site Sp. Cond., 28 days TDS, 7 days Turbidity, 48 hours
Metals, Hardness ,	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
Cyanide	1, 1000 mL narrow mouth polyethylene bottle	Fill to neck	Preserve to pH > 12 with Sodium Hydroxide, if source is chlorinated add 0.6 g ascorbic acid to dechlorinate	14 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
Semivolatile 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 <u>4</u> °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

FINAL DRAFT



Golder Associates

APPENDIX QAPP-A

LABORATORY QA PLAN (TO BE INCLUDED UPON SELECTION)

DMP



FINAL DRAFT

APPENDIX DMP

DATA MANAGEMENT PLAN FOR COMPLIANCE MONITORING AT THE LANDSBURG MINE SITE

REPORT

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

July 31, 2013

923-1000-002.R154



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DMP-1 Organization of Data Management Team



1.0 DATA MANAGEMENT

This Data Management Plan was prepared for the Landsburg PLP Group by Golder Associates Inc. (Golder) as Attachment B of the Compliance Monitoring Plan for remedial action at the Landsburg Mine site. The Compliance Monitoring Plan 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 data management plan (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 for 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 procedure QP-16.1 "Quality Assurance Records Management," the duplicate storage requirements of QP-16.1 Section 8.1.3 shall 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 E-mail 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 the Washington State Department of Ecology;
- A historical file of all versions of the RI/FS Work Plan, RI/FS, Quality Assurance Project Plan, Data Management Plan, Health and Safety Plan, Compliance Monitoring Plan, and supporting 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 Associates Inc (Golder) in both hard copy (paper) and electronic format from all analytical laboratories. The paper copy will be routed to the data validator for confirmation of analytical data receipt and subsequent validation activities. Electronic data, by diskette, or by electronic (E-mail) delivery will be reserved by the data management specialist. Validated analytical data packages and diskettes 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

Following receipt and final data validation of groundwater analytical results, concentrations of detected analytes will be compared to established action levels. The proposed action levels for the RI/FS are provided in Tables QAPP-4 through QAPP-8, Attachment B, of the Quality Assurance Project Plan (QAPP). The groundwater action levels are established as the most protective value as compared to Primary Drinking Water Regulation maximum contaminant level (MCL) Standards (USEPA 2003), Model Toxics Control Act (MTCA) Method A, or MTCA Method B calculated levels for groundwater (Ecology 2007a). Soil action levels are derived from MTCA Method A or Standard Method B formula values for the direct contact pathway or for the protection of groundwater. Where applicable, the more protective level is indicated for carcinogenic compounds.

After data has been received, validated, and reviewed, it 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 and soil 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 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;
- Table of Method B cleanup levels to be used as screening concentrations; and,
- Table of data quality qualifier abbreviations and descriptions.

1.3.2 The Environmental Information Management System

The Environmental Information Management System (EIM) (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 Potentially Liable Parties (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 and /or traditional reporting formats. The scope of the interim record distribution shall be as 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.



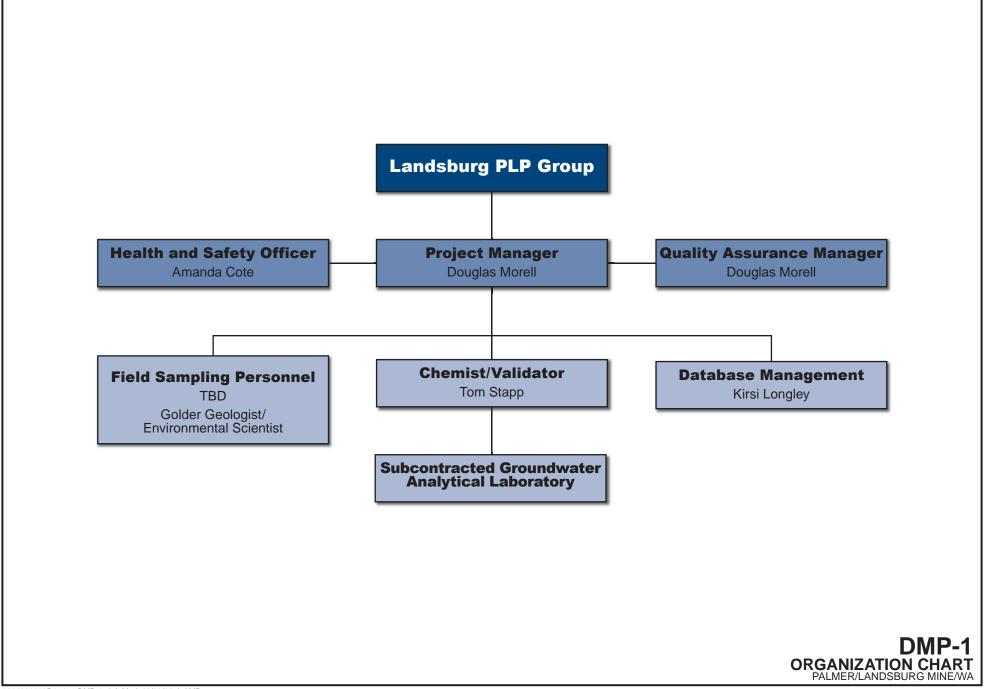
2.0 **REFERENCES**

- USEPA. 2003. National Primary Drinking Water Regulations, List of Contaminants & their MCLs, <u>http://www.epa.gov/safewater/contaminants/index.html</u>, Office of Water (4606M), EPA 816-F-03-016 June 2003
- 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.
- Washington State Department of Ecology (Ecology). 2007b. EIM Submittal Guidelines <u>www.ecy.wa.gov/eim Version 2006.01</u>.



FIGURE

FINAL DRAFT



Golder Associates

APPENIDX HASP



FINAL DRAFT

APPENDIX HASP

HEALTH AND SAFETY PLAN FOR COMPLIANCE MONITORING AT THE LANDSBURG MINE SITE

REPORT

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

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923-1000-002.R154



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Attachment HSP-B	Safety Briefing Acknowledgment Form
Attachment HSP-C	Incident Report Form
Attachment HSP-D	Field Safety Procedures Change Authorization



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 1¹/₂ 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	Amanda Cote
Project Manager	Douglas Morell

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., <u>never</u> 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 at all times.

- 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 (cigarettes, gum, snuff) 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 others' 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/Gatorade/Squencher, 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 (H₂S), 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 MTCA Method B 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 which could potentially be encountered during the 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 with time 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 long-term 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 (to be installed prior to the completion of the remedial action). 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, EC and temperature periodically during purging,
- Collection of all purge water in appropriate containers for on-site temporary storage prior to disposal, and
- Sample collection.

3.1.2 Potential Hazards and Precautionary Measures

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 rubber boots, hard hats, safety glasses with side shields, 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 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 or Microtip 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 exporsure.

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.

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.
- 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.
- 5. Remove Tyvek 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., <u>personnel shall temporarily cease operations</u>, 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, <u>notify the onsite Health and Safety</u> <u>Coordinator</u> 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.
 - 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 <u>Auburn</u> <u>Regional Medical Center</u>. 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 <u>Auburn Regional Medical Center (253-833-7711)</u> for a complete physical examination as soon as possible. <u>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.
 </u>

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, <u>Do Not Move The Injured Person Unless Absolutely Necessary To Save His</u> <u>Or Her Life</u>, until the nature of the injury has been determined. Administer rescue breathing if the victim is not breathing, control severe bleeding and <u>immediately</u> seek medical assistance as discussed below.

3. If further medical treatment is required and:

a. <u>the injury is not immediately life threatening</u>, contact <u>Auburn Regional</u> <u>Medical Center at (253-833-7711)</u> and take the injured party to the hospital by private automobile.

b. <u>the injury is severe</u>, immediately call Paramedics (<u>911</u>). In the interim, determine the status of Auburn Regional Medical Center and advise them of the situation. <u>If Auburn General Hospital is unable to respond immediately and adequately, for any reason, contact the Enumclaw Regional Hospital (<u>360-825-2505</u>) or Airlift Northwest (<u>1-800-426-2430</u>).</u>

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. <u>Never</u> 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:

- If the situation can be readily controlled with available resources <u>without jeopardizing</u> <u>the health and safety of yourself or other site personnel</u>, 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

FINAL DRAFT

TABLE HSP-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 [°])				
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 [°])				



TABLE HSP-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°)		
Trichlorofluoromethane	1000 ppm (TLV ^d)		
Vinyl Chloride	Lowest reliably detectable level (REL [°]) 0.5 ppm (TLV ^d)		
2-Butanone	20 ppm (REL°)		
SEMIVOLATILE ORGANIC (COMPOUNDS		
2-Chlorophenol	None		
2-Methylphenol	2.3 ppm (REL [°])		
4-Methylphenol	2.3 ppm (REL [°])		
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°)		
Phenol	5 ppm (TLV ^d)		
ORGANOCHLORINE PESTICIDES AND PCBs			
Aroclor 1242	Reduce exposure to lowest feasible limit (REL ^c)		



TABLE HSP-1 (Cont.)

ALLOWABLE OCCUPATIONAL EXPOSURE LIMITS

SUBSTANCE	STRICTEST EXPOSURE LIMIT ^a (mg/m ³)
	1 mg/m ³ (TLV ^d)
Aroclor 1254	Reduce exposure to lowest feasible limit (REL [°]) 0.5 mg/m ³ (TLV ^d)

^aUnless otherwise noted, all values are 8-hr time weighted average concentrations in air.

^bPermissible exposure limit promulgated by the Occupational Safety and Health Administration (29 CFR 1910.1000)

^cRecommended exposure limit published by the National Institute for Occupational Safety and Health (1988) ^dThreshold limit value promulgated in WAC 296-62-07515, Table 1.

^eNot applicable



TABLE HSP-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				
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 kidne 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 HSP-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				



TABLE HSP-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 HSP-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, chlorac					
Aroclor 1254		liver damage, animal carcinogen			
^a Source:					

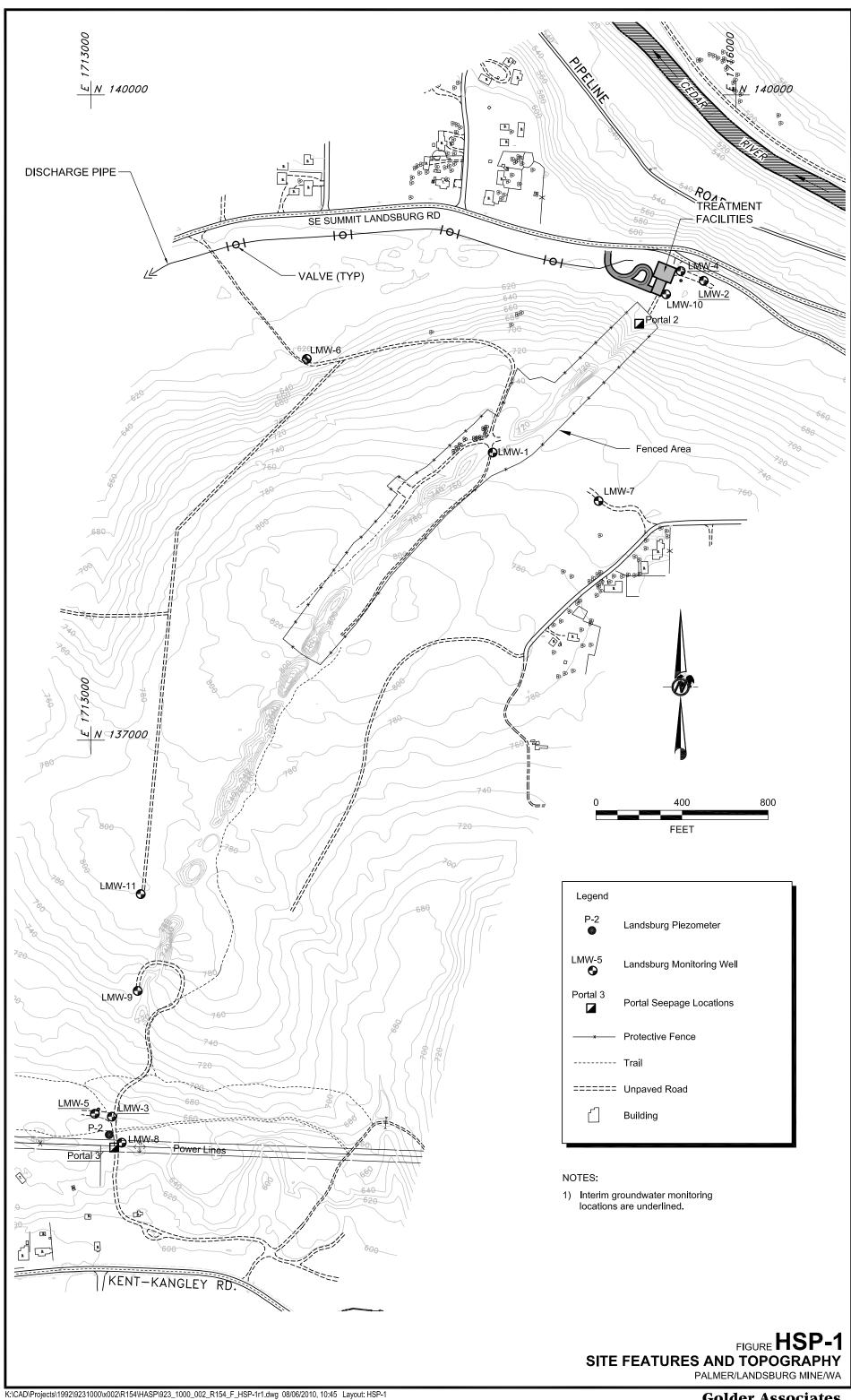
National Institute for Occupational Safety and Health, 1990, NIOSH Pocket Guide to Chemical Hazards, National Institute for Occupational Safety and Health, Cincinnati, Ohio.

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



~	Theelive Fence	
	Trail	
======	Unpaved Road	
	Building	

Golder Associates

APPENDIX HSP-A MAP TO HOSPITAL

Google maps Hospital 202 N Division St # Main, Auburn, WA 98001-4939 - (253) 833-7711 16.1 mi – about 24 mins Save trees. Go green! Download Google Maps on your phone at google.com/gmm Lake (515) Youngs Park Lake (169) SE 208th St Youngs East 84th Ave Hill-Meridian SE 216th S 485 Ave co. (515) Ave Church Rd 986 18 ŝ 167) ŝ Erickson Ave SE 232nd St Soos 路 Creek Park R SE 240th St N Rd James St 045 Arcadia 18 Ave Meridian Valley Meridian Wilderness (516) Ave Golf and ŝ Heights Country Club ŝ SE Kent Kangley Rd SE 256th St (18) Maple Covington Valley 1085 (516) Ave SE 272nd St (516) SE 272nd St (516) SE 272nd St 516 (169) ŝ omas R 9 132nd 124th SE Covington Sakyer Rd SE 288th St Ave AWB ŝ 124 Crest Berrydale ŝ R Airpark Ave Auburn Regional Golf Course Lake ŝ Lake Sawyer Morton-Berrydale SE 304th St +(169) Seattle Lea Hill Auburn International SE 312th St unicipal Raceway Airport Wynaco SE 320th St B **8**890 Roberts D Black Rd uburn Diamond 18 SE Lake Holm Rd SE 336th St SE Auburn-88 3 홏 2180 R St SE Green River SE Green (164) Valley Ro St Green 4 SE Green Valley Rd (164) Flaming Geyser State Park 4 SE 368th St ©2010 Google - Map data ©2010 Google -

Directions to Auburn Regional Medical Center -

 Head west on SE Kent Kangley Rd toward SE Summit Landsburg Rd	go 1.1 mi
About 2 mins	total 1.1 mi
2. Take the 2nd right onto Maple Valley-Black Diamond Rd	go 2.7 m
About 5 mins	total 3.9 m
3. Turn left at SE 231st St	go 0.2 m i
About 1 min	total 4.1 mi
 Turn left to merge onto WA-18 W toward Auburn	go 11.3 m i
About 13 mins	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	go 0.4 m i
About 2 mins	total 15.9 mi
7. Turn left at 2nd St NE	go 0.1 mi
About 1 min	total 16.0 mi
 2nd St NE turns right and becomes A St NE	go 125 ft
Destination will be on the left	total 16.1 mi
Auburn Regional Medical Center - Hospital 202 N Division St # Main, Auburn, WA 98001-4939 - (253) 833-7711	

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

Map data ©2010 Google

Directions weren't right? Please find your route on maps.google.com and click "Report a problem" at the bottom left.

APPENDIX HSP-B SAFETY BRIEFING ACKNOWLEDGMENT FORM

HI	EALTH AND SAFETY FORMS					
INEALTINAND SAFETT FORMS INEALTINAND SAFETT FORMS Project Name: Tailgate Safety Briefing Sign-In Log Date: Time: Date: Signature: 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 Hearing Conservation Respiratory Protection Personal Hygiene Exposure Guidelines	Decontamination Procedures Smoking, Eating, and Drinking Slips, Trips, and Falls Heat Stress Site Control	Emergency Procedures Existing Work Zones Lockout/Tagout Safety Excavation/Confined Space Safety New Work Procedures				
Personnel Sign-in List Printed Name	Signature	Company Name				



Date

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 HSP-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.

<u>Incident:</u> 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:



Date

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	l/correct the incic	lent:			
COMMENTS					
REVIEWED BY:					
	Site	Health and Safety Cool	rdinator		
		ject Manager			
	Pro	ject Director			

APPENDIX HSP-D FIELD SAFETY PROCEDURES CHANGE AUTHORIZATION



- -

Date

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

(Signature of person named above to be obtained within 48 hours of verbal authorization)



1.0 SCOPE

This SWP applies to all Golder Associates Inc. and Golder Construction Services (Golder) staff that work

on a project site with potential for chemical exposure

2.0 CHEMICAL SUBSTANCE

The following safety protocol is intended for personnel who, during the course of their work, may be exposed to or encounter chemical or biological substances not usually encountered under normal working conditions.

Anyone who continually encounters chemical or biological substances will have the appropriate OSHA training. Any individual who does not usually deal with but comes across chemical or biological substances should locate someone with the appropriate OSHA training immediately and inform them of the hazard.

These chemical or biological substances may include the residues from industrial processes or commercial activities, compounds used in manufacturing, and/or materials present in specialized work environments. These substances, if present in sufficient concentrations, could potentially affect worker health and safety. Therefore, it is important to be aware that such hazards could exist and take appropriate measures to reduce and/or eliminate potential exposure.

Note

This protocol does not include exposure to ionizing radiation. Specialized safety measures, monitoring and testing is required for such environments, and is beyond the scope of this protocol.

As a matter of company policy, Golder personnel will not work in chemical and/or biological environments considered immediately dangerous to life or health (IDLH), or requiring personal protective measures to US Environmental Protection Agency (USEPA) Level A (i.e., self-contained breathing apparatus (SCBA) and fully-encapsulating, chemically resistant clothing), unless specific and specialized training for working in such environments is provided to personnel, all required equipment is provided, and all required monitoring (air, exposure, medical, etc.) is undertaken.

Chemicals have the potential to cause irritating localized effects, acute toxic effects or longer term carcinogenic effects. The hazards posed by each chemical will depend on the type of chemical, the form in which it is available for exposure, the frequency of exposure and the duration of each exposure.

Chemicals that employees can come into contact with could be in a solid, liquid or gas form. Each form of each chemical will pose its own hazards.

Pathways leading to possible health effects relate to the inhalation, ingestion or dermal contact with the chemical.

Using lead as an example it can be ingested as solid, cause burns to the skin as a liquid and inhaled as a gas following heating, or when sprayed as a component of a product such as paint. Each of these three forms will cause differing potential acute or toxic health effects either immediately or over time.

For each exposure scenario, the specific physical and chemical properties of chemicals will strongly influence the hazard posed by the chemical. Factors such as boiling point, vapor pressure, flammable limits, melting point, freezing point, corrosiveness, auto ignition temperatures, and vapor density will all affect the risk of injury/illness to an exposed worker.

- Inhalation of chemical and/or biological substances;
- Ingestion of chemical and/or biological substances; and



Contact with or absorption of chemical and/or biological substances.

3.0 POSSIBLE CONSEQUENCES

- Short term health effects such as eye irritations, breathing difficulties, burns and poisoning
- Long term health effects such as organ damage, possible carcinogenic related disease

4.0 **PRECAUTIONS**

Prior to undertaking site work:

- Review the historical activities at and/or previous use of the site or environment in question to identify potential chemicals and/or biological substances that may be present. If possible, ask the Client and/or former site workers for information.
- If chemicals are known to be in use at a site, obtain and review Material Safety Data Sheet (MSDS) documentation.
- Once potential chemical and/or biological hazards have been identified, consult reference materials concerning health effects, allowable exposure limits and appropriate personal protective equipment to be used when encountering such substances. Standard references, available at Golder, include:
 - OSHA Permissible Exposure Limit (PEL) for General Industry: 29 CFR 1910.1000 Z-1 Table.
 - OSHA Permissible Exposure Limit (PEL) for Construction Industry: 29 CFR 1926.55 Appendix A.
 - OSHA Permissible Exposure Limit (PEL) for Maritime: 29 CFR 1915.1000 Table Z-Shipyards.
 - National Institute for Occupational Safety and Health (NIOSH) "Pocket Guide to Chemical Hazards" (latest edition).
 - American Conference of Governmental Industrial Hygienists (ACGIH) "Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices" (latest edition).
- Air monitoring requirements (i.e., the selection of specific, air monitoring devices such as photo and flame ionization detectors, combustible gas meters, chemical specific meters, etc.), the calibration and maintenance requirements of such equipment, the selection and use of appropriate respiratory protection equipment, project-specific medical monitoring requirements, and other procedures deemed appropriate for the protection of human health will be detailed in the HASP or a separate SWP.
- It is important to note that the actual conditions encountered at a site may be different from those anticipated. Therefore, should levels of contamination (i.e., concentrations of chemical and/or biological substances) or physical working conditions (i.e., unstable ground, etc.) be encountered at a site that are substantially different from those originally anticipated, or should any situation arise which is obviously beyond the scope of the monitoring, respiratory protection and/or decontamination procedures specified in the plan, work activities will be halted, pending review by the Project Manager and/or Project Health and Safety Officer.

Revised procedures and protective measures, compatible with the site conditions encountered, will then be identified and implemented.



5.0 MINIMUM PERSONAL PROTECTION EQUIPMENT REQUIRED

- Steel-toed safety boots
- Coveralls
- Hard hat
- Respirator (if required)
- High visibility reflective vest (around moving equipment)
- Hearing Protection (as conditions dictate)
- Eye Protection (as conditions dictate)

5.1 Additional Equipment (Chemical and/or Biological Substances)

- Chemically-resistant safety boots
- Chemically-resistant gloves (latex, nitrile, butyl rubber, etc.)
- Chemically-resistant clothing (Tyvek, Samex suits, etc.)
- Air purifying respirators or supplied air equipment
- Air monitoring equipment

6.0 TRAINING

- OSHA 10 hour Construction Safety course
- First Aid and CPR courses
- 40 Hour HAZWOPER Class or specific Hazard Communication Training

7.0 APPLICABLE OSHA REGULATION PARTS

Further information can be found on chemical and/or biological exposure measures in 29 CFR Sections 1910, 1915, & 1926 as noted on page 2 and:

29 CFR 1910.1200 Hazard Communication 29 CFR 1910.120 HAZWOPER



1.0 SCOPE

This SWP applies to all Golder Associates Inc. and Golder Construction Services (Golder) staff that work

in the field in locations where there may be biological exposure risks to hazardous flora and fauna.

2.0 BIOLOGICAL EXPOSURE RISKS – HAZARDOUS FLORA AND FAUNA INFORMATION

The scope of services for this project may create opportunities for site personnel to come in contact with potentially dangerous plants and animals. Precautionary measures should be taken to reduce possible contact with hazardous flora and fauna which may include, but not be limited to: application of bug spray, caution and care in handling collected organisms including wearing gloves, avoiding or leaving an area identified as containing a suspected hazardous plant or animal (e.g. poisonous snake) until the hazardous organism has been properly identified and/or removed.

If a field team member comes in contact with or is bitten or stung by any hazardous plant or animal, always follow the proper first aid procedures and contact the Site Safety Officer immediately.

In general, almost any terrestrial animal can be hazardous at times. Larger mammals and some birds may attack if you are in their territory, too close to their nest, between them and their offspring, etc. Also, if you are handling/attempting to handle wildlife, there may be a risk of bites or scratches leading to infection, excessive bleeding, or worse. Please always use caution when working with/around wildlife. Although they are often wary and will stay away from you, there are specific situations/times where this is not the case.

3.0 HAZARDOUS INSECTS

Poisonous Spiders

- <u>Widow Spiders (genus Latrodectus)</u> Southern Black Widow, Northern Black Widow, Brown Widow, and Red Widow
- <u>Recluse Spiders (genus Loxosceles)</u> Brown Recluse, Mediterranean Recluse, Chilean Recluse

While the poisonous spiders listed above are not known to be aggressive, spider bites can occur when the spiders are disturbed or feel threatened. Be careful of reaching under objects where the spider is hiding or when putting on clothing, gloves or shoes that have been sitting or stored for a long time into which the spider has crawled. The most common symptoms are intense pain, rigid abdominal muscles, muscle cramping, malaise, local sweating, nausea, vomiting, and hypertension. Blisters frequently appear at the bite site, which can become necrotic. If bitten, remain calm, and seek medical attention (contact your physician, hospital and/or poison control center). Apply an ice pack directly to the bite area to relieve swelling and pain. If possible to do so without further endangerment, collect the spider (even a mangled specimen has diagnostic value) for positive identification by a spider expert.

Bees, Wasps, Yellow jackets, Mosquitoes and Fire Ants

The hazards associated with insect bites and stings are based on allergic reactions to the venom produced by the insect. Anyone who has a history of severe allergic reactions to bee stings should carry an anaphylactic kit with an Epinephrine syringe (epi-pen), with them at all times when working in the field. If an epi-pen is unavailable, remove the victim from the area (to avoid further stinging), monitor for signs of anaphylactic shock, and seek medical attention.



STANDARD WORK PROCEDURE BIOLOGICAL EXPOSURE RISKS HAZARDOUS FLORA AND FAUNA

Tick Identification

- Ticks are divided into two families, "soft" ticks and "hard" ticks. Their only source of nutrition is blood sucked from their hosts.
- Hard ticks live on the ground in vegetation, such as grassy meadows, woods, brush, weeds, and leaf litter.
- Ticks produce a cement-like substance that helps anchor them to the host.
- Ticks inject saliva (the saliva may also contain disease organisms, such as Borrelia burgdorferi which cause Lyme disease) containing a kind of anticoagulant into the blood pool to keep the blood from clotting.
- The Brown Dog Tick (*Rhipicephalus sanguineus*) has evolved to live indoors and can be found living inside your home. Brown Dog Ticks do not feed on humans.
- Treatment for Ticks
- Use a small pair of curved forceps or tweezers, wear some gloves so you don't spread bacteria from the tick to your hands.
- Using tweezers, flip the tick over onto its back. Grasp tick firmly with the tweezers as close to the skin as possible. Gently pulling until the tick comes free. Do Not Twist or turn.
- Once removed, rinse it down a sink or flush it down a toilet. Consider keeping it in a tightly closed jar or taped to a piece of paper. You may need to show the tick to the doctor if you become ill from the tick bite.
- The area of the bite should leave a small crater or indentation where the head and mouthparts were embedded. If significant portions of the head or mouthparts remain, they may need to be removed by a doctor.
- Cleanse the bite area with soap and water or a mild disinfectant. Observe the area for several days for any reaction to the bite, such as a rash or signs of infection. Apply antibiotic cream to the area.
- Remember to wash your hands thoroughly after handling any tick or instruments that touched a tick. Clean and disinfect any instruments that were used.
- Most tick bites are probably harmless and may cause no problems. Ticks that have never fed, if handled properly, will not cause any harm. The earlier a tick is removed, the less the likelihood that the tick transmitted any disease.





Poison Ivy (Rhus radicans) Identification Three forms of poison ivy, 1) Erect woody shrub, 2) Running Shrub 3) Woody Vine. Three leaflets, two to four inches long, dull or glossy green with pointed tips. The middle leaflet is generally larger than the two laterals. The margins of the leaflets are variable, appearing irregularly toothed, lobed, or smooth. The leaves are positioned alternately on the stems. Woody vines grow on trees or objects for support and have aerial roots along the stem. Treatment for Poison Ivy Have a 'poison ivy action kit' ready, with rubbing alcohol, a large bottle of water, some soap and gloves, Cleanse exposed areas with rubbing alcohol. Next, wash the exposed areas with water only (no soap yet, since soap can move the urushiol, which is the oil from the poison ivy that triggers the rash, around your body and actually make the reaction worse). Now, take a shower with soap and warm water. Lastly, put gloves on and wipe everything you had with you, including shoes, tools, and your clothes, with rubbing alcohol and water. Apply Ivy-Block to exposed areas to prevent Poison Ivy. Do NOT burn these poisonous plants! The smoke will irritate your skin badly, and if it enters your nasal passages, throat and lungs it will likely cause serious problems and could result in death.



Poison Oak Identification

- Grows in the Eastern United States (from New Jersey to Texas) as a low shrub.
- Grows in the Western United States (along the Pacific coast) as 6-foot-tall clumps or vines up to 30 feet long.
- Oak-like leaves, usually in clusters of three.
- Can have clusters of yellow berries.
- Treatment for Poison Oak
- Initial treatment consists of washing the area with water immediately after contact with the plants. To relieve symptoms, use wet compresses and take cool baths.
- Nonprescription antihistamines and calamine lotion also may help relieve symptoms.
- Moderate or severe cases of the rash may require treatment by a health professional, who may prescribe corticosteroid pills, creams, or ointments.

Do NOT burn these poisonous plants! The smoke will irritate your skin badly, and if it enters your nasal passages, throat and lungs it will likely cause serious problems and could result in death.







Poison Sumac Identification

- Grows exclusively in very wet or flooded soils.
- Ranges in eastern United States and Canada.
- Pinnate leaves, 25-50 cm long.
- 7 13 leaflets to each leaf, leaflets are 4-10 cm long.
- Red Leaf veins.
- Small white or grey berry, produced in panicles 10-20 cm long.
- Panicles distinguish it from other sumacs which have red berries.

Treatment for Poison Sumac

- Immediately wash everything that might have touched the plant.
- Soothe itching with cool, wet compresses.
- Add ground oatmeal (approximately 5 cups) or baking soda to a cool bath and soak for 15 to 30 minutes you can even add baking soda or epsom salts to your bath, or make a paste of either of these and apply it to the rash.
- Opt for lotions containing calamine, alcohol and zinc acetate; these will dry the blisters and help speed healing and leave rash open to air. That will help it heal.
- Take an oral antihistamine if you are extremely uncomfortable or if the rash is covering a large area of your body.

Do NOT burn these poisonous plants! The smoke will irritate your skin badly, and if it enters your nasal passages, throat and lungs it will likely cause serious problems and could result in death.





	Wild Parsnip Ident	tification
	Pinnately compound leaves, with a main stem and 5 to 15 leaflets.	
	Yellow flowers, in flat-topped umbrella-like clusters at the top of the plant.	Sector 1
•	Wild parsnip rosettes are among the first plants to become green in spring, and its flowers turn a prominent yellow in midsummer. After flowering and going to seed, plants die and turn brown in fall, but first year rosettes remain green until frost.	
	Grows throughout the United States along: Roadsides, abandoned fields, unmowed pastures, edges of woods, prairie restorations.	
Tre	eatment for Wild Parsnip	
•	Take Ibuprophen for help with swelling and pain. The burned area can be covered with a cool, wet cloth. If blisters are present, do not pop them and if the blisters rupture, leave the skin "bandage" in place. To avoid infection, keep the area clean and apply an antibiotic cream.	
	Adding Domeboro powder to cool cloth compresses can help dry any of the seeping blisters.	
	Doctors will recommend a topical or systemic cortisone-steroid for extreme discomfort. See a doctor for serious cases.	
	Washing with Fels-Naptha soap <u>will not</u> help.	

Snakes

- leave snakes alone;
- wear rubber boots, long trousers and long sleeved shirts; the fangs of a snake will not normally penetrate such clothing;
- be noisy when walking in the bush; stamp your feet;
- look carefully when walking through grass; and
- do not place bare hands in hollow logs, under piles of wood or rubbish. **WEAR GLOVES.**



Snake Bite Victims

Most snake bites occur on the limbs, with 75% of reported cases being on the lower limbs. If anyone is bitten be more concerned about the casualty than about identifying the snake. Unconsciousness and breathing failure may occur. The only widely acceptable treatment for venomous snakebites involves the use of antivenin. If someone is bitten by a venomous snake, seek immediate medical attention at the nearest hospital or medical facility. Stay calm, remove any rings that could restrict circulation if tissues swell, keep the bitten limb below the level of the heart, and immediately seek medical attention.

Symptoms of Snake Bite

- headache
- double-vision
- drowsiness
- nausea
- pain or tightness in the chest or abdomen
- giddiness or faintness
- diarrhea

These symptoms do not appear immediately, but from about 15 minutes to 2 hours after being bitten. If a snake bite is suspected, act promptly and obtain medical assistance without delay - **HOWEVER, STAY CALM**.

Signs of Snake Bite

Look for:

- 2 puncture marks about 1 cm apart at the site of the bite, although sometimes they may only be a fang scratch on the skin (although this depends on the size of the snake)
- swelling of the area around the bite
- bruising
- sweating
- vomiting
- breathing difficulties

Management of Snake Bite Victims

- keep the victim at rest
- reassure the victim
- immediately apply a pressure immobilization bandage over the bitten area and around the limb
- apply the bandage firmly enough to compress tissues, but not so firmly as to restrict the flow of blood to the limb below the bandage
- bandage from the bite to the fingers or toes, then up to the armpit or groin



- bandage as much of the limb as possible
- if assistance is available, get them to seek medical aid urgently. It is better to wait for the arrival of an ambulance or ambulance officer rather then to move the victim, but isolation and other circumstances should determine what is to be done
- periodically observe and record the pulse and breathing
- carry out EAR/CPR if breathing or circulation fails

As a precaution: **Do not catch a snake and do not handle one unless you are sure it is not venomous.** In addition, for a short time after a snake is killed, its reflexes may continue to work. Those reflexes typically cause the body to writhe slowly for awhile, but they can cause a convulsive contraction and a bite, so you should not handle a freshly killed venomous snake. Though US medical professionals may not agree on every aspect of what to do for snakebite first aid, they are nearly unanimous in their views of what not to do. Among their recommendations:

WARNING - WHAT <u>NOT</u> TO DO

- NEVER wash the venom off the skin; the venom will help identify what type of snake is involved - EMERGENCY DECONTAMINATION PROCEDURES DO NOT APPLY;
- NEVER cut or excise the bitten area. Such measures have not been proven useful and may cause further injury.
- **NEVER** try to suck the venom out of the wound; and
- NEVER use a constrictive bandage or tourniquet. This cuts blood flow completely and may result in loss of the affected limb.
- **NEVER** ice or any other type of cooling on the bite. Research has shown this to be potentially harmful.



Timber Rattlers Identification

- The Timber Rattler is an endangered species.
- Adult timber rattlers average 35 to 50 inches in total length.
- The tail is short and thick, all black, and tipped with a tan rattle.
- Timber rattlers are diurnal (active during the day) and nocturnal (active after dark) in the summer, but only diurnal in the spring and fall.
- This venomous species can inflict a serious bite, and people are urged to walk away from them when encountered. Records show that there is a greater risk of being bitten if an attempt is made to kill them
- During the summer, they inhabit deciduous forests and open valleys. Rock fissures and crevices provide communal dens for over wintering.
- Timber rattlers begin emerging from hibernation in April to early May.

Treatment for Timber Rattlers

- Moderate symptoms will include mild swelling, discoloration, and pain at the wound site, and may also include general tingling, weakness, rapid pulse, and dimness of vision, nausea, vomiting, and shortness of breath.
- For moderate symptoms, apply a band 3/4 inch to 11/2 inches wide to the limb, 2 to 4 inches above the wound (but not around a joint, or on the head, neck, or trunk). Make it snug, but loose enough so you can slip a finger under it. Check the victim's pulse beyond the band periodically; to be sure blood is flowing past the band. Loosen the band if it becomes too tight.
- Severe symptoms include rapid swelling and numbness, followed by severe pain at the wound site; there may also be pinpoint-size pupils, facial twitching, slurred speech, convulsions, paralysis, and loss of consciousness. For severe symptoms, apply the band, and then make a shallow cut-just through the skin-through each fang puncture, 1/2 inch long and parallel with the long axis of the limb. (Make no cuts on the head, neck, or trunk). Apply a suction cup for 30 minutes, or use your mouth to such out the venom. Don't apply ice packs or any other kind of cold therapy. Continue treatment until you can get medical help. Most people who die of snakebite today die because they didn't seek medical help or delayed too long in going to the hospital. Preventive medicine is the best method for dealing with snakebites.
- Begin first aid treatment by keeping the victim calm and immobile, preferably lying down. Immobilize the bitten limb, at or below heart level. If the victim will be able to get to a hospital within 4 or 5 hours-and no symptoms develop-no more first aid is necessary.





Us_Swp 03 Biological Exposure Risks (Dec2009)



4.0 HAZARDOUS FRESHWATER AND SALTWATER LIFE

Fin spines

Many fish have sharp spines in their fins that can cause puncture wounds if not handled properly. Although most do not have toxins/venom in their spines, the wound may still get infected if not properly cleansed and bandaged. Sharp teeth that may cause moderate to severe lacerations if not handled properly. The following sections provide examples of fishes and/or organisms that may require special handling or avoidance.

Stingrays

Stingray skin can be slippery, and need to be handled with gloves. If a stingray stings you, seek immediate medical attention. Infection can develop from bacteria entering the wound via seawater or from the stinger (spine) itself. A stingray spine can also break off in the wound and cause infection if it is not removed; however, **the spine is serrated**, **so if the spine breaks off in the wound**, **do not remove it yourself**. Instead, apply first aid for a puncture wound, including flushing/rinsing the wound with fresh water or hydrogen peroxide if available, and seek immediate medical attention. Sometimes the spine will stick into the person without breaking off of the animal. In this case, cut the spine from the animal close to the base of the tail, leaving as much of it sticking out of the wound as possible. The pain of the stingray toxin can be alleviated before reaching a medical facility by applying a heat compress to the wound or soaking it in clean, hot water which breaks down the protein-based toxin.

Catfishes

Catfishes have spines very similar to stingrays. Treat as you would for a stingray wound.

Scorpionfishes, Leatherjackets, Toadfishes

Some, if not all species of fish in these groups have poisonous spines in their dorsal, pectoral, and/or anal fins. The spines are very sharp and the toxin in them can cause varying degrees of reaction. By far, the scorpionfishes have the most potent toxin in their spines and some species can be much larger than others. In the case of being stung by any of these fish, apply first aid for a puncture wound, and watch for signs of reaction to the toxins. Seek medical attention if necessary. The pain of the toxin can be alleviated before reaching medical facilities by applying a heat compress to the wound or soaking it in clean, hot water.

Sea Urchins

Sea urchins have sharp spines that project out and protect their main body, or test, from all angles. While some species have poisonous or toxic spines, the primary hazard is from puncture wounds where the spine breaks off in the wound and the resulting infection. The spines, like the rest of the urchin's body, are primarily made of calcium that can be brittle and hard to remove. If someone gets stuck with urchin spines, flush the area well with water and hydrogen peroxide (if available). If the wound is large or there are large pieces of spine embedded in the wound, apply first aid as you would for a normal puncture wound and monitor for signs of allergic reaction to possible toxins. Applying a heat pack in the immediate area of the wound may relieve some of the pain associated with the toxin if it is present. It may be necessary to go to the hospital to get the pieces of spine removed.



Jellyfish

Most species of Jellyfish have stinging cells, called nematocysts, which trigger or "fire" upon touch. If jellyfish are encountered in the net, the use of gloves in handling them can prevent the person from being stung, as the nematocysts are usually very small and will not penetrate the glove. However, be cautious after handling jellyfish even with a glove, as some of the nematocysts can rub off and remain on the glove and still fire long after the jellyfish has been removed. If someone gets stung by a jellyfish, it is best to rinse the area with vinegar (do not use fresh water, as that can cause more nematocysts to fire). Different species of jellies have various levels of toxin in their sting. There is a potential for allergic reaction, so monitor the victim and seek medical attention if necessary.

Corals and Sponges

Corals and Sponges have stinging cells similar to Jellyfish. If someone is stung by a species of coral or sponge, treat the same as above for jellyfish.

Crabs/Crayfish/Lobsters

All of the above can have very strong and very sharp claws. Use caution when handling them.

Oysters/Mussels/Clams

Oysters and Mussels have extremely sharp edges that can cut easily. Care should be taken when handling and always wear gloves.

American Alligator (may encounter on land or in the water).

The best treatment for alligator wounds is avoidance or prevention of encounters. When left alone, alligators will stay away from humans and pose little threat. The springtime is when alligator breeding season begins in Florida. During breeding season, male alligators become very territorial and will defend their area against intruders. Following the breeding, in June-July, females will lay their eggs in nests created in the preceding months. These nests are mounds of mud, leaves and other vegetation and can be ~1 meter tall and ~2 meters wide. Look out for these nests near the shoreline of swamps, rivers, and estuaries, as female alligators remain near the nest, in nearby water or other shelter, throughout the incubation period, which averages 65 days, and will defend her nest if danger threatens. If someone is attacked by an alligator, apply first aid, including pressure to any open wounds, and seek immediate medical attention.



1.0 SCOPE

This SWP applies to all Golder Associates Inc. and Golder Construction Services (Golder) staff that work in the field in locations where there is potential for heat stress conditions to develop.

2.0 HEAT STRESS

Employees may experience heat stress due to a combination of elevated ambient temperatures and the concurrent use of personal protection equipment; this depends in part on the location of the site, the type of work, and the time of year. The project manager (PM) should consider the need to monitor heat stress during the project planning stage. The Site Safety Officer (SSO) and/or field staff will evaluate heat stress using the techniques specified below whenever the ambient temperature exceeds 21°C or 70°F.

3.0 HEAT STRESS RELATED PROBLEMS

- Heat Rash caused by continuous exposure to heat and humid air and aggravated by chafing clothes. Decreases ability to tolerate heat, as well as being a nuisance;
- Heat Cramps caused by profuse perspiration with inadequate fluid intake and chemical replacement. Signs: muscle spasms and pain in the extremities and abdomen;
- Heat Exhaustion caused by increased stress on various organs to meet increased demands to cool the body. Signs: shallow breathing; pale, cool, moist skin; profuse sweating; dizziness, and lassitude. If symptoms occur, the employee should leave the work area and proceed to the nearest air-conditioned location, drinks liquids such as water or Gatorade, and rest until the symptoms pass. Contact the Golder PM immediately; and
- Heat Stroke the most severe form of heat stress. Body must be cooled immediately to prevent severe injury and/or death. Signs: red, hot, dry skin; no perspiration; nausea; dizziness and confusion; strong, rapid pulse; coma. Medical help must be obtained immediately. If heat stroke is suspected, implement emergency response plan. Remove excess clothing and cool the person by sponging with cool or luke warm water. Never place ice on the person or throw water on the individual. Contact the Golder Project Manager as soon as time permits.

4.0 HEAT STRESS MANAGEMENT

4.1 Heat Stress Monitoring

The American Conference of Governmental Industrial Hygienists (1992) states that workers should not be permitted to work when their deep body temperature exceeds 38°C (100.4°F).

For strenuous field activities that are part of ongoing site work activities in hot weather, the following procedures shall be used to monitor the body's physiological response to heat, and to monitor the work cycle of each site worker. There are two phases to this monitoring: initial work/rest cycle determination and physiological monitoring. The initial work/rest cycle is used to estimate how long the first work shifts



of the day should be. Heart rate monitoring of each worker will establish the length of the successive work periods.

4.2 Determination of Initial work/Rest Cycles

Measure the air temperature with a standard thermometer. Estimate the fraction of sunshine by judging what percent the sun is out: 100% sunshine - no cloud cover = 1.0; 50 % sunshine and 50% cloud cover = 0.5; 0% sunshine = full cloud cover = 0.0.

Plug these variable into the following equation to determine the adjusted temperature: T ($^{\circ}$ C, adjusted) = T ($^{\circ}$ C, actual) + (7.2 x fraction sunshine)

Use the chart below to determine the length of the first work shift. At the first break, initiate the heart rate monitoring as described in the next section.

ADJUSTED TEMPERATURE	NORMAL WORK CLOTHING	IMPERMEABLE CLOTHING
21° - 25°C (70-77°F)	150 Minutes	120 Minutes
25° - 28°C (77-82°F)	120 Minutes	90 Minutes
28° - 31°C (82-88°F)	90 Minutes	60 Minutes
31° - 32°C (88-90°F)	60 Minutes	30 Minutes
>32°C (>90°F)	45 Minutes	15 Minutes

4.3 Heart Rate Monitoring

Heart rate (HR) should be measured by radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats/minute. If the HR is higher, the next work period should be shortened by 33 percent while the length of the rest period stays the same. If the pulse rate still exceeds 110 beats/minute at the beginning of the next rest period, the following work period should be further shortened by 33 percent while the length of the rest period stays the same.

4.4 Heat Stress Prevention

The best approach is preventive heat stress management. In general:

have workers drink additional water before beginning work;



- provide disposable cups of water that is maintained at 10 to 16°C (50 to 60 °F);
- urge workers to drink one to two cups of water every 20 minutes or at each rest break for a total of four to eight litres per day;
- provide a cool, preferably air-conditioned area for rest breaks;
- discourage the drinking of alcohol at night and discourage the intake of coffee during working hours;
- monitor for signs of heat stress;
- acclimatize workers to site work conditions by slowly increasing workloads, i.e., do not begin site work activities with extremely demanding activities; and
- Reschedule your work hours so that you are not working in the heat of the day between 10 am and 2 pm.

4.5 Sun Protection

- Employees are encouraged to maximize use of the shade provided by trees, buildings and other structures. Where there is limited access to natural shade, fixed or portable shade structures may be used and will be provided where practical.
- Rotate your work with others between indoor/shaded areas and outdoor/exposed locations to minimize time spent in the sun.
- The selection of appropriate protective clothing will take into account both the need to block out UV and the need to reduce the effects of heat.
- It is recommended that Golder employees tight woven clothing which has a minimum UPF of at least 30. Clothing should be lightweight, loose fitting and have a collar to assist with keeping cool.
- Hats provide shade and the bigger the brim the greater the amount of shade that is provided. Hats should be made of close-weave material and have a wide brim or be legionnaire-style. In circumstances where the wearing of a broad-brimmed hat causes difficulties due to their size sunscreen and other protective measures should be used instead.
- Safety glasses will be supplied to protect the eyes from effects of UV radiation and potential eye injuries from flying objects, dust or chemical splashes. Safety glasses complying with ANSI Z87.1-2003 are recommended.
- Sunscreen does not offer complete protection and should always be used in conjunction with other protection such as protective clothing. Broad spectrum and water-resistant sunscreen with a sun protection factor (SPF) of 30+ should be used.
- Staff using sunscreen are encouraged to regularly check use by dates to ensure sunscreen is not out of date.
- Sunscreen will be placed in an easily accessible location and employees instructed in correct application and use. Sunscreen should be generously applied to all areas of exposed skin at least twenty minutes before going outside and should be reapplied at least every two hours.



STANDARD WORK PROCEDURE COLD ENVIRONMENT – COLD STRESS

1.0 SCOPE

This SWP applies to all Golder Associates Inc. and Golder Construction Services (Golder) staff that work in the field in locations where there is potential for cold stress conditions to develop.

2.0 COLD ENVIRONMENT – COLD STRESS

In a cold environment, body heat must be conserved to maintain the core temperature at normal levels and to ensure an adequate blood flow to the brain and extremities. Feelings of cold and discomfort should not be ignored, since these may be early warning signals. The effects of cold are such that problems can occur before the worker is aware of them, and furthermore, over-exposure to cold may affect judgment.

3.0 MAIN FACTORS INVOLVED IN CAUSING COLD STRESS

- Temperature
- Humidity
- Movement of air
- Radiant temperature of the surroundings
- Clothing/physical activity

4.0 COLD STRESS RELATED PROBLEMS

- Frostbite is a condition in which the skin and underlying tissues freeze. Usually affects fingers, hands, toes, feet, ears and nose.
- Hypothermia is a condition in which a person's body temperature falls below 95⁰ F or 35 degrees Centigrade. Hypothermia occurs when more heat is lost from the body than the body can produce. It usually happens when a person is exposed to extremely cold temperatures but it can occur even at moderate temperatures. It does not have to be freezing outside for a person to become hypothermic. For example, falling into cold water or wearing wet clothing in cold weather can bring on hypothermia. Failing to wear a hat in cold weather can also lead to hypothermia, since a large amount of body heat escapes from the head. Extreme fatigue, hunger or lack of fluids can also lead to hypothermia. As well, excessive wind can increase the amount of heat lost and cause hypothermia.

5.0 FROSTBITE MANAGEMENT

- Move person to a warm dry area. Don't leave the person alone.
- Minimize walking on frozen feet.
- Do not apply any lotions or ointments to frozen skin.
- Remove any wet or tight clothing that may cut off blood flow to the affected area.
- DO NOT rub the affected area, because rubbing causes damage to the skin and tissue.



STANDARD WORK PROCEDURE COLD ENVIRONMENT – COLD STRESS

- Gently place the affected are in a warm (105°F) water bath and monitor the water temperature to slowly warm the tissue. Don't pour warm water directly on the affected area because it will warm the tissue too fast causing tissue damage. Warming takes about 25-40 minutes.
- After the affected area has been warmed, it may become puffy and blister. The affected area may have a burning feeling or numbness. When normal feeling, movement, and skin color have returned, the affected area should be dried and wrapped to keep it warm. NOTE: If there is a chance the affected are may get cold again, do not warm the skin. If the skin is warmed and then becomes cold again, it will cause severe tissue damage.
- Seek medical attention as soon as possible and contact the Site Safety Officer.

6.0 HYPOTHERMIA MANAGEMENT

The most obvious sign of hypothermia is a low core body temperature. The person with hypothermia may not realize that his or her prolonged exposure to cold requires emergency medical care. Other signs and symptoms include:

- apathy or loss of interest in surroundings
- lethargy or difficulty moving
- confusion
- drowsiness
- Ioss of coordination
- cold skin
- shock caused by decreased blood flow
- slurred speech
- uncontrollable shivering
- weakness

If a person is suspected of suffering from hypothermia, contact the Site Safety Officer, and apply first aid.

6.1 What should be done (land):

- Move the person to a warm, dry area. Don't leave the person alone. Remove any wet clothing and replace with warm, drying clothing or wrap the person in blankets.
- Have the person drink warm, sweet drinks (sugar water or sports-type drinks) if they are alert. Avoid drinks with caffeine (coffee, tea or hot chocolate) or alcohol.
- Have the person move their arms and legs to create muscle heat. If they are unable to do this, place warm bottles or hot packs in the arm pits, groin, neck and head areas. DO NOT rub the person's body or place them in a warm bath. This may stop their heart.

6.2 What should be done (water):

DO NOT remove any clothing. Button, buckle, zip and tighten any collars, cuffs, shoes, and hoods because the layer of trapped water closest to the body provides a layer of



STANDARD WORK PROCEDURE COLD ENVIRONMENT – COLD STRESS

insulation that slows the loss of heat. Keep the head out of the water and put on a hat or hood.

- Get out of the water as quickly as possible or climb on anything floating. DO NOT attempt to swim unless a floating object technical water rescue can be reached because swimming or other physical activity uses the body's heat and reduces survival time by about 50 percent.
- If getting out of the water is not possible, wait quietly and conserve body heat by folding arms across the chest, keeping thighs together, bending knees, and crossing ankles. If another person is in the water, huddle together with chests held closely.

7.0 PRECAUTIONS

- Use the buddy system.
- Recognize the environment and workplace conditions that lead to potential cold-induced illnesses and injuries.
- Learn the sign and symptoms of cold induced illnesses/injuries and what to do to help the worker.
- Dress appropriately for expected weather conditions. Dress in a minimum of three layers (a skin layer to absorb moisture and keep the skin dry, an insulating layer, and an outer protective layer), wear a hat and gloves, in addition to underwear that will keep water away from the skin.
- Take frequent short breaks in warm dry shelters to allow the body to warm up.
- Perform work during the warmest part of the day.
- Eat warm, high calorie foods like hot pasta dishes.
- Avoid vasodilators, which allow the body to lose heat faster which can accelerate hypothermia. These include alcohol and drugs;
- Avoid vasoconstrictors, including tobacco products, which constrict blood vessels and can accelerate the onset of frostbite;
- Avoid touching cold metal with bare skin; and
- Keep active.



STANDARD WORK PROCEDURE RESPIRATORY PROTECTION

1.0 SCOPE

This Standard Work Procedures (SWP) applies to all Golder Associates Inc. and Golder Construction Services (Golder) staff working on project sites where respiratory protection is or may be required.

2.0 INTRODUCTION

Respiratory protection is required where atmospheric hazards cannot be reduced to acceptable levels through the use of engineering or administrative controls. Respiratory protection is used to prevent airborne toxic or harmful materials (liquids, vapours, dusts) from entering the body. All respiratory protection must be utilized in accordance with a Respiratory Protection Program compliant with 29 CFR 1910.134.

3.0 HAZARDS AND POSSIBLE CONSEQUENCES

Situations that may require the use of respiratory protection include:

- oxygen deficient atmospheres
- hazardous substances in the air
- confined space entry
- face/eye splash hazards (full-face respirator)

4.0 CONTROL MEASURES AND PPE

Different types of respirators are available for use depending on the nature of the hazard and the degree of required protection. All respirators must be selected from those approved by the National Institutes for Occupational Safety and Health (NIOSH). Common respirator types include:

5.0 AIR PURIFYING RESPIRATORS (APR)

- Negative Pressure Cartridge Respirator work by filtering the air before it is inhaled. APRs can be either full -face or half -face. Hazardous vapors/dusts are removed in special filter cartridges that the attached to the respirator. The specific exposures at the work area must be known to ensure correct cartridge selection. Cartridges must not be used beyond their stated useful life. These respirators <u>do not</u> provide protection in oxygen deficient atmospheres.
- Powered Air Purifying Respirator (PAPR) work by mechanically drawing air through attached filters and blowing the cleaned air into the face mask. PAPRs are generally a full face type mask and consist of a helmet/hood, filter, power source and a face piece. PAPRs <u>do not</u> provide protection in oxygen deficient atmospheres and have the same limitations of other APRs.
- Supplied Air Respirators (SAR) All use of SAR system require prior approval of the Corporate Health and Safety Officer.
- Airliner Respirator provides air from a stationary tank or other source through air lines. Air lines cannot exceed 300 feet in length. Required when working in extremely toxic, oxygen deficient or unknown atmospheres. Air quality must be at least Grade D as defined by the Compressed Gas Association. When using a SAR, employees must wear an 'escape bottle' containing at least 5 minutes of air.



STANDARD WORK PROCEDURE RESPIRATORY PROTECTION

Self Contained Breathing Apparatus (SCBA) is used when complete independence of airlines is required such as emergency response - SCBAs consist of an air cylinder, carrying harness, gauge, safety valve and a full face mask. Only pressure demand versions of SCBAs will be utilized.

6.0 TRAINING

A respirator should be selected for use after either initial qualitative or initial quantitative fit testing. In addition, annual fit testing is required. Fit test type is dependent on the type of respirator. All tight fitting SAR's and SCBA's respirators must be fit tested using quantitive means (TSI Porta Count). Fit testing is also required if any changes are noted, such as cosmetic/dental surgery or significant weight change. Once the user has passed the fit test, the corresponding respirator brand, model and size must be utilized. If the user wishes to change brand or size, a new fit test must be performed. Before donning the mask each time, positive and negative pressure seal checks should be done, according to the manufacturer.

No employee shall be required or permitted to use respiratory protection, including air purifying and/or supplied air respirators, unless they have been approved by a physician or other licensed health care professional, are included in Golder Associates on-going medical surveillance program, are adequately trained in the usage, limitations, maintenance, storage, donning the respirators, and have been properly fit-tested.

- OSHA 10 hour Construction Safety course
- First Aid and CPR courses

7.0 APPLICABLE OSHA REGULATION PARTS

29 CFR 1910.134 Respiratory Protection



1.0 SLIPS, TRIPS AND FALLS

Over half of all office injuries are the result of falls. The majority of falls occur on slippery, uneven, defective, cluttered or obstructed walking surfaces. A significant number of debilitating falls are the result of a person falling out of his or her own chair, typically while in the process of sitting down, or leaning back. Falls from elevations while reaching for an overhead object are also common, and frequently cause severe injuries.

2.0 PRECAUTIONS WHEN IN THE OFFICE - HOUSEKEEPING

- Watch your step! Wipe up spilled liquids immediately. Tripping hazards such as defective floors, missing floor tiles, loose or matted carpeting, bunched-up floor mats, extension cords, phone cords, etc., should be corrected or reported and repaired immediately. Don't carry loads that are so large or bulky that the line of vision is impaired.
- Be careful when sitting down. Sitting on the edge of a seat, sitting too far back, or kicking the chair out from under one's self can result in a fall and fractured vertebrae. Occasionally check the mechanical condition of chairs commonly used.
- Be especially careful going up and down stairs. Avoid using stairs if both arms are loaded. Watch your step and if possible always have one hand free to use a railing. Maintain 3 points of contact when ascending/descending.

3.0 PRECAUTIONS WHEN OUT IN THE FIELD

In the field, falls are the second leading cause of work-related deaths.

4.0 TYPES OF FALLS

Falls are of two basic types: elevated falls and same-level falls. Same-level falls are most frequent, but elevated falls are more severe.

- Same-Level Falls: high frequency--low severity
- Elevated Falls: lower frequency--high severity

Same-level falls are generally slips or trips. Injury results when the individual hits a walking or working surface or strikes some other object during the fall. Over 60 percent of elevated falls are from less than 10 feet.

5.0 SAME-LEVEL FALLS

Examples of same-level falls are described below.

6.0 SLIP AND FALL

Slips are primarily caused by a slippery surface and compounded by wearing the wrong footwear. In normal walking, two types of slips occur. The first of these occurs as the heel of the forward foot contacts the walking surface. Then, the front foot slips forward, and the person falls backward.



The second type of fall occurs when the rear foot slips backward. The force to move forward is on the sole of the rear foot. As the rear heal is lifted and the force moves forward to the front of the sole, the foot slips back and the person falls.

The force that allows you to walk without slipping is commonly referred to as "traction." Common experience shows that dry concrete sidewalks have good traction, while icy surfaces or freshly waxed floors can have low traction. Technically, traction is measured as the "coefficient of friction." A higher coefficient of friction means more friction, and therefore more traction. The coefficient of friction depends on two things: the quality of both the walking surface and the soles of your shoes.

To prevent slips and falls, a high coefficient of friction (COF) between the shoe and walking surface is needed. On icy, wet, and oily surfaces, the COF can be as low as 0.10 with shoes that are not slip resistant. A COF of 0.40 to 0.50 or more is needed for excellent traction. To put these figures in perspective, a brushed concrete surface and a rubber heel will often show a COF greater than 1.0. Leather soles on a wet smooth surface, such as ceramic tile or ice, may have a COF as low as 0.10.



Figure 1. Shoes with soft rubber soles and heels with rubber cleats provide a high coefficient of friction (COF).

Providing dry walking and working surfaces and slip-resistant footwear are the answer to slips and their resultant falls and injuries. Obviously, high heels, with minimal heel-to-surface contact, taps on heels, and shoes with leather or other hard, smooth-surfaced soles lead to slips, falls, and injuries. Shoes with rubber-cleated, soft soles and heels provide a high COF and are recommended for most agricultural work.

In work areas where the walking and working surface is likely to be slippery, non-skid strips or floor coatings should be used. Since a COF of 0.40 to 0.50 is preferred for walking and working surfaces, we should strive for a surface which provides a minimum of 50 percent of this friction. If the working surface is very slippery, no footwear will provide a safe COF.

Trip and Fall Trips occur when the front foot strikes an object and is suddenly stopped. The upper body is then thrown forward, and a fall occurs.



As little as a 3/8" rise in a walkway can cause a person to "stub" his toe resulting in a trip and fall. The same thing can happen going up a flight of stairs: Only a slight difference in the height of subsequent steps and a person can trip and fall.

7.0 CONTRIBUTING FACTORS

Proper housekeeping in work and walking areas can contribute to safety and the prevention of falls. Not only is it important to maintain a safe working environment and walking surface, these areas must also be kept free of obstacles which can cause slips and trips. One method which promotes good housekeeping in work environments is the painting of yellow lines to identify working and walking areas. These areas should never be obstructed by objects of any kind.

Adequate lighting to ensure proper vision is also important in the prevention of slips and falls. Moving from light to dark areas, or vice versa, can cause temporary vision problems that might be just enough to cause a person to slip on an oil spill or trip over a misplaced object.

Carrying an oversized object can also obstruct one's vision and result in a slip or a trip. This is a particularly serious problem on stairs.

8.0 BEHAVIORS THAT LEAD TO FALLS

In addition to wearing the wrong footwear, there are specific behaviors which can lead to slips, trips, and falls. Walking too fast or running can cause major problems. In normal walking, the most force is exerted when the heel strikes the ground, but in fast walking or running, one lands harder on the heel of the front foot and pushes harder off the sole of the rear foot; thus, a greater COF is required to prevent slips and falls. Rapid changes in direction create a similar problem.

Other problems that can lead to slips, trips and falls are: distractions; not watching where one is going; carrying materials which obstruct view; wearing sunglasses in low-light areas; and failure to use handrails. These and other behaviors, caused by lack of knowledge, impatience, or bad habits developed from past experiences, can lead to falls, injuries, or even death.



1.0 SCOPE

This SWP applies to Golder Associates Inc. and Golder Construction Services (Golder) staff working on a project where groundwater sampling is conducted.

2.0 **DEFINITIONS**

Photo ionizing air monitoring instrument – A direct reading air monitoring instrument equipped with an ultraviolet light source that ionizes organic vapors with ionization potentials less than that of the lamp.

Flame ionizing air monitoring instrument – A direct reading air monitoring instrument equipped with a hydrogen flame that ionizes (through combustion) all combustible organic vapors.

3.0 KEY HAZARDS

- Chemical exposure via inhalation, skin contact or ingestion (See Chemical Exposure Risks SWP);
- Compressed gases for calibration (See Compressed Gases SWP);
- Heat or cold stress (See Inclement Weather, Heat Stress and Cold Stress SWPs);
- Lightning and high winds (See Inclement Weather SWP);
- Drilling (See Drilling SWP);
- Motor vehicles (See Motor Vehicles and Driving on Company Business SWPs);
- Slips, Trips and Falls (See Slips, Trips and Falls SWP);
- Electrical device hazards;
- Excavations (See Trenching and Shoring SWP);
- Working near or over water (See Working Over Water SWP);
- Heavy lifting and
- Insect Bites and Stings (See Biological Exposure Risks SWP).

If any of these hazards are anticipated on the project site, the corresponding SWP must be included in the Health and Safety Plan (HASP).

4.0 CHEMICAL HAZARDS

Groundwater sampling often involves using line-operated pumps to extract water from the subsurface. Ensure that the generator utilized is equipped with ground fault interrupter (GFI) circuitry to prevent possible shock hazards. Collect development or purge water in containers as required for proper disposal. Use secure areas for waste storage to protect the public and client staff from investigation derived waste (IDW). If internal combustion engines (generators) are used, they must be in an area with adequate ventilation, and free of combustible materials (i.e. dry grass, gasoline, etc.).



STANDARD WORK PROCEDURE GROUNDWATER SAMPLING

Keep your face as far from the opening of the well as possible to avoid inhaling volatile contaminants. Avoid any direct contact with a skin surface or eyes with groundwater. Continuous air monitoring should be performed utilizing a photo ionizing or flame ionizing instrument that can measure a minimum of 0.5 PPM organic vapor. Calibrate the air monitoring instrument daily as described in the literature provided. In general, total organic vapor readings of less than 1 PPM are safe. Steady breathing zone measurements at 1 PPM or above warrant engineering controls (ventilation) or personal protective equipment (respiratory protection) to reduce exposure. Concentrations in the well opening that exceed 500 PPM could indicate a large quantity of organic vapor, which poses not only a toxicity risk, but also a flammability risk. Wells with high organic vapor concentrations should be sampled carefully with a minimum of ferrous tools or other sources of ignition.

The site-specific Health and Safety Plan (HASP) addressing both known and reasonably anticipated hazards should be prepared prior to the commencement of work. Chemical hazards and their means of detection and control should be reviewed prior to field mobilization.

Maintain material safety data sheets (MSDS) or equivalent for all chemicals of concern at the site including any chemicals required as part of the sampling program (i.e. calibration gas, sample preservatives, etc.). Detailed chemical safety information can be found at <u>www.osha.gov</u> and <u>www.cdc.gov/NIOSH</u>.

5.0 PRECAUTIONS

Sampling groundwater often occurs at sites that contain known hazardous wastes are adjacent to similar sites. Follow all local regulations in regards to working at such properties.

This project presents construction related hazards such as trips, falls, and slips, and resulting injuries which are typical of undeveloped or industrial sites

- Wear proper footwear, including steel toes for earthwork;
- Clean boots and testing equipment, since slips may result from mud on a hard surface;
- Never jump across obstacles (i.e.: anchor trenches) and
- Do not walk on improvised plank bridges across ditches or anchor trenches unless they have been inspected by a competent person.
- Observe site traffic rules and right-of-way practices at all times. Heavy equipment and trucks should be assumed to have the right-of-way. Generally, the following rules apply to determining the right-of-way:
- Heavier equipment has the right-of-way.
- Loaded trucks and equipment have precedence over unloaded ones.
- Equipment moving down slope has precedence over one going upslope.
- Other general site vehicle operation rules are as follows:
- Observe speed limits within the site which usually do not exceed 15 miles per hour;



- Do not follow another vehicle too closely as material may fall off the vehicle or be thrown by the tires when in motion;
- Large equipment may have a significant "blind spot" on the right side of the vehicle. Avoid passing heavy equipment unless specifically instructed to do so by the operator of that equipment. Assume the equipment operator does not know you are present in an area and maneuver accordingly;
- Listen for and heed back-up alarms from heavy equipment and
- When possible, make eye contact with equipment operators.
- Park the company vehicle near the work location to mark your presence in the area. Wear high visibility clothing (reflective vests) to aid the operator in noticing your presence. Use extreme caution when operating in dusty conditions. Drive with your headlights on to increase your visibility. If conditions become dusty and significantly reduce visibility across the site, leave the area and wait for conditions to improve and contact the Golder Project Manager.
- Do not ride on the contractor's equipment, and do not attempt to operate any such equipment.
- Do not ride on anything that does not have a seat designed for human occupancy.
- Wear your seatbelt at all times when operating a motor vehicle.

Because monitoring wells may provide habitat for insects such as bees, spiders, and wasps, use caution when initially opening the well. When opening the well protective cover, open the cover and stand back for a few minutes to allow any flying insects an opportunity to leave. Prior to removing the well cap, inspect the inside of the protective casing to make sure no inhabitants are present.

6.0 MINIMUM PERSONAL PROTECTIVE EQUIPMENT REQUIRED

- Hard hat, as required
- Safety glasses (splash goggles should be made available depending on the known hazards that may be present in the groundwater)
- Respirator with appropriate cartridges, as required
- High visibility clothing (reflective vest)
- Steel-toed and shank safety boots
- Nitrile gloves (or appropriate gloves depending on the known hazards that may be present in the groundwater)

7.0 TRAINING

- 40-hour HAZWOPER or equivalent local requirement (8-hour annual refresher required).
- OSHA 10-hour Construction Safety
- Emergency First Aid/CPR Course
- Golder and/or site-specific training (including HASP review)

8.0 **REFERENCES**

■ 29 CFR 1910.1000: Air Contaminants



- 29 CFR 1926.59: Hazard Communication
- 29 CFR 1926 Subpart E: Personal Protective and Life Saving Equipment



1.0 SCOPE

This SWP applies to all Golder Associates Inc. and Golder Construction Services (Golder) staff who are responsible for housekeeping activities in their workplace; in the office or on a project site. The benefits of good housekeeping far exceed the small additional effort required to establish good housekeeping practices.

2.0 HOUSEKEEPING IN THE OFFICE

- Tools, extension cords, fans, furniture, and loose materials should be located so as not to cause tripping or other hazards. Any tools, materials, and/or equipment subject to displacement or falling must be adequately secured.
- All walkways, stairways, access ways must be kept free of materials, supplies and obstructions at all times. Be alert to tripping hazards. If you see one, correct it.
- Pencils, scissors, letter openers should never be stored in a cup or holder with sharp ends pointed outward.
- Do not store loose knives, razor blades, or other sharp objects in desk drawers.
- Wear rubber "thimbles" when working extensively with files to avoid paper cuts.
- Always use the right tool for the job.

3.0 HOUSEKEEPING ON THE PROJECT SITE

- Tools, extension cords, hoses, and loose debris/materials should be located so as not to cause tripping or other hazards. Any tools, materials, and/or equipment subject to displacement or falling must be adequately secured.
- If you ever have a "close call", chances are that the incident is indicative of an accident waiting to happen and that sooner or later someone (maybe you) will get hurt. Note and report all "near misses" as per Near Miss Incident Report Form (Goldnet).
- Site conditions, vegetation, roadways, pathways must be maintained.
- Collect all waste generated by your work activities daily, and disposal in appropriate containers at the end of each day. Schedule appropriate pick-up and disposal as needed;
- Consolidate and minimize all waste materials, including investigation derived waste (IDW) on a daily basis. Schedule appropriate disposal as needed.
- Although, the overall safety of a construction site is the ultimate responsibility of the general contractor who maintains the site safety plan and communicates its information to all of the subcontractors on site, every worker on the site is responsible for safety. It's every worker's responsibility to know and following the site safety plan, practice good housekeeping, follow recommended work practices, and promptly report and/or correct hazards at the worksite.



- Keep the Golder worksite free of unnecessary clutter and debris that could cause an injury or accident. Limit the amount of materials and chemicals onsite to the quantities that you will need. Place trash and debris in the proper receptacles located throughout the job site. Remove combustible materials such as wood and paper from the site promptly.
- Keep storage, staging, and work areas, along with all stairs and walkways on the construction site, free of obstructions, and debris. Store tools and materials neatly and out of the way in storage bins or lockers and keep flammable or hazardous wastes in covered, segregated waste containers. Ensure that materials stored on roofs or at heights are secured. Never throw waste, materials, or tools from a building or structure.

4.0 **REGULATORY CITATION**

OSHA 1910.22 states that all places of employment, passageways, storerooms, and service rooms shall be kept clean and orderly and in a sanitary condition. The floor of every workroom shall be maintained in a clean and, so far as possible, a dry condition. Where wet processes are used, drainage shall be maintained and false floors, platforms, mats, or other dry standing places should be provided where practicable. To facilitate cleaning, every floor, working place, and passageway shall be kept free from protruding nails, splinters, holes, or loose boards.



1.0 SCOPE

This SWP applies to all Golder Associates Inc. and Golder Construction Services (Golder) staff working on Company-Related Business.

2.0 GUIDELINES FOR CELLULAR TELEPHONE USE

Cellular telephones are considered a vital communication link between field personnel, contractors and clients. Their most important function is to allow us to check in with the office, communicate when we need assistance, and/or provide information from a remote location. Cell phones also represent a significant risk to users if they are not used with due care and attention. Statistics have shown significantly higher accident rates by drivers using cell phones (whether or not they have hands-free). It is not acceptable to endanger your health and safety or the safety of others by distracting attention from the task at hand to respond to a telephone call.

3.0 **DEFINITIONS**

<u>Company Driver</u> – Any Employee of the Company who is operating a Company Vehicle at any time; or, any Employee who operates his/her Personal Vehicle on Company-Related Business.

<u>Company-Related Business</u> – Any act performed by Employees that is within the scope or the duties of employment for which the Employee was engaged by the Company. This definition does not include an act committed during an Employee's employment which is not in the ordinary course of Company's business or not within the scope of the Employee's workplace authority. Generally, operating one's Personal Vehicle from home to work and back does not constitute Company-Related Business.

<u>Company Vehicle(s)</u> – Any vehicle owned, leased, rented and/or insured by the Company. For the purposes of this Policy, this also includes any vehicle that has been rented or leased in either the Company's or the Employee's name.

Operating a Motor Vehicle – A person "operates" a motor vehicle when, while in the vehicle, they make use of any mechanical or electrical system that alone or in sequence sets the vehicle in motion. If the vehicle is parked in a designated parking space and turned on for the purpose of cooling or heating, this does not constitute "operating a motor vehicle".

4.0 CELLULAR TELEPHONE USE DURING PROJECT WORK

Golder's Motor Vehicle Policy prohibits the use of cellular telephones while operating a motor vehicle for Company-Related Business. <u>All employees must comply with Golder's Motor Vehicle Policy effective</u> October 16, 2009.



STANDARD WORK PROCEDURE CELLULAR TELEPHONE USE

If your phone rings, no matter what your activity, first consider if the distraction of answering the phone may place you or others in danger. If it does present a hazard, do not answer the phone. The caller can call back or leave a message on your voice mail.

When appropriate, return the call after you have moved to a safe location on the project site that is away from heavy equipment, moving vehicles, and other hazardous conditions. Frequently information from a call must be written, and the act of transcribing information to a notebook reduces your visual connection with project site hazards.

Do not walk around the project site when you are talking on your cell phone. Stand in one place during the call. If you must move to another location, terminate the call, move to the other location, and reestablish the call.

For staff routinely in the field, we recommend you silence your phone when you are on the project site. You can look at your phone when you have time and return the calls when it is safe.

5.0 CELLULAR TELEPHONE USE WHILE DRIVING

The use of Portable Electronic Devices by a Company Driver in a Policy-Covered vehicle is prohibited while Operating a Motor Vehicle. The Portable Electronic Devices may remain in the "on" mode while Operating a Motor Vehicle. Texting, emailing, surfing the internet, and using headphones are prohibited. Employees are strongly discouraged from performing other activities that result in taking away meaningful attention to operating a vehicle safely (e.g., eating, reading, applying makeup, shaving, etc.). Portable GPS units are allowed, if permitted by applicable local law and client policy, but the units must not obscure forward vision.

Employees are required to comply with all telephone and pager use policies imposed by a Client when traveling or performing services on Client's projects.



1.0 SCOPE

This Standard Work Procedure (SWP) applies to all Golder Associates Inc. and Golder Construction Services (Golder) Company Drivers who operate Company Vehicles or who operate their personal vehicles on Company-Related Business.

2.0 MOTOR VEHICLES AND DRIVING ON COMPANY-RELATED BUSINESS

Unlike other workplaces, the roadway is not a closed environment. Preventing work-related roadway crashes requires strategies that combine traffic safety principles and sound safety management practices. Although employers cannot control roadway conditions, they can provide safety information to workers and set and enforce driver safety policies to promote safe driving behavior. Vehicle crashes are not an unavoidable part of doing business.

<u>All employees must comply with the Golder Motor Vehicle Policy effective October 16, 2009</u>. The terms in this SWP are defined in that Policy.

3.0 GENERAL GUIDELINES

- Only employees who are authorized to drive a company owned motor vehicle or while on company business (company owned, private, or hired) may operate the vehicle.
- Enforce mandatory seat belt use. Seat belts shall be worn by all drivers and passengers in vehicles on company business while the vehicle is in motion.
 - No persons should ride in or on a vehicle unless it is designed to seat a passenger.
- Must carry appropriate insurance if using private vehicles for work purposes.
- Consider the risks driving while fatigued presents on all projects. Do not require workers to drive irregular hours or far beyond their normal working hours.
- Develop work schedules that allow employees to obey speed limits and to follow applicable hours-of-service regulations.
- Do not tailgate or drive in an aggressive manner. Maintain a minimum of 2 seconds behind other vehicles and in the event of inclement weather increase the distance between vehicles to a minimum of 4 seconds or as road and weather conditions warrant.
- Observe all the rules and regulations pertaining to the use of public land. Always ask permission before crossing pastoral land. Leave gates as you find them. Keep to constructed vehicle tracks. Avoid areas that are easily damaged, such as swamps, alpine snow plains and vegetated sand dunes.
- Do not operate any vehicle while under the influence of alcohol, illegal drugs, or certain medications (prescription or over the counter) that might impair your ability to safely operate the vehicle.



- Observe all fire restrictions.
- For portable electronic devices see the Motor Vehicle Policy (dated October 16, 2009) and the SWP 23 "Cellular Telephone Use" for additional information.
 - The employee operating a vehicle while conducting company related business shall not talk (including hand free units), text, email, surf the internet, etc. If the employee needs to perform any of these tasks then they shall park the vehicle in a designated parking spot. Do not park off the side of a road.
 - Employees are strongly discouraged from performing other activities that result in taking away meaningful attention to operating a vehicle safely (e.g. playing with the radio, eating, reading, applying makeup, shaving, etc.)
- Employees are to report any traffic violations and/or vehicle accidents or damage that occurred on company related business to the Project Manager or the Human Resource Representative.

4.0 VEHICLE MAINTENANCE AND FLEET MANAGEMENT

- Adopt and enforce a structured vehicle maintenance program for Golder-owned vehicles.
- Maintain Vehicle Condition Check-out/Check-in list for Golder-owned vehicles.
- Test the brakes, wipers, tires, lights, and turn signals, fluids (oil, break, and washer) and verify that the vehicle has an inflated spare tire and jack prior to use (in company, private, or rented vehicles). Address any notes or oral warnings concerning vehicle deficiencies, which must be remedied at the earliest possible opportunity. If any safety concerns are identified, the vehicle must not be used.
- Report vehicle deficiencies to the Office Manager as soon as they are noticed. The Office Manager, or their delegate, will arrange for maintenance of the vehicle.
- Equip Golder-owned, rented, or private vehicles used for on-site work with fire extinguishers and first aid kits, if required.
- Ensure rented or client-provided vehicles are in a roadworthy condition.

5.0 SAFETY PROGRAMS

- Teach workers strategies for recognizing and managing driver fatigue and in-vehicle distractions.
- Provide appropriate training to workers operating specialized motor vehicles or equipment.
- Emphasize the need to follow safe driving practices on and off the job.
- Consider fire safety when parking vehicles in areas with dried grasses, leaves, or other plant material. Hot engine fluids, catalytic converters or other vehicle equipment could ignite dry plant material, and cause a fire.



6.0 DRIVER PERFORMANCE

- Make sure each driver of a vehicle being used on company business (company owned, private, or hired) possesses a valid driver's license that is appropriate for the type of vehicle to be driven.
- Check driving records of prospective employees, and perform periodic rechecks after hiring.
- Maintain complete and accurate records of workers' driving performance.

7.0 SECURING LOADS

Unsecured and poorly secured items inside or outside of a vehicle can be extremely dangerous if they are loose or become airborne. They can harm the vehicle driver and passenger, and/or occupants in vehicles behind you. The following recommendations should be followed:

- Use tie-down straps that are in good condition and rated for the load you will carry. Ratcheting tie downs are better than bungee cords or tie downs that just pull tight.
- Loads shall not exceed the manufactures specifications and legal limits for the vehicle.
- Install mounts to secure loads that you haul frequently in the same vehicle or trailer.
- Secure tarps covering loads so they are snug and do not flap.
- Check your load after you have driven a short distance to make sure it has not shifted.
- Do not pile items higher than the side walls of the truck bed or trailer.

8.0 VEHICLE SAFETY EQUIPMENT

You may not know when a highway emergency will happen, but you can be prepared by ensuring that your vehicle is equipped to deal with roadside emergencies. Consider carrying items such as the following, and know how to use them properly:

- Flashlight
- Reflective safety vest
- Light sticks
- Fire extinguisher
- Tire inflator or sealant
- Reflective triangles or flares
- Blanket
- Tow rope or cable with a hook (in case the vehicle is disabled)



9.0 DRIVING TECHNIQUES FOR 4-WHEEL DRIVING

9.1 Driving In Heavy Vegetation

- Get out and check road conditions before proceeding if you are unsure of the ground ahead, especially if there is mud or water.
- Position your hands on the steering wheel so that your thumbs are on the outside the steering wheel.
- Do not change transmission gears in the middle of a hazardous area, if in doubt always choose the lower gear.
- Tire pressures play an important part in off-road driving. Lowering tire pressures helps in getting through. 140-180 kPa (20-26 psi) is a good tire pressure for soft tracks. If you choose to use a lower tire pressure, the vehicle must be operated at a lower speed. Remember to re-inflate your tires as soon as you're back on hard ground.
- Cross small ridges 'square on' and cross ditches at a slight angle.
- Turn the steering wheel from side to side to maintain traction and move forward if you begin to lose traction going uphill, along a rutted track, or in mud.

9.2 Driving On Steep Hills

- Use low second or third gear for going uphill and low first gear for going downhill.
- Use the footbrake sparingly and with caution.
- Avoid turning the vehicle sideways on a hill. If the vehicle begins to slide sideways, very slightly accelerating and steering into the slide will normally straighten your descent.
- Allow any vehicle in front of your vehicle plenty of room.
- Do not touch the clutch or accelerator if you stall going uphill.

9.3 Sand Driving

- Speed and flotation are the keys to success. High transmission gear ratio is best, if possible.
- Lower the tire pressure to 20 psi. If you choose to use a lower tire pressure, the vehicle must be operated at a lower speed. Remember to re-inflate your tires as soon as you are back on hard ground.
- Drive in existing wheel tracks if they are present.
- Avoid sudden changes in direction or acceleration. Coast to a stop if possible.
- Approach dunes head on.



STANDARD WORK PROCEDURE MOTOR VEHICLES & DRIVING ON COMPANY BUSINESS

- Avoid braking when descending a dune. Point the front of the vehicle downhill. Do not go fast, but also do not go so slow that the wheels stop rolling, or the vehicle begins to slide sideways. A touch on the throttle will keep the wheels moving and the vehicle pointing in the right direction.
- Try to rock the vehicle backwards or forwards, building up a small stretch of hardpack sand that you can accelerate from if the vehicle gets stuck. Do not spin the wheels!
- Be sure that recovery gear is always in the vehicle in these driving conditions.
- Wash the vehicle after use.

9.4 Snow, Rain, and Ice Driving

- Carry chains and install them on the tires when required.
- Prepare your vehicle and carry safety gear.
- Travel only on roads and tracks that are open to traffic.
- Drive with low beam lights on. Do not travel when visibility is poor.
- Vehicles travelling uphill in snow and ice conditions have right of way.
- Park only where directed and as close to the bank as possible. When parking, leave the vehicle in gear. Do not use the handbrake it could freeze in the "on" position.
- Lift the wiper blades off the wind shield when leaving the vehicle parked.
- Watch for other travelers and animals and drive slowly in areas where they may be present. In the event that an animal is encountered on a road where driving conditions are poor due to the presence of snow, ice, or rain, do not over steer to avoid hitting the animal. The act of over steering may cause the vehicle to slide or roll. Most of the time the animal will move out of the road before the vehicle reaches it.
- Consider increasing the load or weight on the rear axle of front-wheel drive vehicles to improve traction when driving in snow, ice, or rain.

9.5 Driving in Mud

- Good tires with deep tread are helpful when driving in muddy conditions.
- Low second or third are probably the best gears for vehicle operation.
- Move the steering wheel rapidly from side to side to improve traction.
- Keep a steady pace.
- Stay out of ruts if possible.
- Rock the vehicle backwards or forwards by alternating between first and reverse if you do become stuck.



9.6 Driving in Fog/Limited Visibility

- Drive with low beam lights on. Do not travel when visibility is poor.
- Drive slowly and carefully.
- Pull over to a safe location if you cannot see vehicles in front or behind you until weather improves.

10.0 REGULATORY CITATION

There are no Federal OSHA regulations relating to driving safety. The Department of Transportation (DOT) Title 49 (Transportation) Subtitle VI (Motor Vehicle and Driver Programs) provides information about commercial motor vehicle operations.



STANDARD WORK PROCEDURE COMPRESSED GAS CYLINDERS

1.0 SCOPE

This SWP applies to all Golder Associates Inc. and Golder Construction Services (Golder) employees who use compressed gas cylinders on a project site. Before using compressed gas cylinder you must have proper training and knowledge of the operation of the equipment.

2.0 KEY HAZARDS

- Explosion
- Accidental discharge of contents of cylinder. Gases may be toxic, flammable, an asphyxiant, oxidizer, corrosive, or cryogenic.
- Cylinders can become flying projectiles (i.e., when cylinder valves are damaged or broken off).
- Regulators can become bullets.

3.0 **PRECAUTIONS**

3.1 Storage

- All compressed gas cylinders must be clearly marked with the name of the compressed gas or liquid it contains.
- Cylinders shall be chained or otherwise adequately protected from movement to prevent a tipping hazard.
- Cylinders must be stored in an area that is dry, well ventilated, and away from sources of electricity, ignition or excessive heat (< 125°F).</p>
- Outdoor storage areas for compressed gas cylinders should have good drainage, secured against general access (locked in protective enclosures), and should be protected from direct sunlight.
- While in storage, regulators shall be removed and stored appropriately, cylinder valveprotection caps must be firmly in place and cylinders should be secured from falling and stored in an upright position.
- Empty cylinders should be stored separately and labeled "empty", full cylinders shall e labeled "full".
- If the labeling on a cylinder becomes unclear, the cylinder should be marked "contents unknown" and returned to the supplier.
- Gas cylinders should not be stored in public hallways, near exits, under stairways, or other unprotected areas.
- Cylinders must be segregated in hazard classes while in storage (e.g., oxidizers (oxygen) separated from flammable gases).
- Oxygen cylinders minimum of 20 feet maintained between flammable gas cylinders and oxygen cylinder or separated by a 5 foot firewall with a fire rating of 30 minutes.
- Never store acetylene cylinders on their side.

3.2 Handling

Safety glasses, gloves, and safety shoes should be worn when handling cylinders.



STANDARD WORK PROCEDURE COMPRESSED GAS CYLINDERS

- When moving a cylinder, do not allow it to fall or to strike another cylinder.
- Never move a gas cylinder without its valve protection cap being firmly in place (regulator must be removed).
- Make sure cylinder secured to the cart before moving it.
- Do not use valve cover to lift cylinder; they could be damaged and become unattached. If it is dropped on a hard surface, it can cause explosion.

3.3 Use of Compressed Gas Cylinders

- Before removing the valve-protection cap, gas cylinders should be properly secured by using a floor stand, wall bracket, or bench bracket.
- After removing the protective cap, inspect the cylinder valve for damaged threads, dirt, oil, or grease. Remove any dust or dirt with a clean cloth.
- Never use oil or grease to lubricate regulators or valves because explosion hazard.
- Select a pressure regulator that is chemically compatible with the intended gas service and has the proper Compressed Gas Association (CGA) connection and appropriate pressure gauges.
- Install the regulator securely on the cylinder valve using a proper wrench.
- The regulator adjusting knob should be turned in the full counter clockwise or closed direction. Refer to the operating instructions for the regulator for further safety guidelines.
- Cylinders shall have pressure relief devices installed and maintained in accordance with CGA pamphlets S-1, 1-1963, and 1965 addenda and S-1.2-1963.
- All gas lines leading from a compressed gas supply should be clearly labeled to identify the gas and the area served.
- Fire extinguisher equipment should be readily available when combustible materials can be exposed to welding or cutting operations using compressed cylinder gases.
- Back off the pressure adjusting screw of the regulator to release spring force before opening the cylinder valve.
- Do not refill a cylinder due to the risk of mixing gases. Contact a vendor for service.
- Never leave pressure in a regulator when not in use.
- Use soapy water to detect a leak.
- Do not use compressed gases for cleaning purposes; unless the pressure at the nozzle is reduced to less than 30 psi.
- Flammable/oxygen lines shall be equipped with a spark arresting device between the torch and the regulator to prevent any flame from reaching cylinders.

4.0 TRANSPORTATION

- A transported cylinder must have its valve-protection cap in place and the cylinder must be stored securely in the vehicle.
- It is preferable to transport cylinders upright in an open air vehicle such as a pickup truck.
- DO NOT transport compressed gas cylinders by airplane or make them available for transport by airplane without proper RCRA/DOT training relating to packing, labeling and shipping.



STANDARD WORK PROCEDURE COMPRESSED GAS CYLINDERS

5.0 INSPECTION

- Visual and other inspections shall be conducted as prescribed in Compressed Gas Association (CGA) pamphlets and Department of Transportation (DOT) regulations.
- Determine that the cylinders under your control are in a safe condition based on visual inspection.

6.0 MINIMUM PERSONAL PROTECTIVE EQUIPMENT REQUIRED

- Steel Toe Safety Boots (to protect feet from dropped cylinders)
- Safety Glasses (to protect from unanticipated gas releases)
- Gloves
- Other task-specific personal protective equipment ort clothing as needed (welding shield, face shield, flame resistant clothing, etc.)

7.0 TRAINING

- Hazard Communications
- Trained in use of the material and pressurized systems
- OSHA 10-hour Construction Safety
- Emergency First Aid/CPR Course

8.0 **REFERENCES**

The following are the major OSHA standards impacted by this work:

- 29 CFR 1910.101-105 (Subpart H Hazardous Materials)
- 29 CFR 1910.169 (Subpart M Compressed Air)
- 29 CFR 1910 Subpart Q: Welding, Cutting, and Brazing
- 29 CFR 1926 Subpart J: Welding and Cutting
- Compressed Gas Association (CGA) pamphlets (incorporated by reference in 1910 Subpart H)
 - P-1-1965/1974
 - C-6-1968
 - C-8-1962
 - G-8.1-1964
 - S-1.1-1963 and 1965 addenda
 - S-1.2-1963
- http://cganet.com
- 49 CFR 171-179
- 14 CFR 103
- NFPA 55



1.0 SCOPE

This SWP applies to all Golder Associates Inc. and Golder Construction Services (Golder) staff working on Company-Related Business.

2.0 **DEFINITIONS**

Fatigue - physical or mental weariness from labor, exertion, lack of sleep or stress. Fatigue may occur in an office or field-based environment.

Company-Related Business – Any act performed by Golder staff that is within the scope or the duties of employment for which the employee was engaged by the Company. Generally, operating one's Personal Vehicle from home to work and back does not constitute Company-Related Business.

Emergency Situation - where life and/or property are in danger.

Extended Work Day/Period - work in excess of a 12 hour day.

Sufficient Rest- enough time for an employee to eat, have time for relaxation and sleep. This should typically be 8-10 hours between the time work is ceased and returning to work. In some instances, travel may be considered as a rest period, providing you can ensure effective sleep during this period.

Shift work - shift work involves working outside normal daylight hours (7 am- 7 pm).

Standard Working Day/Period - 12 hours including travel time.

Travel - any work related journey that may include car, bus, train, walking, taxi or aircraft.

3.0 SYMPTOMS OF FATIGUE

The following symptoms are commonly associated with fatigue, and may not be recognized by the fatigued employee. It is important that colleagues watch for symptoms of fatigue in each other during long work shifts.

- Weariness
- Sleepiness
- Irritability
- Lack of motivation
- Increased susceptibility to illness
- Depression
- Headache
- Blurred vision
- Giddiness
- Loss of appetite and digestive problems



- Slower reaction times
- Reduced alertness, lack of concentration and memory
- Reduced ability to carry out complex tasks
- Incorrect or inappropriate response
- More likely to take risks
- Reduced communication skills
- Effects similar to alcohol impairment

4.0 KEY HAZARDS

Fatigue caused by long working hours, strenuous work, or lack of sleep can impair the ability to complete activities safely and may result in harm to the employee, work colleagues, third parties or the reputation of Golder. Fatigue can contribute to health and safety incidents and to technical errors. These incidents or errors could result in an employee or other person(s) being injured or killed, or Golder suffering a legal claim resulting from professional error.

Fatigued workers may be more susceptible to accidents involving potential hazards such as:

- Exposure to chemicals
- Slips, trips, and falls
- Effect of noise
- Effect of vibration
- Temperature extremes
- Traffic-related accidents (driving)
- Accidents associated with operation of or proximity to working equipment, such as excavators, drill rigs, mobile heavy equipment.

In addition to the above hazards, other important factors to note include:

- Fatigued people can be less efficient, less productive, and there is increased likelihood of technical errors
- Fatigued people tend to overestimate their ability to perform tasks safely
- Fatigued people may experience a greater susceptibility to adverse weather conditions
- Fatigued people may suffer from memory loss resulting in them carrying out work activities unsafely

5.0 **PRECAUTIONS**

OSHA recommends the following to mitigate fatigue and hazards associated with longer working hours:

- Limiting use of extended shifts;
- Provide breaks when shifts extend beyond normal working hours;



- Complete tasks that require heavy physical labor or focused concentration at the beginning of shifts;
- Workers and management should learn to recognize the signs and symptoms of fatigue and provide control measures;
- Plan projects with adequate staff members and include breaks, rest areas, and quiet areas for sleeping; and,
- Monitor hazardous chemical and physical agent exposure levels during extended work shifts.

6.0 **RESPONSIBILITIES**

Golder has a duty of care to provide training and awareness for employees and a requirement that employees are familiar with Golder requirements for managing fatigue. All employees have a responsibility to take reasonable care to ensure their own safety and health and others affected by their work. Part of that personal responsibility is that employees must arrive to work fit for duty. As a minimum, reporting fit for duty involves:

- Having had sufficient rest over previous two days.
 - As a guide the amount of sleep required in the previous 48 hours needs to be greater than the length of the intended work period. If you plan to work 12 hours in any given day you need to have had at least 12 hours sleep over the previous 48 hours.
- Ensuring non-work activities allow for sufficient rest.
- Ensuring illnesses that may be affecting fatigue levels are managed.
- Being free of drugs and/or alcohol or other substances that may impair the ability to carry out the job.

All employees, irrespective of level or experience, are empowered and required to inform managers should they be concerned with the potential for experiencing fatigue or should they actually be fatigued. Employees are also empowered and obliged to inform the project manager/office manager that they are too fatigued to work safely.

All employees have a responsibility to each other regarding observing potentially unsafe work environments or other staff that are showing signs of not being fit for duty.

If you think your fellow workers are not working in a safe manner due to fatigue or any other factor you are empowered and required to inform them of your concerns. If the situation represents an immediate risk to persons or property then you have the right to demand they cease the activity and report to their manager.

7.0 WORK HOURS

Golder acknowledges that flexible working hours may be required to ensure business continuity and delivery of client service. Golder has a duty of care to employees to ensure that guidelines for work hours are set so that fatigue is managed and the risk of accidents is reduced to the lowest practical level. To



STANDARD WORK PROCEDURE FATIGUE MANAGEMENT

facilitate this, the following guidelines on working hours are provided and must be adhered to by all employees, and in particular be followed when arranging work schedules.

All activities at Golder should be designed to fit into the Standard Work Day/work shift of 12 hours (including travel time). In addition, all activities at Golder should be designed and managed so that no employee works more than 144 hours in a two week period (consisting of 14 consecutive days).

The Working Hours guidelines rely on individual employees monitoring their own fitness for duty in preparing for work periods of up to 12 hours in duration.

If under extreme or unforeseen circumstances a project or activity requires working greater than 12 hours per day, a project specific or activity specific risk assessment must be conducted and permission sought from either the Project Manager or Office Manager. It will be a requirement that if this permission is to be granted, the following minimum control measures will be required:

- When possible, the employee is joined by a "buddy" so that they are not working alone.
- Employees shall be specifically consulted to identify factors that may affect their ability to work beyond the Standard Working Day. During this consultation, staff should alert their supervisor if there are any personal or other matters that may need to be considered in extending working hours beyond the Standard Working Day.

If international or remote site work requires employees to be onsite for greater than the two week period, a project specific or activity specific risk assessment must be carried out and permission sought from either the Project Manager or the Office Manager. It will be a requirement that if this permission is to be granted, the following minimum control measures will be required:

- All efforts made to ensure that breaks are taken during the work period so that the 144 hours is not exceeded.
- Working plan allows for flexibility in work hours such as half day breaks to rest.
- During downtime in operation such as breakdowns, employees are given the chance to rest.

A lower operational daily Standard Working Day may be set based on environmental factors and the specific nature of the work to be undertaken. These include conditions such as extreme weather conditions, remoteness, or degree of the physical exertion required.

7.1 Breaks

Breaks are an important control measure when managing fatigue. Time spent away from the work environment has the potential to allow employees to recover from fatigue and improve safety, work performance, and efficiency. Factors such as the physical demands of the task or the weather conditions must be considered.



STANDARD WORK PROCEDURE FATIGUE MANAGEMENT

- Breaks during a Standard Working Day should be adequate and regular. Rest during the lunch break. At other times this could be as simple as taking a break while demobilizing from a test location. There should be a minimum of one 30 minute break in each 8 hour work period or part thereof.
- If a period of 12 hours has been worked, an employee is required to ensure that a break away from work of at least 8 hours is taken prior to returning to work.
- In extreme circumstances when a period of >16 hours has been worked, an employee is required to ensure a minimum break away from work of 10 hours is taken prior to returning to work.

7.2 Travel/Transport

- When you need to drive a motor vehicle for Golder business, consult the MOTOR VEHICLES AND DRIVING ON COMPANY BUSINESS Standard Work Procedure.
- An employee should not drive a vehicle home if the work period has exceeded 14 hours and should make arrangements for alternative transport or accommodations.

7.3 Fatigue Risk Assessment

A Fatigue Risk Assessment shall include the following factors:

- Time required to complete the task
- Degree of physical exertion
- A person's physical limitations
- A person's recent sleep and work patterns
- Level of concentration required
- Environmental conditions including weather, temperature (heat or cold)
- Distance, and/or time, of travel to and from the work site from the home office
- Whether the task is to be undertaken outside of office 'normal' work hours (i.e. night shift work or rotating shifts) and
- Seasonal differences to allow for daylight hours, particularly where driving is involved
- Time zone changes

Work schedules/activities to minimize risks associate with fatigue will be incorporated in the HASP as identified through the risk assessment process. The fatigue risk assessment process must follow the accepted hierarchy of controls when determining how fatigue is to be managed.

- Eliminate the fatigue hazard
- Substitute with a lesser hazard
- Use Engineering controls to reduce fatigue hazard
- Use Administrative controls such as workplace procedures to reduce fatigue hazard

Fatigue Management Strategies may include:

Breaking the task into shorter periods



- Providing relief- additional employees
- Use of additional rest breaks
- Minimizing travel time to/from job sites
- Budgetary and timing allowances for overnight accommodations or taxis etc.
- Rescheduling activities
- Budgetary and timing allowance for staff changeovers on lengthy tasks

8.0 PERSONAL PROTECTIVE EQUIPMENT

Not applicable.



1.0 SCOPE

This Standard Work Practice (SWP) applies to all Golder Associates Inc. and Golder Construction Services (Golder) staff working in areas where areas that could cause injury and require first-aid or where Emergency Medical Services (EMS) may be slow to respond or not available.

2.0 FIRST-AID AND CPR

First-aid, Cardiopulmonary Resuscitation (CPR) and Automated External Defibrillator (AED) training is available for Golder staff. The training must be a certified program sanctioned by the American Red Cross or equivalent. No Golder employee is responsible for providing first-aid as a routine part of their job duties, and it is hoped that no employee will ever be faced with administering first-aid, CPR or AED resuscitation in the course of their work. In the event of a life threatening emergency, Golder staff is trained to contract professionally trained Emergency Medical Technicians (EMT) through the local 911 system or other site specific emergency contact numbers listed in the site specific Health and Safety Plan (HASP). Field personnel are, on occasion responsible for providing on-site minor (secondary) first-aid. Golder encourages all employees, field personnel in particular, to take advantage of available first-aid, CPR, and AED training. Acting in the capacity of a designated first-aid provider, however, is not mandatory and anyone who is uncomfortable with being so designated should notify the Project Manager and/or Office Health and Safety Coordinator (HSC).

2.1 First-Aid and OSHA's Bloodborne Pathogens Requirements

The Occupational Safety and Health Administration (OSHA) has promulgated regulations (29 CFR 1910.1030) to protect employees who may be occupationally exposed to blood and other potentially infectious materials. The primary concerns include the Acquired Immune Deficiency Syndrome (AIDS) is caused by the Human Immunodeficiency Virus (HIV) and Hepatitis B (HBV) viruses which may be present in infected individuals' body fluids. Also see Golder's "Standard Work Practice – Bloodborne Pathogens" for additional information.

For the purposes of the standard, occupational exposure means "a reasonably anticipated skin, eye, mucous membrane, or potential contact with blood or other potentially infectious materials that may result from the performance of the employee's duties."

2.1.1 Exposure Control Plan

Certain portions of the bloodborne pathogen regulations apply to so-called "secondary first-aid providers who provide first-aid only infrequently in response to workplace accidents." OSHA's position is to "treat



all human blood and other potentially infectious materials **as if they were infectious** for HBV and HIV." Consequently, in the event that an employee does administer CPR or render first-aid involving contact with a victim's blood or other bodily fluid, occupational exposure as defined above is presumed.

In essence, designated first-aid providers must receive specific training required by the bloodborne pathogens standard but do not otherwise fall under the bloodborne pathogen requirements unless and until they administer first-aid. Training is required for all first-aid providers upon initial assignment and annually thereafter. In addition all first-aid providers are offered HBV vaccination as required in the standard. Training records will be maintained for a minimum of three years.

While there is some risk associated with any contact with another human being's body fluids, the risk associated with providing emergency first-aid is low and the measures set out below are intended to reduce the risk even further. The prevailing opinion in the emergency medical community is that the direct life-saving benefits of immediate emergency assistance (i.e., administering CPR to a heart attack victim, or controlling severe bleeding in traumatic injury cases), far outweigh the risks associated with properly administered assistance. Nevertheless, first-aid providers shall take reasonable precautions to limit contact with the victim's body fluids.

Nitrile, neoprene, and/or latex gloves, CPR masks, cleansing wipes and red plastic "biohazard" bags should be included in all first-aid kits. The use of "biohazard' bags are the only labeling requirement anticipated for communication of hazards. In the event that it is necessary for you to administer first-aid to another person or CPR in the course of your job duties, use nitrile, neoprene, and/or latex gloves and/or the CPR mask, as appropriate. Place all potentially contaminated clothing and other contaminated items into the red "biohazard" bag. Either give the bag to the EMTs upon their arrival or bring it back to the office and give it to the HSC for proper disposal. Do not eat anything, smoke, or touch your eyes until you thoroughly wash your hands with at a minimum soap and water. Disposable rescue masks and nitrile, neoprene, and/or latex gloves are available through the HSC, and are standard field equipment for personnel designated as first-aid providers in the field.

Golder staff should immediately report any non-life threatening work-related injury or exposure incident to WorkSafe at 888-449-7787. WorkSafe will communicate with the appropriate office manager and Human Resources Representative (HRR) for injury or exposure reporting.

If necessary, WorkSafe will request for testing of the "source individual's" blood for HIV and HBV. The results of the source individual's blood test will be made available to Golder's occupational physician as soon as possible through the injured person's attending physician.



The post-exposure medical evaluation will include a review of the exposure incident, a review of the exposed person's medical history including HBV vaccination status, a review of the source individual's blood test results if available, a baseline sample of your blood, and possibly (if appropriate in the opinion of the attending physician) a HBV vaccination or booster.

Following the post-exposure evaluation, the attending physician will provide a written opinion to the National Health and Safety Leader (NHSL). This opinion shall be limited to a statement that you have been informed of the results of the evaluation and told of the need, if any, for any further evaluation or treatment. Golder is required to provide the affected staff with a copy of the physician's opinion within 15 days. The physician's written opinion shall be the only information provided to Golder's HHR regarding the exposure incident; all other medical findings and records will remain confidential. Medical records will be maintained for a period of 30 years plus employment as required under 29 CFR 1910.1020 and available to the employees on request.

2.2 First-Aid Facilities

First-aid supplies shall be readily accessible in the office and at all job sites. First-aid supplies shall meet at a minimum the ANSI Standard Z308.1-2003. A listing of first-aid items identified by the ANSI Standard Z308.1-2003 can be found in Appendix 1 below.

The contents of the first-aid kits shall be checked before being sent out to each job site by the HSC, Project Manager, or the Site Safety Officer (SSO). For long term projects, weekly on the job site inspections shall be conducted by the SSO to ensure that the first-aid supplies are intact and/or that any expended items are replaced. First-aid kits shall consist of the appropriate items identified by Appendix 1 of this document and stored in a weather proof container with individually sealed packages of each item.

The HASP shall identify the emergency action plan to be used in getting an injured person to a physician or hospital. In the event that the area is not served by emergency services (i.e. "911"), a list of the telephone numbers and addresses of doctors, hospitals and ambulance services shall be posted at each first-aid station or within the field vehicle(s). For field operations, the list shall also include the address location of the worksite.

In the absence of readily accessible first-aid facilities all drill rigs, trucks, field trailers and similar work areas must be equipped with not less than a 10 person first-aid kit.



All vehicles used for transporting workers must be equipped with not less than a 10-person first-aid kit. When more than five employees are being transported on any one trip, the first-aid kit shall be increased in size depending upon the number of personnel being transported.

At least one first-aid kit must be available on all field operations. The size and quantity of first-aid kits required to be located at any site shall be determined by the number of personnel normally dependent upon each kit. Consult the HSC for kit requirements.

First-aid stations are required when there are 50-200 persons working at a field worksite. They must be located as close as practicable to the highest concentration of personnel. First-aid stations must be well marked and available to personnel during all working hours. First-aid stations shall be equipped with a minimum of two first-aid kits, the size of which shall be dependent upon the number of personnel normally employed at the worksite. One first-aid kit may be a permanent wall-mounted kit, but in all cases the station shall be equipped with at least one portable first-aid kit. One person holding a valid first-aid certificate and in a position of responsibility shall be responsible for the maintenance of each office and field first-aid station.

- Maintenance of first-aid kits stationed within the office is the responsibility of the HSC
- Maintenance of first-aid kits in the laboratory is the responsibility of the lab manager
- Maintenance of first-aid kits in project related vehicles and establishment of a first-aid station where required is the responsibility of the field manager or Project Manager for the project

Where the eyes or body of any person may be exposed to injurious chemicals and/or materials, facilities for quick drenching or flushing of the eyes and body must be provided. Facilities are provided for immediate emergency use in the laboratory and must be provided near the work area or office trailer for site related activities.

3.0 JOB RELATED INJURIES AND ILLNESSES

If an employee is injured on the job or is exposed to an agent that causes immediate illness or is exposed without benefit of protective equipment to known hazardous materials, this injury or exposure must be reported immediately to the office HRR. The employee may elect to call WorkCare at 888-449-7787. WorkCare will notify the corporate HRR and within 24 hours they will notify the NHSL. If the injury occurs in the state in which the employee resides, the physician's "first report of injury" will initiate a Worker's Compensation Claim. If an employee is injured outside of their state of residence, the Worker's Compensation Claim must be initiated from the employee's "home" office.



The HRR must make a determination if the injury or illness is OSHA recordable on the 300 Log. This determination MUST be made as soon as possible (i.e. within 24 hours). In many cases an injury or illness that requires medical attention by a physician may be considered a recordable or lost-time accident and must be entered into the office OSHA 300 Log. The OSHA 300 Log must be kept current at all times to comply with OSHA regulations. Once the incident information is recorded, an e-mail must be sent to the GAI President; HRR, and the NHSL with the following information:

- Employee name
- Office location
- Project manager
- Incident description

Records will be maintained by the HRR for all cases of occupational injury and illness, which may include the following:

- Every occupational illness
- Every occupational injury that results in one of the following:
 - 1. Fatality
 - 2. Unconsciousness
 - 3. Inability to perform all phases of regular job
 - 4. Inability to work full time on regular job
 - 5. Temporary assignment to another job
 - 6. Medical treatment beyond first-aid

All injuries or illnesses are OSHA recordable unless:

- Visits to a physician or other licensed health care professional are solely for observation or counseling
- The procedure is diagnostic in origin such as x-rays, blood tests or related administration of prescription medications
- The treatment is limited to first-aid and means the following:
 - 1. Using non-prescription medications at non-prescription strength
 - 2. Administering tetanus immunizations
 - 3. Cleaning, flushing or soaking wounds on the surface of the skin
 - 4. Using wound coverings such as bandages, gauze pads and butterfly strips
 - 5. Using hot or cold therapy



- 6. Using any non-rigid means of support, such as elastic bandages, wraps, non-rigid back belts, etc.
- 7. Using temporary immobilization while transporting an accident victim
- 8. Drilling a finger or toenail to relieve pressure or draining fluid from a blister
- 9. Using eye patches
- 10. Removing foreign bodies form the eye using only irrigation or a cotton swab
- 11. Removing splinters or foreign material from other than the eye by irrigation, tweezers, cotton swabs or other simple means
- 12. Using messages (physical therapy or chiropractic treatment are medical treatment)
- 13. Drinking fluids for relief of heat stress

Following incidents that are OSHA recordable, employees are to enter the recordable into Golder's Learnings Database. An incident investigation must be conducted by the HSC and the Project Manager. This incident investigation must be completed within one week of the incident. A copy of the incident investigation must be provided to the NHSL immediately after completion. The NHSL will follow-up on all OSHA recordable accidents to implement prevention-related activities.

State and federal law requires that within 8 hours of the occurrence of a work related accident which results in an immediate or probable fatality, or which results in the hospitalization of three or more employees, Golder must report the accident, by telephone or telegraph, to the nearest appropriate state or federal regulatory agency. The Golder reporter shall relate the circumstances of the accident, the numbers of fatalities, and the extent of any injuries. The NHSL will follow up with a written report and shall respond to any additional requests for information from the state or federal regulatory agency.

Equipment involved in an accident resulting in an immediate or probable fatality must not be moved until a representative of the appropriate state or federal regulatory agency investigates the accident and releases such equipment, except where removal is essential to prevent further injuries or accidents. Where moving of equipment is necessary to remove the victim, such equipment may be moved only to the extent of making possible such removal.

All Golder staff shall assist the appropriate regulatory agency in every way in investigating accidents or incidents. Personnel responsible for supervision, or witnesses to the accident shall likewise provide assistance to the fullest extent required.

4.0 APPLICABLE OSHA REGULATION PARTS

■ 1926.50 (Medical Services and First Aid)

APPENDIX 1

FIRST-AID CHECKLIST

Quantity	Description
1	Absorbent Compress, 32 sq. in. with no side smaller than 4 in.
16	Adhesive Bandages, 1 x 3 in.
1	Adhesive Tape, 5 yds.
10	Antiseptic, 0.5 g (0.14 fl. oz.) application
6	Burn Treatment, 0.5 g (.014 fl. oz.) application
4	Medical Exam Gloves
4	Sterile Pad, 3 x 3 in.
1	Triangular Bandage, 40 x 40 x 56 in 1 each
16	Analgesic/Pain Reliever (i.e. Tylenol, Aspirin)
6	Antibiotic Treatment 1/32 oz
4	Bandage Compress 2" x 36"
2	Bandage Compress 3" x 36"
1	Bandage Compress 4" x 36"
1	Breathing Barrier
1	Burn Dressing 4" x 4"
1	Cold Pack
2	Eye Covering, 2.9 sq Inches per eye
1	Eye Wash 1 oz
1	Roller Bandage 4" x 6 yd
2	Roller Bandage 2" x 6 yd
1	Bloodborne Pathogens Exposure Prevention Kit

List of Minimum Required First-Aid Kit Equipment per ANSI Z308.1-2003

Caution: This kit meets ANSI Z308.1–2003 only when the minimum is maintained with first-aid products marked "ANSI Z308.1–2003."

Part B OPERATION AND MAINTENANCE PLAN



FINAL DRAFT

PART B OPERATION AND MAINTENANCE PLAN

Landsburg Mine Site MTCA Remediation Project Ravensdale, Washington

REPORT

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

July 31, 2013

Project No. 923-1000-002.R154



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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 Operation and Maintenance (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.

B-1

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 developed and provided with the Engineering Design and Specifications. Groundwater monitoring is described in the Compliance Monitoring Plan under confirmation (long-term) monitoring (Section 1.6).

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, then a treatment technology specific O&M Plan will be developed and submitted to Ecology for review after identification of a groundwater threat. The groundwater treatment system-specific O&M Plan would be incorporated into this O&M 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-ft 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 annually for the next five (5) years thereafter.

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 (preearthquake) 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 E). Contingency actions will be implemented in accordance with this plan.

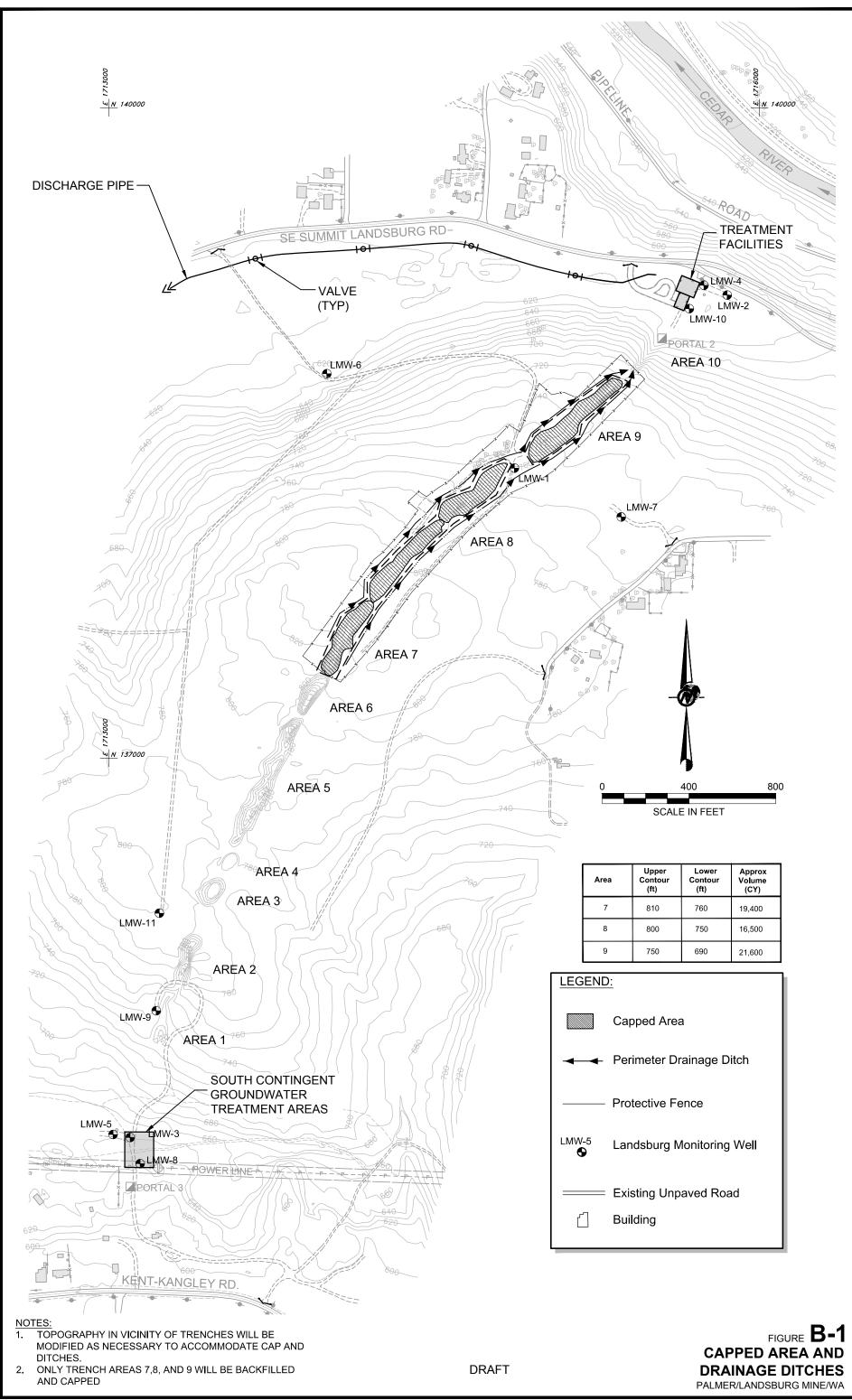


1.6 Reporting

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; Plum Creek Timberlands Company, L.P.; Browning-Ferris Industries of Illinois, Inc.; TOC Holdings Co.; 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).

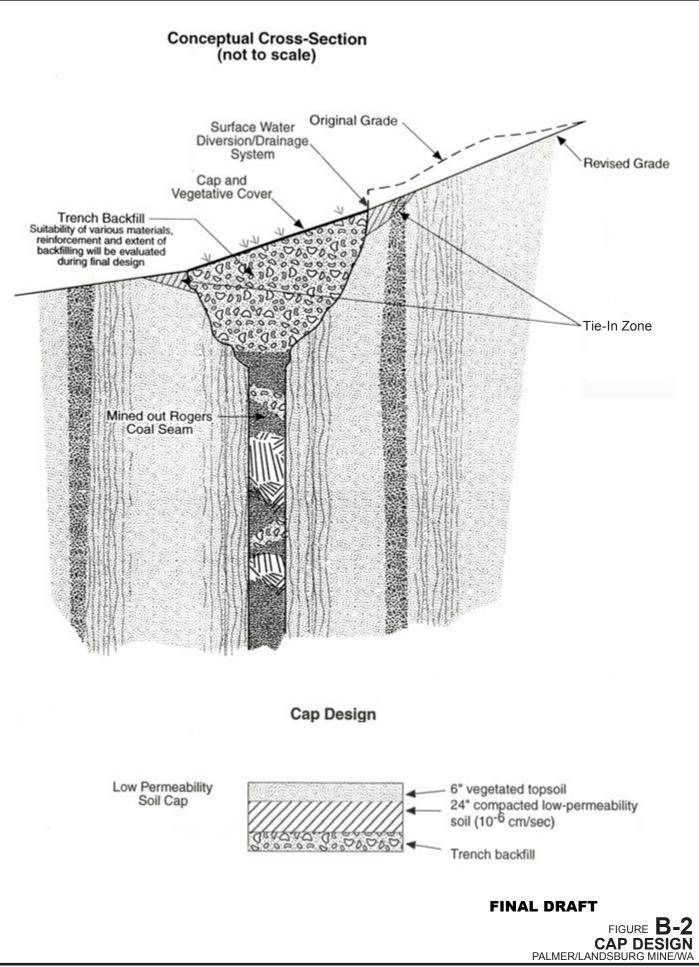


FIGURES



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



Golder Associates

Part C CONTINGENT GROUNDWATER EXTRACTION AND TREATMENT SYSTEM PLAN



FINAL DRAFT

PART C

CONTINGENT GROUNDWATER EXTRACTION AND TREATMENT SYSTEM PLAN

Landsburg Mine Site MTCA Remediation Project Ravensdale, Washington

REPORT

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

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Project No. 923-1000-002.R154

exhibit e -part c_groundwater contingency plan_07-31-2013.doc

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Appendix A King County Letter to Washington State Department of Ecology



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 the groundwater extraction and treatment system for the Landsburg Mine (Site). This document is a supplement to the Draft Cleanup Action Plan (DCAP). The primary purpose of the DCAP was 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 within the Roger coal mine (Rogers Seam) at the Site. For the purpose of this Contingency Plan, such compounds are referred to as "mine waste contaminants".

Groundwater at the Landsburg Mine compliance boundaries currently meets all designated concentrations of contaminants listed under the Washington Department of Ecology (Ecology) Model Toxics Control Act (MTCA) Method B cleanup levels. MTCA Method B cleanup levels are the most restrictive regulatory limits under MTCA.

The Landsburg Mine groundwater extraction and treatment system described herein would be operated only if mine waste contaminant concentrations reach MTCA cleanup levels at the compliance boundaries in the future. Should MTCA cleanup levels be exceeded in the future, it will be desirable to implement 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 keep any contaminants from being released beyond the compliance boundaries. Because it is unknown if any mine waste contaminants will exceed action 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 10 years from now.

The fundamentals of a groundwater treatment system described herein 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 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 compliance boundaries 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 from 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 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 will be the MTCA Method B cleanup levels. Conditional points of compliance will be 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 will serve as the northern point of compliance monitoring points; monitoring wells LMW-3, LMW-5, and LMW-8 will 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 the completion of the remedial action. 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 wells 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.



July 31, 2013

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 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 (estimated to be about 150 feet deep). This sentinel well will be installed before remedial actions are completed. 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 sentinel well location 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.

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 monitor water level changes in the Rogers coal mine due to remedial actions.

2.2.2 North Sentinel Well System

The northern compliance boundary of the Site 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 after the CAP is finalized and remedial action is complete. 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 200 foot depth within the mine. These two additional sentinel wells, together with monitoring of LMW-10 as a sentinel well, provide full 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) were installed ahead of time. 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 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 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 be installed after site groundwater reaches a confirmed concentration of 0.5 MTCA cleanup Levels at the south compliance boundary wells. 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 discharge to the Metro Publicly Owned Treatment Works (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 gpm. This rate was selected based on historical rates of 30 to 40 gpm that were required to dewater the underground mine during operation. 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 sentinel wells and compliance wells are within the vertical aquifer at various depth intervals. The groundwater levels monitored in sentinel wells and compliance wells together with the drawdown in the pumping well will provide the data for analyzing the effective aquifer capture zone. Monitoring the groundwater quality at the compliance wells will provide data on compliance for the system.

Impacted groundwater would be extracted from the pumping wells located near the mine portals, which are hydraulically up-gradient from the north or south site boundaries. However; affected groundwater will only be treated at the northern boundary. 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, only the north site boundary will have a 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 to be used in case the contingent groundwater treatment system needs to be implemented. Similar infrastructure will be installed at the south portal.

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 remediation levels are exceeded and confirmed at a compliance well that triggers this contingent remedial action, the design of the contingent system will be submitted to Ecology along with a contingent system-specific Operation and Maintenance (O&M) Plan for approval. It is anticipated that the designs presented in this document can be detailed or revised and an O&M Plan prepared and submitted to Ecology in one month after confirmation of the remediation level exceedance.

Contingency groundwater extraction and treatment would continue until groundwater at the points of compliance meets MTCA Method B cleanup levels. 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 CONTINGENCY PLAN TRIGGERS

A response action will depend on information gained during groundwater monitoring. In the event that routine groundwater monitoring detects a mine waste contaminant at a compliance boundary or sentinel well above the laboratory minimum detection limit (MDL), the steps that will be taken are identified and presented in Part A of this Compliance Monitoring Plan.



5.0 SYSTEM INSTALLATION PROCESS

The following is the general guide to the installation process for the contingent groundwater treatment system, once it has been determined that the treatment system must be installed. Steps 1 through 4 presented below will be immediately initialized and conducted concurrently, while steps 5, 6 and 7 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.

- 1. Initiate Completion of North Discharge Pipeline
- 2. Install South Discharge Pipeline (if groundwater is impacted at the south portal)
- 3. Design Treatment System
- 4. Install Extraction Well And Pump
- 5. Order and install necessary Equipment
- 6. Hook-up Equipment to power source
- 7. Start Operation of the Contingent Groundwater Pump and Treat System

5.1 Initiate Completion of North Discharge Pipeline

The discharge pipeline in the north needs to be completed to discharge pre-treated groundwater. 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 (CULs). 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.

5.2 Install South Extraction Pipeline (if needed)

If groundwater is above 0.5 MTCA cleanup level concentrations at the south compliance boundary wells, a temporary or a permanent pipeline that will 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.



5.3 Design Treatment System

The contingent groundwater treatment system will be designed and a system specific O&M Plan will be prepared that will be able to adequately remediate the specific mine waste contaminants that has been detected in compliance wells. 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 treatment system design along with a system-specific O&M Plan will be proposed to Ecology in a Draft Corrective Action Plan for approval. The Draft Corrective Action Plan 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. The time for design of the treatment system and Draft Corrective Action Plan is estimated to be one month. The time for Ecology and King County review and approval is estimated to be one month. One month 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; or start extracting groundwater with temporary discharge back to the mine workings until all reviews and approvals are obtained and the permanent system is installed and operational.

5.4 Install Extraction Well And Pump

The extraction well(s) and dedicated extraction pump(s) will be installed. The pump that will be installed will have a flow rate of approximately 10 to 40 gallons per minute capacity. Installation of the well head will also occur at this time. The extraction system consists of up to two wells: one new 6-inch well to be located (if needed) at the north and south ends of the site. 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-inch well would be installed while the treatment system is being designed, purchased and delivered. The extraction wells are anticipated to take about one month to design, 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 regardless of which treatment system (organics or inorganics) is needed. A general schematic of an extraction well is

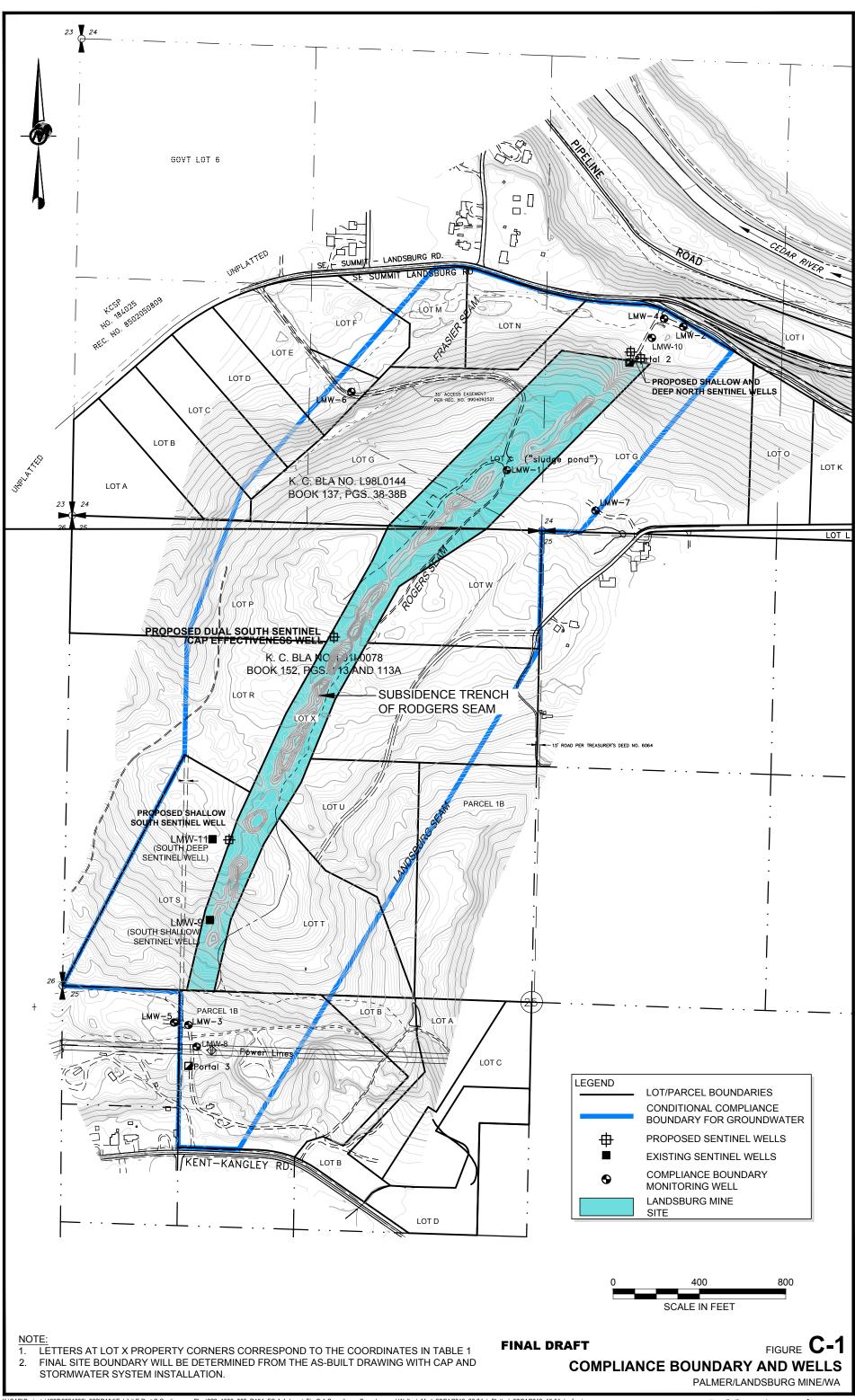


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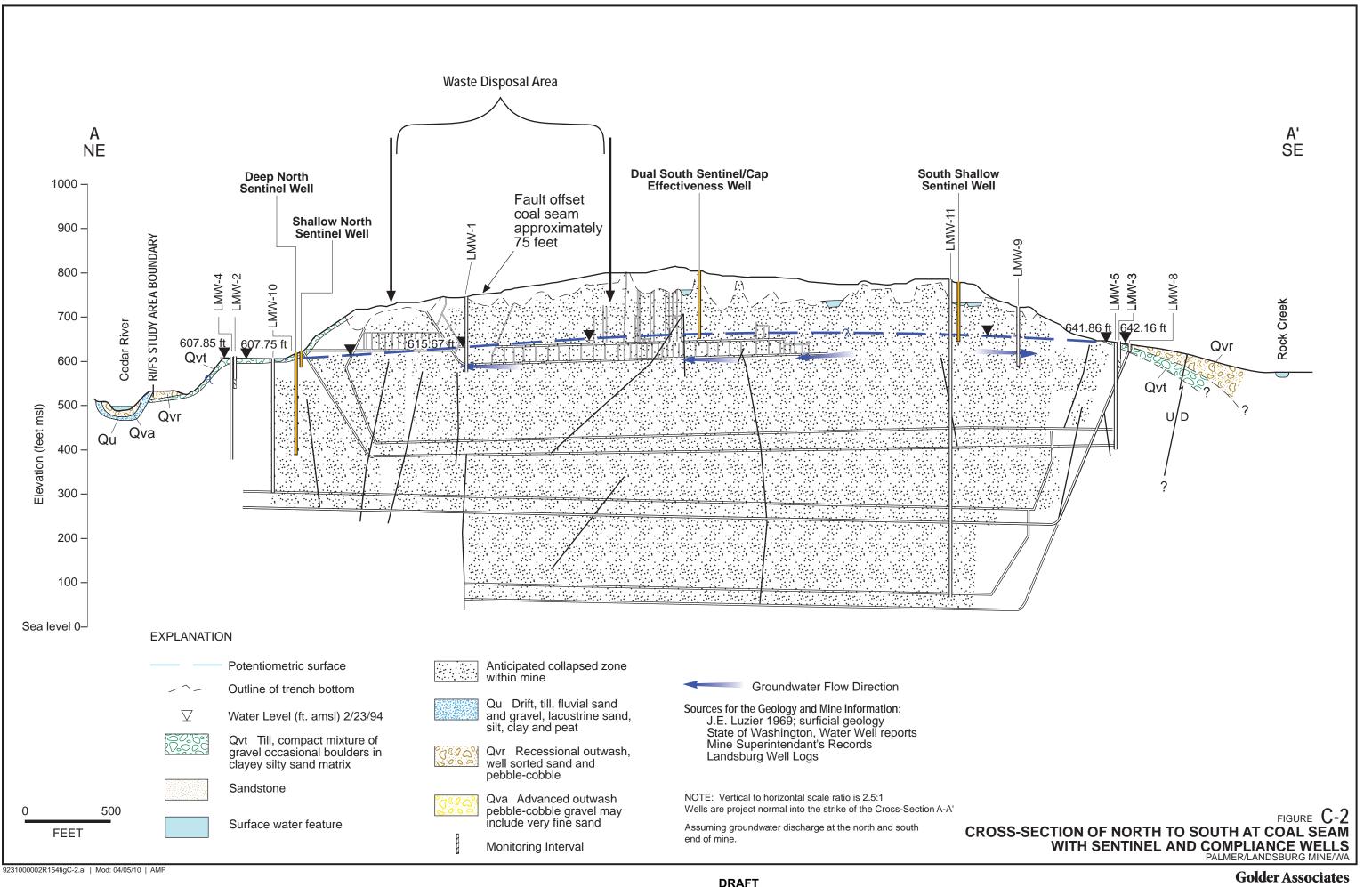
illustrated in Figure C-6. Well pumps would primarily operate on water level control within the wells. High water level in treatment system tanks (Figure C-5) would also automatically shut off the well pumps.

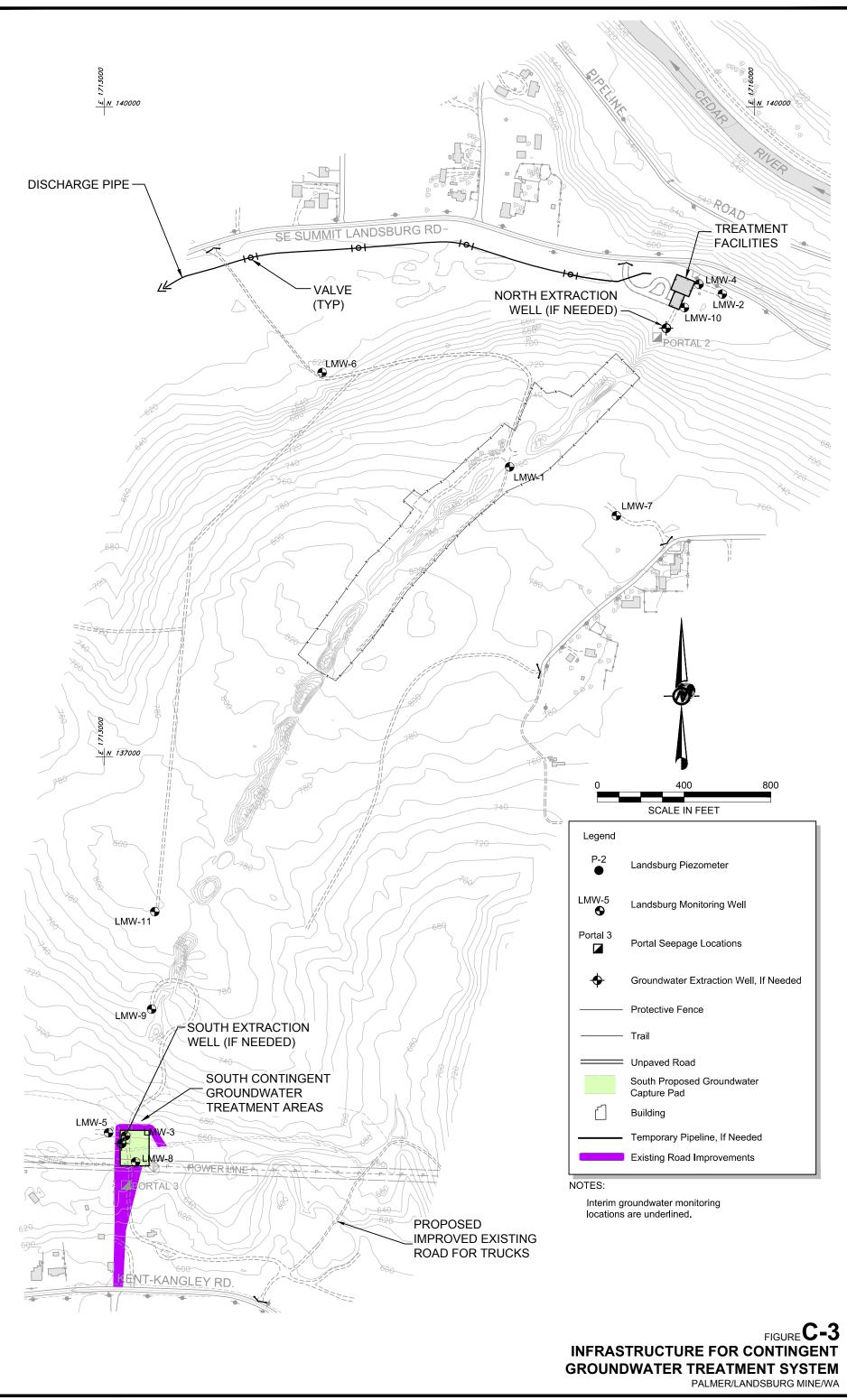


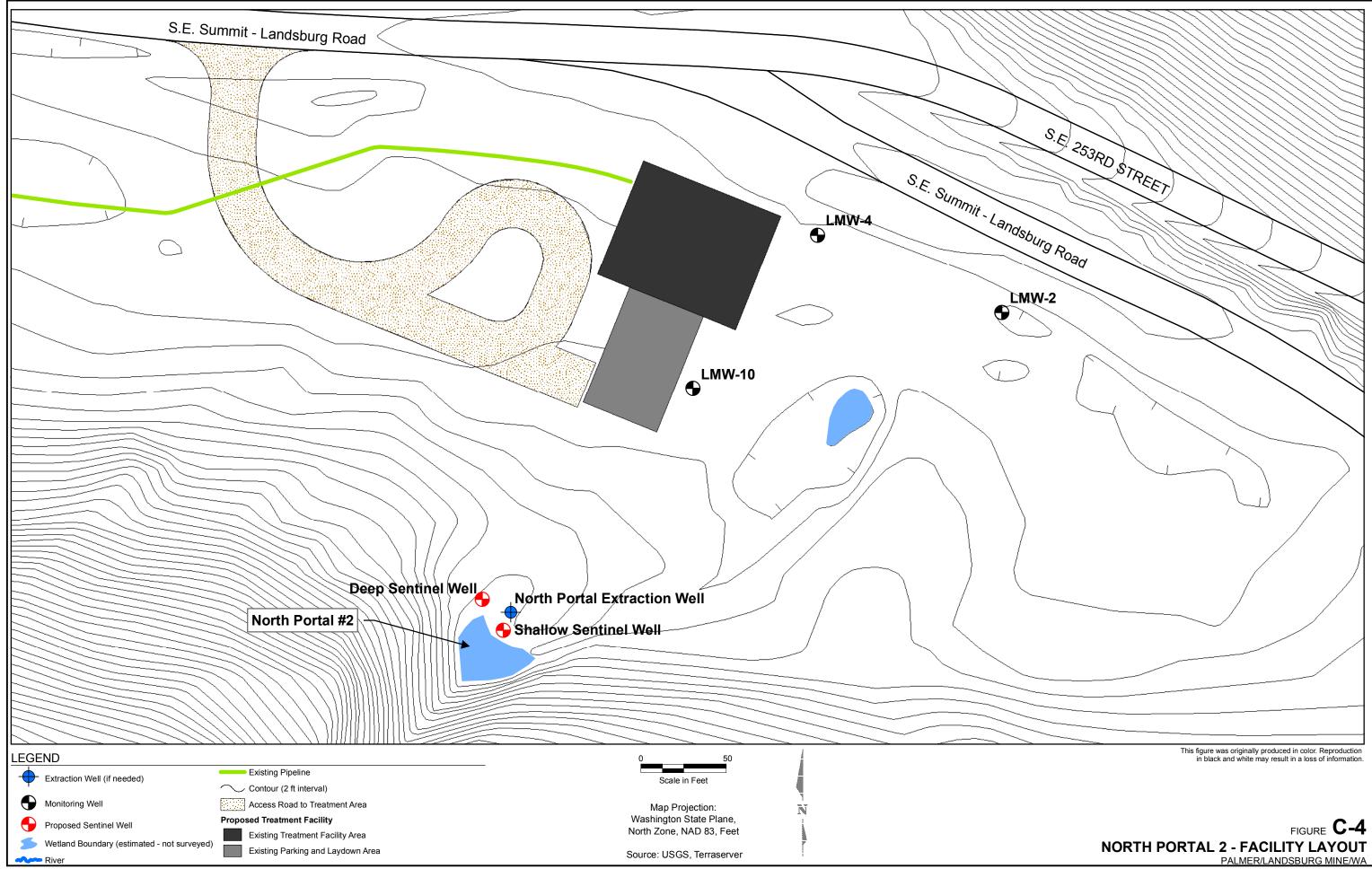
FIGURES

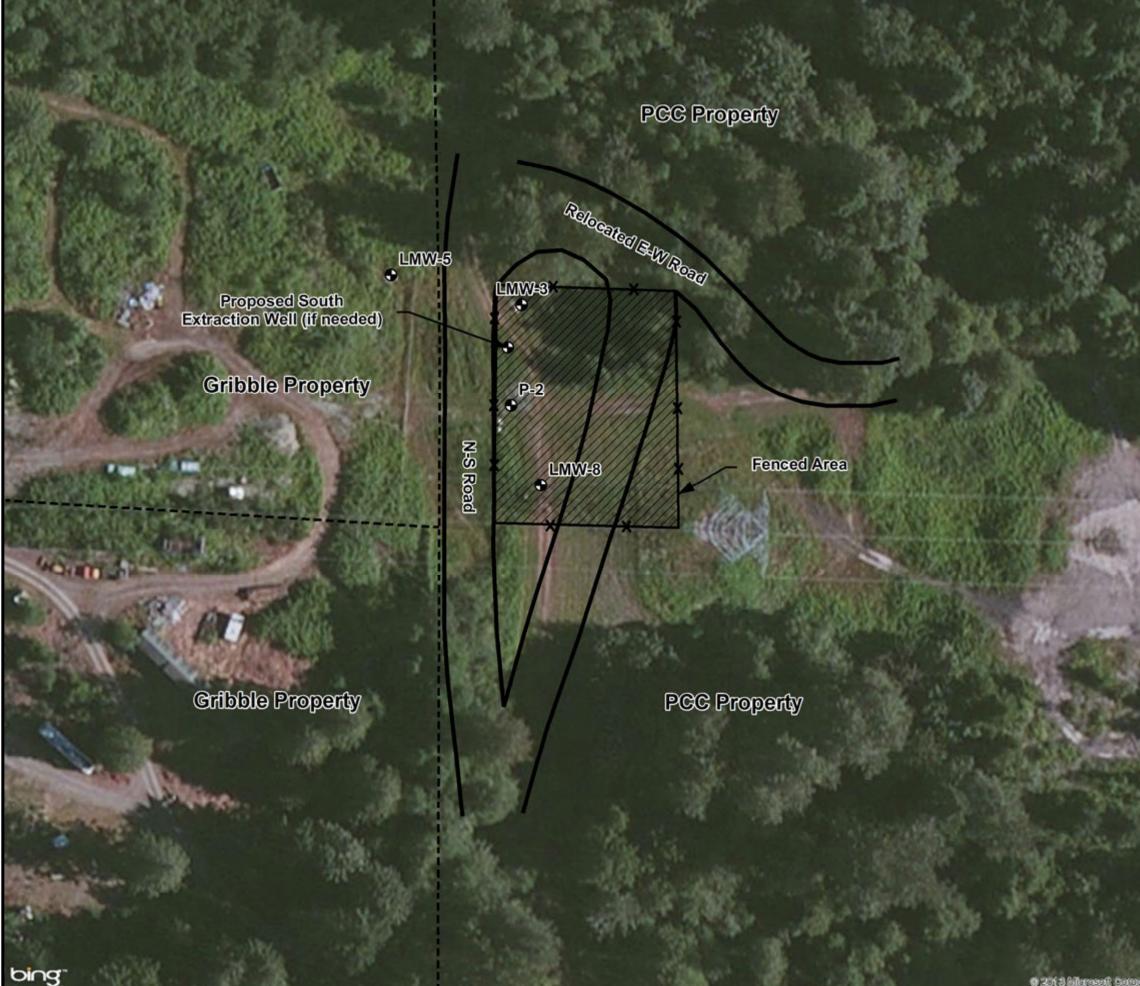


K:\CAD\Projects\1992\9231000\x002\R154\Exhibit E Part C Contingency Plan\923_1000_002_R154_FC-1r4.dwg | Fig C-1 Compliance Boundary and Wells | Mod: 07/31/2013, 08:34 | Plotted: 07/31/2013, 15:54 | aforcier









LEGEND

Wells

South Portal Contingent Groundwater Extraction Area

- Truck Access Roadway

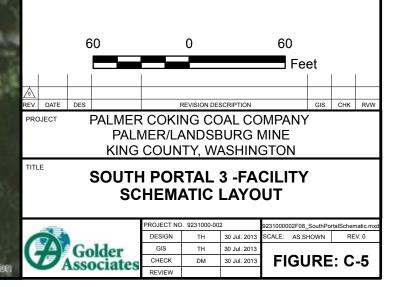
--- Property Boundary

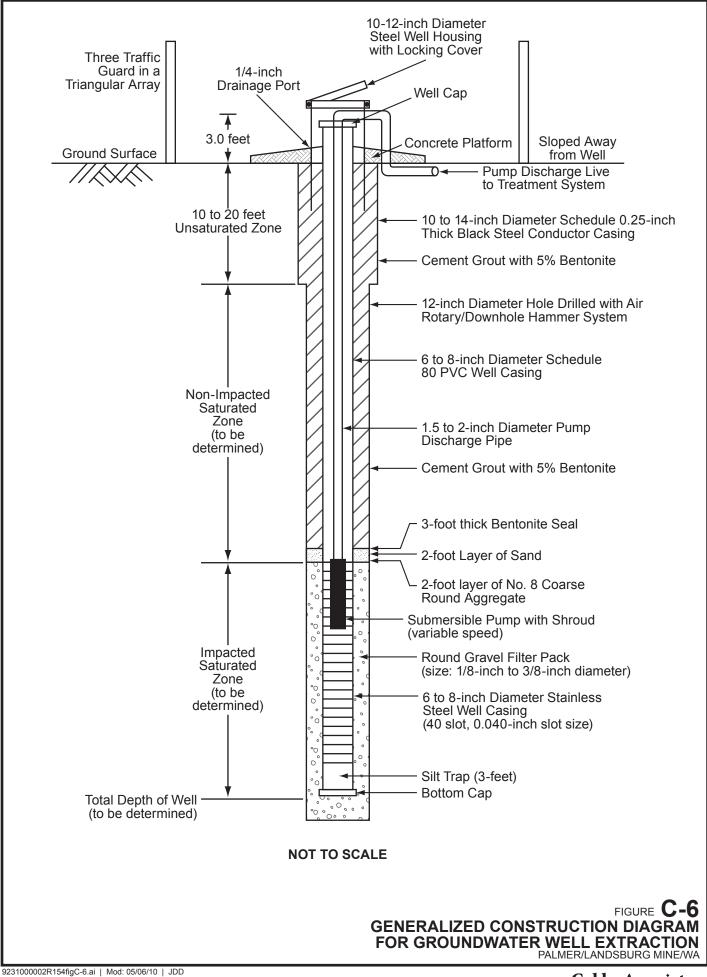
X Fence

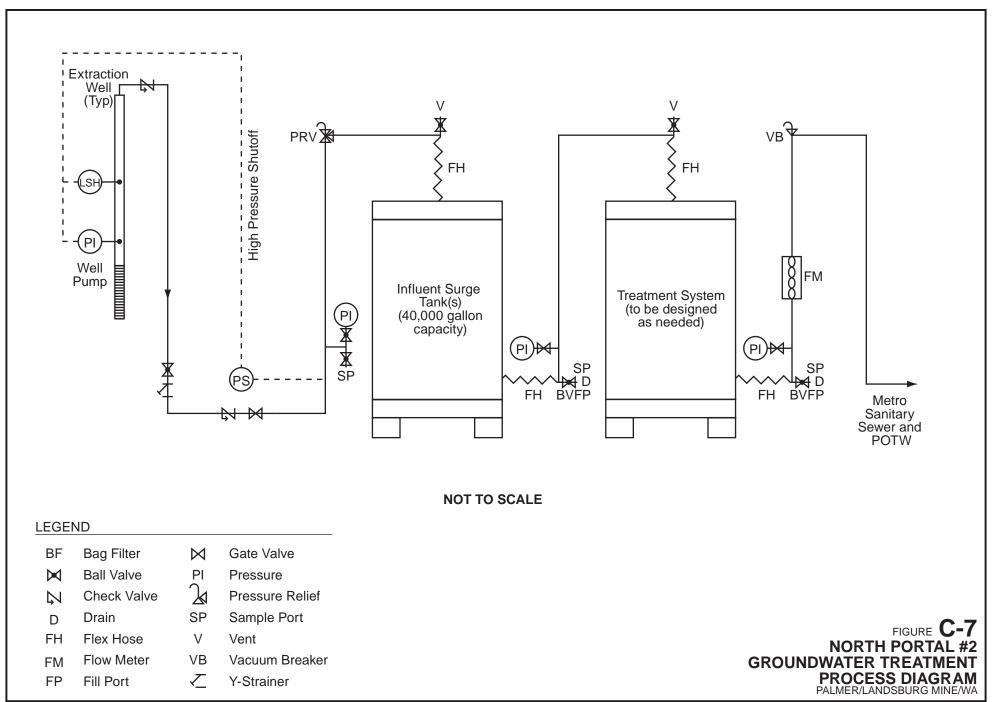
REFERENCES

Bing Maps (Imagery)
 Golder Associates Inc.
 COORDINATE SYSTEM: NAD 1983 StatePlane Washington North FIPS 4601 Feet

FINAL DRAFT







9231000002R154figC-7_R1.ai | Mod: 08/06/10 | AMP

APPENDIX A

KING COUNTY LETTER TO WASHINGTON STATE DEPARTMENT OF ECOLOGY



· Conto 15024



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:

Ihank 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 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

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Jerome Cruz February 15, 2006 Page 2

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-Scattle 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.

Sincercly,

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

Received Time Feb 15. 4:46PM

EXHIBIT F

RESTRICTIVE COVENANT

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 ______, 2013 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").

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. 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.

<u>Section 2</u>. 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.

<u>Section 3</u>. 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.

<u>Section 4</u>. 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.

<u>Section 5</u>. 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.

<u>Section 6</u>. 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 _____, 2013, 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

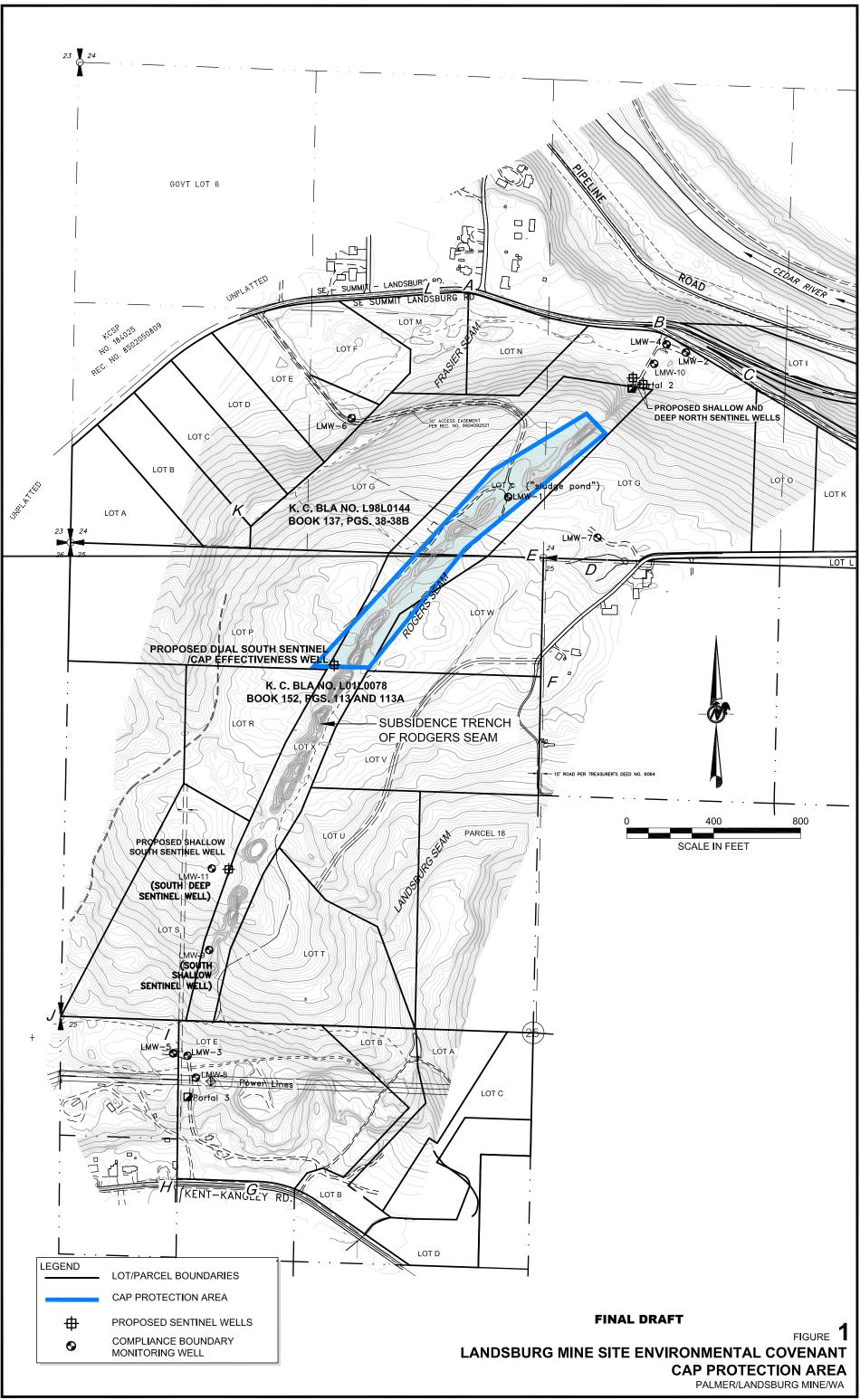
FILL IN FULL LEGAL DESCRIPTION WHEN AVAILABLE AFTER REMEDIAL ACTION CONSTRUCTION

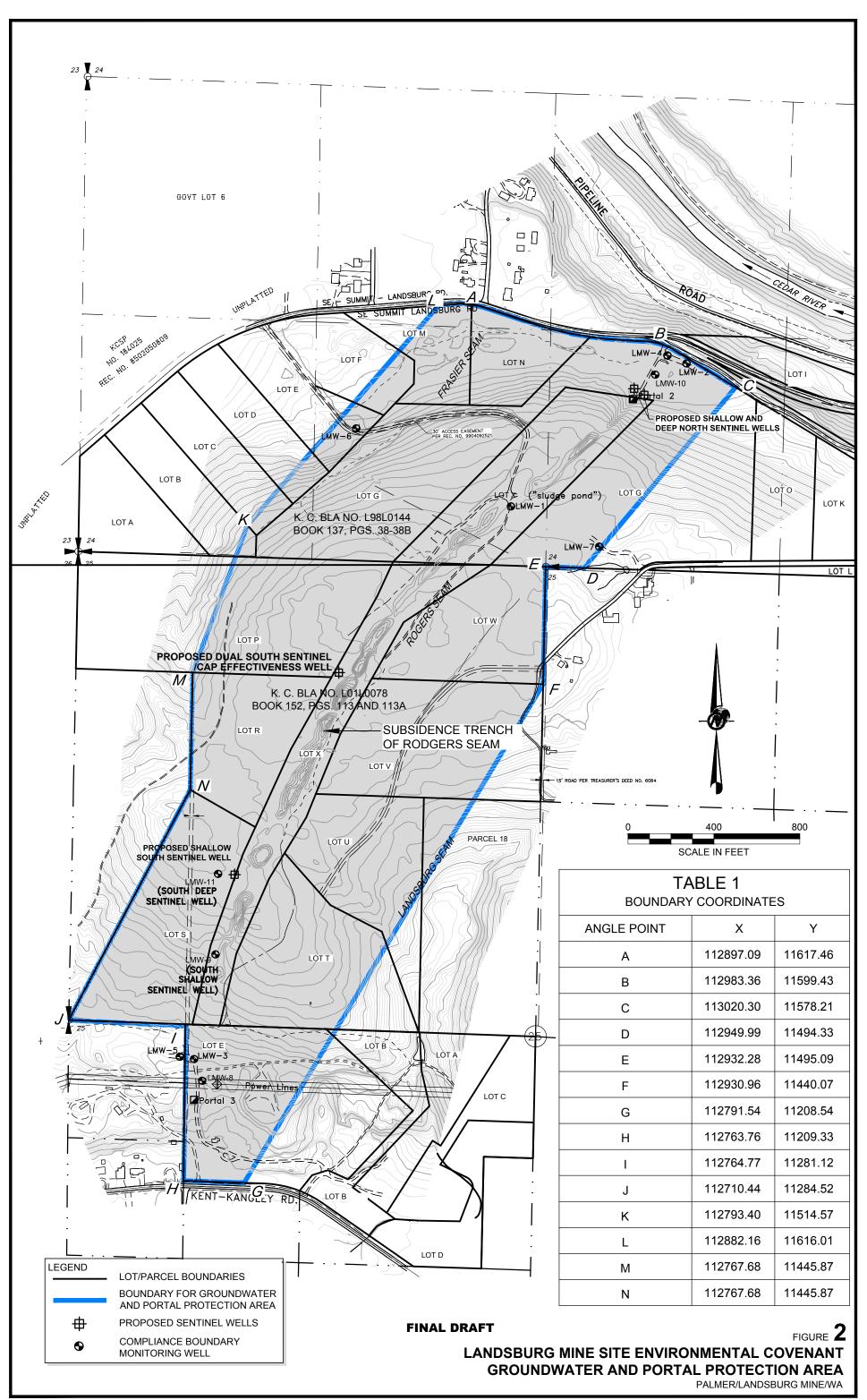
CAP PROTECTION AREA:

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

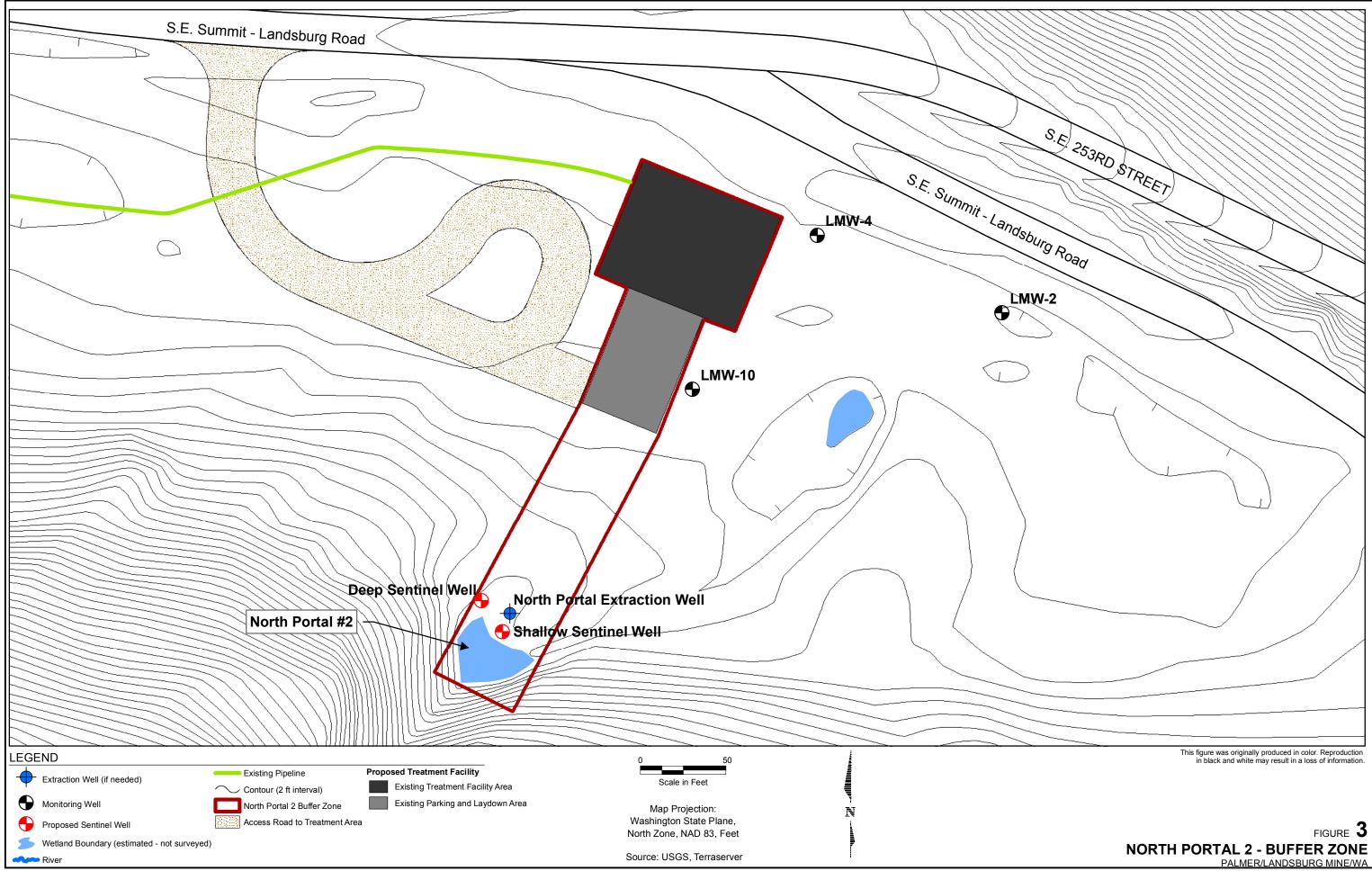




Golder Associates

K1CADIProjects/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

Figures 3 & 4 North Portal 2 Buffer Zone & South Portal 3 Buffer Zone



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LEGEND

Wells

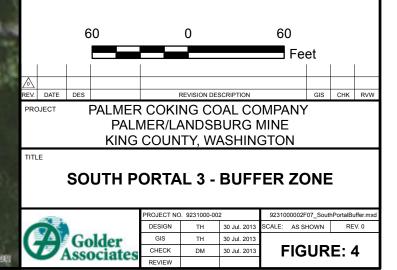
South Portal Buffer Zone

- Truck Access Roadway
- --- Property Boundary

REFERENCES

Bing Maps (Imagery)
 Golder Associates Inc.
 COORDINATE SYSTEM: NAD 1983 StatePlane Washington North FIPS 4601 Feet

FINAL DRAFT



DM 30 Jul. 2013

CHECK

FIGURE: 4

EXHIBIT F

RESTRICTIVE COVENANT

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 ______, 2013 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.

<u>Section 2</u>. 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.

<u>Section 3</u>. 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.

<u>Section 4</u>. 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 ______, 2013, 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

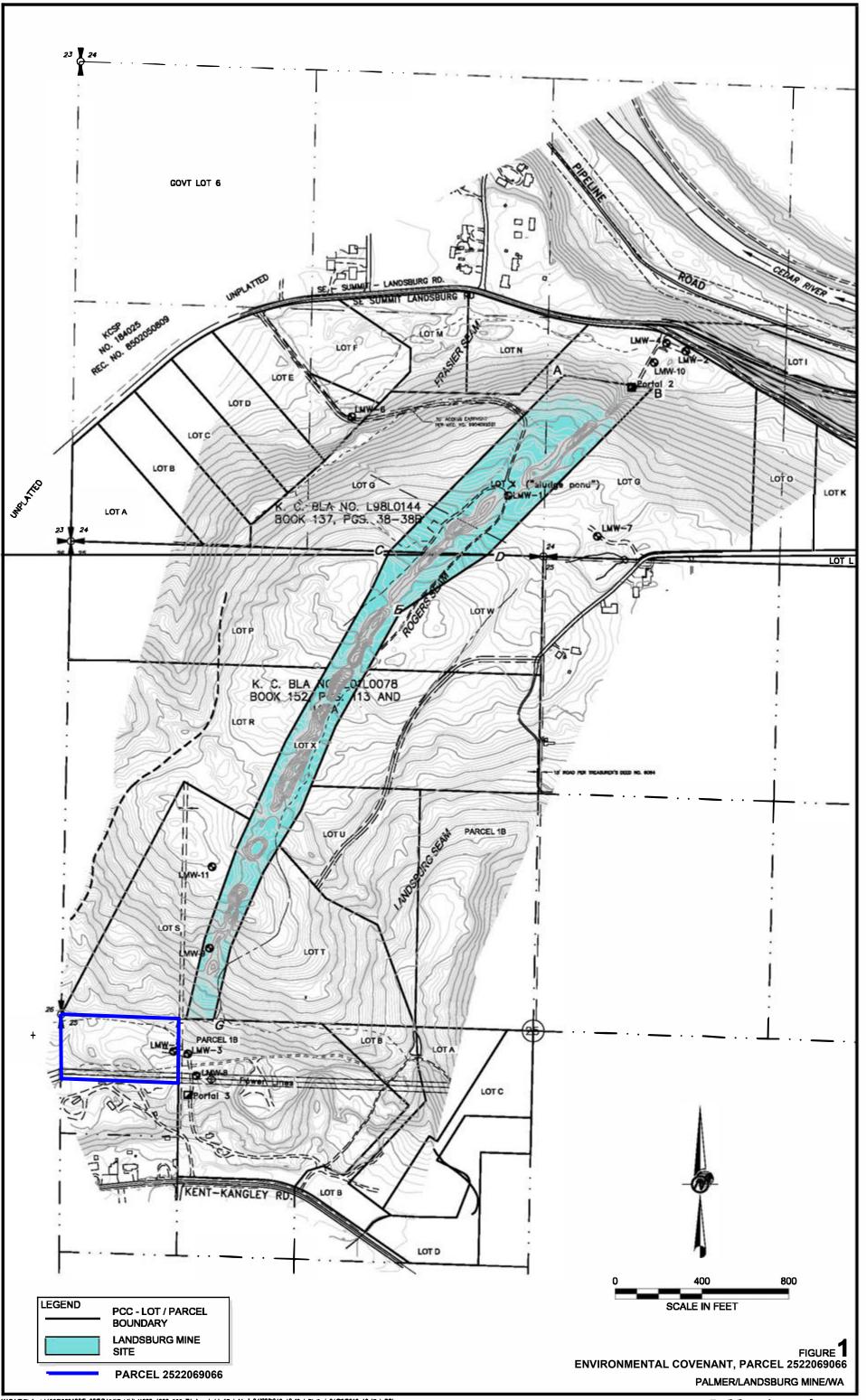
FULL LEGAL DESCRIPTION :

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



K1CAD1970jects/199219231000tz002/R1541Exhibit A1923_1000_002_F1.dwg | 11x17 | Mod: 04/28/2010, 10:43 | Plotted: 04/28/2010, 12:47 | SSimmons

EXHIBIT G

REMEDIAL ACTION PERMITS

TECHNICAL MEMORANDUM

TO: Landsburg PLP Group DATE: FR: OUR REF: **Douglas Morell**

July 31, 2013 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 current Draft Cleanup Action Plan (DCAP). 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 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 DCAP 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 certain Washington State permits and local permits from procedural requirements [RCW 70.105D.090], if conducted under a Consent Decree. The remedial Actions are planned to be implemented under a Consent Decree and would have these exemptions. Specific procedural requirements exempted under a MTCA Consent Decree includes RCW Chapters 70.94, 70.95, 70.105, 77.55, 90.48, 90.58, and anv laws requiring or authorizing local government permits or approvals for remedial actions. The only cases where the procedural exemption does not apply are if it would result in the loss of approval from a Federal agency necessary for the State to administer any Federal law under these chapters. Even though the permit is procedurally exempt, the substantive requirements of each exempted permit are required for approval by the permitting governmental agency. If a



MEMORANDUM	FINAL DRAFT	July 31, 2013
Landsburg Mine Site PLP Group	-2-	923-1000-002.R154

State or local permit is not exempted under MTCA, they will be specifically identified below, otherwise only the substantive requirenments of the State or local permits listed below are necessary. 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 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 will be required to obtain and local or state permits for the project including permits from Ecology. The Landsburg PLP Group will prepare and submit a permit application and SEPA Checklist to Ecology (SEPA lead) to initiate SEPA review. Any project that requires state or local agency permitting, licensing, funding, or adoption of a policy, plan, or program can trigger environmental review under SEPA. A Determination of Non Significance (DNS) needs to be obtained to implement remedial actions. Ecology has the option of preparing an EIS for the project if they feel it is likely to have significant adverse impacts, but is unlikely for remedial actions at Landsburg Mine Site.



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 take jurisdiction of the Site wetlands, a wetland permit would be required from the State of Washington. Again a consultation with the State Department of Ecology will identify whether any wetland permits are required. 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) will be 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. A Construction Stormwater General Permit will be required because activities will include clearing, grading, and excavating and more than one acre will be disturbed. This permit will require the submission of a Notice of Intent application and the development of a Stormwater Pollution Prevention Plan. A new draft permit was released by Ecology on July 21, 2010.

2.2.4 Section 106 of the National Historic Preservation Act

A Cultural Resources review (Section 106) could also potentially be 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

A Coastal Zone Management (CZM) certification is required for work conducted within a coastal county. This certifies the project is consistent with the CZM program. If a NWP 38 is required, the CZM is already certified. If a NWP 38 is not required, a CZM certification is needed from the State.



2.3 King County

2.3.1 Clearing and Grading Permit

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 for any amount of grading in a critical area or 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.

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; 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.

2.3.3 Shoreline Management Act

A Shoreline Management Act Permit will not be required from King County, because the project does not involves 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 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 is potentially needed if the treatment system generates dangerous wastes.

3.2.2 Clean Air Act

A Quality Notice of Construction (NOC) Permit may 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 will be required by Ecology if the treatment system emissions exceed certain thresholds of hazardous air pollutants specified by this permit.

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 is changed to a discharge to surface water, then an NPDES Industrial General Stormwater Permit will be required once the treatment system is operational. This permit is not exempt under MTCA.

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..

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.

