SITE HAZARD ASSESSMENT REPORT
FOR
LANDSBURG MINE
RAVENSDALE, WASHINGTON

Contract No.: C0089007

Document Control No. WD8025.1.1

Date: May 1991

Prepared By: ECOLOGY AND ENVIRONMENT, INC.

Submitted To:

WASHINGTON STATE DEPARTMENT OF ECOLOGY
Toxics Cleanup Program

TABLE OF CONTENTS

LIST OF FIGURES

Table of Contents (Cont.)

1. INTRODUCTION

Pursuant to Contract No. C0089007, Ecology and Environment, Inc. (E & E) has conducted a Site Hazard Assessment (SHA) of the Landsburg Mine site located near Ravensdale, Washington. The Washington State Department of Ecology (Ecology) SHA process, in general, is intended to evaluate actual or potential environmental or public health hazards at a particular site and to generate sufficient information for Ecology to determine, if deemed necessary, the hazard ranking of the site using the Washington Ranking Method (WARM). The SHA process does not include extensive or complete site characterization, contaminant fate determination, or quantitative risk assessment.

This document provides a description of the Landsburg Mine SHA, and presents the results of the assessment. Included are brief descriptions of the site background (Section 2), project objectives and scope of work (Section 3), sampling programs (Section 4), results (Section 5), discussion (Section 6), and references (Section 7). Photodocumentation is provided in Appendix A. Site hazard assessment Data Collection Summary Sheets (DCSS) are provided in Appendix B. Complete analytical results are provided in Appendix C. Appendix D provides an analytical data quality assurance review (with definition of data qualifiers). Appendix E includes the results of the geophysical survey. Project contact reports are provided in Appendix F.

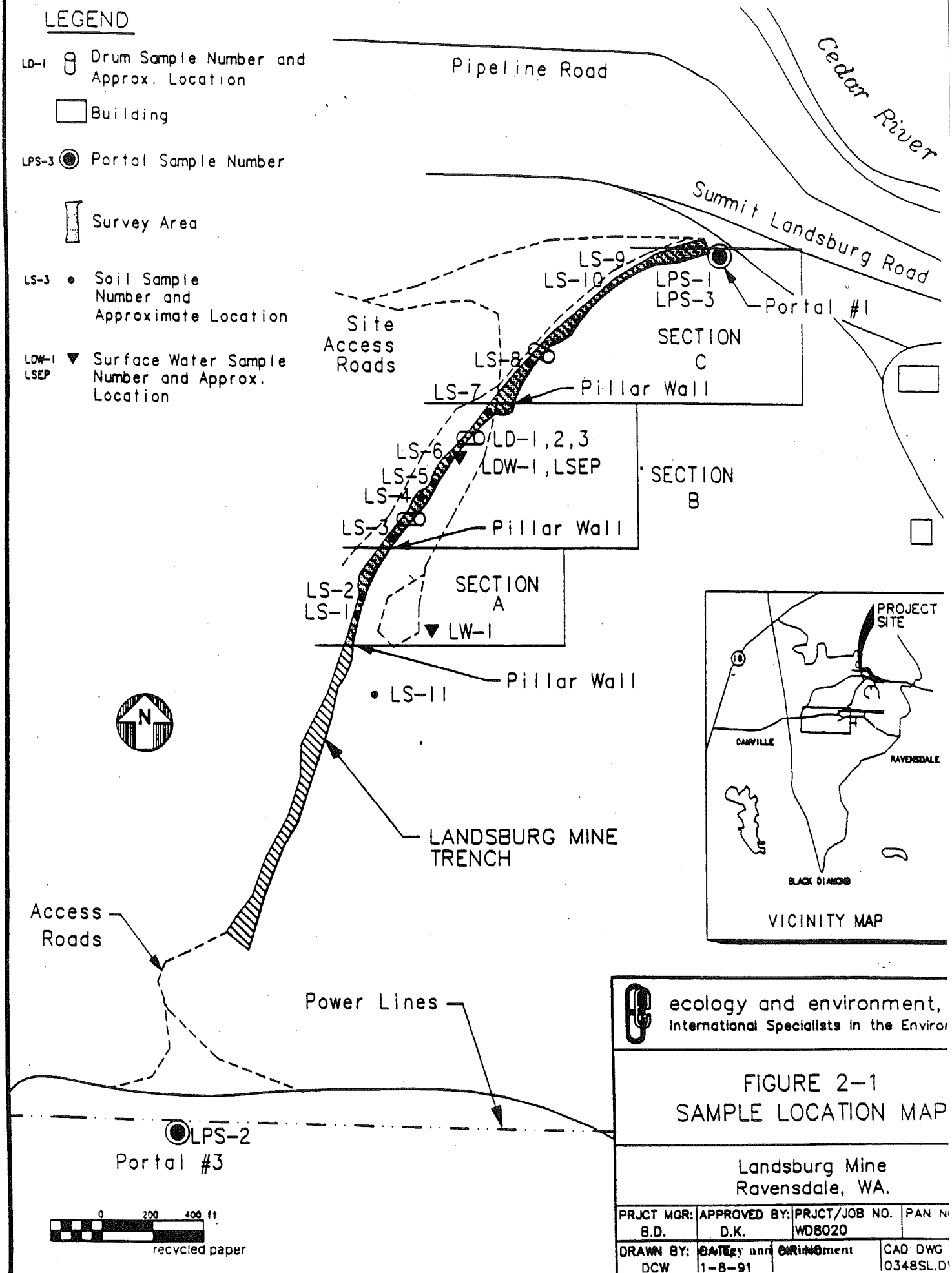
2. BACKGROUND

2.1 SITE LOCATION AND DESCRIPTION

Landsburg Mine extends directly south and east of S.E. Summit Landsburg Road and approximately 1-1/2 miles northwest of Ravensdale, Washington (Figure 2-1). The mine site occupies property owned by Palmer Coking Coal Company, Inc. and Plum Creek Timber Company, Inc. and is located within sections 24 and 25, Township 22 N., Range 6 E. (USGS 1973). The Landsburg Mine entrance is located near the intersection of State Route 516 and State Route 169 in the southwest quarter of section 25, Township 22 N., Range 7 E.

The Landsburg Mine site overlies a former underground coal mine and is topographically upgradient to the surrounding vicinity. The coal seam has a near vertical dip and is approximately 11 feet wide and 3/4-mile long. Mining occurred at depths of up to 750 feet, following the coal seam vertically. A series of contiguous trenches, with near vertical side walls, formed as the result of overburden subsidence following subsurface excavation of coal in the Rogers Seam. Each trench section is separated by a pillar wall (Appendix A, Photo No. 20). Dimensions of the trench vary, with the study area portion ranging from between 60 to 100 feet wide and between 20 to 60 feet in depth. Based on field observation, the variable depths appeared to result from disposal of waste material with added fill and/or natural sluffing from the trench wall.

The site includes the northern portion of the collapsed mine trench, where alleged dumping and disposal activities took place. The site boundary was determined through visual observations of the fill, statements made by Bill Kombol (Palmer Coking Coal Company), and access road termination. The portion of the trench studied is physically


LEGEND
LD-1 Drum Sample Number and Approx. Location
Building
LPS-3 Portal Sample Number
Survey Area
LS-3 Soil Sample Number and Approximate Location
LDW-1 LSEP Surface Water Sample Number and Approx. Location
Pipeline Road
Cedar River
Summit Landsburg Road
LS-9
LS-10
LPS-1
LPS-3
Portal #1
Site Access Roads
LS-8
SECTION C
LS-7
Pillar Wall
LS-6
LD-1,2,3
LDW-1,LSEP
LS-5
LS-4
SECTION B
LS-3
Pillar Wall
LS-2
LS-1
SECTION A
LW-1
Pillar Wall
LS-11
N
LANDSBURG MINE TRENCH
Access Roads
Power Lines
LPS-2
Portal #3
0 200 400 ft
recycled paper
PROJECT SITE
DANVILLE
RAVENSDALE
BLACK DIAMOND
VICINITY MAP
ecology and environment,
International Specialists in the Enviror
FIGURE 2-1
SAMPLE LOCATION MAP
Landsburg Mine
Ravensdale, WA.
PRJCT MGR: B.D.
APPROVED BY: D.K.
PRJCT/JOB NO. WD8020
PAN N
DRAWN BY: DCW
DATE: 1-8-91
CAD DWG 0348SL.D

divided from the southern portion by a pillar wall. Each section of the study area also is separated by a pillar wall (Figure 2-1).

The site is surrounded by an undeveloped area. A dirt road accesses the site and trails lie parallel to the east and west sides of the trench. The dirt access road begins near S.E. Summit-Landsburg Road and follows along the northern portion of the trench to the southern extent of the study area. A lockable gate secures at the dirt access road entrance.

The trench rim is approximately 240 feet above the Cedar River at an elevation of approximately 880 feet above mean sea level (AMSL). The southern portion of the trench was not studied and consists of large ponded areas and areas of trench wall sluffing (no evidence of dumping activity).

The site is located in the drainage basin of Rock Creek and Clark Springs which drain into the Cedar River. Surface runoff flowing into the site trench collects and generally flows southwest in each trench section, where it either infiltrates or evaporates. Significant amounts of water were observed to be flowing from the southern portal (Portal #3), during the field sampling event; smaller amounts of water were observed flowing from the northern portal (Portal #1). The portals reportedly allowed access to the mine and were plugged by mine operators after mining operations ceased.

Abandoned mine workings are potential pathways for vertical and horizontal migration of groundwater. It is unknown if the pools of water observed in the trench are hydrologically connected to groundwater flowing from the portals. The Cedar River Valley has been designated a sole-source aquifer area (EPA 1988b) under the authority of Section 1424(e) of the Safe Drinking Water Act (P.L. 93-523).

2.2 SITE OPERATIONS AND WASTE CHARACTERISTICS

The Landsburg Mine has a long history of use for disposal of industrial materials, construction materials, and land-clearing debris. According to Bill Kombol, materials disposed of at the site have been

deposited along the length of the site access road indicated in Figure 2-1. A summary of the waste-related history at the Landsburg Mine site is described below:

1969	-	Disposal of industrial wastes and land clearing debris in the trench. The specific nature of the industrial wastes placed at the site is unknown (Ecology 1990).
Summer of 1971	-	Fires occurred in the trench on June 16 and 28, July 27, and August 2 and 3 (Office of the Zoning and Subdivision Examiner 1974).
August 16, 1971	-	The King County Department of Building and Land Development placed a stop work order on dumping operations due to the recent fires (Ecology 1971).
August 28, 1972	-	The King County Council approved, on recommendations of the Zoning and Subdivision Examiner, an unclassified use permit for Palmer (proposed ordinance number 71-631). This permit allowed disposal of stumps, brush, natural vegetation, and earth cover materials (Ecology 1972).
1978	-	Seven 4,500-gallon tank loads of oily sludge were disposed before operations were halted in June 1978, by Ecology (Ecology 1990).
June 1978	-	An informant notified officials that double-unit tankers had been dumping corrosive materials in the trench for the past 6 to 8 years (Ecology 1990).
1983	-	The trench reportedly was being filled with demolition debris. Evidence of nonhazardous materials, including scrap lumber and construction debris, and old drums were discovered in the trench (EPA 1984).
1989	-	A former truck driver said he had left several hundred drums in the trench over a period of years and specifically had deposited 600 to 700 drums (Ecology 1990).

During site activities in February 1991, field personnel identified extensive fill areas covered by soils along much of the floor and sidewalls in the northern half of the trench. The soil is a silty sand with gravel. According to Bill Kombol, these fill areas resulted from past

disposal activities, which usually included covering the waste periodically with soil. Native soil generally was bulldozed over the trench edge to cover the waste material. Undulating surface conditions observed around the trench rim are indicative of bulldozer blade cuts. The thickness of introduced fill and naturally sluffed soils is variable.

In February 1991, field personnel observed approximately 50 exposed drums in three different areas within the trench. The inspectors noted drum deterioration, bullet holes, and liquid/solids within some of the accessible drums. Analytical results of sampled drums confirm the presence of metals, cyanide, volatile organics, semivolatile organics, and polychlorinated biphenyls (PCBs).

Two areas of ponded water were observed within the trench study area, both in the vicinity of exposed drums. Analytical results of ponded water collected adjacent to drums confirm the presence of metals, volatile organics, and semivolatile organics.

Soil samples collected in the trench indicate the presence of metals, cyanide, volatile organics, semivolatile organics, and PCBs. Soil and surface water samples collected outside of the trench area near the portals and beyond the trench rim did not contain analytes above concentrations of concern.

3. PROJECT DESCRIPTION

The purpose of the Landsburg Mine SHA is to provide a preliminary assessment of hazardous wastes at the site and to gather sufficient data for application of the WARM model by Ecology. To meet these objectives, E & E has completed the SHA Data Collection Summary Sheets (DCSS) provided by Ecology (Appendix B). Information needed to complete the DCSS was obtained from a site visit, the WARM Scoring Manual, and data collected from regulatory agencies, as referenced in Appendix B. Additional site characterization data were obtained from a field sampling event conducted between February 12 through February 19, 1991.

To accomplish the field sampling objectives as stated in the site work plan (E & E 1991), E & E performed the four primary tasks listed below:

- o A site survey incorporating visual observations and magnetometer measurements within the trench.
- o Surface and subsurface soil sampling from the site with analysis for metals, volatile organic compounds, semi-volatile compounds, pesticides/PCBs, and cyanide.
- o Surface water sampling from two ponds with analysis for metals, volatile organic compounds, semivolatile compounds, pesticides/PCBs, cyanide, and hardness.
- o Liquid sampling from exposed drums with analysis for metals, volatile organic compounds, semivolatile compounds, pesticides/PCBs, and cyanide.

4. SAMPLING PROGRAM AND INVESTIGATION ACTIVITIES

The field program for the Landsburg Mine SHA was comprised of two phases. Phase I field work included visual and magnetometer surveys, collection of soil and water samples adjacent to exposed drums (Figure 2-1, Section B), and collection of soil samples near the portals located at each end of the trench. Phase II field work included collection of drum samples and additional subsurface soil samples at the base of fill areas, as directed by field observations and magnetometer survey results.

A summary of the sampling information, including a description of the type of sample and number of samples collected during the Landsburg Mine SHA is provided in Table 4-1. Quality control (QC) sample analytical requirements are provided in Table 4-2. Refer to Figure 2-1 for locations of field activities described below.

4.1 SITE SURVEY

The site survey included establishing trench access/egress routes and making visual observations along the entire trench, conducting an ambient air survey with an organic vapor analyzer (flame ionization detector) and photo vac microtip (photoionization detector), and performance of a geophysical survey using a proton precession magnetometer.

Magnetometer readings were utilized at this site to provide an improved understanding of subsurface conditions and to guide selection of subsequent subsurface soil sample locations. Although the majority of disposed material was reported to be wood, brush, and tree stumps, magnetometry was used to identify potential locations within the study area indicative of buried ferrous metal debris.

Table 4-1

FIELD SAMPLE ANALYTICAL SUMMARY
LANDSBURG MINE
RAVENSDALE, WASHINGTON
February 1991

Task	Sample Matrix	Sample Type	Number of Samples	Sample Identification	Analytical Requirements	Method (1)
Drum Sampling	Liquid	Grab	3	LD-1,2,3	o Metals	o 3005/6010 and 7000
					o Volatile Organic Compounds	o 5030/8240
					o Semivolatile Compounds	o 3510/8270
					o Pesticides/PCBs	o 3510/8080
					o Cyanide	o 335.3 (2)
Surface Water Sampling	Water	Grab	2	LDW-1	o Metals	o 3005/6010 and 7000
				LSEP	o Volatile Organic Compounds	o 524.2 (3)
					o Semivolatile Compounds	o 3510/8270
					o Pesticides/PCBs	o 3510/8080
					o Cyanide	o 335.3 (2)
					o Hardness	o 130.2 (2)
Surface Soil Sampling	Soil	Composite	3	LPS-1,2,3	o Metals	o 3005/6010 and 7000
					o Volatile Organic Compounds	o 5030/8240
					o Semivolatile Compounds	o 3510/8270
					o Pesticides/PCBs	o 3510/8080
					o Cyanide	o 9010
Subsurface Soil Sampling	Soil	Composite	11	LS-1 to LS-11	o Metals	o 3005/6010 and 7000
					o Volatile Organic Compounds	o 5030/8240
					o Semivolatile Compounds	o 3510/8270
					o Pesticides/PCBs	o 3510/8080
					o Cyanide	o 9010

(1) Based on EPA SW-846, Test Methods for Evaluating Solid Waste (EPA 1986), unless otherwise noted.
(2) EPA 600/4-79-020 (EPA 1979).
(3) EPA 600/4-88/039 (EPA 1988).

Table 4-2

FIELD QUALITY CONTROL SAMPLES
LANDSBURG MINE
RAVENSDALE, WASHINGTON
February 1991

Task	Sample Matrix	Sample Type	Number of Samples	Analytical Requirements	Method (1)
Background Sampling	Soil	Subsurface Composite	2	o Metals o Volatile Organic Compounds o Semivolatile Compounds o Pesticides/PCBs o Cyanide	o 3005/6010 and 7000 o 5030/8240 o 3510/8270 o 3510/8080 o 9010
Background Sampling	Water	Grab	1	o Metals o Volatile Organic Compounds o Semivolatile Compounds o Pesticides/PCBs o Cyanide	o 3005/6010 and 7000 o 524.2 (3) o 3510/8270 o 3510/8080 o 335.3 (2)
Trip Blank	Water	Grab	1	o Metals o Volatile Organic Compounds o Semivolatile Compounds o Pesticides/PCBs o Cyanide	o 3005/6010 and 7000 o 524.2 (3) o 3510/8270 o 3510/8080 o 335.3 (2)

(1) Based on EPA SW-846, Test Methods for Evaluating Solid Waste (EPA 1986), unless otherwise noted.
(2) EPA 600/4-79-020 (EPA 1979).
(3) EPA 600/4-88/039 (EPA 1988).

The magnetic survey was conducted using an EG & G Geometrics G-856 Proton Precession Magnetometer with stations at 50-foot intervals along a single survey line extending along the approximate center of the trench. This instrument measures the earth's total magnetic field at discreet locations. Subtle variations in field strength may be caused by the natural distribution of iron oxides within the soil and rock. More significant changes in the magnetic field intensity will be caused by the presence of buried objects composed of iron, steel, or other ferrous alloys. The response of the magnetometer is a function of an object's depth and mass (Breiner 1973).

At each measurement station three readings were recorded. These readings were averaged to provide a single measurement per station. Each transect was traveled twice, once in each direction. The Section A transect was 300 feet in length, the Section B transect was 800 feet in length, and the Section C transect 500 feet in length. Measurements were obtained at a reference station both before and after transect readings were made. Steep trench walls, extensive vegetation, ponded water, and mounded fill within the trench limited access to all areas.

4.2 SAMPLING PROGRAM

Sampling performed in the Landsburg Mine trench study area included collection of drum contents, surface water, surface soils, and subsurface soils. Descriptions of these activities are provided below.

4.2.1 Drum Samples

Three drum samples (LD-1 through LD-3) were collected from three different drums at the north Section B drum location shown in Figure 2-1. Sample LD-1 was collected from a closed bung drum, sample LD-2 was collected from an open top drum that was approximately one-half full, and sample LD-3 was collected through a pre-existing hole on a third drum. No drums were observed to be labeled. There were no indications of drum contents or drum origins observed during field activities. The drums appeared to have been pushed over the trench rim and piled on top of one another. All drum samples were collected using a glass thieving

tube and transferred directly to sample bottles. Sampling was conducted in Level B personal protective clothing and equipment.

4.2.2 Surface Water Samples

Two surface water samples (LDW-1 and LSEP) were collected from two different ponds located adjacent to exposed drums in the trench. One sample was collected from a 50-foot diameter pond located adjacent to approximately 45 exposed drums in Section B. A number of the drums were submerged in this pond. The second surface water sample (LSEP) was collected from ponded water located adjacent to approximately 6 drums in Section C, some of them partially buried and partially full of a dry, powdery substance (these drums were not sampled). A background sample was collected from a ponded area above the trench and to the southeast in Section A. Sample jars were submerged until required volumes were attained.

4.2.3 Surface Soil Samples

Two surface soil samples (LPS-1 and LPS-2) were collected from the two abandoned portals located at the ends of the trench area (Figure 2-1). One background sample (LPS-3) was collected from an undisturbed area in the vicinity of the northern portal. Two samples also were collected from the drum area of Section B (LDS-1 and LDS-2). Samples were composited over 2- by 2-foot areas and homogenized in stainless steel bowls. Volatile samples were not homogenized, but were transferred directly to sample jars.

4.2.4 Subsurface Soil Samples

Eleven subsurface soil samples (LS-1 through LS-11) were collected at locations shown on Figure 2-1. Samples were collected at locations indicated during the site surveys as potential fill areas. Two samples

were collected from Section A, five samples were collected from Section B, and three samples were collected from Section C. One soil sample (LS-11) was collected from an undisturbed location above the trench rim beyond the end of the access road to represent a background sample. All samples were collected using a hand-auger and homogenized in stainless steel bowls. Volatile samples were not homogenized, but were transferred directly to sample jars.

5. INVESTIGATION RESULTS

5.1 SITE SURVEY

The entire trench was visually inspected, with dumping/fill activity observed throughout the northern area, defined as the site (Figure 2-1). Areas of natural trench wall sluffing were noticed along the entire trench length. It appears that dumping continued along the trench as far as the dirt access road extends along the rim. The three trench sections identified in the study area are physically separated by pillar walls, one of which allows access between opposite trench rims.

Table 5-1 contains a surficial description of the trench coinciding with magnetometer station locations. The observed magnetic field along the trench exhibited broad anomalies, dominated by a few high-intensity narrow peaks attributed to exposed or shallow buried objects. The natural ambient field was measured at 55,000 gammas. The average measured values ranged from 51,976 to 57,932 gammas, with field intensities ranging from -3,024 to +2,932 gammas. Figure 5-1 illustrates the magnetometer survey results across the Landsburg Mine study area. Raw data for the magnetometer survey is included as Appendix E of this report. Figure 5-1 also indicates the relative depth below the trench rim observed at each measurement station. At five locations, the trench bottom with no fill material was identified (indicated in Figure 5-1).

The reconnaissance survey indicates that Section A of the study area is magnetically consistent with the background control station; however, Station 20 indicates a magnetic low anomaly that may be attributed to a refrigerator observed at the surface.

The magnetic low across Section B between stations 0 and 500 does not appear to be indicative of buried ferrous metal, such as drums; although, this area was observed to be covered with fill, in some areas sloping to the top of the rim. Two partially buried drums were identified near stations 0 and 50. The consistent low readings along

Table 5-1

**AMBIENT AIR MONITORING AND SURFICIAL DESCRIPTIONS
LANDSBURG MINE TRENCH
RAVENSDALE, WASHINGTON
February 1991**

Section/Station (ft.)	OVA/Micro-Tip Measurements (ppm)	Description
A / 400-350	0	Natural trench bottom. Trench width approx. 50′; eroded sandstone blocks scattered on trench bottom; 60′ below trench rim.
300-200	0	Trench bottom constricts to approx. 25′; wooded nob above trench rim.
150	0	At base of vertically dipping strata and horizontal weathering features; 45′ below trench rim.
125	0	Fill on east side of trench; no visible waste observed, except for wood debris and natural sluff material on west side of trench; trench width approx. 50′.
50	0	One small mound consisting of wood debris.
20	0	Natural sluff mixed with some tree stumps and a refrigerator.
00	0	Water in bottom of trench; seep coming out of sandstone; overgrown blackberry bushes, pillar wall to the north; base of trench has a depth of approx. 30′; scattered sandstone chips along east of wall.
B / 00	0	Drum visible on surface; 20′ below trench rim.
50	0	Partially buried drum.

Table 5-1 (Cont.)

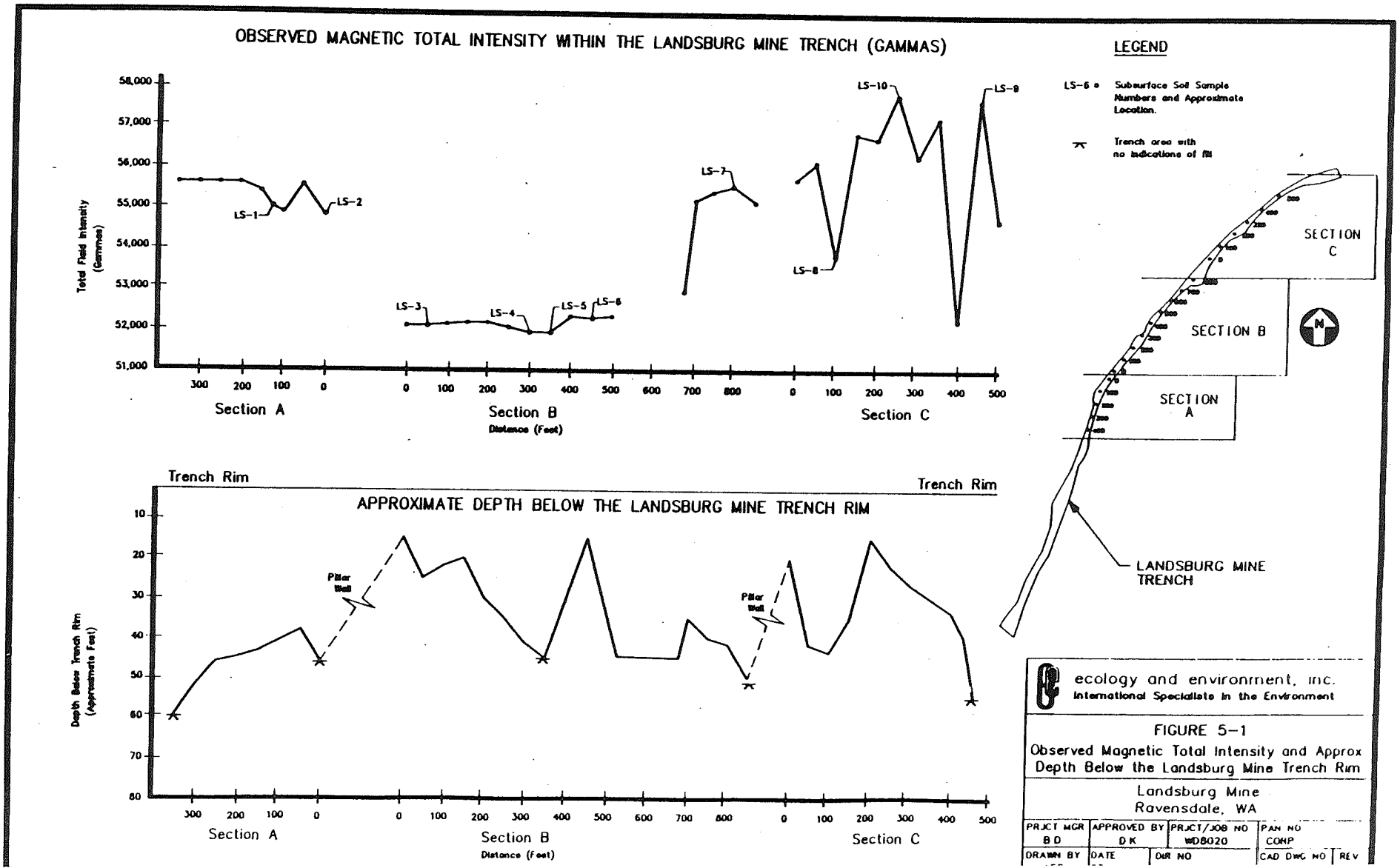
AMBIENT AIR MONITORING AND SURFICIAL DESCRIPTIONS
LANDSBURG MINE TRENCH
RAVENSDALE, WASHINGTON
February 1991

Section/Station (ft.)	OVA/Micro-Tip Measurements (ppm)	Description
B / 100	0	Large slabs of concrete on surface; PVC stick-ups spaced in 10'-intervals; large fill area.
150	0	At PVC stick-up (2" tubing) #14; 20' below trench rim.
200	0	At PVC stick-up #17; fill area; trench width approx. 30'.
250	0	Mound area; east side of trench is covered with fill, sloping up to rim; west side of trench consists of sandstone rubble; approx. 30' below trench rim.
300	0	Extensive fill area; fill slopes up to rim at 45°.
350	0	At PVC stick-up #27; some wood debris; 40-45' below trench rim.
400	0	Surface rises to 30' below trench rim.
450	0	At top of extensive fill area along east wall; 15' below trench rim.
450 500	0.2 3.2	Fill area slopes downward toward the edge of a large pond adjacent to exposed drums, approx. 100' long and 50-60' in diameter; 50' below trench rim.
675 700	10 2.8	Northern edge of drum area; mound area stretching from east to west wall, possibly remnant of barrier pillar; 30' below trench rim.

Table 5-1 (Cont.)

AMBIENT AIR MONITORING AND SURFICIAL DESCRIPTIONS
LANDSBURG MINE TRENCH
RAVENSDALE, WASHINGTON
February 1991

Section/Station (ft.)	OVA/Micro-Tip Measurements (ppm)	Description
B / 750	0	Bottom of mound; area has scattered tires and plastic on surface.
800	0	Top of a mound approx. 5' high stretching from east wall.
850	5-19	At base of small mound; trench is approx. 50' below trench rim and 30' wide; sandstone blocks scatter the area; barrier pillar 20' high.
C / 00	0	Concrete blocks and small fallen trees in area; 10' below trench rim.
50	0	Approx. 5 drums open at surface; one drum contains a yellow powdery material; north end of small pond area with drums in pond; 35' below trench rim.
100	0	
150	0	Impassable fill area mixed with evergreen, blackberry bushes; 15' below trench rim.
200-250	0	Top of large fill area; 15' below trench rim.
300	0	Surface slopes down to north at approx. 10%.
400	0	Surface continues to slope downward.
450	0	Two drums visible on top of east rim.
500	0	Bottom of trench approx. 55' bgs.


OBSERVED MAGNETIC TOTAL INTENSITY WITHIN THE LANDSBURG MINE TRENCH (GAMMAS)
Total Field Intensity (Gammas)
58,000
57,000
56,000
55,000
54,000
53,000
52,000
51,000
LS-1
LS-2
LS-3
LS-4
LS-5
LS-6
LS-7
LS-8
LS-9
LS-10
300 200 100 0
Section A
0 100 200 300 400 500 600 700 800
Section B
Distance (Feet)
0 100 200 300 400 500
Section C
LEGEND
LS-6 • Subsurface Soil Sample Numbers and Approximate Location.
Trench area with no indications of fill
SECTION C
SECTION B
SECTION A
N
LANDSBURG MINE TRENCH
Trench Rim
Trench Rim
APPROXIMATE DEPTH BELOW THE LANDSBURG MINE TRENCH RIM
Depth Below Trench Rim (Approximate Feet)
10
20
30
40
50
60
70
80
Pillar Wall
Pillar Wall
300 200 100 0
Section A
0 100 200 300 400 500 600 700 800
Section B
Distance (Feet)
0 100 200 300 400 500
Section C
ecology and environment, inc.
International Specialists in the Environment
FIGURE 5-1
Observed Magnetic Total Intensity and Approx Depth Below the Landsburg Mine Trench Rim
Landsburg Mine
Ravensdale, WA
PRJCT MGR BD
APPROVED BY DK
PRJCT/JOB NO WD8020
PAN NO COMP
DRAWN BY
DATE
DWG NO
CAD DWG NO
REV

the 500 foot transect may reflect subsurface structural affects resulting from the mine or trench formation.

The magnetometer data indicates that several deposits of ferrous material probably are distributed along Section C of the trench. The trend of positive and negative fluctuations in the magnetic field is consistent with visual observations of apparent dumping in the area. Between stations 50 and 150, approximately five drums containing a yellow powdery material were observed. A large fill area consisting of soil and shrubs was observed between station 150 and 250.

5.2 SAMPLE ANALYSIS

A summary of chemicals identified in site samples, and therefore of potential concern, is provided in Table 5-2. Laboratory analytical results are provided in Appendix C, with the quality assurance review contained in Appendix D.

Summary data tables provided for soil and surface water in this section include MTCA cleanup standards for comparison purposes. Method A values are provided where available. Method B calculations were performed when enough background information existed. Method B is not necessarily the standard which would be used in the final cleanup at the site.

5.2.1 Drum Samples

Cadmium, chromium, copper, lead, mercury, zinc, cyanide, acetone, 2-butanone (MEK), 4-methyl-2-pentanone (MIBK), toluene, ethylbenzene, styrene, total xylenes, dibutyl phthalate, phenol, and Aroclor 1242 (PCB) were detected in samples collected from drums exposed on the east side of the trench in Section B (Table 5-3).

No cleanup standards are provided for comparison since drum samples do not reflect environmental media. Each drum appears to represent a different waste profile, based on the mix and concentration ranges identified. Note that volatile organics detection limits are elevated for sample LD-3, due to the high concentration of ethylbenzene and total xylenes encountered.

Table 5-2

SUMMARY OF CHEMICALS OF POTENTIAL CONCERN
LANDSBURG MINE
RAVENSDALE, WASHINGTON
February 1991

Analytes	Concentration Ranges		
	Soils (mg/kg)	Surface Water (µg/L)	Drums (mg/kg)
Total Metals			
Antimony	14	ND	ND
Arsenic	4-19	ND	ND
Cadmium	22	ND	1.4
Chromium	14-912	6-46	2
Copper	10-702	ND	6-69
Lead	56-3,200	10-56	3.8
Mercury	3.7	0.2	0.34
Nickel	12-46	ND	ND
Selenium	2	ND	ND
Silver	4	ND	ND
Zinc	31-2,130	160-370	59-628
Cyanide	9.2	ND	0.6
VOCs			
1,1,1-Trichloroethane	0.011	110-240	ND
1,1-Dichloroethene	ND	0.4	ND
1,2-Dichlorobenzene	16	0.3	ND
1,2-Dichloroethane	ND	7.4	ND
1,2,4-Trimethylbenzene	ND	170	ND
1,3,5-Trimethlybenzene	ND	60	ND
1,4-Dichlorobenzene	0.0096	ND	ND
4-Isopropyltoluene	ND	6.0	ND
4-Methyl-2-pentanone	ND	NA	4,960
Acetone	0.118-0.251	NA	2,480
Benzene	ND	4.2-10	ND
Chloroethane	ND	2.8	ND
Chlorobenzene	ND	0.6	ND
cis-1,2-Dichloroethene	ND	12-680	ND
Ethylbenzene	0.0085	10-570	683-23,100
Isopropylbenzene	ND	8.6	ND
Naphthalene	ND	26	ND
n-Propylbenzene	ND	10	ND

ND - Not detected
NA - Not available

Table 5-2 (Cont.)

SUMMARY OF CHEMICALS OF POTENTIAL CONCERN
LANDSBURG MINE
RAVENSDALE, WASHINGTON
February 1991

Analytes	Concentration Ranges		
	Soils (mg/kg)	Surface Water (µg/L)	Drums (mg/kg)
VOC's (cont.)			
Methylene Chloride	ND	41-42,000	ND
Styrene	0.0083	32	1.0
sec-Butylbenzene	ND	1.4	ND
Tetrachloroethene	0.056	1.0	ND
Toluene	ND	130-4,400	0.83-3,780
Total Xylenes	0.045	70-2,900	1.0-73,600
Trichloroethene	0.137	18-3,700	71
Trichlorofluoroethane	ND	0.8-460	ND
Vinyl Chloride	ND	0.3	ND
2-Butanone	ND	ND	16,000
Semivolatile Organic Compounds			
2-Chlorophenol	ND	342	ND
2-Methylphenol	ND	37	ND
4-Methylphenol	ND	60	ND
2,4-dimethylphenol	ND	43	ND
Benzyl Alcohol	ND	106	ND
Benzoic Acid	ND	296	ND
Bis(2-ethylhexyl)Phthalate	0.6-178	26	ND
Bis(2-chloroethyl) Ether	ND	24	ND
Butylbenzyl Phthalate	0.4	ND	ND
Dibutyl Phthalate	7	ND	130
Dimethyl Phthalate	23	34	ND
Isophorone	2.3	56-602	ND
Phenol	ND	262	40
Organochlorine Pesticides and PCBs			
Aroclor 1242	7.9	ND	21-7,960
Aroclor 1254	0.3-27.2	ND	ND

ND - Not detected
NA - Not available

Table 5-3

SUMMARY OF CONSTITUENTS FROM DRUM SAMPLES
LANDSBURG MINE
RAVENSDALE, WASHINGTON
February 1991
(mg/kg)

Analytes	Sample LD-1	LD-2	LD-3
Metals			
Cadmium	1.4	0.5 U	0.5 UJ
Chromium	1.0 U	2.0	1.0 U
Copper	69.0	6.0	1.0 U
Lead	3.8	3.8	0.5 U
Mercury	0.02 U	0.02 U	0.34
Zinc	628.0	59.0	1.0 UJ
Cyanide	0.5 U	0.6	0.5 U
Volatile Organic Compounds			
2-Butanone	5.0 U	16,000	500 U
4-Methyl-2-pentanone	5.0 U	4,960	500 U
Acetone	10.0 U	2,480	1,000 U
Ethylbenzene	0.5 U	683	23,100
Styrene	1.0	50 U	50 U
Toluene	0.83	3,780	204
Total Xylenes	1.0	4,380	73,600
Trichloroethene	0.5 U	71	50 U
Semivolatile Organics			
Dibutyl Phthalate	300 U	130	300 U
Phenol	300 U	40	300 U
Pesticides/PCBs			
Aroclor 1242	1 U	7,960	21

Note: Detailed descriptions of data qualifiers are provided in Appendix D.

The origin of the drums is unknown and no labels were identified during field activities. Contents of the three drums sampled indicate the potential for classification as Extremely Hazardous waste (EHW) or Dangerous Waste (DW) according to WAC 173-303-081 (discarded chemical products) and WAC 173-303-9903 for the following compounds:

Constituent	Dangerous Waste No.	Ecology Hazard Designation
Cyanide	P030	EHW
Phenol	U188	EHW
Toluene	U220	EHW
Xylene	U239	EHW
Acetone	U002	DW
Dibutylphthalate	U069	DW
2-Butanone	U159	DW
4-Methyl-2-pentanone	U161	DW

In addition to these listed discarded chemical products, drum contents may exhibit dangerous waste characteristics as defined in WAC 173-303-090. Drums containing cadmium, chromium, lead, mercury, 2-butanone, and trichloroethene may exceed toxicity characteristic limits for EHW or DW. Other compounds are potentially ignitable, depending on concentration and/or mixtures present. Due caution should be observed during future drum removal activities.

5.2.2 Surface Water Samples

Surface water ponds associated with drums were sampled in Sections B and C of the trench study area. Chromium, lead, mercury, and zinc were detected in pond water samples (Table 5-4). Cleanup standards were exceeded for lead in both Section B and C samples, for mercury in Section B, and for zinc in Section C. No metals were identified above detection limits in the background sample collected away from the trench. All cleanup levels were obtained from the Clean Water Act §304(a) list, reflecting concentrations with chronic effects (EPA 1991). Criteria for mercury and cyanide listed in WAC 173-201-047 correlate to §304(a) acute effects values. Use of these cleanup levels would effectively make the criteria less strict.

Table 5-4

SUMMARY OF TOTAL METALS, HARDNESS, AND CYANIDE ANALYTICAL RESULTS
SURFACE WATER SAMPLES
LANDSBURG MINE
RAVENSDALE, WASHINGTON
February 1991
(mg/L)

Analytes	Sample			Ecology Cleanup Standards
	LDW-1 (Section B)	LSEP (Section C)	LW-1 (Background)	
Chromium	0.046	0.006	0.005 U	0.117
Lead	0.056	0.010	0.001 U	0.0013
Mercury	0.0002	0.0002 U	0.0002 U	0.000012
Zinc	0.037	0.16	0.01 U	0.058
Cyanide	0.01 U	0.01 U	0.01 U	0.0052
Hardness	15.5	24.6	11.3	NA

NA - Not Applicable.

U - The material was analyzed for, but was not detected. The associated numerical value is a contractural quantitation limit, adjusted for sample weight/volume, extraction volume, percent solids, and sample dilution.

Method A Cleanup Standards based on chronic values defined in WAC 173-201-047 and Clean Water Act §304(a) database (EPA 1991) (chromium III values used).

A variety of volatile organic compounds (VOCs) were identified in surface water samples collected from both ponded areas (Table 5-5). In Section B, only 1,1-dichloroethane exceeded the Method B cleanup criteria and in Section C, only methylene chloride exceeded the criteria. However, a wide variety of VOCs were identified in both trench pond samples. No Method A cleanup standards are available for the organic compounds found in surface waters, so Method B calculations were completed based on the assumptions outlined earlier. No VOCs were identified in the background sample.

Table 5-6 provides a list of semivolatile compounds identified in trench pond samples. The Section B pond exceeded cleanup standards for bis(2-ethylhexyl)phthalate and isophorone. The Section C pond exceeded the cleanup standard for bis(2-chloroethyl)ether. All compounds identified were below the part per million range. No semivolatile organic compounds were identified in the background sample.

5.2.3 Surface Soil Samples

Soil sample results (both surface and subsurface) are presented in Tables 5-7, 5-8, and 5-9. Only those analytes detected are included. Acetone was found in surficial soils, both near the drums in Section B and near the southern portal. Lead was found at elevated levels near the same drums and at the northern portal. Aroclor 1254 was identified in both samples collected near the drums in Section B at 20.6 and 0.3 mg/kg. No contaminants exceeded cleanup standards, except PCB in sample LDS-1 (cleanup standard of 1.0 mg/kg).

5.2.4 Subsurface Soil Samples

Sample LS-8 was the only sample to exhibit concentrations exceeding cleanup standards collected from the subsurface. Standards were exceeded for cadmium, chromium, lead, and mercury, as provided by the Method A list (WAC 173-340-740). Note also that the arsenic standard was closely approached at this location. Sample LS-8 was collected near the exposed drum area identified in Section C of the trench.

Acetone was detected in sample LS-11 (background) at a concentration approximately twice the detection limit. At 118 µg/kg, the

Table 5-5

SUMMARY OF VOLATILE ORGANIC COMPOUNDS ANALYTICAL RESULTS
SURFACE WATER SAMPLES
LANDSBURG MINE
RAVENSDALE, WASHINGTON
February 1991
(µg/L)

Analytes	Sample		Ecology Cleanup Standard
	LDW-1 (Section B)	LSEP (Section C)	
4-Isopropyltoluene	6.0	10 U	NA
1,1-Dichloroethene	0.4	10 U	1.9
1,1-Dichloroethane	60.0	20	1.9
1,2-Dichlorobenzene	0.3	10 U	419
1,2-Dichloroethane	7.4	10 U	59.4
1,1,1-Trichloroethane	110	240	417
1,2,4-Trimethylbenzene	170	10 U	NA
1,3,5-Trimethylbenzene	60.0	10 U	NA
Benzene	4.2	10	43
Chlorobenzene	0.6	10 U	5,030
Chloroethane	2.8	10 U	NA
cis-1,2-Dichloroethene	12.0	680	NA
Ethylbenzene	570	10	6,910
Isopropylbenzene	8.6	10 U	NA
Methylene Chloride	41.0	42,000	960
n-Propylbenzene	10.0	10 U	NA
Naphthalene	26.0	20 U	987
sec-Butylbenzene	1.4	10 U	NA
Styrene	32.0	10 U	NA
Tetrachloroethene	1.0	10 U	NA
Trichlorethene	18.0	3,700	NA
Trichlorofluoromethane	0.8	460	NA
Toluene	4,400	130	48,500
Total Xylenes	2,900	70	NA
Vinyl Chloride	0.3	10 U	2.9

U - The material was analyzed for, but was not detected. The associated numerical value is a contractural quantitation limit, adjusted for sample weight/volume, extraction volume, percent solids, and sample dilution.
NA - Information not available for Method B calculation.

Method B Compliance Cleanup Level calculated for each compound except where noted.

Table 5-6

SUMMARY OF SEMIVOLATILE ORGANIC COMPOUNDS ANALYTICAL RESULTS
SURFACE WATER SAMPLES
LANDSBURG MINE
RAVENSDALE, WASHINGTON
February, 1991
(µg/L)

Analytes	Sample		Ecology Cleanup Standards
	LDW-1 (Section B)	LSEP (Section C)	
2-Chlorophenol	342	5 U	NA
2-Methylphenol	37	5 U	NA
4-Methylphenol	60	5 U	NA
2,4-Dimethylphenol	43	5 U	55,300
Benzoic Acid	296	50 U	NA
Benzyl Alcohol	106	5 U	NA
bis(2-Chloroethyl) Ether	25 U	24	0.9
bis(2-Ethylhexyl) Phthalate	26	5 U	3.6
Dimethyl Phthalate	34	5 U	72,000
Isophorone	602	56 UJ	362
Naphthalene	26	5 U	987
Phenol	262	5 U	1,110,000

U - The material was analyzed for, but was not detected. The associated numerical value is a contractural quantitation limit, adjusted for sample weight/volume, extraction volume, percent solids, and sample dilution.
NA - Information not available for Method B calculation.

Method B Compliance Cleanup Level calculated for each compound except where noted.

Table 5-7

SUMMARY OF TOTAL METALS AND CYANIDE ANALYTICAL RESULTS
SOIL SAMPLES
LANDSBURG MINE
RAVENSDALE, WASHINGTON
February 1991
(mg/kg)

Analytes	Drum Area Surface Soil			Subsurface Soil										Portal Area Surface Soil			Ecology Cleanup Standards	
	LDS-1	LDS-2	LS1	LS2	LS3	LS4	LS5	LS6	LS7	LS8	LS9	LS10	LS11	LPS1	LPS2	LPS3		
Antimony	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	14	10U	10 U	R	10 U	10 U	10 U	32	
Arsenic	9	5	6	7	6	12	13	10	6	19	6	5	4	5	5	8	20	(A)
Cadmium	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	22	1	1 U	1 U	1 U	1 U	1 U	2	(A)
Chromium	61	28	21	21	14	22	20	19	25	912	23	28	28	30	23	58	100	(A)
Copper	32	37	12	18	10	18	36	15	16	702	30	20	18	29	25	25	NA	
Lead	56	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	3,200	20 U	20 U	20 U	245	20 U	20 U	250	(A)
Mercury	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	3.7	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	1	(A)
Nickel	41	36	13	18	12	21	26	19	25	30	43	20	20	27	24	46	1,600	
Selenium	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2	1 U	1	1 U	1 U	1 U	1 U	240	
Silver	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	4	2 U	2 U	2 UJ	2 U	2 U	2 U	NA	
Zinc	66	91	39	35	34	50	60	40	47	2,130	79	55	31	85	59	81	16,000	
Cyanide	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	9.2	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	1,600	

Note: Detailed description of data qualifiers are provided in Appendix D.

Method B Compliance Cleanup Level calculated except where noted.

(A) Method A Compliance Cleanup Level for Residential Soils

NA - Information not available for Method B calculation.

Table 5-8

SUMMARY OF VOLATILE ORGANIC COMPOUNDS ANALYTICAL RESULTS
SOIL SAMPLES
LANDSBURG MINE
RAVENSDALE, WASHINGTON
February1991
(µg/kg)

Analytes	Drum Area Surface Soil		Subsurface Soil											Portal Area Surface Soil			Ecology Cleanup Standards
	LDS-1	LDS-2	LS1	LS2	LS3	LS4	LS5	LS6	LS7	LS8	LS9	LS10	LS11	LPS1	LPS2	LPS3	
1,2-Dichlorobenzene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	16 J	5 U	5 U	5 U	5 U	5 U	5 U	720,000
1,4-Dichlorobenzene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	9.6J	5 U	5 U	5 U	5 U	5 U	5 U	41,700
1,1,1-Trichloroethane	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	11 J	5 U	5 U	5 U	5 U	5 U	5 U	20,000 (A)
Acetone	50 U	251	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 UJ	50 U	50 U	118	50 U	149	50 U	8,000,000
Ethylbenzene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	8.5J	5 U	5 U	5 U	5 U	5 U	5 U	20,000 (A)
Styrene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	8.3J	5 U	5 U	5 U	5 U	5 U	5 U	33,300
Tetrachloroethene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	56 J	5 U	5 U	5 U	5 U	5 U	5 U	500 (A)
Total Xylenes	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	45 J	5 U	5 U	5 U	5 U	5 U	5 U	20,000 (A)
Trichloroethene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	137 J	5 U	5 U	5 U	5 U	5 U	5 U	500 (A)

Note: Detailed description of data qualifiers are provided in Appendix D.

Method B Compliance Cleanup Level calculated except where noted.

(A) Method A Compliance Cleanup Level for Residential Soils.

NA - Information not available for Method B calculation.

Table 5-9

SUMMARY OF SEMIVOLATILE ORGANIC COMPOUNDS ANALYTICAL RESULTS
SOIL SAMPLES
LANDSBURG MINE
RAVENSDALE, WASHINGTON
February 1991
(µg/kg)

Analytes	Drum Area Surface Soil			Subsurface Soil										Portal Area Surface Soil			Ecology Cleanup Standards
	LDS-1	LDS-2	LS1	LS2	LS3	LS4	LS5	LS6	LS7	LS8	LS9	LS10	LS11	LPS1	LPS2	LPS3	
Isophorone	2.3	0.3 U	0.3 U	0.3 U	0.4 U	0.4 U	0.3 U	0.4 U	0.3 U	5.0 U	0.3 U	0.4 U	0.4 U	0.3 U	0.4 U	0.4 U	243,900
Dimethyl Phthalate	0.4 U	0.3 U	0.3 U	0.3 U	0.4 U	0.4 U	0.3 U	0.4 U	0.3 U	23	0.3 U	0.4 U	0.4 U	0.3 U	0.4 U	0.4 U	80,000,000
Butylbenzyl Phthalate	0.4 U	0.3	0.3 U	0.3 U	0.4 U	0.4 U	0.3 U	0.4 U	0.3 U	10	0.3 U	0.4 U	0.4 U	0.3 U	0.4 U	0.4 U	NA
Bis(2-ethylhexyl) Phthalate	0.6	1.3	0.3 U	0.3 U	0.4 U	0.4 U	0.3 U	0.4 U	0.3 U	178	0.3 U	0.4 U	0.4 U	0.9 U	0.4 U	0.4 U	71,400
Dibutyl Phthalate	0.4 U	0.3 U	0.3 U	0.3 U	0.4 U	0.4 U	0.3 U	0.4 U	0.3 U	7.0	0.3 U	0.4 U	0.4 U	0.3 U	0.4 U	0.4 U	80,000

Note: Detailed descriptions of data qualifiers are provided in Appendix D.

Method B Compliance Cleanup Level calculated for each compound.

NA - Information not available for Method B calculation.

presence of acetone may be related to laboratory contamination or contamination in the field. No volatile compounds exceeded cleanup standards.

The phthalates identified in sample LS-8 are generally at low concentrations and may be due to laboratory contamination. Since this sample exhibited relatively high levels of other constituents, these compounds also may truly exist in soils at the location sampled. No semivolatile organic compounds exceeded calculated cleanup standards.

Aroclors 1242 and 1254 were detected in sample LS-8 at 7.9 and 27.2 mg/kg, respectively. This sample was collected near the drums in Section A of the trench. The cleanup standard for PCBs at this location was exceeded, as described above.

6. DISCUSSION

The visual reconnaissance and geophysical surveys conducted along the Landsburg Mine trench indicate that material has been buried along the northern portion of the trench. The material appears to consist of construction waste (wood and scrap metal), as well as drums containing various organic and inorganic constituents. A major group of drums (approximately 50) were identified and three were sampled in Section B of the study area. Other drums were identified in smaller groupings throughout trench Sections B and C. The magnetometer survey indicated a high likelihood of buried metal (possibly drums) along Section C. Fill material resulting from direct placement of soil or trench wall sluffing apparently covers disposed materials throughout the entire trench study area. The three drums sampled at the site indicate the presence of concentrated metals, cyanide, VOCs, semivolatile organics, and PCBs. A very small portion of the visible drums were sampled, with contaminants identified in all cases. Evidence of contaminated soil and ponded water adjacent to drums indicate environmental release and the potential for direct contact.

Subsurface soil sampling was conducted along the length of the trench at locations associated with identified fill areas. In general, contamination was not found, except near a group of drums visible in Section A of the study area.

Surface soil samples collected at the mine portals at either end of the trench identified limited contamination by acetone and lead. It is unclear if the acetone detected is attributable to laboratory or environmental contamination. No conclusions can be drawn concerning the potential for contaminated groundwater resulting from releases of chemicals at the site; however, groundwater is considered to be a sole source aquifer for the region.

7. REFERENCES

Chapter 173-201 WAC

Chapter 173-340 WAC

Breiner, S., 1973, Application Manual for Portable Magnetometers, California, GeoMetrics, Inc.

Ecology and Environment, Inc. (E & E), 1991, Site Hazard Assessment Work Plan, submitted to Ecology in February.

Office of the Zoning and Subdivision Examiner, October 19, 1974, Department of Planning File No. 317-71-2A, Public Hearing.

United States Environmental Protection Agency (EPA), 1991, EPA Region 4, "Clean Water Act §304(a) Criteria and Related Information for Toxic Pollutants", Memorandum February update.

_____, 1990, Fourth Quarter FY-1990, Health Effects Assessment Summary Tables.

_____, 1988a, Methods for Determination of Organic Compounds in Drinking Water, December.

_____, 1988b, EPA Region 10, Sole-Source Aquifer Map, Office of Groundwater.

_____, 1986, SW-846, Test Methods for Evaluating Solid Waste.

_____, 1984, Preliminary Assessment for Landsburg Mine, prepared by Ecology and Environment, Inc. Field Investigation Team.

_____, 1983, Methods for Chemical Analysis of Water and Waste (March Revision).

United States Geological Survey, 1973, Cumberland Quadrangle.

Washington State Department of Ecology (Ecology), October 19, 1971, Preliminary Report, Department of Planning, Public Hearing.

_____, 1972, Site file, Department of Planning File No. 317-71-2A, Proposed Ordinance No. 71-631.

_____, 1990, Landsburg Mine site file, miscellaneous documents reviewed by E & E.

Appendix A

PHOTODOCUMENTATION

ABSTRACT

A Site Hazard Assessment (SHA) was conducted at the Landsburg Mine located near Ravensdale, Washington. The Landsburg Mine site consists of a portion of a trench ranging between 60 to 100 feet wide by 20 to 60 feet in depth and 2,000-feet long, created by the collapse of a working mine. The SHA included two phases of field work that included a geophysical survey, drum sampling, surface water sampling, and surface and subsurface soil sampling. Samples were analyzed for volatile organic compounds, semivolatile organic compounds, pesticides/ polychlorinated biphenyls (PCBs), and cyanide. It was determined through visual and geophysical surveys that ferrous buried objects do exist within the trench at suspected dumping locations. Sample results were compared to the Washington State Model Toxics Control Act (MTCA) cleanup standards as determined by either Method A or Method B calculations.

Drum samples contained elevated concentrations of metals, cyanide, volatile and semivolatile organic compounds, and PCBs. Surface water (pond) samples contained chromium, lead, mercury, zinc, 1,1-dichloroethane, methylene chloride, bis(2-ethylhexyl)phthalate, and isophorone above MTCA cleanup standards. Soils contained cadmium, chromium, lead, mercury, and PCBs in excess of MTCA cleanup standards.

LIST OF TABLES

PHOTO IDENTIFICATION SHEET

TYPE OF CAMERA: Olympus Infinity

JOB NO.: WD8025

TYPE OF FILM: Kodak 400

SITE NAME: Landsbury Mine

Frame No.	Roll No.	Date	Time	Taken By	Witnessed By	Description of Photo
22	2	02-13-91		B. Duffner	D. Kovanen	Section B, B150, PVC Stick-ups, left in place from soil-gas survey.
23	2	02-13-91		B. Duffner	D. Kovanen	Section B, large pond area adjacent to 45 exposed exposed drums on east wall.
24	2	02-13-91		B. Duffner	D. Kovanen	Same. Staton B525, looking north.
25	2	02-13-91		B. Duffner	D. Kovanen	Debris and partially buried drum exposed in Sectio B35.
26	2			B. Duffner	D. Kovanen	Disposal debris.
27	2			B. Duffner	D. Kovanen	Magnetometer survey, Station Section C
28	2	02-13-91		B. Duffner	D. Kovanen	Partially buried drum at B50, Section B.
29	2			D. Kovanen	B. Duffner	Sandstone east wall of trench.
30	3			B. Duffner	L. Burely	Drum sampling, Section B.
31	3			B. Duffner	L. Burely	Drum sampling, Section B.
32	3			B. Duffner	B. Duffner	North end of Section B, Station 800.
33	3			B. Duffner	D. Kovanen	Exposed drums Section C, Station 100.
34	3			B. Duffner	D. Kovanen	Exposed drums Section C, Station 200.
35	3			B. Duffner	D. Kovanen	Section C, Station 250.
36	3			B. Duffner	D. Kovanen	Section C, Station 375.
37	3			B. Duffner	D. Kovanen	Section C, Station 400.
38	3			B. Duffner	D. Kovanen	Clam cast in terriary sandstone. West wall, Section C, Station 450

PHOTO IDENTIFICATION SHEET

TYPE OF CAMERA: Olympus Infinity JOB NO.: WD8025

TYPE OF FILM: Kodak 400 SITE NAME: Landsburg Mine

Frame No.	Roll No.	Date	Time	Taken By	Witnessed By	Description of Photo
1	1	12-7-90	0945	D. Kovanen	B. Duffner	North end of trench. Seepage from abandoned portal
2	1	12-7-90	0945	D. Kovanen	B. Duffner	North end of trench. Seepage from abandoned portal
3	1	12-7-90	0945	D. Kovanen	B. Duffner	Photo showing blue-purple sheen on flowing seepage from portal #1
4	1	12-7-90	0945	D. Kovanen	B. Duffner	Looking southwest at northern end of trench. Abandoned portal #1 area.
5	1	12-7-90	1015	D. Kovanen	B. Duffner	Old mine workings along access road. Not of Landsbu Mine-Rogers Coal seam.
6	1	12-7-90	1015	D. Kovanen	B. Duffner	During site reconnaissance walking up old access ro Approximately 1/4 mile off of Summit-Landsburg Road.
7	1	12-7-90	1015	D. Kovanen	B. Duffner	Old access road.
8	1	12-7-90	1030	D. Kovanen	B. Duffner	Looking into northend of trench from the west rim.
9	1	12-7-90	1045	D. Kovanen	B. Duffner	Overgrown blackberry bushes observed growing over much of the trench rim areas.
10	1	12-7-90	1100	D. Kovanen	B. Duffner	Exposed drums in northern end of trench disposal on east wall of trench
11	1	12-7-90	1130	D. Kovanen	B. Duffner	Pool water in southern section of trench area. (sink-hole like)
12	1	12-7-90	1150	D. Kovanen	B. Duffner	South end of trench area. No visible signs of contamination.
13	2	02-13-91	1100	L. Burely	D. Kovanen	B.D. and J.M., Section A within trench, Level C respiratory protection.
14	2	02-13-91	1100	L. Burely	D. Kovanen	Entering Section A of trench, near Station 0.0.
15	2	02-13-91	1130	L. Burely	D. Kovanen	E & E field team within trench, Section A.
16	2	02-13-91	1200	L. Burely	D. Kovanen	Decontamination area.
17	2	02-13-91	1205	J. Mullesky	D. Kovanen	D.K. and B.D., magnetometer survey, station 300, Section A.
18	2	02-13-91	1205	J. Mullesky	B. Duffner	Section A, during magnetometer survey 300'.
19	2	02-13-91	1210	D. Kovanen	J. Mullesky	Station 350, Section A, during magnetometer survey.
20	2	02-13-91	1210	D. Kovanen	J. Mullesky	Station 425, Section A. Barrier Pillar. Southern of survey area.
21	2	02-13-91	1220	B. Duffner	D. Kovanen	Station 250, Section A, looking northeast within tr

C-LINE #52584
35MM PRINTS

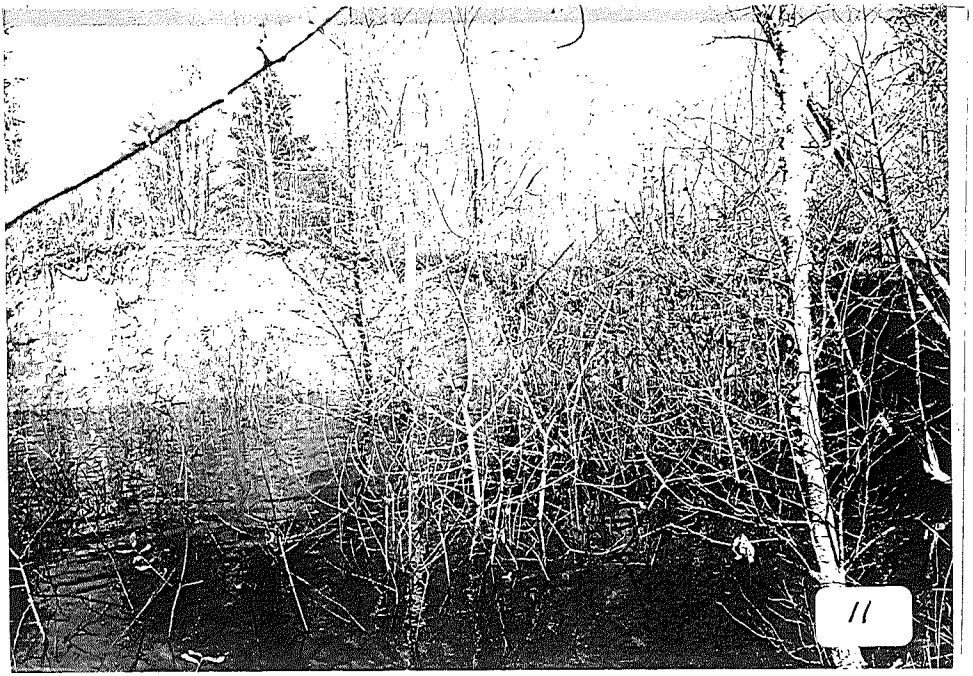
9

8

5

7

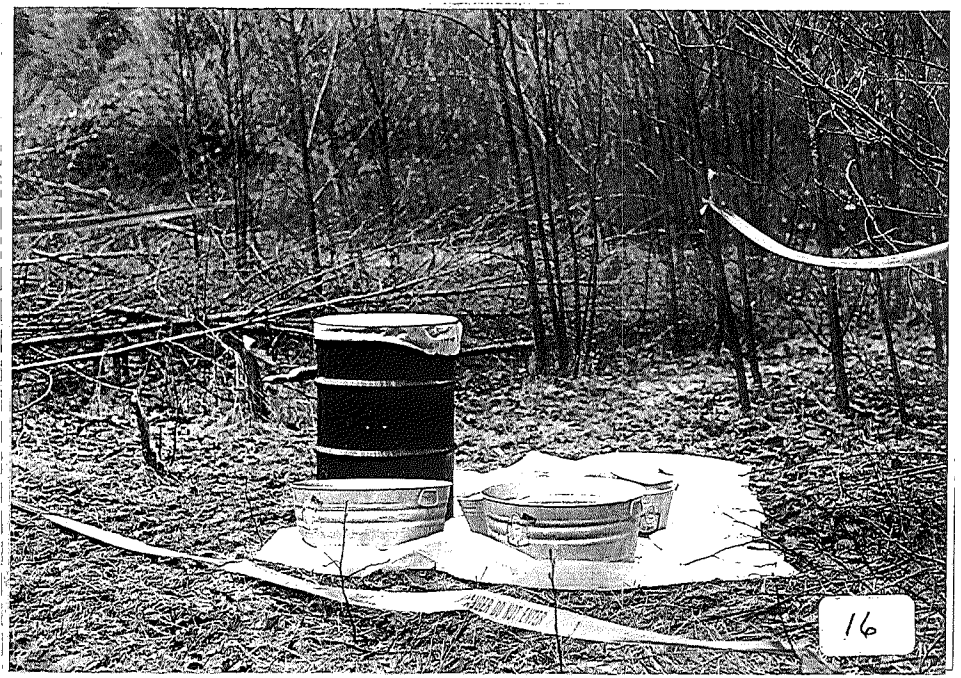
C-LINE #52584
35MM PRINTS



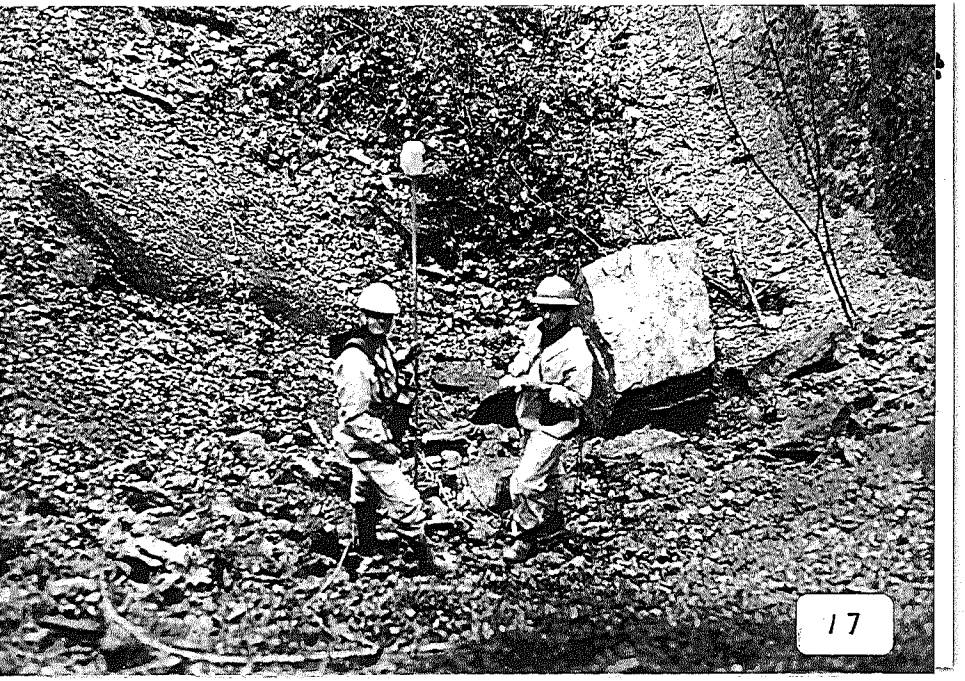

13

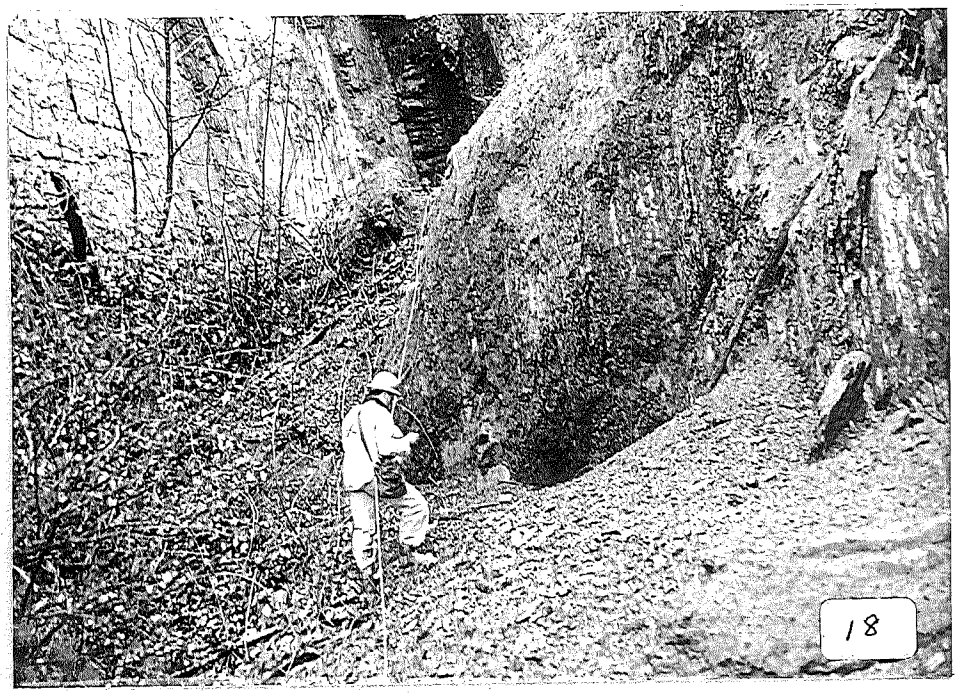

14

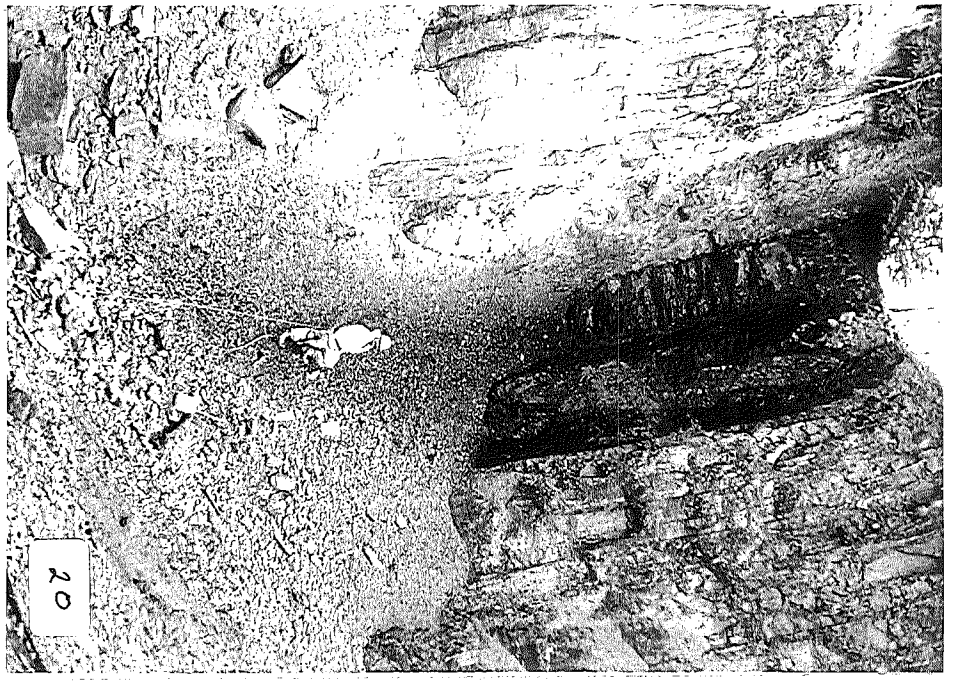

15


16

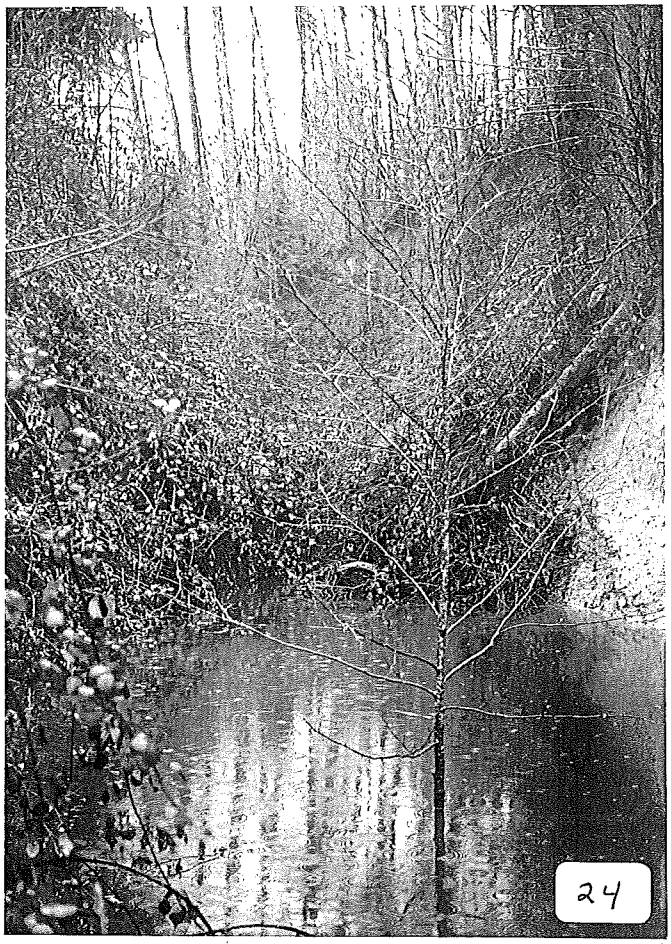
C-LINE #52584
35MM PRINTS







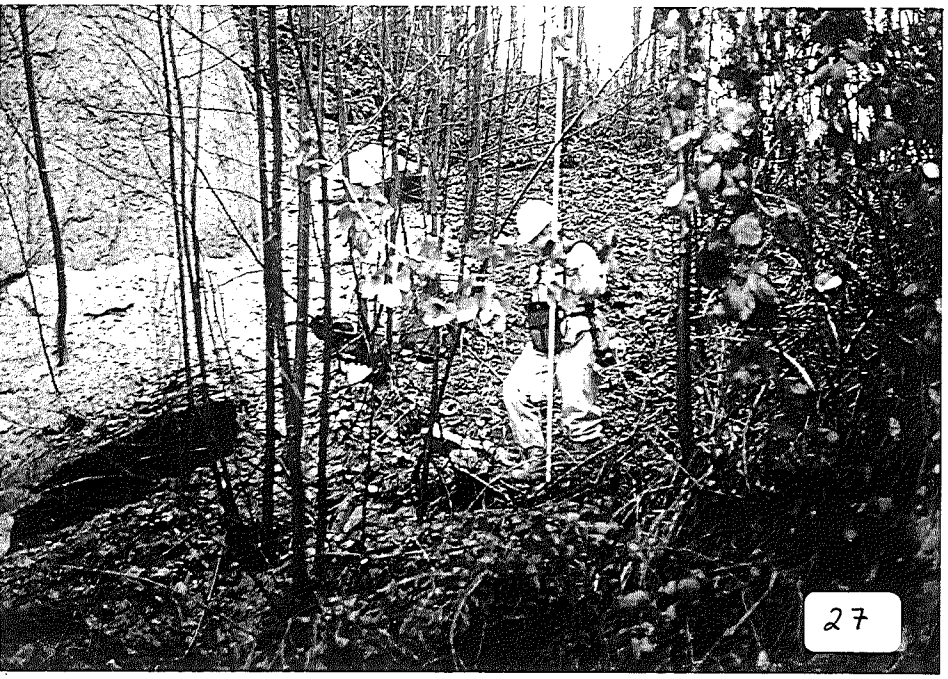

22

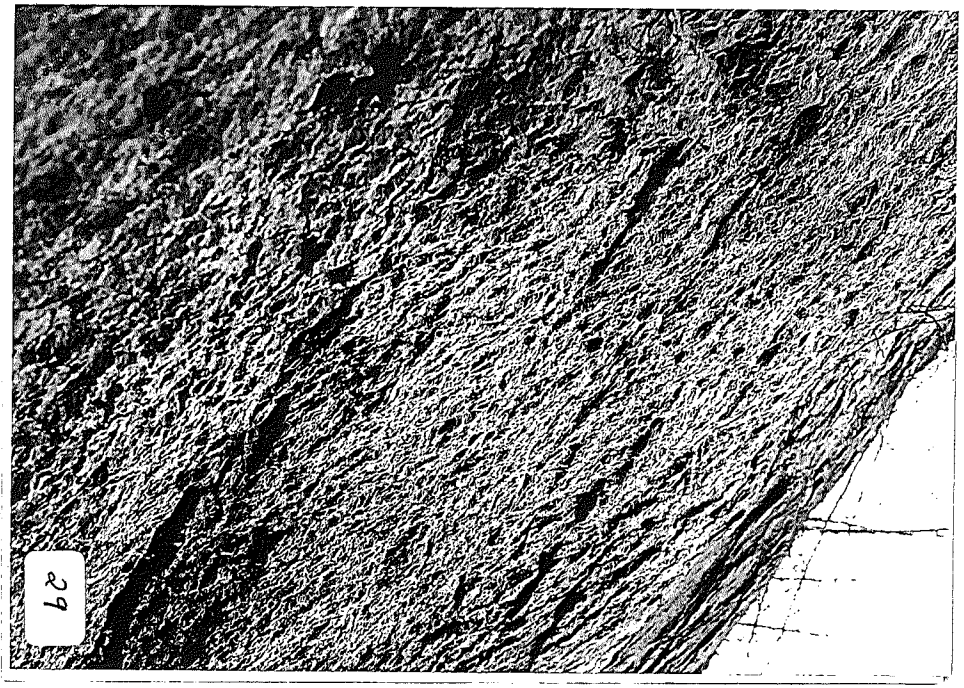

24


21


23

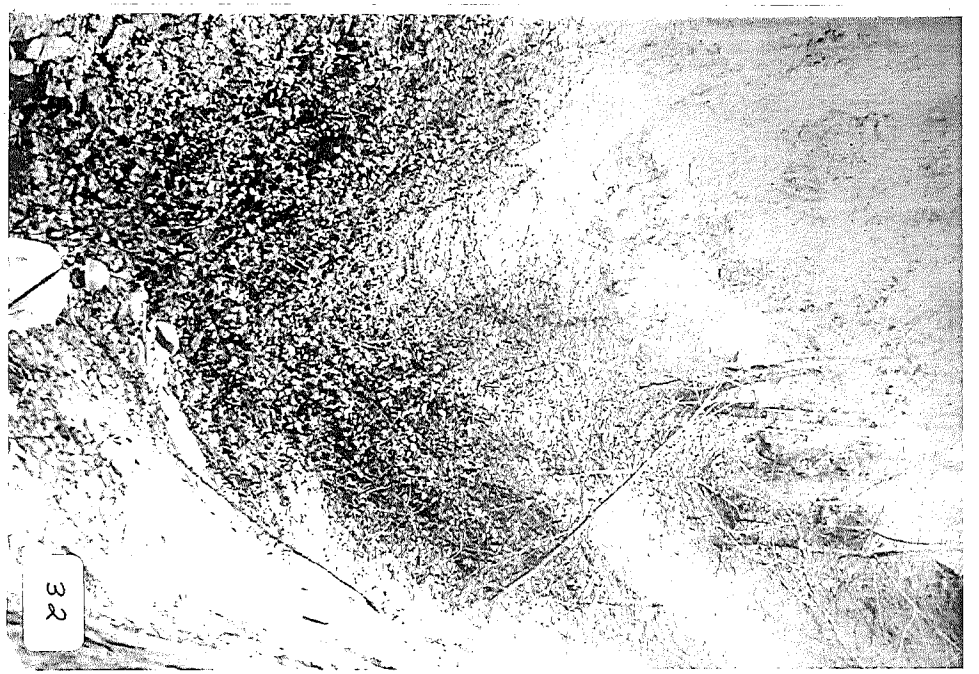
C-LINE #52564
35MM PRINTS



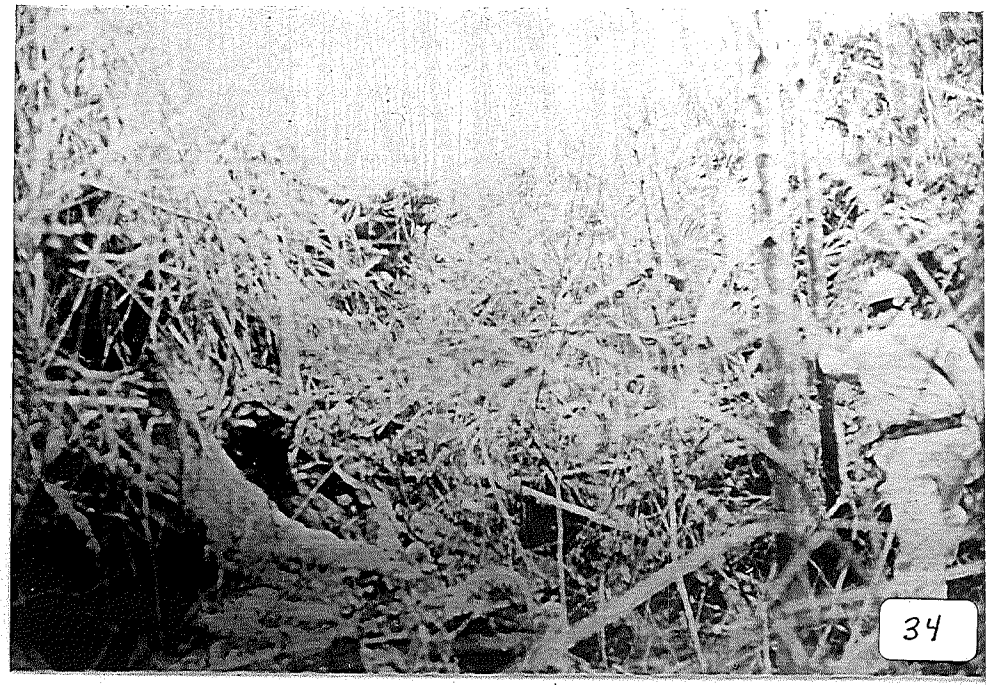

29

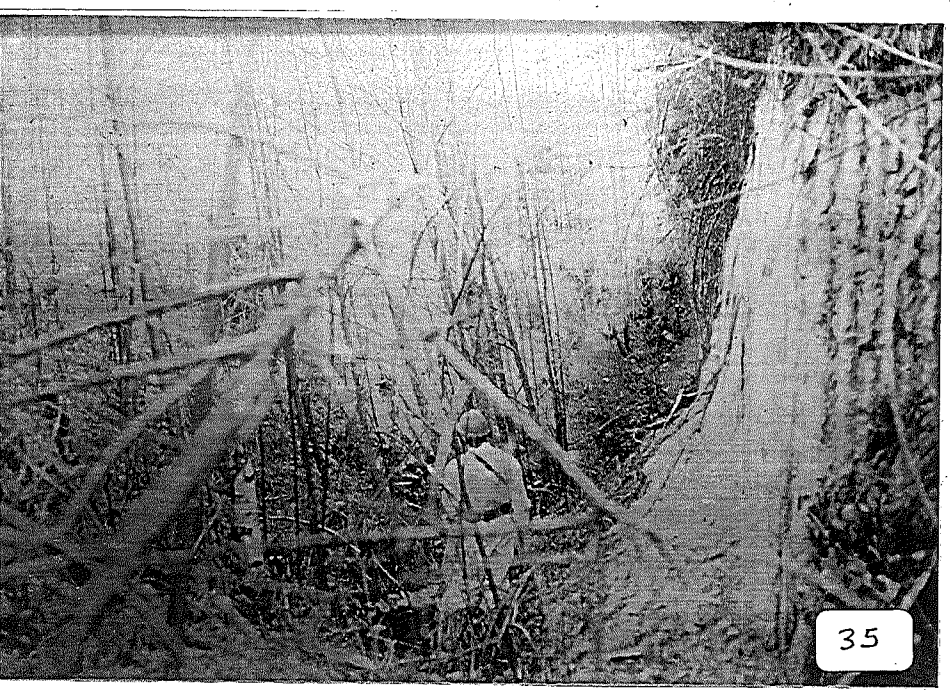

30


31


32

C-LINE #52564
35MM PRINTS





38

37

Appendix B

SITE HAZARD ASSESSMENT
DATA COLLECTION SUMMARY SHEETS

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
TOXICS CLEANUP PROGRAM

SITE HAZARD ASSESSMENT DATA COLLECTION SUMMARY SHEETS
FOR
WASHINGTON RANKING METHOD

Site Name: Landsburg Mine SHA

Location: Sections 24/25, T22N, R6E accessed from of S.E. Landsburg Road, approximately 1-1/2 miles northwest of Ravensdale, Washington.

Site Owner/Operator: Plum Creek Timber Co. and Palmer Coking Coal Co. 844 Mountain Villa Dr., Enumclaw Washington 98022

Address: P.O. Box 10/31407, Highway 169, Black Diamond, Washington 98010, respectively

Any other known PLP(s):

Address:

Site Number:

Date(s) of field site hazard assessment: February 13 - February 19, 1991

Samples or field measurements:

16	soil	3	surface water
	groundwater		air
		3	drums

(Attached copies of pertinent sampling and analytical data, as well as all other supporting documentation.)

Photographs: Appendix A

Weather: Fair, 30 - 50° F with intermittent rains and clearing

Lead Inspector: Dori Kovanen, E & E

Other Inspectors: Robert Duffner, David Byers, Lisa Burley, Joe Mollusky, and David Anderson (E & E)

Signature:

PART I: Hazardous Substances

NOTE: Page numbers, or worksheet numbers, shown in parentheses refer to WARM Scoring Manual.

A. LIST

List hazardous substances known or suspected (check K or S), currently at the property, or that have been previously (check C or P) at the property:

Hazardous Substances	K	S	C	P	Quantity	Units
1. Volatile Organic Compounds (k-c)					Unknown	Unknown
2. Metals (k-c)					Unknown	Unknown
3. Semivolatile Organic Compounds (k-c)					Unknown	Unknown
4. Polychlorinated Pesticides/Biphenyls (PCBs) (k-c)					Unknown	Unknown
5. Cyanide (k-c)					Unknown	Unknown
6.						
7.						
8.						
9.						
10.						

Additional? X (list on attachment) See summary Table 5-1 in text of SHA report, Section 5.

By which routes are these available?

Number (from above)	Surface Water	Air	Groundwater
1. 1	X	X	
2. 2	X		
3. 3	X		
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Comment: Confirmed release to surface water and ambient air; groundwater not sampled

B. SOURCES

Check those known or observed:

X	Drums or other containers
	Electrical transformers
	Above ground tanks
	Below ground tanks
	Ponds, pits, or other impoundments
	Pipelines (other than water, sever, or gas)
	Floor drains
	Exterior drains for rainwater, surface waters, spills, etc.
X	Other? Identify: Surface water ponds exist as subsidence - like features along the trench. One pond is located immediately down-gradient of approximately 45 exposed drums. Another pond exists in the vicinity of approximately 8 partially buried drums, some containing dry powdery substances. The surface waters cover an approximate 3,400 to 16,900 square foot area.

C. INDICATORS

Check those known or observed:

	Discolored soils
X	Disturbed soils
	Discolored standing water
X	Unusual or noxious odors
	Sick or dead vegetation
	Groundwater monitoring wells
X	Other? Identify: Observed PVC stick-ups in bottom of trench installed for soil-gas survey conducted by Applied Geotechnology, Inc. August 15, 1990 (Figure 2-1, Section B). Unusual odors were noted in various locations within Sections B and C of the trench.

If any are checked in B or C, explain details including exact locations (identify location in a map or drawing).

Additional information: See Figure 2-1 sample location map. Exact locations of PVC stick-ups are generally located within Section B, and are spaced 10 feet apart. Level B respiratory protection was necessary in the vicinity of the exposed drums. Disturbed soils were noted within most of the trench survey area, due to natural slurfing of the trench walls, and the filling/dumping/disposal activities that reportedly occurred. Soil contamination (visible or odor) included areas ranging from 27 to 135 square feet, 675 to 3,400 square feet, and 3,400 to 16,900 square feet.

II: **Releases**

A. KNOWN OR SUSPECTED RELEASES

List those hazardous substances identified (by number) in I.A. which are known or suspected to have been released:

Substance No.	Quantity Released	Units	When	Location
1,2,3,4,5	Unknown	--	--	Within Section B and C of the trench.

Additional information/reference? See Figure 2-1 for locations. Refer to waste-related history for additional information. References are numerous to disposal of "oil sludge" and "dumping of corrosive materials". In addition, several fires were reported in the trench area in the summer of 1971.

B. SOURCES AND IMPACTS (Pages B-9, 10)

List those hazardous substances identified (by number) in II.A and identify the source and impact:

Substance No.	Source	Impacts/Affects To	Area
1-5	Drum, and disposal from tanker trucks	Known impact to soils, air, vegetation; unknown impact to groundwater.	Throughout trench, see Figure 2-1

PART III: Migration Potential

A. CONTAINMENT--LANDFILLS (SW-7; A-12; GW-8, 9)

Present? X How many? _____

Check those that apply:

1. _____ An engineered, maintained runon/runoff control system
2. _____ An engineered/maintained cover without ponding
3. _____ Unmaintained runon/runoff control system or cover
4. X No runon/runoff control or no cover
5. _____ Uncontaminated soil cover greater than 6 inches thick
6. _____ Uncontaminated soil cover less than 6 inches thick
7. _____ Contaminated soil used as cover

8. _____ A functioning vapor collection system

9. _____ Mixing or agitation used

10. ___X___ No liner

11. _____ Single clay or compacted soil liner (permeability _____ cm/sec)

12. _____ Single synthetic liner (permeability _____ cm/sec)

13. _____ Double liner system (permeability _____ cm/sec)

14. _____ Leachate collection system, maintained and functioning

15. _____ Leachate collection system, unknown condition or not functioning

16. _____ Liquid wastes may have been disposed of

17. ___X___ Liquid wastes were disposed of in landfill

18. _____ Reliable evidence no liquid wastes were disposed

Additional comments: The trench is an uncontrolled disposal area. There is no containment system in place. Item 4: No runoff control was observed. However, pillar walls within the trench effectively block off site surface water migration. Item 17: See Section 2 of the SHA report.

B. CONTAINMENT--SURFACE IMPOUNDMENTS (SW-7, 8; A-13; GW-10, 11)

Present? No How many? _____

Check those that apply:

1. _____ The dike is apparently sound
2. _____ The dike is regularly inspected and maintained
3. _____ There is evidence of failure, erosion, slumping, or release of contents
4. _____ Two feet of freeboard maintained automatically
5. _____ The freeboard is manually controlled so that there is at least 2 feet of freeboard
6. _____ Evidence of insufficient freeboard (<2 feet)
7. _____ A maintained cover
8. _____ Unmaintained cover, no cover
9. _____ No liner
10. _____ Single synthetic liner
11. _____ Single clay or compacted soil liner
12. _____ Double liner
13. _____ Working leak detection system
14. _____ Evidence of loss of fluid (other than by evaporation)

Additional comments: No controlled surface impoundments are present; however, ponded water has been contaminated.

C. CONTAINMENT--DRUMS AND SMALL CONTAINERS (SW-9; A-11; GW-11)

Present? Yes How many? 50 observed

Check those that apply:

1. X No functional containment
2. _____ There is secondary containment capacity for the total volume of containers
3. _____ There is secondary containment with capacity for at least 110% of volume of the largest container
4. _____ The secondary containment is less than 110% of the volume of the largest container
5. _____ The containers are stored in single, or double layers on pallets, or in racks
6. X The containers are stored in an unstable manner
7. X Some containers are open or have visible liquid
8. X Some containers are leaking - containers have leaked in the past
9. _____ Containers are protected from weather
10. X Containers showing deterioration
11. _____ Containment surface is impervious
12. X Containment surface has cracks or semipermeable - Containment surface is soil
13. _____ No base material/permeable base such as gravel/base materials unknown
14. _____ Containment is regularly inspected and maintained
15. X Evidence of containment failure

Additional comments: Volume of drums ranged from 50 to 60 gallons. Item 6: Drum were disposed of over the trench rim. Drums now rest piled on one another. The containers are not stored in a stable manner. Item 10: Drums shoved rust. Item 15: Some containers have leaked into surrounding ponds and soil. Containers have been used for target practice (evident by bullet holes).

D. CONTAINMENT-STORAGE TANKS (SW-9; A-11; GW-11)

Present? No How many? Unknown

Check those that apply:

1. _____ Secondary containment with a capacity of 110% of the volume of the tanks

2. _____ Secondary containment at least 50% of the volume of all tanks

3. _____ Containment system with capacity for at least 10% of volume of containers or tanks

4. _____ No containment, or less than 10% capacity

5. _____ Tank volumes maintained

6. _____ Automatic controls used for volume maintenance

7. _____ Tanks are covered

8. _____ Uncovered tanks have aeration, mixing, or heating of tank contents

9. _____ Containers sealed, protected

10. _____ Containers sealed, no protected

11. _____ Containers deteriorated

12. _____ Containers leaking

13. _____ Record the #s of above which apply only to above ground tank: _____

14. _____ Record the #s of above which apply only to below ground tanks: _____

15. _____ Record the #s of above which apply to both above and below ground tanks: _____

Additional comments: _____

E. CONTAINMENT--WASTE PILES (SW-10; A-13; GW-12, 13)

Present? Yes . How many? Unknown

Check those that apply:

1. ____ Waste pile is outside, no protecting structure
2. ____ Waste pile is outside, in open structure with roof
3. ____ Waste pile is outside, with partial or unmaintained cover
4. ____ Waste pile is outdoors, with maintained cover
5. X Waste pile is present
6. ____ Waste pile is fully enclosed, intact building
7. ____ There is an engineered runon/runoff control
8. ____ The runon/runoff is maintained
9. ____ Runon/runoff control present, unknown condition
10. X No runon/runoff control system present, or unknown if present
11. ____ Liner or base present; X Not present
12. ____ Single clay or compacted soil liner
13. ____ Single synthetic liner
14. ____ Double liner
15. ____ Maintained. functioning leachate collection system
16. ____ Leachate collection system; ____ Unknown condition; or ____ Not functioning

Additional comments: Waste piles exist in Sections B and C of the trench (Figure 2-1) and generally consist of drums, wood, trees, and shrub debris that have been disposed of over the edge of the trench throughout the survey area. The description conforms to the Part III-A landfill.

F. CONTAINMENT--SPILLS, DISCHARGES, AND CONTAMINATED SOIL (SW-10, 11; A-13, 14; GW-13)

Check those that apply:

1. _____ Spill, discharge, or contaminated soil only in the subsurface at the site--including dry wells, drain fields, leaking underground storage tanks

2. __X__ Soil contamination that has been covered partially excavated and filled with at least 6 inches of clean soil

3. __X__ Soil contamination that has been covered or partially excavated and filled with less than 6 inches of clean soil

4. _____ Uncontaminated soil cover >2 feet thick

5. _____ No cover; or _____ Cover <2 inches but >6 inches thick

6. _____ Spill, discharge, or contaminated soil present at the surface in an area with maintained runon/runoff controls

7. _____ Spill, discharge, or contaminated soil present at the surface in an area with unmaintained runon/runoff controls

8. __X__ Spill, discharge, or contaminated soil present at the surface with no runon/runoff controls or unknown controls

9. _____ Contaminated soil has been disturbed or excavated and stored above grade

10. _____ A functioning vapor recovery system

11. _____ No vapor recovery system

Additional comments: Items 2/3: Throughout the survey area within the trench, native soil has been pushed into the trench by bulldozers to cover debris that were dumped. It is reasonable to presume that these soils were originally uncontaminated. Item 8: Drums containing product have leaked, spilled, and contaminated soils within Sections B and C of the trench (Figure 2-1).

G. CONTAINMENT--SITE CHARACTERISTICS (SW-11, 12; A-6, S/W 5)

1. How would you evaluate the site soils? Circle predominant textural class.

X (1)	Sand, gravel, sandy gravel, well-graded sand. well-graded gravel, gravelly sand, gravelly ad loam, silty sandy loam?
_____	Poorly-graded sands with fines, silt-sand mixtures, loam, silt loam, sandy silt loam, clayey sand, clay sand loam?
_____	Clayey sands, sand-clay mixtures, clayey gravels, clay-sand-gravel mixtures, inorganic silts, clayey silt loam, silty clay loam, porous rock outcrop, sandy silty clay, sandy clay loam?
_____	Clay (organic and inorganic), clay loam, rock outcrop, peat, peaty clay?

Is the above based on personal observation, laboratory analysis, or professional judgment by a soil expert? (underline)

2. What is the total annual precipitation?
   57.2 (2) inches/year (SW-12; W/S 5)

3. What is the maximum 2-year, 24-hour precipitation?
   0.20 (3) inches (SW-14; W/S 5)

4. Is the site not in a floodplain? Yes (SW-14; W/S 5)
   Is the site in a 500-year floodplain?
   Is the site in a 100-year floodplain?

5. What is the terrain slope to the nearest surface water?
   14 (4) % (SW-14, 15; W/S 5)

6. What is the subsurface hydraulic conductivity?
   $>10^{-3}$ (5) cm/sec (GW-14; W/S 6)

7. What is the vertical depth from the deepest point of known contamination to groundwater? (See comment) feet (GW-15; W/S 7)

Additional comments: Net precipitation is approximately 35.5 inches/yr. (2). Item 7: Unknown depth to water. Although nearby well logs show water levels at approximately 200 feet, it is unknown whether there is a hydraulic connection between the ponded surface water (within the trench) and groundwater. In addition, the old mine workings are a potential contaminant pathway.

PART IV: Targets

A. DISTANCE TO SURFACE WATER (SW-16)

1. What surface water(s) (lake, stream, river, pond, bay, etc.) is/are within 10,000 feet (downgradient) of the site?

Name	Distance-Feet	Obs.	Meas.
Cedar River	N 2,000		X

None? _____. Comments: (7)

2. What drinking water intakes are within 2 miles of the site? (all lake intakes, river intakes downstream only) (SW-16; W/S 5)

None? _____

Source (8,9)	Location	Population Served
Unnamed spring	T22N R6E Section 14	51
Unnamed spring	T22N R6E Section 36	135
Clark Springs	T22N R6E Section 35	2,720
		2,896 (Total)

3. How much acreage (anywhere) is irrigated by surface water intakes (downstream only) or wells (anywhere) within 2 miles of the site? (SW-16; GW-18; W/S 5; W/S 7)

None? _____

SURFACE WATER: Acres 60.0 (1,600 acres maximum)

Source(s) UNN stream, UNN Lake, Rock Creek. (9)

GROUNDWATER: Acres 4.0 (4,500 acres maximum)

Source(s) 1. King County - Division of PKs well (9)
2. Short/Buxton well

4. What is the distance to the nearest fishery resource (total of overland distance plus downgradient distance)? (SW-17; W/S 5)

   Over 10,000 feet? No Distance if less than 10,000 feet? 2,050 (10) feet

5. What is the distance to the nearest sensitive environment (total of overland distance plus downgradient distance)? (SW-18; A-15; W/S 5) (11, 12, 13)

   Over 10.000 feet? No Distance if less than 10,000 feet? 1,320 feet

6. Is the aquifer a federally-designated soil-source aquifer? Yes (14) (GW-16; W/S 7)

7. Is the groundwater used for: (GW-16; W/S 7) (8)

   X Private supply, but alternate sources available with minimum hook-up requirements
   ____ Public supply
   X Irrigation of human food crops or livestock
   ____ Non-food (human) vegetation
   ____ Not used due to natural contaminants
   ____ Groundwater not used, but usable

8. Distance to nearest drinking water? 250 (1,6) feet (GW-17; W/S 7)

9. Is there an alternate source available to groundwater for private or public water supply? No (8)

10. Population served by drinking water wells within 2 miles? 8,110 (6,8) (GW-17; W/S 7)

11. Distance to the nearest population? 250 (1,4) feet (A-15; 16; W/S 6)

12. Population within one-half mile radius? 150 (15) (A-16; W/S 6)

Additional comments: Item #5: Bald eagles winter along the Cedar River (3/4 mile North), great blue herons along Rock Creek (very close to the site) and at Ravensdale Lake (about 1 mile). Department of Wildlife letter, dated January 17, 1991 confirms fisher sighting within 1/4 mile of site. National Wetland Inventory Map indicates Ravensdale Lake as lacustrine, limnetic, open water (Cumberland, WA); Cedar River as riverine, upper perennial, open water (Hobart, WA). Item #4: Rock Creek is also the nearest fishery resource, spawning Chinook, Coho, and Sockeye salmon frequent the creek.

REFERENCES FOR SHA SUMMARY SHEETS

(1) Logbook of Field Observations, Ecology and Environment (E & E), subsurface soils were evaluated by a on-site geologist during subsurface soil sampling, February, 1991.

(2) From Climatic Atlas of the United States, U.S. Department of Commerce, National Oceanographic and Atmospheric Administration (NOAA), reprinted 1979.

(3) Washington Department of Ecology, April 1990, Figure SW-1, Isopluvials of 2-year, 24-hour Precipitation in Tenths of an Inch, Washington Ranking Method (WARM), Pub. No. 90-14.

(4) Measurements from United States Geological Survey (USGS) Cumberland and Hobart 7.5-minute topographic quadrangles, photorevised 1973.

(5) From Groundwater, Freeze and Cherry, 1979.

(6) From well logs provided by Washington Department of Ecology.

(7) From USGS Black Diamond 7.5-minute topographic quadrangle, photorevised 1973.

(8) From Public Water Supply System database (2-mile), Washington Department of Health, 12-11-90 printout.

(9) From recorded water rights information system (WRIS) database for Region 1, Department of Ecology, 12-5-90 printout.

(10) Washington Department of Fisheries, A Catalog of Washington Streams and Salmon Utilization, published 1975.

(11) National Wetlands Inventory Maps of Black Diamond (1988), Cumberland (1987), and Hobart (1987), Washington.

(12) Letters from the Department of Wildlife dated January 17, 1991 and January 11, 1991.

(13) Letter from Washington State Department of Natural Resources, Washington Natural Heritage Program, dated January 23, 1991.

(14) From sole-source aquifer maps, Region 10 Environmental Protection Agency (EPA), Seattle, Washington.

(15) From counting buildings on USGS Cumberland and Hobart 7.5-minute topographic quadrangles, photorevised 1973.

Appendix C

LABORATORY ANALYTICAL RESULTS

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02/20/9
Work Order #: K91090

Volatile Organic Compounds
EPA Method 8240 (Low Level)
µg/Kg (ppb) Dry Weight Basis

Sample Name:		LDS-1	LDS-2
Lab Code:		K0908-1	K0908
Date Analyzed:		02/26/91	02/26/9
Analytes	**MRL**		
Chloromethane	5	ND	ND
Vinyl Chloride	5	ND	ND
Bromomethane	5	ND	ND
Chloroethane	5	ND	ND
Trichlorofluoromethane (Freon 11)	5	ND	ND
Trichlorotrifluoroethane (Freon 113)	10	ND	ND
1,1-Dichloroethene	5	ND	ND
Acetone	50	ND	ND
Carbon Disulfide	5	ND	ND
Methylene Chloride	10	ND	ND
trans-1,2-Dichloroethene	5	ND	ND
cis-1,2-Dichloroethene	5	ND	ND
2-Butanone (MEK)	10	ND	ND
1,1-Dichloroethane	5	ND	ND
Chloroform	5	ND	ND
1,1,1-Trichloroethane (TCA)	5	ND	ND
Carbon Tetrachloride	5	ND	ND
Benzene	5	ND	ND
1,2-Dichloroethane	5	ND	ND
Vinyl Acetate	10	ND	ND
Trichloroethene (TCE)	5	ND	ND
1,2-Dichloropropane	5	ND	ND
Bromodichloromethane	5	ND	ND
2-Chloroethyl Vinyl Ether	10	ND	ND
trans-1,3-Dichloropropene	5	ND	ND
2-Hexanone	10	ND	ND
4-Methyl-2-pentanone (MIBK)	10	ND	ND
Toluene	5	ND	ND
cis-1,3-Dichloropropene	5	ND	ND
1,1,2-Trichloroethane	5	ND	ND
Tetrachloroethene (PCE)	5	ND	ND
Dibromochloromethane	5	ND	ND
Chlorobenzene	5	ND	ND
Ethylbenzene	5	ND	ND
Styrene	5	ND	ND
Total Xylenes	5	ND	ND
Bromoform	5	ND	ND
1,1,2,2-Tetrachloroethane	5	ND	ND
1,3-Dichlorobenzene	5	ND	ND
1,4-Dichlorobenzene	5	ND	ND
1,2-Dichlorobenzene	5	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

MW-

0

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02/20/9
Work Order #: K91090

Volatile Organic Compounds
EPA Method 8240 (Low Level)
µg/Kg (ppb) Dry Weight Basis

Sample Name:		LS1	LS2	LS3
Lab Code:		K0908-6	K0908-7	K0908
Date Analyzed:		02/27/91	02/27/91	02/27/
Analytes	MRL			
Chloromethane	5	ND	ND	ND
Vinyl Chloride	5	ND	ND	ND
Bromomethane	5	ND	ND	ND
Chloroethane	5	ND	ND	ND
Trichlorofluoromethane (Freon 11)	5	ND	ND	ND
Trichlorotrifluoroethane (Freon 113)	10	ND	ND	ND
1,1-Dichloroethene	5	ND	ND	ND
Acetone	50	ND	251	ND
Carbon Disulfide	5	ND	ND	ND
Methylene Chloride	10	ND	ND	ND
trans-1,2-Dichloroethene	5	ND	ND	ND
cis-1,2-Dichloroethene	5	ND	ND	ND
2-Butanone (MEK)	10	ND	ND	ND
1,1-Dichloroethane	5	ND	ND	ND
Chloroform	5	ND	ND	ND
1,1,1-Trichloroethane (TCA)	5	ND	ND	ND
Carbon Tetrachloride	5	ND	ND	ND
Benzene	5	ND	ND	ND
1,2-Dichloroethane	5	ND	ND	ND
Vinyl Acetate	10	ND	ND	ND
Trichloroethene (TCE)	5	ND	ND	ND
1,2-Dichloropropane	5	ND	ND	ND
Bromodichloromethane	5	ND	ND	ND
2-Chloroethyl Vinyl Ether	10	ND	ND	ND
trans-1,3-Dichloropropene	5	ND	ND	ND
2-Hexanone	10	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	10	ND	ND	ND
Toluene	5	ND	ND	ND
cis-1,3-Dichloropropene	5	ND	ND	ND
1,1,2-Trichloroethane	5	ND	ND	ND
Tetrachloroethene (PCE)	5	ND	ND	ND
Dibromochloromethane	5	ND	ND	ND
Chlorobenzene	5	ND	ND	ND
Ethylbenzene	5	ND	ND	ND
Styrene	5	ND	ND	ND
Total Xylenes	5	ND	ND	ND
Bromoform	5	ND	ND	ND
1,1,2,2-Tetrachloroethane	5	ND	ND	ND
1,3-Dichlorobenzene	5	ND	ND	ND
1,4-Dichlorobenzene	5	ND	ND	ND
1,2-Dichlorobenzene	5	ND	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

3-29-91 00

Approved by _____ Date 3/29/91

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil.

Date Received: 02/20/91
Work Order #: K910908

Volatile Organic Compounds
EPA Method 8240 (Low Level)
µg/Kg (ppb) Dry Weight Basis

Sample Name:		LS4	LS5	LS6
Lab Code:		K0908-9	K0908-10	K0908-
Date Analyzed:		02/27/91	02/27/91	02/27/9
Analytes	MRL			
Chloromethane	5	ND	ND	ND
Vinyl Chloride	5	ND	ND	ND
Bromomethane	5	ND	ND	ND
Chloroethane	5	ND	ND	ND
Trichlorofluoromethane (Freon 11)	5	ND	ND	ND
Trichlorotrifluoroethane (Freon 113)	10	ND	ND	ND
1,1-Dichloroethene	5	ND	ND	ND
Acetone	50	ND	ND	ND
Carbon Disulfide	5	ND	ND	ND
Methylene Chloride	10	ND	ND	ND
trans-1,2-Dichloroethene	5	ND	ND	ND
cis-1,2-Dichloroethene	5	ND	ND	ND
2-Butanone (MEK)	10	ND	ND	ND
1,1-Dichloroethane	5	ND	ND	ND
Chloroform	5	ND	ND	ND
1,1,1-Trichloroethane (TCA)	5	ND	ND	ND
Carbon Tetrachloride	5	ND	ND	ND
Benzene	5	ND	ND	ND
1,2-Dichloroethane	5	ND	ND	ND
Vinyl Acetate	10	ND	ND	ND
Trichloroethene (TCE)	5	ND	ND	ND
1,2-Dichloropropane	5	ND	ND	ND
Bromodichloromethane	5	ND	ND	ND
2-Chloroethyl Vinyl Ether	10	ND	ND	ND
trans-1,3-Dichloropropene	5	ND	ND	ND
2-Hexanone	10	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	10	ND	ND	ND
Toluene	5	ND	ND	ND
cis-1,3-Dichloropropene	5	ND	ND	ND
1,1,2-Trichloroethane	5	ND	ND	ND
Tetrachloroethene (PCE)	5	ND	ND	ND
Dibromochloromethane	5	ND	ND	ND
Chlorobenzene	5	ND	ND	ND
Ethylbenzene	5	ND	ND	ND
Styrene	5	ND	ND	ND
Total Xylenes	5	ND	ND	ND
Bromoform	5	ND	ND	ND
1,1,2,2-Tetrachloroethane	5	ND	ND	ND
1,3-Dichlorobenzene	5	ND	ND	ND
1,4-Dichlorobenzene	5	ND	ND	ND
1,2-Dichlorobenzene	5	ND	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

3-29-91

000

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02/20/91
Work Order #: K910908

Volatile Organic Compounds
EPA Method 8240 (Low Level)
µg/Kg (ppb) Dry Weight Basis

Sample Name:		LS7	LS8	LS9
Lab Code:		K0908-12	K0908-13	K0908-[illegible]
Date Analyzed:		02/28/91	02/28/91	02/28/91
Analytes	MRL			
Chloromethane	5	ND	ND UJ	ND
Vinyl Chloride	5	ND	ND	ND
Bromomethane	5	ND	ND	ND
Chloroethane	5	ND	ND	ND
Trichlorofluoromethane (Freon 11)	5	ND	ND	ND
Trichlorotrifluoroethane (Freon 113)	10	ND	ND	ND
1,1-Dichloroethene	5	ND	ND	ND
Acetone	50	ND	ND	ND
Carbon Disulfide	5	ND	ND	ND
Methylene Chloride	10	ND	ND	ND
trans-1,2-Dichloroethene	5	ND	ND	ND
cis-1,2-Dichloroethene	5	ND	ND	ND
2-Butanone (MEK)	10	ND	ND	ND
1,1-Dichloroethane	5	ND	ND	ND
Chloroform	5	ND	ND	ND
1,1,1-Trichloroethane (TCA)	5	ND	11 J	ND
Carbon Tetrachloride	5	ND	ND UJ	ND
Benzene	5	ND	ND	ND
1,2-Dichloroethane	5	ND	ND	ND
Vinyl Acetate	10	ND	ND	ND
Trichloroethene (TCE)	5	ND	137 J	ND
1,2-Dichloropropane	5	ND	ND UJ	ND
Bromodichloromethane	5	ND	ND	ND
2-Chloroethyl Vinyl Ether	10	ND	ND	ND
trans-1,3-Dichloropropene	5	ND	ND	ND
2-Hexanone	10	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	10	ND	ND	ND
Toluene	5	ND	ND	ND
cis-1,3-Dichloropropene	5	ND	ND	ND
1,1,2-Trichloroethane	5	ND	ND	ND
Tetrachloroethene (PCE)	5	ND	56 J	ND
Dibromochloromethane	5	ND	ND UJ	ND
Chlorobenzene	5	ND	ND UJ	ND
Ethylbenzene	5	ND	8.5 J	ND
Styrene	5	ND	8.3 J	ND
Total Xylenes	5	ND	45 J	ND
Bromoform	5	ND	ND UJ	ND
1,1,2,2-Tetrachloroethane	5	ND	ND	ND
1,3-Dichlorobenzene	5	ND	ND	ND
1,4-Dichlorobenzene	5	ND	9.6 J	ND
1,2-Dichlorobenzene	5	ND	16 J	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

3-29-91

Approved by _____ Date _____

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02/20/91
Work Order #: K910908

Volatile Organic Compounds
EPA Method 8240 (Low Level)
µg/Kg (ppb) Dry Weight Basis

Sample Name:		LS10	LS11	LPS1
Lab Code:		K0908-15	K0908-16	K0908-1
Date Analyzed:		02/28/91	02/28/91	02/28/9
Analytes	**MRL**			
Chloromethane	5	ND	ND	ND
Vinyl Chloride	5	ND	ND	ND
Bromomethane	5	ND	ND	ND
Chloroethane	5	ND	ND	ND
Trichlorofluoromethane (Freon 11)	5	ND	ND	ND
Trichlorotrifluoroethane (Freon 113)	10	ND	ND	ND
1,1-Dichloroethene	5	ND	ND	ND
Acetone	50	ND	118	ND
Carbon Disulfide	5	ND	ND	ND
Methylene Chloride	10	ND	ND	ND
trans-1,2-Dichloroethene	5	ND	ND	ND
cis-1,2-Dichloroethene	5	ND	ND	ND
2-Butanone (MEK)	10	ND	ND	ND
1,1-Dichloroethane	5	ND	ND	ND
Chloroform	5	ND	ND	ND
1,1,1-Trichloroethane (TCA)	5	ND	ND	ND
Carbon Tetrachloride	5	ND	ND	ND
Benzene	5	ND	ND	ND
1,2-Dichloroethane	5	ND	ND	ND
Vinyl Acetate	10	ND	ND	ND
Trichloroethene (TCE)	5	ND	ND	ND
1,2-Dichloropropane	5	ND	ND	ND
Bromodichloromethane	5	ND	ND	ND
2-Chloroethyl Vinyl Ether	10	ND	ND	ND
trans-1,3-Dichloropropene	5	ND	ND	ND
2-Hexanone	10	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	10	ND	ND	ND
Toluene	5	ND	ND	ND
cis-1,3-Dichloropropene	5	ND	ND	ND
1,1,2-Trichloroethane	5	ND	ND	ND
Tetrachloroethene (PCE)	5	ND	ND	ND
Dibromochloromethane	5	ND	ND	ND
Chlorobenzene	5	ND	ND	ND
Ethylbenzene	5	ND	ND	ND
Styrene	5	ND	ND	ND
Total Xylenes	5	ND	ND	ND
Bromoform	5	ND	ND	ND
1,1,2,2-Tetrachloroethane	5	ND	ND	ND
1,3-Dichlorobenzene	5	ND	ND	ND
1,4-Dichlorobenzene	5	ND	ND	ND
1,2-Dichlorobenzene	5	ND	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

MAR 7-19-91

Approved by _____ Date _____

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02/20/91
Work Order #: K910908

Volatile Organic Compounds
EPA Method 8240 (Low Level)
µg/Kg (ppb) Dry Weight Basis

Sample Name:		LPS2	LPS3
Lab Code:		K0908-18	K0908-1
Date Analyzed:		02/28/91	02/28/91
Analytes	**MRL**		
Chloromethane	5	ND	ND
Vinyl Chloride	5	ND	ND
Bromomethane	5	ND	ND
Chloroethane	5	ND	ND
Trichlorofluoromethane (Freon 11)	5	ND	ND
Trichlorotrifluoroethane (Freon 113)	10	ND	ND
1,1-Dichloroethene	5	ND	ND
Acetone	50	148	ND
Carbon Disulfide	5	ND	ND
Methylene Chloride	10	ND	ND
trans-1,2-Dichloroethene	5	ND	ND
cis-1,2-Dichloroethene	5	ND	ND
2-Butanone (MEK)	10	ND	ND
1,1-Dichloroethane	5	ND	ND
Chloroform	5	ND	ND
1,1,1-Trichloroethane (TCA)	5	ND	ND
Carbon Tetrachloride	5	ND	ND
Benzene	5	ND	ND
1,2-Dichloroethane	5	ND	ND
Vinyl Acetate	10	ND	ND
Trichloroethene (TCE)	5	ND	ND
1,2-Dichloropropane	5	ND	ND
Bromodichloromethane	5	ND	ND
2-Chloroethyl Vinyl Ether	10	ND	ND
trans-1,3-Dichloropropene	5	ND	ND
2-Hexanone	10	ND	ND
4-Methyl-2-pentanone (MIBK)	10	ND	ND
Toluene	5	ND	ND
cis-1,3-Dichloropropene	5	ND	ND
1,1,2-Trichloroethane	5	ND	ND
Tetrachloroethene (PCE)	5	ND	ND
Dibromochloromethane	5	ND	ND
Chlorobenzene	5	ND	ND
Ethylbenzene	5	ND	ND
Styrene	5	ND	ND
Total Xylenes	5	ND	ND
Bromoform	5	ND	ND
1,1,2,2-Tetrachloroethane	5	ND	ND
1,3-Dichlorobenzene	5	ND	ND
1,4-Dichlorobenzene	5	ND	ND
1,2-Dichlorobenzene	5	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine-SHA/#WD8023
Sample Matrix: Oil

Date Received: 02/15/91
Work Order #: K910844

Metals
mg/Kg (ppm)

	Sample Name:	LD-1	LD-2	LD-3
	Lab Code:	K0844-1	K0844-2	K0844-3
Analytes	Method	MRL		
Antimony	6010	5	ND	ND	ND UJ
Arsenic	7060	0.5	ND	ND	ND UJ
Beryllium	6010	0.5	ND	ND	ND
Cadmium	6010	0.5	1.4	ND	ND UJ
Chromium	6010	1	ND	2	ND
Copper	6010	1	69	6	ND
Lead	7421	0.5	3.8	3.8	ND
Mercury	7471	0.02	ND	ND	0.34
Nickel	6010	5	ND	ND	ND
Selenium	7740	0.5	ND	ND	ND
Silver	6010	1	ND	ND	ND UJ
Thallium	7841	0.5	ND	ND	ND
Zinc	6010	1	628	59	ND UJ

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

3-29-91

Approved by _____ Date 3-14-91

0000

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine-SHA/#WD8023
Sample Matrix: Water

Date Received: 02/16/91
Work Order #: K910844

Total Metals
mg/L (ppm)

Sample Name:			LW-1
Lab Code:			K0844-4
Analytes	Method	MRL	
Antimony	6010	0.05	ND
Arsenic	7060	0.005	ND
Beryllium	6010	0.005	ND
Cadmium	6010	0.003	ND
Chromium	6010	0.005	ND
Copper	6010	0.01	ND
Lead	7421	0.001	ND
Mercury	7470	0.0002	ND
Nickel	6010	0.02	ND
Selenium	7740	0.001	ND
Silver	6010	0.01	ND UJ
Thallium	7841	0.001	ND
Zinc	6010	0.01	ND
Hardness	*SM*314A/6010	0.1	11.3

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
SM *Standard Methods for the Examination of Water and Wastewater, 16th Ed., 1985*

MR
3-29-91

Approved by _____ Date 3-14-91

0001

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Water

Date Received: 02/20/91
Work Order #: K910908

Total Metals
mg/L (ppm)
Dry Weight Basis

	Sample Name:		LDW-1	LSEP
	Lab Code:		K0908-3	K0908-4
Analytes	Method	MRL		
Antimony	6010	0.05	ND	ND
Arsenic	7060	0.005	ND	ND
Beryllium	6010	0.005	ND	ND
Cadmium	6010	0.003	ND	ND
Chromium	6010	0.005	0.046	0.006
Copper	6010	0.01	ND	ND
Lead	7421	0.002	0.056	0.010
Mercury	7470	0.0002	0.0002	ND
Nickel	6010	0.02	ND	ND
Selenium	7740	0.005	ND	ND
Silver	6010	0.01	ND	ND
Thallium	7841	0.005	ND	ND
Zinc	6010	0.01	0.37	0.16
Hardness	SM314A/6010	0.1	15.5	24.6

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by _____ Date _____

0000

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02/20/91
Work Order #: K910908

Total Metals
mg/Kg (ppm)
Dry Weight Basis

	Sample Name:		LDS-1	LDS-2	LS1
	Lab Code:		K0908-1	K0908-2	K0908-
Analytes	Method	MRL			
Antimony	6010	10	ND	ND	ND
Arsenic	7060	1	9	5	6
Beryllium	6010	1	ND	ND	ND
Cadmium	6010	1	ND	ND	ND
Chromium	6010	2	61	28	21
Copper	6010	2	32	37	12
Lead	6010	20	56	ND	ND
Mercury	7471	0.2	ND	ND	ND
Nickel	6010	10	41	36	13
Selenium	7740	1	ND	ND	ND
Silver	6010	2	ND	ND	ND
Thallium	7841	1	ND	ND	ND
Zinc	6010	2	66	91	39

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

MR 3-2

Approved by: _____ Date 3.11.91

000

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Ecology & Environment	Date Received:	02/20/91
Submitted By:	Bob Duffner	Work Order #:	K910908
Project:	E & E Landsburg Mine - SHA/#WD8023		
Sample Matrix:	Soil		

Total Metals
mg/Kg (ppm)
Dry Weight Basis

	Sample Name:		LS2	LS3	LS4
	Lab Code:		K0908-7	K0908-8	K0908-9
Analytes	Method	MRL			
Antimony	6010	10	ND	ND	ND
Arsenic	7060	1	7	6	12
Beryllium	6010	1	ND	ND	ND
Cadmium	6010	1	ND	ND	ND
Chromium	6010	2	21	14	22
Copper	6010	2	18	10	18
Lead	6010	20	ND	ND	ND
Mercury	7471	0.2	ND	ND	ND
Nickel	6010	10	18	12	21
Selenium	7740	1	ND	ND	ND
Silver	6010	2	ND	ND	ND
Thallium	7841	1	ND	ND	ND
Zinc	6010	2	35	34	50

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by _____ Date 3-14-91

0000

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02/20/91
Work Order #: K9109

Total Metals
mg/Kg (ppm)
Dry Weight Basis

	Sample Name:		LS5	LS6	LS7
	Lab Code:		K0908-10	K0908-11	K0908-12
Analytes	Method	MRL			
Antimony	6010	10	ND	ND	ND
Arsenic	7060	1	13	10	6
Beryllium	6010	1	ND	ND	ND
Cadmium	6010	1	ND	ND	ND
Chromium	6010	2	20	19	25
Copper	6010	2	36	15	16
Lead	6010	20	ND	ND	ND
Mercury	7471	0.2	ND	ND	ND
Nickel	6010	10	26	19	25
Selenium	7740	1	ND	ND	ND
Silver	6010	2	ND	ND	ND
Thallium	7841	1	ND	ND	ND
Zinc	6010	2	60	40	47

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

MW 3-

Approved by _____ Date 3-14-91

U1

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Ecology & Environment		
Submitted By:	Bob Duffner	Date Received:	02/20/91
Project:	E & E Landsburg Mine - SHA/#WD8023	Work Order #:	K910908
Sample Matrix:	Soil		

Total Metals
mg/Kg (ppm)
Dry Weight Basis

Sample Name: / Lab Code:			LS8 K0908-13	LS9 K0908-14	LS10 K0908-1
Analytes	Method	MRL			
Antimony	6010	10	14	ND	ND
Arsenic	7060	1	19	6	5
Beryllium	6010	1	ND	ND	ND
Cadmium	6010	1	22	1	ND
Chromium	6010	2	912	23	28
Copper	6010	2	702	30	20
Lead	6010	20	3,200	ND	ND
Mercury	7471	0.2	3.7	ND	ND
Nickel	6010	10	30	43	20
Selenium	7740	1	2	ND	1
Silver	6010	2	4	ND	ND
Thallium	7841	1	ND	ND	ND
Zinc	6010	2	2,130	79	55

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

MW 3

Approved by _____ Date 2-26-91

000

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02/20/91
Work Order #: K910908

Total Metals
mg/Kg (ppm)
Dry Weight Basis

Sample Name: / Lab Code:			LS11 K0908-16	LPS1 K0908-17	LPS2 K0908-
Analytes	Method	MRL			
Antimony	6010	10	ND R	ND	ND
Arsenic	7060	1	4	5	5
Beryllium	6010	1	ND	ND	ND
Cadmium	6010	1	ND	ND	ND
Chromium	6010	2	28	30	23
Copper	6010	2	18	29	25
Lead	6010	20	ND	245	ND
Mercury	7471	0.2	ND	ND	ND
Nickel	6010	10	20	27	24
Selenium	7740	1	ND	ND	ND
Silver	6010	2	ND UJ	ND	ND
Thallium	7841	1	ND	ND	ND
Zinc	6010	2	31	85	59

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

MW 3-2

Approved by _____ Date _____

000

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Ecology & Environment	Date Received:	02/15/91
Submitted By:	Bob Duffner	Work Order #:	K910844
Project:	E & E Landsburg Mine-SHA/#WD8023		
Sample Matrix:	Oil		

Cyanide
EPA Metbhod 335.3
mg/Kg (ppm)

Sample Name	Lab Code	MRL	Result
LD-1	K0844-1	0.5	ND
LD-2	K0844-2	0.5	0.6
LD-3	K0844-3	0.5	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

MR
3-29-91

Approved by _____ Date 3-14-91

000

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Ecology & Environment	Date Received:	02/20/91
Submitted By:	Bob Duffner	Work Order #:	K910908
Project:	E & E Landsburg Mine - SHA/#WD8023		
Sample Matrix:	Soil		

Total Metals
mg/Kg (ppm)
Dry Weight Basis

Sample Name:			LPS3
Lab Code:			K0908-19
Analytes	**Method**	**MRL**	
Antimony	6010	10	ND
Arsenic	7060	1	8
Beryllium	6010	1	ND
Cadmium	6010	1	ND
Chromium	6010	2	58
Copper	6010	2	25
Lead	6010	20	ND
Mercury	7471	0.2	ND
Nickel	6010	10	46
Selenium	7740	1	ND
Silver	6010	2	ND
Thallium	7841	1	ND
Zinc	6010	2	81

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by _____ Date _____

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Ecology & Environment	Date Received:	02/20/91
Submitted By:	Bob Duffner	Work Order #:	K910908
Project:	E & E Landsburg Mine - SHA/#WD8023		
Sample Matrix:	Water		

Cyanide
EPA Method 335.3
mg/L (ppm)

Sample Name	Lab Code	MRL	Result
LDW-1	K0908-3	0.01	ND
LSEP	K0908-4	0.01	ND UJ

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

MR ?

Approved by _____ Date 3-14-91

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Ecology & Environment		
Submitted By:	Bob Duffner	Date Received:	02/16/91
Project:	E & E Landsburg Mine-SHA/#WD8023	Work Order #:	K910844
Sample Matrix:	Water		

Cyanide
EPA Method 335.3
mg/L (ppm)

Sample Name	Lab Code	MRL	Result
LW-1	K0844-4	0.01	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

3-19-91

Approved by _____ Date 3-14-91

001

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Ecology & Environment	Date Received:	02/20/91
Submitted By:	Bob Duffner	Work Order #:	K910908
Project:	E & E Landsburg Mine - SHA/#WD8023		
Sample Matrix:	Soil		

Cyanide
EPA Method 335.3
mg/Kg (ppm)
Dry Weight Basis

Sample Name	Lab Code	MRL	Result
LDS-1	K0908-1	0.5	ND
LDS-2	K0908-2	0.5	ND
LS1	K0908-6	0.5	ND
LS2	K0908-7	0.5	ND
LS3	K0908-8	0.5	ND
LS4	K0908-9	0.5	ND
LS5	K0908-10	0.5	ND
LS6	K0908-11	0.5	ND
LS7	K0908-12	0.5	ND
LS8	K0908-13	0.5	9.2
LS9	K0908-14	0.5	ND
LS10	K0908-15	0.5	ND
LS11	K0908-16	0.5	ND
LPS1	K0908-17	0.5	ND
LPS2	K0908-18	0.5	ND
LPS3	K0908-19	0.5	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

MR 3

Approved by _____ Date _____

000

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Ecology & Environment		
Submitted By:	Bob Duffner	Date Received:	02/15/91
Project:	E & E Landsburg Mine-SHA/#WD8023	Date Extracted:	02/23/91
Sample Matrix:	Oil	Work Order #:	K910844

Volatile Organic Compounds
EPA Method 8240
mg/Kg (ppm)

Sample Name:		LD-1
Lab Code:		K0844-1
Date Analyzed:		02/23/91
Analytes	MRL*	
Chloromethane	5.0	ND
Vinyl Chloride	5.0	ND
Bromomethane	5.0	ND
Chloroethane	5.0	ND
Trichlorofluoromethane (Freon 11)	0.5	ND
Trichlorotrifluoroethane (Freon 113)	5.0	ND
1,1-Dichloroethene	1.0	ND
Acetone	10.0	ND
Carbon Disulfide	0.5	ND
Methylene Chloride	5.0	ND
trans-1,2-Dichloroethene	0.5	ND
cis-1,2-Dichloroethene	0.5	ND
2-Butanone (MEK)	5.0	ND
1,1-Dichloroethane	0.5	ND
Chloroform	0.5	ND
1,1,1-Trichloroethane (TCA)	0.5	ND
Carbon Tetrachloride	0.5	ND
Benzene	0.5	ND
1,2-Dichloroethane	0.5	ND
Vinyl Acetate	5.0	ND
Trichloroethene (TCE)	0.5	ND
1,2-Dichloropropane	0.5	ND
Bromodichloromethane	0.5	ND
2-Chloroethyl Vinyl Ether	5.0	ND
trans-1,3-Dichloropropene	0.5	ND
2-Hexanone	5.0	ND
4-Methyl-2-pentanone (MIBK)	5.0	ND
Toluene	0.5	0.83
cis-1,3-Dichloropropene	0.5	ND
1,1,2-Trichloroethane	0.5	ND
Tetrachloroethene (PCE)	0.5	ND
Dibromochloromethane	0.5	ND
Chlorobenzene	0.5	ND
Ethylbenzene	0.5	ND
Styrene	0.5	1.0
Total Xylenes	0.5	1.0
Bromoform	0.5	ND
1,1,2,2-Tetrachloroethane	0.5	ND
1,3-Dichlorobenzene	0.5	ND
1,4-Dichlorobenzene	0.5	ND
1,2-Dichlorobenzene	0.5	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* Elevated MRLs because of matrix interferences.

3-26-91

Approved by

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02/20/9
Date Extracted: 02/27/9
Date Analyzed: 03/03/9
Work Order #: K9109(

Organochlorine Pesticides and PCBs
EPA Methods 3540/8080
mg/Kg (ppm)
Dry Weight Basis

Sample Name: / Lab Code:		LS8 K0908-13*	LS9 K0908-14	LS10 K0908-15
Analytes	MRL			
Alpha-BHC	0.01	<1	ND	ND
Gamma-BHC (Lindane)	0.01	<1	ND	ND
Beta-BHC	0.03	<3	ND	ND
Heptachlor	0.01	<1	ND	ND
Delta-BHC	0.01	<1	ND	ND
Aldrin	0.01	<1	ND	ND
Heptachlor Epoxide	0.01	<1	ND	ND
Endosulfan I	0.01	<1	ND	ND
4,4'-DDE	0.01	<1	ND	ND
Dieldrin	0.01	<1	ND	ND
Endrin	0.01	<1	ND	ND
4,4'-DDD	0.01	<1	ND	ND
Endosulfan II	0.01	<1	ND	ND
4,4'-DDT	0.01	<1	ND	ND
Endrin Aldehyde	0.01	<1	ND	ND
Endosulfan Sulfate	0.01	<1	ND	ND
Methoxychlor	0.02	<2	ND	ND
Toxaphene	0.3	<3	ND	ND
Chlordane	0.1	<1	ND	ND
PCBs: Aroclor 1016	0.1	<1	ND	ND
Aroclor 1221	0.1	<1	ND	ND
Aroclor 1232	0.1	<1	ND	ND
Aroclor 1242	0.1	7.9	ND	ND
Aroclor 1248	0.1	<1	ND	ND
Aroclor 1254	0.1	27.2	ND	ND
Aroclor 1260	0.1	<1	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* Elevated MRLs because of matrix interferences

MR 3-29-9

Approved by _____ Date _____

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02/20/
Date Extracted: 02/26/
Date Analyzed: 03/03/
Work Order #: K9109(

Organochlorine Pesticides and PCBs
EPA Methods 3540/8080
mg/Kg (ppm)
Dry Weight Basis

Sample Name: / Lab Code:		LS5 K0908-10	LS6 K0908-11	LS7 K0908-12
Analytes	MRL			
Alpha-BHC	0.01	ND	ND	ND
Gamma-BHC (Lindane)	0.01	ND	ND	ND
Beta-BHC	0.03	ND	ND	ND
Heptachlor	0.01	ND	ND	ND
Delta-BHC	0.01	ND	ND	ND
Aldrin	0.01	ND	ND	ND
Heptachlor Epoxide	0.01	ND	ND	ND
Endosulfan I	0.01	ND	ND	ND
4,4'-DDE	0.01	ND	ND	ND
Dieldrin	0.01	ND	ND	ND
Endrin	0.01	ND	ND	ND
4,4'-DDD	0.01	ND	ND	ND
Endosulfan II	0.01	ND	ND	ND
4,4'-DDT	0.01	ND	ND	ND
Endrin Aldehyde	0.01	ND	ND	ND
Endosulfan Sulfate	0.01	ND	ND	ND
Methoxychlor	0.02	ND	ND	ND
Toxaphene	0.3	ND	ND	ND
Chlordane	0.1	ND	ND	ND
PCBs: Aroclor 1016	0.1	ND	ND	ND
Aroclor 1221	0.1	ND	ND	ND
Aroclor 1232	0.1	ND	ND	ND
Aroclor 1242	0.1	ND	ND	ND
Aroclor 1248	0.1	ND	ND	ND
Aroclor 1254	0.1	ND	ND	ND
Aroclor 1260	0.1	ND	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

MR 3-29-91

000

Approved by [signature] Date 3-14-91

COLUMBIA ANALYTICA ,ERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02/2(
Date Extracted: 02/2(
Date Analyzed: 03/0:
Work Order #: K91C

Organochlorine Pesticides and PCBs
EPA Methods 3540/8080
mg/Kg (ppm)
Dry Weight Basis

Sample Name: / Lab Code:		LS2 K0908-7	LS3 K0908-8	LS4 K0908-(
Analytes	MRL			
Alpha-BHC	0.01	ND	ND	ND
Gamma-BHC (Lindane)	0.01	ND	ND	ND
Beta-BHC	0.03	ND	ND	ND
Heptachlor	0.01	ND	ND	ND
Delta-BHC	0.01	ND	ND	ND
Aldrin	0.01	ND	ND	ND
Heptachlor Epoxide	0.01	ND	ND	ND
Endosulfan I	0.01	ND	ND	ND
4'-DDE	0.01	ND	ND	NC
Dieldrin	0.01	ND	ND	ND
Endrin	0.01	ND	ND	ND
4,4'-DDD	0.01	ND	ND	ND
Endosulfan II	0.01	ND	ND	ND
4,4'-DDT	0.01	ND	ND	ND
Endrin Aldehyde	0.01	ND	ND	ND
Endosulfan Sulfate	0.01	ND	ND	ND
Methoxychlor	0.02	ND	ND	ND
Toxaphene	0.3	ND	ND	ND
Chlordane	0.1	ND	ND	ND
PCBs: Aroclor 1016	0.1	ND	ND	ND
Aroclor 1221	0.1	ND	ND	ND
Aroclor 1232	0.1	ND	ND	ND
Aroclor 1242	0.1	ND	ND	ND
Aroclor 1248	0.1	ND	ND	ND
Aroclor 1254	0.1	ND	ND	ND
Aroclor 1260	0.1	ND	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

MW 3-29

001

Approved by Lee Wolff Date 3-14-91

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02/20/
Date Extracted: 02/26/
Date Analyzed: 03/03/
Work Order #: K9109(

Organochlorine Pesticides and PCBs
EPA Methods 3540/8080
mg/Kg (ppm)
Dry Weight Basis

Sample Name:		LDS-1	LDS-2	LS1
Lab Code:		K0908-1*	K0908-2*	K0908-6
Analytes	MRL			
Alpha-BHC	0.01	<0.1	ND	ND
Gamma-BHC (Lindane)	0.01	<0.1	ND	ND
Beta-BHC	0.03	<0.3	ND	ND
Heptachlor	0.01	<0.1	ND	ND
Delta-BHC	0.01	<0.1	ND	ND
Aldrin	0.01	<0.5	<0.05	ND
Heptachlor Epoxide	0.01	<0.5	<0.05	ND
Endosulfan I	0.01	<0.5	<0.05	ND
4,4'-DDE	0.01	<0.5	<0.05	ND
Dieldrin	0.01	<0.5	<0.05	ND
Endrin	0.01	<0.5	<0.05	ND
4,4'-DDD	0.01	<0.5	<0.05	ND
Endosulfan II	0.01	<0.5	<0.05	ND
4,4'-DDT	0.01	<0.5	<0.05	ND
Endrin Aldehyde	0.01	<0.5	<0.05	ND
Endosulfan Sulfate	0.01	<0.5	<0.05	ND
Methoxychlor	0.02	<1	<0.1	ND
Toxaphene	0.3	<3	ND	ND
Chlordane	0.1	<1	ND	ND
PCBs: Aroclor 1016	0.1	<1	ND	ND
Aroclor 1221	0.1	<1	ND	ND
Aroclor 1232	0.1	<1	ND	ND
Aroclor 1242	0.1	<1	ND	ND
Aroclor 1248	0.1	<1	ND	ND
Aroclor 1254	0.1	20.6	0.3	ND
Aroclor 1260	0.1	<1	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* Elevated MRLs because of matrix interferences

Approved by _____ Date 3-14-91

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Water

Date Received: 02/20/
Date Extracted: 02/22/
Date Analyzed: 02/28/
Work Order #: K9109

Organochlorine Pesticides and PCBs
EPA Methods 3510/8080
µg/L (ppb)

Sample Name:		LDW-1	LSEP
Lab Code:		K0908-3*	K0908-4
Analytes	MRL		
Alpha-BHC	0.04	<0.4	ND
Gamma-BHC (Lindane)	0.04	<0.4	ND
Beta-BHC	0.1	<1	ND
Heptachlor	0.04	<0.4	ND
Delta-BHC	0.04	<0.4	ND
Aldrin	0.04	<0.4	ND
Heptachlor Epoxide	0.04	<0.4	ND
Endosulfan I	0.04	<0.4	ND
4,4'-DDE	0.04	<0.4	ND
Dieldrin	0.04	<0.4	ND
Endrin	0.04	<0.4	ND
4,4'-DDD	0.04	<0.4	ND
Endosulfan II	0.04	<0.4	ND
4,4'-DDT	0.04	<0.4	ND
Endrin Aldehyde	0.04	<0.4	ND
Endosulfan Sulfate	0.04	<0.4	ND
Methoxychlor	0.1	<1	ND
Toxaphene	1	<10	ND
Chlordane	0.5	<5	ND
PCBs: Aroclor 1016	0.2	<2	ND
Aroclor 1221	0.2	<2	ND
Aroclor 1232	0.2	<2	ND
Aroclor 1242	0.2	<2	ND
Aroclor 1248	0.2	<2	ND
Aroclor 1254	0.2	<2	ND
Aroclor 1260	0.2	<2	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* Elevated MRLs because the sample required dilution.

MW 3-2

00

Approved by _____ Date 3-12-91

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine-SHA/#WD8023
Sample Matrix: Water

Date Received: 02/16/
Date Extracted: 02/22/
Date Analyzed: 02/28/
Work Order #: K9108

Organochlorine Pesticides and PCBs
EPA Methods 3510/8080
µg/L (ppb)

Sample Name:		LW-1
Lab Code:		K0844-4
Analytes	MRL	
Alpha-BHC	0.04	ND
Gamma-BHC (Lindane)	0.04	ND
Beta-BHC	0.1	ND
Heptachlor	0.04	ND
Delta-BHC	0.04	ND
Aldrin	0.04	ND
Heptachlor Epoxide	0.04	ND
Endosulfan I	0.04	ND
4,4'-DDE	0.04	ND
Dieldrin	0.04	ND
Endrin	0.04	ND
4,4'-DDD	0.04	ND
Endosulfan II	0.04	ND
4,4'-DDT	0.04	ND
Endrin Aldehyde	0.04	ND
Endosulfan Sulfate	0.04	ND
Methoxychlor	0.1	ND
Toxaphene	1	ND
Chlordane	0.5	ND
PCBs: Aroclor 1016	0.2	ND
Aroclor 1221	0.2	ND
Aroclor 1232	0.2	ND
Aroclor 1242	0.2	ND
Aroclor 1248	0.2	ND
Aroclor 1254	0.2	ND
Aroclor 1260	0.2	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by _____ Date 3-14-91

3-14-91

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02/20/
Date Extracted: 02/26/
Date Analyzed: 03/03/
Work Order #: K9109

Organochlorine Pesticides and PCBs
EPA Methods 3540/8080
mg/Kg (ppm)
Dry Weight Basis

	Sample Name:	LPS3
	Lab Code:	K0908-19
Analytes	MRL	
Alpha-BHC	0.01	ND
Gamma-BHC (Lindane)	0.01	ND
Beta-BHC	0.03	ND
Heptachlor	0.01	ND
Delta-BHC	0.01	ND
Aldrin	0.01	ND
Heptachlor Epoxide	0.01	ND
Endosulfan I	0.01	ND
4,4'-DDE	0.01	ND
Dieldrin	0.01	ND
Endrin	0.01	ND
4,4'-DDD	0.01	ND
Endosulfan II	0.01	ND
4,4'-DDT	0.01	ND
Endrin Aldehyde	0.01	ND
Endosulfan Sulfate	0.01	ND
Methoxychlor	0.02	ND
Toxaphene	0.3	ND
Chlordane	0.1	ND
PCBs: Aroclor 1016	0.1	ND
Aroclor 1221	0.1	ND
Aroclor 1232	0.1	ND
Aroclor 1242	0.1	ND
Aroclor 1248	0.1	ND
Aroclor 1254	0.1	ND
Aroclor 1260	0.1	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

MW 3-29

001

Approved by _____ Date _____

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02/2(
Date Extracted: 02/2
Date Analyzed: 03/0
Work Order #: K910

Organochlorine Pesticides and PCBs
EPA Methods 3540/8080
mg/Kg (ppm)
Dry Weight Basis

Sample Name: / Lab Code: / Analytes	MRL	LS11 K0908-16	LPS1 K0908-17	LPS2 K0908-1
Alpha-BHC	0.01	ND	ND	ND
Gamma-BHC (Lindane)	0.01	ND	ND	ND
Beta-BHC	0.03	ND	ND	ND
Heptachlor	0.01	ND	ND	ND
Delta-BHC	0.01	ND	ND	ND
Aldrin	0.01	ND	ND	ND
Heptachlor Epoxide	0.01	ND	ND	ND
Endosulfan I	0.01	ND	ND	ND
4,4'-DDE	0.01	ND	ND	ND
Dieldrin	0.01	ND	ND	ND
Endrin	0.01	ND	ND	ND
4,4'-DDD	0.01	ND	ND	ND
Endosulfan II	0.01	ND	ND	ND
4,4'-DDT	0.01	ND	ND	ND
Endrin Aldehyde	0.01	ND	ND	ND
Endosulfan Sulfate	0.01	ND	ND	ND
Methoxychlor	0.02	ND	ND	ND
Toxaphene	0.3	ND	ND	ND
Chlordane	0.1	ND	ND	ND
PCBs: Aroclor 1016	0.1	ND	ND	ND
Aroclor 1221	0.1	ND	ND	ND
Aroclor 1232	0.1	ND	ND	ND
Aroclor 1242	0.1	ND	ND	ND
Aroclor 1248	0.1	ND	ND	ND
Aroclor 1254	0.1	ND	ND	ND
Aroclor 1260	0.1	ND	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

MW 3-29-9

Approved by _____ Date 3-14-91

recycled paper

ecology and environment

0001

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine-SHA/#WD8023
Sample Matrix: Oil

Date Received: 02/
Date Extracted: 02/
Date Analyzed: 03/
Work Order #: K9

Acid/Base Neutral Semivolatile Organic Compounds
EPA Methods 3580/8270
mg/Kg (ppm)

Sample Name: LD-1
Lab Code: K0844-1

Analytes	MRL*	mg/Kg
N-Nitrosodimethylamine	300	ND
Aniline	300	ND
Bis(2-chloroethyl) Ether	300	ND
1,2-Dichlorobenzene	300	ND
1,3-Dichlorobenzene	300	ND
1,4-Dichlorobenzene	300	ND
Bis(2-chloroisopropyl) Ether	300	ND
N-Nitroso-di-n-propylamine	300	ND
Hexachloroethane	300	ND
Nitrobenzene	300	ND
Isophorone	300	ND
Bis(2-chloroethoxy)methane	300	ND
1,2,4-Trichlorobenzene	300	ND
Naphthalene	300	ND
4-Chloroaniline	300	ND
Hexachlorobutadiene	300	ND
2-Methylnaphthalene	300	ND
Hexachlorocyclopentadiene	300	ND
2-Chloronaphthalene	300	ND
2-Nitroaniline	2,000	ND
Dimethyl Phthalate	300	ND
Acenaphthylene	300	ND
3-Nitroaniline	2,000	ND
Acenaphthene	300	ND
Dibenzofuran	300	ND
2,4-Dinitrotoluene	300	ND
2,6-Dinitrotoluene	300	ND
Diethyl Phthalate	300	ND
4-Chlorophenyl Phenyl Ether	300	ND
Fluorene	300	ND
4-Nitroaniline	2,000	ND
N-Nitrosodiphenylamine	300	ND
4-Bromophenyl Phenyl Ether	300	ND
Hexachlorobenzene	300	ND

Analytes	MRL*
Phenanthrene	300
Anthracene	300
Dibutyl Phthalate	300
Fluoranthene	300
Pyrene	300
Butylbenzyl Phthalate	300
3,3'-Dichlorobenzidine	300
Benzo(a)anthracene	300
Bis(2-ethylhexyl) Phthalate	300
Chrysene	300
Di-n-octyl Phthalate	300
Benzo(b)fluoranthene	300
Benzo(k)fluoranthene	300
Benzo(a)pyrene	300
Indeno(1,2,3-c,d)pyrene	300
Dibenzo(a,h)anthracene	300
Benzo(g,h,i)perylene	300
Phenol	300
2-Chlorophenol	300
Benzyl Alcohol	300
2-Methylphenol	300
4-Methylphenol	300
2-Nitrophenol	300
2,4-Dimethylphenol	300
Benzoic Acid	2,000
2,4-Dichlorophenol	300
4-Chloro-3-methylphenol	300
2,4,6-Trichlorophenol	300
2,4,5-Trichlorophenol	300
2,4-Dinitrophenol	2,000
4-Nitrophenol	2,000
2-Methyl-4,6-dinitrophenol	2,000
Pentachlorophenol	2,000

MRL Method Reporting Limit
* Elevated MRLs because of matrix interferences.
ND None Detected at or above the method reporting limit

Approved by: Date 3-14-91

COLUMBIA ANALYTIC SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Water

Date Received: 02/20/91
Date Analyzed: 03/01/91
Work Order #: K910908

Volatile Organic Compounds
EPA Method 524.2
µg/L (ppb)

Sample Name: TB
Lab Code: K0908-5

Analytes	MRL	µg/L
Dichlorodifluoromethane (Freon 12)	0.1	ND
Chloromethane	0.1	ND
Vinyl Chloride	0.1	ND
Bromomethane	0.1	ND
Chloroethane	0.1	ND
Trichlorofluoromethane (Freon 11)	0.1	ND
1,1-Dichloroethene	0.1	ND
Methylene Chloride	3	ND
trans-1,2-Dichloroethene	0.1	ND
2,2-Dichloropropane	0.1	ND
cis-1,2-Dichloroethene	0.1	ND
1,1-Dichloroethane	0.1	ND
Chloroform	0.1	ND
Bromochloromethane	0.1	ND
1,1,1-Trichloroethane (TCA)	0.1	ND
1,1-Dichloropropene	0.1	ND
Carbon Tetrachloride	0.1	ND
Benzene	0.1	ND
1,2-Dichloroethane	0.1	ND
Trichloroethene (TCE)	0.1	ND
1,2-Dichloropropane	0.1	ND
Bromodichloromethane	0.1	ND
Dibromomethane	0.1	ND
cis-1,3-Dichloropropene	0.1	ND
Toluene	0.3	ND
trans-1,3-Dichloropropene	0.1	ND
1,1,2-Trichloroethane	0.1	ND
Tetrachloroethene (PCE)	0.1	ND
1,3-Dichloropropane	0.1	ND

Analytes	MR
Dibromochloromethane	0.
1,2-Dibromoethane (EDB)	0.
Chlorobenzene	0.
Ethylbenzene	0.
1,1,1,2-Tetrachloroethane	0.
Styrene	0.
Total Xylenes	0.
Bromoform	0.
Isopropylbenzene	0.
1,1,2,2-Tetrachloroethane	0.1
1,2,3-Trichloropropane	0.1
Bromobenzene	0.1
n-Propylbenzene	0.1
1,3,5-Trimethylbenzene	0.1
2-Chlorotoluene	0.1
4-Chlorotoluene	0.1
tert-Butylbenzene	0.1
1,2,4-Trimethylbenzene	0.1
sec-Butylbenzene	0.1
4-Isopropyltoluene	0.1
1,3-Dichlorobenzene	0.1
1,4-Dichlorobenzene	0.1
n-Butylbenzene	0.1
1,2-Dichlorobenzene	0.1
1,2-Dibromo-3-chloropropane (DBCP)	0.2
1,2,4-Trichlorobenzene	0.2
Hexachlorobutadiene	0.2
Naphthalene	0.2
1,2,3-Trichlorobenzene	0.2

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by _____ Date 3-14-91

TNN 00047

3-29-91

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine-SHA/#WD8023
Sample Matrix: Oil

Date Received: 02
Date Extracted: 02
Date Analyzed: 03
Work Order #: K9

Acid/Base Neutral Semivolatile Organic Compounds
EPA Methods 3580/8270
mg/Kg (ppm)

Sample Name: LD-3
Lab Code: K0844-3

Analytes	MRL*	mg/Kg
N-Nitrosodimethylamine	300	ND
Aniline	300	ND
Bis(2-chloroethyl) Ether	300	ND
1,2-Dichlorobenzene	300	ND
1,3-Dichlorobenzene	300	ND
1,4-Dichlorobenzene	300	ND
Bis(2-chloroisopropyl) Ether	300	ND
N-Nitroso-di-n-propylamine	300	ND
Hexachloroethane	300	ND
Nitrobenzene	300	ND
Isophorone	300	ND
Bis(2-chloroethoxy)methane	300	ND
1,2,4-Trichlorobenzene	300	ND
Naphthalene	300	ND
4-Chloroaniline	300	ND
Hexachlorobutadiene	300	ND
2-Methylnaphthalene	300	ND
Hexachlorocyclopentadiene	300	ND
2-Chloronaphthalene	300	ND
2-Nitroaniline	2,000	ND
Dimethyl Phthalate	300	ND
Acenaphthylene	300	ND
3-Nitroaniline	2,000	ND
Acenaphthene	300	ND
Dibenzofuran	300	ND
2,4-Dinitrotoluene	300	ND
2,6-Dinitrotoluene	300	ND
Diethyl Phthalate	300	ND
4-Chlorophenyl Phenyl Ether	300	ND
Fluorene	300	ND
4-Nitroaniline	2,000	ND
N-Nitrosodiphenylamine	300	ND
4-Bromophenyl Phenyl Ether	300	ND
Hexachlorobenzene	300	ND

Analytes	MRL*
Phenanthrene	300
Anthracene	300
Dibutyl Phthalate	300
Fluoranthene	300
Pyrene	300
Butylbenzyl Phthalate	300
3,3'-Dichlorobenzidine	300
Benzo(a)anthracene	300
Bis(2-ethylhexyl) Phthalate	300
Chrysene	300
Di-n-octyl Phthalate	300
Benzo(b)fluoranthene	300
Benzo(k)fluoranthene	300
Benzo(a)pyrene	300
Indeno(1,2,3-c,d)pyrene	300
Dibenzo(a,h)anthracene	300
Benzo(g,h,i)perylene	300
Phenol	300
2-Chlorophenol	300
Benzyl Alcohol	300
2-Methylphenol	300
4-Methylphenol	300
2-Nitrophenol	300
2,4-Dimethylphenol	300
Benzoic Acid	2,000
2,4-Dichlorophenol	300
4-Chloro-3-methylphenol	300
2,4,6-Trichlorophenol	300
2,4,5-Trichlorophenol	300
2,4-Dinitrophenol	2,000
4-Nitrophenol	2,000
2-Methyl-4,6-dinitrophenol	2,000
Pentachlorophenol	2,000

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* Elevated MRLs because of matrix interferences.

MM
3-29-91

Approved by _____ Date 3-29-91

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine-SHA/#WD8023
Sample Matrix: Oil

Date Received: 02
Date Extracted: 02
Date Analyzed: 03
Work Order #: K9

Acid/Base Neutral Semivolatile Organic Compounds
EPA Methods 3580/8270
mg/Kg (ppm)

Sample Name: LD-2
Lab Code: K0844-2

Analytes	MRL	mg/Kg
N-Nitrosodimethylamine	30	ND
Aniline	30	ND
Bis(2-chloroethyl) Ether	30	ND
1,2-Dichlorobenzene	30	ND
1,3-Dichlorobenzene	30	ND
1,4-Dichlorobenzene	30	ND
Bis(2-chloroisopropyl) Ether	30	ND
N-Nitroso-di-n-propylamine	30	ND
Hexachloroethane	30	ND
Nitrobenzene	30	ND
Isophorone	30	ND
Bis(2-chloroethoxy)methane	30	ND
1,2,4-Trichlorobenzene	30	ND
Naphthalene	30	ND
4-Chloroaniline	30	ND
Hexachlorobutadiene	30	ND
2-Methylnaphthalene	30	ND
Hexachlorocyclopentadiene	30	ND
2-Chloronaphthalene	30	ND
2-Nitroaniline	200	ND
Dimethyl Phthalate	30	ND
Acenaphthylene	30	ND
3-Nitroaniline	200	ND
Acenaphthene	30	ND
Dibenzofuran	30	ND
2,4-Dinitrotoluene	30	ND
2,6-Dinitrotoluene	30	ND
Diethyl Phthalate	30	ND
4-Chlorophenyl Phenyl Ether	30	ND
Fluorene	30	ND
4-Nitroaniline	200	ND
N-Nitrosodiphenylamine	30	ND
4-Bromophenyl Phenyl Ether	30	ND
Hexachlorobenzene	30	ND

Analytes	MRL
Phenanthrene	30
Anthracene	30
Dibutyl Phthalate	30
Fluoranthene	30
Pyrene	30
Butylbenzyl Phthalate	30
3,3'-Dichlorobenzidine	30
Benzo(a)anthracene	30
Bis(2-ethylhexyl) Phthalate	30
Chrysene	30
Di-n-octyl Phthalate	30
Benzo(b)fluoranthene	30
Benzo(k)fluoranthene	30
Benzo(a)pyrene	30
Indeno(1,2,3-c,d)pyrene	30
Dibenzo(a,h)anthracene	30
Benzo(g,h,i)perylene	30
Phenol	30
2-Chlorophenol	30
Benzyl Alcohol	30
2-Methylphenol	30
4-Methylphenol	30
2-Nitrophenol	30
2,4-Dimethylphenol	30
Benzoic Acid	200
2,4-Dichlorophenol	30
4-Chloro-3-methylphenol	30
2,4,6-Trichlorophenol	30
2,4,5-Trichlorophenol	30
2,4-Dinitrophenol	200
4-Nitrophenol	200
2-Methyl-4,6-dinitrophenol	200
Pentachlorophenol	200

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by _____ Date 3-14-91

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Ecology & Environment	Date Received:	02/15/
Submitted By:	Bob Duffner	Date Extracted:	02/21/
Project:	E & E Landsburg Mine-SHA/#WD8023	Date Analyzed:	02/28/
Sample Matrix:	Oil	Work Order #:	K9108

Organochlorine Pesticides and PCBs
EPA Methods 3550/8080
mg/Kg (ppm)

	Sample Name:	LD-1	LD-2	LD-3
	Lab Code:	K0844-1	K0844-2*	K0844-3*
Analytes	MRL			
Alpha-BHC	0.2	ND	<100	<0.9
Gamma-BHC (Lindane)	0.2	ND	<100	<0.9
Beta-BHC	0.6	ND	<100	<0.9
Heptachlor	0.2	ND	<100	<0.9
Delta-BHC	0.2	ND	<100	<0.9
Aldrin	0.2	ND	<100	<0.9
Heptachlor Epoxide	0.2	ND	<100	<0.9
Endosulfan I	0.2	ND	<100	<0.9
4,4'-DDE	0.2	ND	<100	ND
Dieldrin	0.2	ND	<100	ND
Endrin	0.2	ND	<20	ND
4,4'-DDD	0.2	ND	<20	ND
Endosulfan II	0.2	ND	<20	ND
4,4'-DDT	0.2	ND	<20	ND
Endrin Aldehyde	0.2	ND	<20	ND
Endosulfan Sulfate	0.2	ND	<20	ND
Methoxychlor	0.4	ND	<20	ND
Toxaphene	2	ND	<200	ND
Chlordane	1	ND	<100	ND
PCBs: Aroclor 1016	1	ND	<100	ND
Aroclor 1221	1	ND	<100	ND
Aroclor 1232	1	ND	<100	ND
Aroclor 1242	1	ND	7,960	21
Aroclor 1248	1	ND	<100	ND
Aroclor 1254	1	ND	<100	ND
Aroclor 1260	1	ND	<100	ND

MRL Method Reporting Limit
* Elevated MRLs because of matrix interferences.
ND None Detected at or above the method reporting limit

3-29-91

Approved by _____ Date 3-14-91

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02/2
Date Extracted: 02/2
Date Analyzed: 03/0
Work Order #: K91

Acid/Base Neutral Semivolatile Organic Compounds
EPA Methods 3540/8270
mg/Kg (ppm)
Dry Weight Basis

Sample Name: LPS3
Lab Code: K0908-19

Analytes	MRL*	mg/Kg
N-Nitrosodimethylamine	0.4	ND
Aniline	0.4	ND
Bis(2-chloroethyl) Ether	0.4	ND
1,2-Dichlorobenzene	0.4	ND
1,3-Dichlorobenzene	0.4	ND
1,4-Dichlorobenzene	0.4	ND
Bis(2-chloroisopropyl) Ether	0.4	ND
N-Nitroso-di-n-propylamine	0.4	ND
Hexachloroethane	0.4	ND
Nitrobenzene	0.4	ND
Isophorone	0.4	ND
Bis(2-chloroethoxy)methane	0.4	ND
1,2,4-Trichlorobenzene	0.4	ND
Naphthalene	0.4	ND
4-Chloroaniline	0.4	ND
Hexachlorobutadiene	0.4	ND
2-Methylnaphthalene	0.4	ND
Hexachlorocyclopentadiene	0.4	ND
2-Chloronaphthalene	0.4	ND
2-Nitroaniline	3	ND
Dimethyl Phthalate	0.4	ND
Acenaphthylene	0.4	ND
3-Nitroaniline	3	ND
Acenaphthene	0.4	ND
Dibenzofuran	0.4	ND
2,4-Dinitrotoluene	0.4	ND
2,6-Dinitrotoluene	0.4	ND
Diethyl Phthalate	0.4	ND
4-Chlorophenyl Phenyl Ether	0.4	ND
Fluorene	0.4	ND
4-Nitroaniline	3	ND
N-Nitrosodiphenylamine	0.4	ND
4-Bromophenyl Phenyl Ether	0.4	ND
Hexachlorobenzene	0.4	ND

Analytes	*MRL
Phenanthrene	0.4
Anthracene	0.4
Dibutyl Phthalate	0.4
Fluoranthene	0.4
Pyrene	0.4
Butylbenzyl Phthalate	0.4
3,3'-Dichlorobenzidine	0.4
Benzo(a)anthracene	0.4
Bis(2-ethylhexyl) Phthalate	0.4
Chrysene	0.4
Di-n-octyl Phthalate	0.4
Benzo(b)fluoranthene	0.4
Benzo(k)fluoranthene	0.4
Benzo(a)pyrene	0.4
Indeno(1,2,3-c,d)pyrene	0.4
Dibenzo(a,h)anthracene	0.4
Benzo(g,h,i)perylene	0.4
Phenol	0.4
2-Chlorophenol	0.4
Benzyl Alcohol	0.4
2-Methylphenol	0.4
4-Methylphenol	0.4
2-Nitrophenol	0.4
2,4-Dimethylphenol	0.4
Benzoic Acid	3
2,4-Dichlorophenol	0.4
4-Chloro-3-methylphenol	0.4
2,4,6-Trichlorophenol	0.4
2,4,5-Trichlorophenol	0.4
2,4-Dinitrophenol	3
4-Nitrophenol	3
2-Methyl-4,6-dinitrophenol	3
Pentachlorophenol	3

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* Elevated MRLs because of the low percent solids in the sample as received

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02
Date Extracted: 02
Date Analyzed: 03
Work Order #: K9

Acid/Base Neutral Semivolatile Organic Compounds
EPA Methods 3540/8270
mg/Kg (ppm)
Dry Weight Basis

Sample Name: LPS2
Lab Code: K0908-18

Analytes	MRL*	mg/Kg
N-Nitrosodimethylamine	0.4	ND
Aniline	0.4	ND
Bis(2-chloroethyl) Ether	0.4	ND
1,2-Dichlorobenzene	0.4	ND
1,3-Dichlorobenzene	0.4	ND
1,4-Dichlorobenzene	0.4	ND
Bis(2-chloroisopropyl) Ether	0.4	ND
N-Nitroso-di-n-propylamine	0.4	ND
Hexachloroethane	0.4	ND
Nitrobenzene	0.4	ND
Isophorone	0.4	ND
Bis(2-chloroethoxy)methane	0.4	ND
1,2,4-Trichlorobenzene	0.4	ND
Naphthalene	0.4	ND
4-Chloroaniline	0.4	ND
Hexachlorobutadiene	0.4	ND
2-Methylnaphthalene	0.4	ND
Hexachlorocyclopentadiene	0.4	ND
2-Chloronaphthalene	0.4	ND
2-Nitroaniline	2	ND
Dimethyl Phthalate	0.4	ND
Acenaphthylene	0.4	ND
3-Nitroaniline	2	ND
Acenaphthene	0.4	ND
Dibenzofuran	0.4	ND
2,4-Dinitrotoluene	0.4	ND
2,6-Dinitrotoluene	0.4	ND
Diethyl Phthalate	0.4	ND
4-Chlorophenyl Phenyl Ether	0.4	ND
Fluorene	0.4	ND
4-Nitroaniline	2	ND
N-Nitrosodiphenylamine	0.4	ND
4-Bromophenyl Phenyl Ether	0.4	ND
Hexachlorobenzene	0.4	ND

Analytes	*MRL
Phenanthrene	0.4
Anthracene	0.4
Dibutyl Phthalate	0.4
Fluoranthene	0.4
Pyrene	0.4
Butylbenzyl Phthalate	0.4
3,3'-Dichlorobenzidine	0.4
Benzo(a)anthracene	0.4
Bis(2-ethylhexyl) Phthalate	0.4
Chrysene	0.4
Di-n-octyl Phthalate	0.4
Benzo(b)fluoranthene	0.4
Benzo(k)fluoranthene	0.4
Benzo(a)pyrene	0.4
Indeno(1,2,3-c,d)pyrene	0.4
Dibenzo(a,h)anthracene	0.4
Benzo(g,h,i)perylene	0.4
Phenol	0.4
2-Chlorophenol	0.4
Benzyl Alcohol	0.4
2-Methylphenol	0.4
4-Methylphenol	0.4
2-Nitrophenol	0.4
2,4-Dimethylphenol	0.4
Benzoic Acid	2
2,4-Dichlorophenol	0.4
4-Chloro-3-methylphenol	0.4
2,4,6-Trichlorophenol	0.4
2,4,5-Trichlorophenol	0.4
2,4-Dinitrophenol	2
4-Nitrophenol	2
2-Methyl-4,6-dinitrophenol	2
Pentachlorophenol	2

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* Elevated MRLs because of the low percent solids in the sample as received

Approved by: _____ Date: 3-10-91

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 0
Date Extracted: 0
Date Analyzed: 0
Work Order #: K

Acid/Base Neutral Semivolatile Organic Compounds
EPA Methods 3540/8270
mg/Kg (ppm)
Dry Weight Basis

Sample Name: LPS1
Lab Code: K0908-17

Analytes	MRL*	mg/Kg
N-Nitrosodimethylamine	0.4	ND
Aniline	0.4	ND
Bis(2-chloroethyl) Ether	0.4	ND
1,2-Dichlorobenzene	0.4	ND
1,3-Dichlorobenzene	0.4	ND
1,4-Dichlorobenzene	0.4	ND
Bis(2-chloroisopropyl) Ether	0.4	ND
N-Nitroso-di-n-propylamine	0.4	ND
Hexachloroethane	0.4	ND
Nitrobenzene	0.4	ND
Isophorone	0.4	ND
Bis(2-chloroethoxy)methane	0.4	ND
1,2,4-Trichlorobenzene	0.4	ND
Naphthalene	0.4	ND
4-Chloroaniline	0.4	ND
Hexachlorobutadiene	0.4	ND
2-Methylnaphthalene	0.4	ND
Hexachlorocyclopentadiene	0.4	ND
2-Chloronaphthalene	0.4	ND
2-Nitroaniline	3	ND
Dimethyl Phthalate	0.4	ND
Acenaphthylene	0.4	ND
3-Nitroaniline	3	ND
Acenaphthene	0.4	ND
Dibenzofuran	0.4	ND
2,4-Dinitrotoluene	0.4	ND
2,6-Dinitrotoluene	0.4	ND
Diethyl Phthalate	0.4	ND
4-Chlorophenyl Phenyl Ether	0.4	ND
Fluorene	0.4	ND
4-Nitroaniline	3	ND
N-Nitrosodiphenylamine	0.4	ND
4-Bromophenyl Phenyl Ether	0.4	ND
Hexachlorobenzene	0.4	ND

Analytes	*MRL
Phenanthrene	0.4
Anthracene	0.4
Dibutyl Phthalate	0.4
Fluoranthene	0.4
Pyrene	0.4
Butylbenzyl Phthalate	0.4
3,3'-Dichlorobenzidine	0.4
Benzo(a)anthracene	0.4
Bis(2-ethylhexyl) Phthalate	0.4
Chrysene	0.4
Di-n-octyl Phthalate	0.4
Benzo(b)fluoranthene	0.4
Benzo(k)fluoranthene	0.4
Benzo(a)pyrene	0.4
Indeno(1,2,3-c,d)pyrene	0.4
Dibenzo(a,h)anthracene	0.4
Benzo(g,h,i)perylene	0.4
Phenol	0.4
2-Chlorophenol	0.4
Benzyl Alcohol	0.4
2-Methylphenol	0.4
4-Methylphenol	0.4
2-Nitrophenol	0.4
2,4-Dimethylphenol	0.4
Benzoic Acid	3
2,4-Dichlorophenol	0.4
4-Chloro-3-methylphenol	0.4
2,4,6-Trichlorophenol	0.4
2,4,5-Trichlorophenol	0.4
2,4-Dinitrophenol	3
4-Nitrophenol	3
2-Methyl-4,6-dinitrophenol	3
Pentachlorophenol	3

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* Elevated MRLs because of the low percent solids in the sample as received

Approved by

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02.
Date Extracted: 02.
Date Analyzed: 03.
Work Order #: K9

Acid/Base Neutral Semivolatile Organic Compounds
EPA Methods 3540/8270
mg/Kg (ppm)
Dry Weight Basis

Sample Name: LS11
Lab Code: K0908-16

Analytes	MRL*	mg/Kg
N-Nitrosodimethylamine	0.4	ND
Aniline	0.4	ND
Bis(2-chloroethyl) Ether	0.4	ND
1,2-Dichlorobenzene	0.4	ND
1,3-Dichlorobenzene	0.4	ND
1,4-Dichlorobenzene	0.4	ND
Bis(2-chloroisopropyl) Ether	0.4	ND
N-Nitroso-di-n-propylamine	0.4	ND
Hexachloroethane	0.4	ND
Nitrobenzene	0.4	ND
Isophorone	0.4	ND
Bis(2-chloroethoxy)methane	0.4	ND
1,2,4-Trichlorobenzene	0.4	ND
Naphthalene	0.4	ND
4-Chloroaniline	0.4	ND
Hexachlorobutadiene	0.4	ND
2-Methylnaphthalene	0.4	ND
Hexachlorocyclopentadiene	0.4	ND
2-Chloronaphthalene	0.4	ND
2-Nitroaniline	2	ND
Dimethyl Phthalate	0.4	ND
Acenaphthylene	0.4	ND
3-Nitroaniline	2	ND
Acenaphthene	0.4	ND
Dibenzofuran	0.4	ND
2,4-Dinitrotoluene	0.4	ND
2,6-Dinitrotoluene	0.4	ND
Diethyl Phthalate	0.4	ND
4-Chlorophenyl Phenyl Ether	0.4	ND
Fluorene	0.4	ND
4-Nitroaniline	2	ND
N-Nitrosodiphenylamine	0.4	ND
4-Bromophenyl Phenyl Ether	0.4	ND
Hexachlorobenzene	0.4	ND

Analytes	*MRL
Phenanthrene	0.4
Anthracene	0.4
Dibutyl Phthalate	0.4
Fluoranthene	0.4
Pyrene	0.4
Butylbenzyl Phthalate	0.4
3,3'-Dichlorobenzidine	0.4
Benzo(a)anthracene	0.4
Bis(2-ethylhexyl) Phthalate	0.4
Chrysene	0.4
Di-n-octyl Phthalate	0.4
Benzo(b)fluoranthene	0.4
Benzo(k)fluoranthene	0.4
Benzo(a)pyrene	0.4
Indeno(1,2,3-c,d)pyrene	0.4
Dibenzo(a,h)anthracene	0.4
Benzo(g,h,i)perylene	0.4
Phenol	0.4
2-Chlorophenol	0.4
Benzyl Alcohol	0.4
2-Methylphenol	0.4
4-Methylphenol	0.4
2-Nitrophenol	0.4
2,4-Dimethylphenol	0.4
Benzoic Acid	2
2,4-Dichlorophenol	0.4
4-Chloro-3-methylphenol	0.4
2,4,6-Trichlorophenol	0.4
2,4,5-Trichlorophenol	0.4
2,4-Dinitrophenol	2
4-Nitrophenol	2
2-Methyl-4,6-dinitrophenol	2
Pentachlorophenol	2

MRL Method Reporting Limit
ND None Detected at,or above the method reporting limit
* Elevated MRLs because of the low percent solids in the sample as received

0003

Approved by [signature] Date 3-14-91

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02/
Date Extracted: 02/
Date Analyzed: 03/
Work Order #: K91

Acid/Base Neutral Semivolatile Organic Compounds
EPA Methods 3540/8270
mg/Kg (ppm)
Dry Weight Basis

Sample Name: LS10
Lab Code: K0908-15

Analytes	MRL*	mg/Kg
N-Nitrosodimethylamine	0.4	ND
Aniline	0.4	ND
Bis(2-chloroethyl) Ether	0.4	ND
1,2-Dichlorobenzene	0.4	ND
1,3-Dichlorobenzene	0.4	ND
1,4-Dichlorobenzene	0.4	ND
Bis(2-chloroisopropyl) Ether	0.4	ND
N-Nitroso-di-n-propylamine	0.4	ND
Hexachloroethane	0.4	ND
Nitrobenzene	0.4	ND
Isophorone	0.4	ND
Bis(2-chloroethoxy)methane	0.4	ND
1,2,4-Trichlorobenzene	0.4	ND
Naphthalene	0.4	ND
4-Chloroaniline	0.4	ND
Hexachlorobutadiene	0.4	ND
2-Methylnaphthalene	0.4	ND
Hexachlorocyclopentadiene	0.4	ND
2-Chloronaphthalene	0.4	ND
2-Nitroaniline	3	ND
Dimethyl Phthalate	0.4	ND
Acenaphthylene	0.4	ND
3-Nitroaniline	3	ND
Acenaphthene	0.4	ND
Dibenzofuran	0.4	ND
2,4-Dinitrotoluene	0.4	ND
2,6-Dinitrotoluene	0.4	ND
Diethyl Phthalate	0.4	ND
4-Chlorophenyl Phenyl Ether	0.4	ND
Fluorene	0.4	ND
4-Nitroaniline	3	ND
N-Nitrosodiphenylamine	0.4	ND
4-Bromophenyl Phenyl Ether	0.4	ND
Hexachlorobenzene	0.4	ND

Analytes	*MRL
Phenanthrene	0.4
Anthracene	0.4
Dibutyl Phthalate	0.4
Fluoranthene	0.4
Pyrene	0.4
Butylbenzyl Phthalate	0.4
3,3'-Dichlorobenzidine	0.4
Benzo(a)anthracene	0.4
Bis(2-ethylhexyl) Phthalate	0.4
Chrysene	0.4
Di-n-octyl Phthalate	0.4
Benzo(b)fluoranthene	0.4
Benzo(k)fluoranthene	0.4
Benzo(a)pyrene	0.4
Indeno(1,2,3-c,d)pyrene	0.4
Dibenzo(a,h)anthracene	0.4
Benzo(g,h,i)perylene	0.4
Phenol	0.4
2-Chlorophenol	0.4
Benzyl Alcohol	0.4
2-Methylphenol	0.4
4-Methylphenol	0.4
2-Nitrophenol	0.4
2,4-Dimethylphenol	0.4
Benzoic Acid	3
2,4-Dichlorophenol	0.4
4-Chloro-3-methylphenol	0.4
2,4,6-Trichlorophenol	0.4
2,4,5-Trichlorophenol	0.4
2,4-Dinitrophenol	3
4-Nitrophenol	3
2-Methyl-4,6-dinitrophenol	3
Pentachlorophenol	3

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* Elevated MRLs because of the low percent solids in the sample as received

Approved by

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02
Date Extracted: 02
Date Analyzed: 03
Work Order #: K9

Acid/Base Neutral Semivolatile Organic Compounds
EPA Methods 3540/8270
mg/Kg (ppm)
Dry Weight Basis

Sample Name: LS9
Lab Code: K0908-14

Analytes	MRL	mg/Kg
N-Nitrosodimethylamine	0.3	ND
Aniline	0.3	ND
Bis(2-chloroethyl) Ether	0.3	ND
1,2-Dichlorobenzene	0.3	ND
1,3-Dichlorobenzene	0.3	ND
1,4-Dichlorobenzene	0.3	ND
Bis(2-chloroisopropyl) Ether	0.3	ND
N-Nitroso-di-n-propylamine	0.3	ND
Hexachloroethane	0.3	ND
Nitrobenzene	0.3	ND
Isophorone	0.3	ND
Bis(2-chloroethoxy)methane	0.3	ND
1,2,4-Trichlorobenzene	0.3	ND
Naphthalene	0.3	ND
4-Chloroaniline	0.3	ND
Hexachlorobutadiene	0.3	ND
2-Methylnaphthalene	0.3	ND
Hexachlorocyclopentadiene	0.3	ND
2-Chloronaphthalene	0.3	ND
2-Nitroaniline	2	ND
Dimethyl Phthalate	0.3	ND
Acenaphthylene	0.3	ND
3-Nitroaniline	2	ND
Acenaphthene	0.3	ND
Dibenzofuran	0.3	ND
2,4-Dinitrotoluene	0.3	ND
2,6-Dinitrotoluene	0.3	ND
Diethyl Phthalate	0.3	ND
4-Chlorophenyl Phenyl Ether	0.3	ND
Fluorene	0.3	ND
4-Nitroaniline	2	ND
N-Nitrosodiphenylamine	0.3	ND
4-Bromophenyl Phenyl Ether	0.3	ND
Hexachlorobenzene	0.3	ND

Analytes	MRL
Phenanthrene	0.3
Anthracene	0.3
Dibutyl Phthalate	0.3
Fluoranthene	0.3
Pyrene	0.3
Butylbenzyl Phthalate	0.3
3,3'-Dichlorobenzidine	0.3
Benzo(a)anthracene	[illegible]
Bis(2-ethylhexyl) Phthalate	0.3
Chrysene	0.3
Di-n-octyl Phthalate	0.3
Benzo(b)fluoranthene	0.3
Benzo(k)fluoranthene	0.3
Benzo(a)pyrene	0.3
Indeno(1,2,3-c,d)pyrene	0.3
Dibenzo(a,h)anthracene	0.3
Benzo(g,h,i)perylene	0.3
Phenol	0.3
2-Chlorophenol	0.3
Benzyl Alcohol	0.3
2-Methylphenol	0.3
4-Methylphenol	0.3
2-Nitrophenol	0.3
2,4-Dimethylphenol	0.3
Benzoic Acid	2
2,4-Dichlorophenol	0.3
4-Chloro-3-methylphenol	0.3
2,4,6-Trichlorophenol	0.3
2,4,5-Trichlorophenol	0.3
2,4-Dinitrophenol	2
4-Nitrophenol	2
2-Methyl-4,6-dinitrophenol	2
Pentachlorophenol	2

MRL None Detected at or above the method reporting limit
ND Method Reporting Limit

Approved by

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02/
Date Extracted: 02/
Date Analyzed: 03/
Work Order #: K91

Acid/Base Neutral Semivolatile Organic Compounds
EPA Methods 3540/8270
mg/Kg (ppm)
Dry Weight Basis

Sample Name: LS8
Lab Code: K0908-13

Analytes	MRL*	mg/Kg
N-Nitrosodimethylamine	5	ND
Aniline	5	ND
Bis(2-chloroethyl) Ether	5	ND
1,2-Dichlorobenzene	5	ND
1,3-Dichlorobenzene	5	ND
1,4-Dichlorobenzene	5	ND
Bis(2-chloroisopropyl) Ether	5	ND
N-Nitroso-di-n-propylamine	5	ND
Hexachloroethane	5	ND
Nitrobenzene	5	ND
Isophorone	5	ND
Bis(2-chloroethoxy)methane	5	ND
1,2,4-Trichlorobenzene	5	ND
Naphthalene	5	ND
4-Chloroaniline	5	ND
Hexachlorobutadiene	5	ND
2-Methylnaphthalene	5	ND
Hexachlorocyclopentadiene	5	ND
2-Chloronaphthalene	5	ND
2-Nitroaniline	30	ND
Dimethyl Phthalate	5	23
Acenaphthylene	5	ND
3-Nitroaniline	30	ND
Acenaphthene	5	ND
Dibenzofuran	5	ND
2,4-Dinitrotoluene	5	ND
2,6-Dinitrotoluene	5	ND
Diethyl Phthalate	5	ND
4-Chlorophenyl Phenyl Ether	5	ND
Fluorene	5	ND
4-Nitroaniline	30	ND
N-Nitrosodiphenylamine	5	ND
4-Bromophenyl Phenyl Ether	5	ND
Hexachlorobenzene	5	ND

Analytes	MRL*
Phenanthrene	5
Anthracene	5
Dibutyl Phthalate	5
Fluoranthene	5
Pyrene	5
Butylbenzyl Phthalate	5
3,3'-Dichlorobenzidine	5
Benzo(a)anthracene	5
Bis(2-ethylhexyl) Phthalate	5
Chrysene	5
Di-n-octyl Phthalate	5
Benzo(b)fluoranthene	5
Benzo(k)fluoranthene	5
Benzo(a)pyrene	5
Indeno(1,2,3-c,d)pyrene	5
Dibenzo(a,h)anthracene	5
Benzo(g,h,i)perylene	5
Phenol	5
2-Chlorophenol	5
Benzyl Alcohol	5
2-Methylphenol	5
4-Methylphenol	5
2-Nitrophenol	5
2,4-Dimethylphenol	5
Benzoic Acid	30
2,4-Dichlorophenol	5
4-Chloro-3-methylphenol	5
2,4,6-Trichlorophenol	5
2,4,5-Trichlorophenol	5
2,4-Dinitrophenol	30
4-Nitrophenol	30
2-Methyl-4,6-dinitrophenol	30
Pentachlorophenol	30

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* Elevated MRLs because of the low percent solids in the sample as received and because of m interferences.

00

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02/
Date Extracted: 02/
Date Analyzed: 03/
Work Order #: K9

Acid/Base Neutral Semivolatile Organic Compounds
EPA Methods 3540/8270
mg/Kg (ppm)
Dry Weight Basis

Sample Name: LS7
Lab Code: K0908-12

Analytes	MRL	mg/Kg
N-Nitrosodimethylamine	0.3	ND
Aniline	0.3	ND
Bis(2-chloroethyl) Ether	0.3	ND
1,2-Dichlorobenzene	0.3	ND
1,3-Dichlorobenzene	0.3	ND
1,4-Dichlorobenzene	0.3	ND
Bis(2-chloroisopropyl) Ether	0.3	ND
N-Nitroso-di-n-propylamine	0.3	ND
Hexachloroethane	0.3	ND
Nitrobenzene	0.3	ND
Isophorone	0.3	ND
Bis(2-chloroethoxy)methane	0.3	ND
1,2,4-Trichlorobenzene	0.3	ND
Naphthalene	0.3	ND
4-Chloroaniline	0.3	ND
Hexachlorobutadiene	0.3	ND
2-Methylnaphthalene	0.3	ND
Hexachlorocyclopentadiene	0.3	ND
2-Chloronaphthalene	0.3	ND
2-Nitroaniline	2	ND
Dimethyl Phthalate	0.3	ND
Acenaphthylene	0.3	ND
3-Nitroaniline	2	ND
Acenaphthene	0.3	ND
Dibenzofuran	0.3	ND
2,4-Dinitrotoluene	0.3	ND
2,6-Dinitrotoluene	0.3	ND
Diethyl Phthalate	0.3	ND
4-Chlorophenyl Phenyl Ether	0.3	ND
Fluorene	0.3	ND
4-Nitroaniline	2	ND
N-Nitrosodiphenylamine	0.3	ND
4-Bromophenyl Phenyl Ether	0.3	ND
Hexachlorobenzene	0.3	ND

Analytes	MRL
Phenanthrene	0.3
Anthracene	0.3
Dibutyl Phthalate	0.3
Fluoranthene	0.3
Pyrene	0.3
Butylbenzyl Phthalate	0.3
3,3'-Dichlorobenzidine	0.3
Benzo(a)anthracene	0.3
Bis(2-ethylhexyl) Phthalate	0.3
Chrysene	0.3
Di-n-octyl Phthalate	0.3
Benzo(b)fluoranthene	0.3
Benzo(k)fluoranthene	0.3
Benzo(a)pyrene	0.3
Indeno(1,2,3-c,d)pyrene	0.3
Dibenzo(a,h)anthracene	0.3
Benzo(g,h,i)perylene	0.3
Phenol	0.3
2-Chlorophenol	0.3
Benzyl Alcohol	0.3
2-Methylphenol	0.3
4-Methylphenol	0.3
2-Nitrophenol	0.3
2,4-Dimethylphenol	0.3
Benzoic Acid	2
2,4-Dichlorophenol	0.3
4-Chloro-3-methylphenol	0.3
2,4,6-Trichlorophenol	0.3
2,4,5-Trichlorophenol	0.3
2,4-Dinitrophenol	2
4-Nitrophenol	2
2-Methyl-4,6-dinitrophenol	2
Pentachlorophenol	2

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by 3-29-91

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02/2
Date Extracted: 02/2
Date Analyzed: 03/0
Work Order #: K91(

Acid/Base Neutral Semivolatile Organic Compounds
EPA Methods 3540/8270
mg/Kg (ppm)
Dry Weight Basis

Sample Name: LS6
Lab Code: K0908-11

Analytes	MRL*	mg/Kg
N-Nitrosodimethylamine	0.4	ND
Aniline	0.4	ND
Bis(2-chloroethyl) Ether	0.4	ND
1,2-Dichlorobenzene	0.4	ND
1,3-Dichlorobenzene	0.4	ND
1,4-Dichlorobenzene	0.4	ND
Bis(2-chloroisopropyl) Ether	0.4	ND
N-Nitroso-di-n-propylamine	0.4	ND
Hexachloroethane	0.4	ND
Nitrobenzene	0.4	ND
Isophorone	0.4	ND
Bis(2-chloroethoxy)methane	0.4	ND
1,2,4-Trichlorobenzene	0.4	ND
Naphthalene	0.4	ND
4-Chloroaniline	0.4	ND
Hexachlorobutadiene	0.4	ND
2-Methylnaphthalene	0.4	ND
Hexachlorocyclopentadiene	0.4	ND
2-Chloronaphthalene	0.4	ND
2-Nitroaniline	2	ND
Dimethyl Phthalate	0.4	ND
Acenaphthylene	0.4	ND
3-Nitroaniline	2	ND
Acenaphthene	0.4	ND
Dibenzofuran	0.4	ND
2,4-Dinitrotoluene	0.4	ND
2,6-Dinitrotoluene	0.4	ND
Diethyl Phthalate	0.4	ND
4-Chlorophenyl Phenyl Ether	0.4	ND
Fluorene	0.4	ND
4-Nitroaniline	2	ND
N-Nitrosodiphenylamine	0.4	ND
4-Bromophenyl Phenyl Ether	0.4	ND
Hexachlorobenzene	0.4	ND

Analytes	*MRL
Phenanthrene	0.4
Anthracene	0.4
Dibutyl Phthalate	0.4
Fluoranthene	0.4
Pyrene	0.4
Butylbenzyl Phthalate	0.4
3,3'-Dichlorobenzidine	0.4
Benzo(a)anthracene	0.4
Bis(2-ethylhexyl) Phthalate	0.4
Chrysene	0.4
Di-n-octyl Phthalate	0.4
Benzo(b)fluoranthene	0.4
Benzo(k)fluoranthene	0.4
Benzo(a)pyrene	0.4
Indeno(1,2,3-c,d)pyrene	0.4
Dibenzo(a,h)anthracene	0.4
Benzo(g,h,i)perylene	0.4
Phenol	0.4
2-Chlorophenol	0.4
Benzyl Alcohol	0.4
2-Methylphenol	0.4
4-Methylphenol	0.4
2-Nitrophenol	0.4
2,4-Dimethylphenol	0.4
Benzoic Acid	2
2,4-Dichlorophenol	0.4
4-Chloro-3-methylphenol	0.4
2,4,6-Trichlorophenol	0.4
2,4,5-Trichlorophenol	0.4
2,4-Dinitrophenol	2
4-Nitrophenol	2
2-Methyl-4,6-dinitrophenol	2
Pentachlorophenol	2

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* Elevated MRLs because of the low percent solids in the sample as received

000

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02
Date Extracted: 02
Date Analyzed: 03
Work Order #: K9

Acid/Base Neutral Semivolatile Organic Compounds
EPA Methods 3540/8270
mg/Kg (ppm)
Dry Weight Basis

Sample Name: LS5
Lab Code: K0908-10

Analytes	MRL	mg/Kg
N-Nitrosodimethylamine	0.3	ND
Aniline	0.3	ND
Bis(2-chloroethyl) Ether	0.3	ND
1,2-Dichlorobenzene	0.3	ND
1,3-Dichlorobenzene	0.3	ND
1,4-Dichlorobenzene	0.3	ND
Bis(2-chloroisopropyl) Ether	0.3	ND
N-Nitroso-di-n-propylamine	0.3	ND
Hexachloroethane	0.3	ND
Nitrobenzene	0.3	ND
Isophorone	0.3	ND
Bis(2-chloroethoxy)methane	0.3	ND
1,2,4-Trichlorobenzene	0.3	ND
Naphthalene	0.3	ND
4-Chloroaniline	0.3	ND
Hexachlorobutadiene	0.3	ND
2-Methylnaphthalene	0.3	ND
Hexachlorocyclopentadiene	0.3	ND
2-Chloronaphthalene	0.3	ND
2-Nitroaniline	2	ND
Dimethyl Phthalate	0.3	ND
Acenaphthylene	0.3	ND
3-Nitroaniline	2	ND
Acenaphthene	0.3	ND
Dibenzofuran	0.3	ND
2,4-Dinitrotoluene	0.3	ND
2,6-Dinitrotoluene	0.3	ND
Diethyl Phthalate	0.3	ND
4-Chlorophenyl Phenyl Ether	0.3	ND
Fluorene	0.3	ND
4-Nitroaniline	2	ND
N-Nitrosodiphenylamine	0.3	ND
4-Bromophenyl Phenyl Ether	0.3	ND
Hexachlorobenzene	0.3	ND

Analytes	MRL
Phenanthrene	0.3
Anthracene	0.3
Dibutyl Phthalate	0.3
Fluoranthene	0.3
Pyrene	0.3
Butylbenzyl Phthalate	0.3
3,3'-Dichlorobenzidine	0.3
Benzo(a)anthracene	0.3
Bis(2-ethylhexyl) Phthalate	0.3
Chrysene	0.3
Di-n-octyl Phthalate	0.3
Benzo(b)fluoranthene	0.3
Benzo(k)fluoranthene	0.3
Benzo(a)pyrene	0.3
Indeno(1,2,3-c,d)pyrene	0.3
Dibenzo(a,h)anthracene	0.3
Benzo(g,h,i)perylene	0.3
Phenol	0.3
2-Chlorophenol	0.3
Benzyl Alcohol	0.3
2-Methylphenol	0.3
4-Methylphenol	0.3
2-Nitrophenol	0.3
2,4-Dimethylphenol	0.3
Benzoic Acid	2
2,4-Dichlorophenol	0.3
4-Chloro-3-methylphenol	0.3
2,4,6-Trichlorophenol	0.3
2,4,5-Trichlorophenol	0.3
2,4-Dinitrophenol	2
4-Nitrophenol	2
2-Methyl-4,6-dinitrophenol	2
Pentachlorophenol	2

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

001

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02/
Date Extracted: 02/
Date Analyzed: 03/
Work Order #: K91

Acid/Base Neutral Semivolatile Organic Compounds
EPA Methods 3540/8270
mg/Kg (ppm)
Dry Weight Basis

Sample Name: LS4
Lab Code: K0908-9

Analytes	MRL*	mg/Kg
N-Nitrosodimethylamine	0.4	ND
Aniline	0.4	ND
Bis(2-chloroethyl) Ether	0.4	ND
1,2-Dichlorobenzene	0.4	ND
1,3-Dichlorobenzene	0.4	ND
1,4-Dichlorobenzene	0.4	ND
Bis(2-chloroisopropyl) Ether	0.4	ND
N-Nitroso-di-n-propylamine	0.4	ND
Hexachloroethane	0.4	ND
Nitrobenzene	0.4	ND
Isophorone	0.4	ND
Bis(2-chloroethoxy)methane	0.4	ND
1,2,4-Trichlorobenzene	0.4	ND
Naphthalene	0.4	ND
4-Chloroaniline	0.4	ND
Hexachlorobutadiene	0.4	ND
2-Methylnaphthalene	0.4	ND
Hexachlorocyclopentadiene	0.4	ND
2-Chloronaphthalene	0.4	ND
2-Nitroaniline	2	ND
Dimethyl Phthalate	0.4	ND
Acenaphthylene	0.4	ND
3-Nitroaniline	2	ND
Acenaphthene	0.4	ND
Dibenzofuran	0.4	ND
2,4-Dinitrotoluene	0.4	ND
2,6-Dinitrotoluene	0.4	ND
Diethyl Phthalate	0.4	ND
4-Chlorophenyl Phenyl Ether	0.4	ND
Fluorene	0.4	ND
4-Nitroaniline	2	ND
N-Nitrosodiphenylamine	0.4	ND
4-Bromophenyl Phenyl Ether	0.4	ND
Hexachlorobenzene	0.4	ND

Analytes	*MRL
Phenanthrene	0.4
Anthracene	0.4
Dibutyl Phthalate	0.4
Fluoranthene	0.4
Pyrene	0.4
Butylbenzyl Phthalate	0.4
3,3'-Dichlorobenzidine	0.4
Benzo(a)anthracene	0.4
Bis(2-ethylhexyl) Phthalate	0.4
Chrysene	0.4
Di-n-octyl Phthalate	0.4
Benzo(b)fluoranthene	0.4
Benzo(k)fluoranthene	0.4
Benzo(a)pyrene	0.4
Indeno(1,2,3-c,d)pyrene	0.4
Dibenzo(a,h)anthracene	0.4
Benzo(g,h,i)perylene	0.4
Phenol	0.4
2-Chlorophenol	0.4
Benzyl Alcohol	0.4
2-Methylphenol	0.4
4-Methylphenol	0.4
2-Nitrophenol	0.4
2,4-Dimethylphenol	0.4
Benzoic Acid	2
2,4-Dichlorophenol	0.4
4-Chloro-3-methylphenol	0.4
2,4,6-Trichlorophenol	0.4
2,4,5-Trichlorophenol	0.4
2,4-Dinitrophenol	2
4-Nitrophenol	2
2-Methyl-4,6-dinitrophenol	2
Pentachlorophenol	2

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* Elevated MRLs because of the low percent solids in the sample as received

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02/
Date Extracted: 02/
Date Analyzed: 03/
Work Order #: K91

Acid/Base Neutral Semivolatile Organic Compounds
EPA Methods 3540/8270
mg/Kg (ppm)
Dry Weight Basis

Sample Name: LS3
Lab Code: K0908-8

Analytes	MRL*	mg/Kg
N-Nitrosodimethylamine	0.4	ND
Aniline	0.4	ND
Bis(2-chloroethyl) Ether	0.4	ND
1,2-Dichlorobenzene	0.4	ND
1,3-Dichlorobenzene	0.4	ND
1,4-Dichlorobenzene	0.4	ND
Bis(2-chloroisopropyl) Ether	0.4	ND
N-Nitroso-di-n-propylamine	0.4	ND
Hexachloroethane	0.4	ND
Nitrobenzene	0.4	ND
Isophorone	0.4	ND
Bis(2-chloroethoxy)methane	0.4	ND
1,2,4-Trichlorobenzene	0.4	ND
Naphthalene	0.4	ND
4-Chloroaniline	0.4	ND
Hexachlorobutadiene	0.4	ND
2-Methylnaphthalene	0.4	ND
Hexachlorocyclopentadiene	0.4	ND
2-Chloronaphthalene	0.4	ND
2-Nitroaniline	2	ND
Dimethyl Phthalate	0.4	ND
Acenaphthylene	0.4	ND
3-Nitroaniline	2	ND
Acenaphthene	0.4	ND
Dibenzofuran	0.4	ND
2,4-Dinitrotoluene	0.4	ND
2,6-Dinitrotoluene	0.4	ND
Diethyl Phthalate	0.4	ND
4-Chlorophenyl Phenyl Ether	0.4	ND
Fluorene	0.4	ND
4-Nitroaniline	2	ND
N-Nitrosodiphenylamine	0.4	ND
4-Bromophenyl Phenyl Ether	0.4	ND
Hexachlorobenzene	0.4	ND

Analytes	*MRL
Phenanthrene	0.4
Anthracene	0.4
Dibutyl Phthalate	0.4
Fluoranthene	0.4
Pyrene	0.4
Butylbenzyl Phthalate	0.4
3,3'-Dichlorobenzidine	0.4
Benzo(a)anthracene	0.4
Bis(2-ethylhexyl) Phthalate	0.4
Chrysene	0.4
Di-n-octyl Phthalate	0.4
Benzo(b)fluoranthene	0.4
Benzo(k)fluoranthene	0.4
Benzo(a)pyrene	0.4
Indeno(1,2,3-c,d)pyrene	0.4
Dibenzo(a,h)anthracene	0.4
Benzo(g,h,i)perylene	0.4
Phenol	0.4
2-Chlorophenol	0.4
Benzyl Alcohol	0.4
2-Methylphenol	0.4
4-Methylphenol	0.4
2-Nitrophenol	0.4
2,4-Dimethylphenol	0.4
Benzoic Acid	2
2,4-Dichlorophenol	0.4
4-Chloro-3-methylphenol	0.4
2,4,6-Trichlorophenol	0.4
2,4,5-Trichlorophenol	0.4
2,4-Dinitrophenol	2
4-Nitrophenol	2
2-Methyl-4,6-dinitrophenol	2
Pentachlorophenol	2

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* Elevated MRLs because of the low percent solids in the sample as received

0002

Approved by [signature] Date 3-29-91

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02/
Date Extracted: 02/
Date Analyzed: 03/
Work Order #: K9

Acid/Base Neutral Semivolatile Organic Compounds
EPA Methods 3540/8270
mg/Kg (ppm)
Dry Weight Basis

Sample Name: LS2
Lab Code: K0908-7

Analytes	MRL	mg/Kg
N-Nitrosodimethylamine	0.3	ND
Aniline	0.3	ND
Bis(2-chloroethyl) Ether	0.3	ND
1,2-Dichlorobenzene	0.3	ND
1,3-Dichlorobenzene	0.3	ND
1,4-Dichlorobenzene	0.3	ND
Bis(2-chloroisopropyl) Ether	0.3	ND
N-Nitroso-di-n-propylamine	0.3	ND
Hexachloroethane	0.3	ND
Nitrobenzene	0.3	ND
Isophorone	0.3	ND
Bis(2-chloroethoxy)methane	0.3	ND
1,2,4-Trichlorobenzene	0.3	ND
Naphthalene	0.3	ND
4-Chloroaniline	0.3	ND
Hexachlorobutadiene	0.3	ND
2-Methylnaphthalene	0.3	ND
Hexachlorocyclopentadiene	0.3	ND
2-Chloronaphthalene	0.3	ND
2-Nitroaniline	2	ND
Dimethyl Phthalate	0.3	ND
Acenaphthylene	0.3	ND
3-Nitroaniline	2	ND
Acenaphthene	0.3	ND
Dibenzofuran	0.3	ND
2,4-Dinitrotoluene	0.3	ND
2,6-Dinitrotoluene	0.3	ND
Diethyl Phthalate	0.3	ND
4-Chlorophenyl Phenyl Ether	0.3	ND
Fluorene	0.3	ND
4-Nitroaniline	2	ND
N-Nitrosodiphenylamine	0.3	ND
4-Bromophenyl Phenyl Ether	0.3	ND
Hexachlorobenzene	0.3	ND

Analytes	MRL
Phenanthrene	0.3
Anthracene	0.3
Dibutyl Phthalate	0.3
Fluoranthene	0.3
Pyrene	0.3
Butylbenzyl Phthalate	0.3
3,3'-Dichlorobenzidine	0.3
Benzo(a)anthracene	0.3
Bis(2-ethylhexyl) Phthalate	0.3
Chrysene	0.3
Di-n-octyl Phthalate	0.3
Benzo(b)fluoranthene	0.3
Benzo(k)fluoranthene	0.3
Benzo(a)pyrene	0.3
Indeno(1,2,3-c,d)pyrene	0.3
Dibenzo(a,h)anthracene	0.3
Benzo(g,h,i)perylene	0.3
Phenol	0.3
2-Chlorophenol	0.3
Benzyl Alcohol	0.3
2-Methylphenol	0.3
4-Methylphenol	0.3
2-Nitrophenol	0.3
2,4-Dimethylphenol	0.3
Benzoic Acid	2
2,4-Dichlorophenol	0.3
4-Chloro-3-methylphenol	0.3
2,4,6-Trichlorophenol	0.3
2,4,5-Trichlorophenol	0.3
2,4-Dinitrophenol	2
4-Nitrophenol	2
2-Methyl-4,6-dinitrophenol	2
Pentachlorophenol	2

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

0002

Approved by: 4-29-91

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02/
Date Extracted: 02/
Date Analyzed: 03/
Work Order #: K9

Acid/Base Neutral Semivolatile Organic Compounds
EPA Methods 3540/8270
mg/Kg (ppm)
Dry Weight Basis

Sample Name: LS1
Lab Code: K0908-6

Analytes	MRL	mg/Kg
N-Nitrosodimethylamine	0.3	ND
Aniline	0.3	ND
Bis(2-chloroethyl) Ether	0.3	ND
1,2-Dichlorobenzene	0.3	ND
1,3-Dichlorobenzene	0.3	ND
1,4-Dichlorobenzene	0.3	ND
Bis(2-chloroisopropyl) Ether	0.3	ND
N-Nitroso-di-n-propylamine	0.3	ND
Hexachloroethane	0.3	ND
Nitrobenzene	0.3	ND
Isophorone	0.3	ND
Bis(2-chloroethoxy)methane	0.3	ND
1,2,4-Trichlorobenzene	0.3	ND
Naphthalene	0.3	ND
4-Chloroaniline	0.3	ND
Hexachlorobutadiene	0.3	ND
2-Methylnaphthalene	0.3	ND
Hexachlorocyclopentadiene	0.3	ND
2-Chloronaphthalene	0.3	ND
2-Nitroaniline	2	ND
Dimethyl Phthalate	0.3	ND
Acenaphthylene	0.3	ND
3-Nitroaniline	2	ND
Acenaphthene	0.3	ND
Dibenzofuran	0.3	ND
2,4-Dinitrotoluene	0.3	ND
2,6-Dinitrotoluene	0.3	ND
Diethyl Phthalate	0.3	ND
4-Chlorophenyl Phenyl Ether	0.3	ND
Fluorene	0.3	ND
4-Nitroaniline	2	ND
N-Nitrosodiphenylamine	0.3	ND
4-Bromophenyl Phenyl Ether	0.3	ND
Hexachlorobenzene	0.3	ND

Analytes	MRL
Phenanthrene	0.3
Anthracene	0.3
Dibutyl Phthalate	0.3
Fluoranthene	0.3
Pyrene	0.3
Butylbenzyl Phthalate	0.3
3,3'-Dichlorobenzidine	0.3
Benzo(a)anthracene	0.3
Bis(2-ethylhexyl) Phthalate	0.3
Chrysene	0.3
Di-n-octyl Phthalate	0.3
Benzo(b)fluoranthene	0.3
Benzo(k)fluoranthene	0.3
Benzo(a)pyrene	0.3
Indeno(1,2,3-c,d)pyrene	0.3
Dibenzo(a,h)anthracene	0.3
Benzo(g,h,i)perylene	0.3
Phenol	0.3
2-Chlorophenol	0.3
Benzyl Alcohol	0.3
2-Methylphenol	0.3
4-Methylphenol	0.3
2-Nitrophenol	0.3
2,4-Dimethylphenol	0.3
Benzoic Acid	2
2,4-Dichlorophenol	0.3
4-Chloro-3-methylphenol	0.3
2,4,6-Trichlorophenol	0.3
2,4,5-Trichlorophenol	0.3
2,4-Dinitrophenol	2
4-Nitrophenol	2
2-Methyl-4,6-dinitrophenol	2
Pentachlorophenol	2

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

000

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02/
Date Extracted: 02/
Date Analyzed: 03/
Work Order #: K91

Acid/Base Neutral Semivolatile Organic Compounds
EPA Methods 3540/8270
mg/Kg (ppm)
Dry Weight Basis

Sample Name: LDS-2
Lab Code: K0908-2

Analytes	MRL	mg/Kg
N-Nitrosodimethylamine	0.3	ND
Aniline	0.3	ND
Bis(2-chloroethyl) Ether	0.3	ND
1,2-Dichlorobenzene	0.3	ND
1,3-Dichlorobenzene	0.3	ND
1,4-Dichlorobenzene	0.3	ND
Bis(2-chloroisopropyl) Ether	0.3	ND
N-Nitroso-di-n-propylamine	0.3	ND
Hexachloroethane	0.3	ND
Nitrobenzene	0.3	ND
Isophorone	0.3	ND
Bis(2-chloroethoxy)methane	0.3	ND
1,2,4-Trichlorobenzene	0.3	ND
Naphthalene	0.3	ND
4-Chloroaniline	0.3	ND
Hexachlorobutadiene	0.3	ND
2-Methylnaphthalene	0.3	ND
Hexachlorocyclopentadiene	0.3	ND
2-Chloronaphthalene	0.3	ND
2-Nitroaniline	2	ND
Dimethyl Phthalate	0.3	ND
Acenaphthylene	0.3	ND
3-Nitroaniline	2	ND
Acenaphthene	0.3	ND
Dibenzofuran	0.3	ND
2,4-Dinitrotoluene	0.3	ND
2,6-Dinitrotoluene	0.3	ND
Diethyl Phthalate	0.3	ND
4-Chlorophenyl Phenyl Ether	0.3	ND
Fluorene	0.3	ND
4-Nitroaniline	2	ND
N-Nitrosodiphenylamine	0.3	ND
4-Bromophenyl Phenyl Ether	0.3	ND
Hexachlorobenzene	0.3	ND

Analytes	MRL
Phenanthrene	0.3
Anthracene	0.3
Dibutyl Phthalate	0.3
Fluoranthene	0.3
Pyrene	0.3
Butylbenzyl Phthalate	0.3
3,3'-Dichlorobenzidine	0.3
Benzo(a)anthracene	0.3
Bis(2-ethylhexyl) Phthalate	0.3
Chrysene	0.3
Di-n-octyl Phthalate	0.3
Benzo(b)fluoranthene	0.3
Benzo(k)fluoranthene	0.3
Benzo(a)pyrene	0.3
Indeno(1,2,3-c,d)pyrene	0.3
Dibenzo(a,h)anthracene	0.3
Benzo(g,h,i)perylene	0.3
Phenol	0.3
2-Chlorophenol	0.3
Benzyl Alcohol	0.3
2-Methylphenol	0.3
4-Methylphenol	0.3
2-Nitrophenol	0.3
2,4-Dimethylphenol	0.3
Benzoic Acid	2
2,4-Dichlorophenol	0.3
4-Chloro-3-methylphenol	0.3
2,4,6-Trichlorophenol	0.3
2,4,5-Trichlorophenol	0.3
2,4-Dinitrophenol	2
4-Nitrophenol	2
2-Methyl-4,6-dinitrophenol	2
Pentachlorophenol	2

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

00025

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Soil

Date Received: 02/
Date Extracted: 02/
Date Analyzed: 03/
Work Order #: K91

Acid/Base Neutral Semivolatile Organic Compounds
EPA Methods 3540/8270
mg/Kg (ppm)
Dry Weight Basis

Sample Name: LDS-1
Lab Code: K0908-1

Analytes	MRL*	mg/Kg
N-Nitrosodimethylamine	0.4	ND
Aniline	0.4	ND
Bis(2-chloroethyl) Ether	0.4	ND
1,2-Dichlorobenzene	0.4	ND
1,3-Dichlorobenzene	0.4	ND
1,4-Dichlorobenzene	0.4	ND
Bis(2-chloroisopropyl) Ether	0.4	ND
N-Nitroso-di-n-propylamine	0.4	ND
Hexachloroethane	0.4	ND
Nitrobenzene	0.4	ND
Isophorone	0.4	2.3
Bis(2-chloroethoxy)methane	0.4	ND
1,2,4-Trichlorobenzene	0.4	ND
Naphthalene	0.4	ND
4-Chloroaniline	0.4	ND
Hexachlorobutadiene	0.4	ND
2-Methylnaphthalene	0.4	ND
Hexachlorocyclopentadiene	0.4	ND
2-Chloronaphthalene	0.4	ND
2-Nitroaniline	3	ND
Dimethyl Phthalate	0.4	ND
Acenaphthylene	0.4	ND
3-Nitroaniline	3	ND
Acenaphthene	0.4	ND
Dibenzofuran	0.4	ND
2,4-Dinitrotoluene	0.4	ND
2,6-Dinitrotoluene	0.4	ND
Diethyl Phthalate	0.4	ND
4-Chlorophenyl Phenyl Ether	0.4	ND
Fluorene	0.4	ND
4-Nitroaniline	3	ND
N-Nitrosodiphenylamine	0.4	ND
4-Bromophenyl Phenyl Ether	0.4	ND
Hexachlorobenzene	0.4	ND

Analytes	*MRL
Phenanthrene	0.4
Anthracene	0.4
Dibutyl Phthalate	0.4
Fluoranthene	0.4
Pyrene	0.4
Butylbenzyl Phthalate	0.4
3,3'-Dichlorobenzidine	0.4
Benzo(a)anthracene	0.4
Bis(2-ethylhexyl) Phthalate	0.4
Chrysene	0.4
Di-n-octyl Phthalate	0.4
Benzo(b)fluoranthene	0.4
Benzo(k)fluoranthene	0.4
Benzo(a)pyrene	0.4
Indeno(1,2,3-c,d)pyrene	0.4
Dibenzo(a,h)anthracene	0.4
Benzo(g,h,i)perylene	0.4
Phenol	0.4
2-Chlorophenol	0.4
Benzyl Alcohol	0.4
2-Methylphenol	0.4
4-Methylphenol	0.4
2-Nitrophenol	0.4
2,4-Dimethylphenol	0.4
Benzoic Acid	3
2,4-Dichlorophenol	0.4
4-Chloro-3-methylphenol	0.4
2,4,6-Trichlorophenol	0.4
2,4,5-Trichlorophenol	0.4
2,4-Dinitrophenol	3
4-Nitrophenol	3
2-Methyl-4,6-dinitrophenol	3
Pentachlorophenol	3

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* Elevated MRLs because of the low percent solids in the sample as received

00024

Approved by _____ Date 3-14-91

MW 3-29-91

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Water

Date Received: 02/
Date Extracted: 02/
Date Analyzed: 02/
Work Order #: K91

Acid/Base Neutral Semivolatile Organic Compounds
EPA Methods 3510/8270
µg/L (ppb)

Sample Name: LSEP
Lab Code: K0908-4

Analytes	MRL	µg/L
N-Nitrosodimethylamine	5	ND
Aniline	5	ND
Bis(2-chloroethyl) Ether	5	24
1,2-Dichlorobenzene	5	ND
1,3-Dichlorobenzene	5	ND
1,4-Dichlorobenzene	5	ND
Bis(2-chloroisopropyl) Ether	5	ND
N-Nitroso-di-n-propylamine	5	ND
Hexachloroethane	5	ND
Nitrobenzene	5	ND
Isophorone	5	56 UJ
Bis(2-chloroethoxy)methane	5	ND
1,2,4-Trichlorobenzene	5	ND
Naphthalene	5	ND
4-Chloroaniline	5	ND
Hexachlorobutadiene	5	ND
2-Methylnaphthalene	5	ND
Hexachlorocyclopentadiene	5	ND
2-Chloronaphthalene	5	ND
2-Nitroaniline	20	ND
Dimethyl Phthalate	5	ND
Acenaphthylene	5	ND
3-Nitroaniline	20	ND
Acenaphthene	5	ND
Dibenzofuran	5	ND
2,4-Dinitrotoluene	5	ND
2,6-Dinitrotoluene	5	ND
Diethyl Phthalate	5	ND
4-Chlorophenyl Phenyl Ether	5	ND
Fluorene	5	ND
4-Nitroaniline	20	ND
N-Nitrosodiphenylamine	5	ND
4-Bromophenyl Phenyl Ether	5	ND
Hexachlorobenzene	5	ND

Analytes	MRL
Phenanthrene	5
Anthracene	5
Dibutyl Phthalate	5
Fluoranthene	5
Pyrene	5
Butylbenzyl Phthalate	5
3,3'-Dichlorobenzidine	5
Benzo(a)anthracene	5
Bis(2-ethylhexyl) Phthalate	5
Chrysene	5
Di-n-octyl Phthalate	5
Benzo(b)fluoranthene	5
Benzo(k)fluoranthene	5
Benzo(a)pyrene	5
Indeno(1,2,3-c,d)pyrene	5
Dibenzo(a,h)anthracene	5
Benzo(g,h,i)perylene	5
Phenol	5
2-Chlorophenol	5
Benzyl Alcohol	5
2-Methylphenol	5
4-Methylphenol	5
2-Nitrophenol	5
2,4-Dimethylphenol	5
Benzoic Acid	50
2,4-Dichlorophenol	5
4-Chloro-3-methylphenol	5
2,4,6-Trichlorophenol	5
2,4,5-Trichlorophenol	5
2,4-Dinitrophenol	50
4-Nitrophenol	50
2-Methyl-4,6-dinitrophenol	20
Pentachlorophenol	20

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

000.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Water

Date Received: 02/
Date Extracted: 02/
Date Analyzed: 02/
Work Order #: K9

Acid/Base Neutral Semivolatile Organic Compounds
EPA Methods 3510/8270
µg/L (ppb)

Sample Name: LDW-1
Lab Code: K0908-3

Analytes	MRL*	µg/L	Analytes	MRL*
N-Nitrosodimethylamine	25	ND	Phenanthrene	25
Aniline	25	ND	Anthracene	25
Bis(2-chloroethyl) Ether	25	ND	Dibutyl Phthalate	25
1,2-Dichlorobenzene	25	ND	Fluoranthene	25
1,3-Dichlorobenzene	25	ND	Pyrene	25
1,4-Dichlorobenzene	25	ND	Butylbenzyl Phthalate	25
Bis(2-chloroisopropyl) Ether	25	ND	3,3'-Dichlorobenzidine	25
N-Nitroso-di-n-propylamine	25	ND	Benzo(a)anthracene	25
Hexachloroethane	25	ND	Bis(2-ethylhexyl) Phthalate	25
Nitrobenzene	25	ND	Chrysene	25
Isophorone	25	602	Di-n-octyl Phthalate	25
Bis(2-chloroethoxy)methane	25	ND	Benzo(b)fluoranthene	25
1,2,4-Trichlorobenzene	25	ND	Benzo(k)fluoranthene	25
Naphthalene	25	26	Benzo(a)pyrene	25
4-Chloroaniline	25	ND	Indeno(1,2,3-c,d)pyrene	25
Hexachlorobutadiene	25	ND	Dibenzo(a,h)anthracene	25
2-Methylnaphthalene	25	ND	Benzo(g,h,i)perylene	25
Hexachlorocyclopentadiene	25	ND		
2-Chloronaphthalene	25	ND	Phenol	25
2-Nitroaniline	200	ND	2-Chlorophenol	25
Dimethyl Phthalate	25	34	Benzyl Alcohol	25
Acenaphthylene	25	ND	2-Methylphenol	25
3-Nitroaniline	200	ND	4-Methylphenol	25
Acenaphthene	25	ND	2-Nitrophenol	25
Dibenzofuran	25	ND	2,4-Dimethylphenol	25
2,4-Dinitrotoluene	25	ND	Benzoic Acid	250
2,6-Dinitrotoluene	25	ND	2,4-Dichlorophenol	25
Diethyl Phthalate	25	ND	4-Chloro-3-methylphenol	25
4-Chlorophenyl Phenyl Ether	25	ND	2,4,6-Trichlorophenol	25
Fluorene	25	ND	2,4,5-Trichlorophenol	25
4-Nitroaniline	200	ND	2,4-Dinitrophenol	250
N-Nitrosodiphenylamine	25	ND	4-Nitrophenol	250
4-Bromophenyl Phenyl Ether	25	ND	2-Methyl-4,6-dinitrophenol	100
Hexachlorobenzene	25	ND	Pentachlorophenol	100

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* Elevated MRLs because of matrix interferences and because the sample required dilution.

000

Approved by

COLUMBIA ANALYTICAL SERVICES, INC.

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine-SHA/#WD8023
Sample Matrix: Water

Analytical Report

Date Received: 0
Date Extracted: 0
Date Analyzed: 0
Work Order #: K

Acid/Base Neutral Semivolatile Organic Compounds
EPA Methods 3510/8270
µg/L (ppb)

Sample Name: LW-1
Lab Code: K0844-4

Analytes	MRL	µg/L
N-Nitrosodimethylamine	5	ND
Aniline	5	ND
Bis(2-chloroethyl) Ether	5	ND
1,2-Dichlorobenzene	5	ND
1,3-Dichlorobenzene	5	ND
1,4-Dichlorobenzene	5	ND
Bis(2-chloroisopropyl) Ether	5	ND
N-Nitroso-di-n-propylamine	5	ND
Hexachloroethane	5	ND
Nitrobenzene	5	ND
Isophorone	5	ND
Bis(2-chloroethoxy)methane	5	ND
1,2,4-Trichlorobenzene	5	ND
Naphthalene	5	ND
4-Chloroaniline	5	ND
Hexachlorobutadiene	5	ND
2-Methylnaphthalene	5	ND
Hexachlorocyclopentadiene	5	ND
2-Chloronaphthalene	5	ND
2-Nitroaniline	5	ND
Dimethyl Phthalate	20	ND
Acenaphthylene	5	ND
3-Nitroaniline	5	ND
Acenaphthene	20	ND
Dibenzofuran	5	ND
2,4-Dinitrotoluene	5	ND
2,6-Dinitrotoluene	5	ND
Diethyl Phthalate	5	ND
4-Chlorophenyl Phenyl Ether	5	ND
Fluorene	5	ND
4-Nitroaniline	5	ND
N-Nitrosodiphenylamine	20	ND
4-Bromophenyl Phenyl Ether	5	ND
Hexachlorobenzene	5	ND

Analytes	MRL
Phenanthrene	5
Anthracene	5
Dibutyl Phthalate	5
Fluoranthene	5
Pyrene	5
Butylbenzyl Phthalate	5
3,3'-Dichlorobenzidine	5
Benzo(a)anthracene	5
Bis(2-ethylhexyl) Phthalate	5
Chrysene	5
Di-n-octyl Phthalate	5
Benzo(b)fluoranthene	5
Benzo(k)fluoranthene	5
Benzo(a)pyrene	5
Indeno(1,2,3-c,d)pyrene	5
Dibenzo(a,h)anthracene	5
Benzo(g,h,i)perylene	5
Phenol	5
2-Chlorophenol	5
Benzyl Alcohol	5
2-Methylphenol	5
4-Methylphenol	5
2-Nitrophenol	5
2,4-Dimethylphenol	5
Benzoic Acid	50
2,4-Dichlorophenol	5
4-Chloro-3-methylphenol	5
2,4,6-Trichlorophenol	5
2,4,5-Trichlorophenol	5
2,4-Dinitrophenol	50
4-Nitrophenol	50
2-Methyl-4,6-dinitrophenol	20
Pentachlorophenol	20

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

M.P.
3-29-91

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Ecology & Environment	Date Received:	02/15/9
Submitted By:	Bob Duffner	Date Extracted:	02/23/9
Project:	E & E Landsburg Mine-SHA/#WD8023	Work Order #:	K91084
Sample Matrix:	Oil		

Volatile Organic Compounds
EPA Method 8240
mg/Kg (ppm)

Sample Name:		LD-2	LD-3
Lab Code:		K0844-2	K0844
Date Analyzed:		02/23/91	02/23/
Analytes	**MRL***		
Chloromethane	500	ND	ND
Vinyl Chloride	500	ND	ND
Bromomethane	500	ND	ND
Chloroethane	500	ND	ND
Trichlorofluoromethane (Freon 11)	50	ND	ND
Trichlorotrifluoroethane (Freon 113)	500	ND	ND
1,1-Dichloroethene	100	ND	ND
Acetone	1,000	2,480	ND
Carbon Disulfide	50	ND	ND
Methylene Chloride	500	ND	ND
trans-1,2-Dichloroethene	50	ND	ND
cis-1,2-Dichloroethene	50	ND	ND
2-Butanone (MEK)	500	**16,000	ND
1,1-Dichloroethane	50	ND	ND
Chloroform	50	ND	ND
1,1,1-Trichloroethane (TCA)	50	ND	ND
Carbon Tetrachloride	50	ND	ND
Benzene	50	ND	ND
1,2-Dichloroethane	50	ND	ND
Vinyl Acetate	500	ND	ND
Trichloroethene (TCE)	50	71	ND
1,2-Dichloropropane	50	ND	ND
Bromodichloromethane	50	ND	ND
2-Chloroethyl Vinyl Ether	500	ND	ND
trans-1,3-Dichloropropene	50	ND	ND
2-Hexanone	500	ND	ND
4-Methyl-2-pentanone (MIBK)	500	4,960	ND
Toluene	50	3,780	204
cis-1,3-Dichloropropene	50	ND	ND
1,1,2-Trichloroethane	50	ND	ND
Tetrachloroethene (PCE)	50	ND	ND
Dibromochloromethane	50	ND	ND
Chlorobenzene	50	ND	ND
Ethylbenzene	50	683	***23,100
Styrene	50	ND	ND
Total Xylenes	50	4,380	***73,600
Bromoform	50	ND	ND
1,1,2,2-Tetrachloroethane	50	ND	ND
1,3-Dichlorobenzene	50	ND	ND
1,4-Dichlorobenzene	50	ND	ND
1,2-Dichlorobenzene	50	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* Elevated MRLs because the sample required dilution.
** Result from analysis of a diluted sample performed on 02/23/91.
*** Result from analysis of a diluted sample performed on 02/25/91.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine-SHA/#WD8023
Sample Matrix: Water

Date Received: 02/16/91
Date Analyzed: 03/01/91
Work Order #: K910844

Volatile Organic Compounds
EPA Method 524.2
µg/L (ppb)

Sample Name: LW-1
Lab Code: K0844-4

Analytes	MRL	µg/L
Dichlorodifluoromethane (Freon 12)	0.1	ND
Chloromethane	0.1	ND
Vinyl Chloride	0.1	ND
Bromomethane	0.1	ND
Chloroethane	0.1	ND
Trichlorofluoromethane (Freon 11)	0.1	ND
1,1-Dichloroethene	0.1	ND
Methylene Chloride	3	ND
trans-1,2-Dichloroethene	0.1	ND
2,2-Dichloropropane	0.1	ND
cis-1,2-Dichloroethene	0.1	ND
1,1-Dichloroethane	0.1	ND
Chloroform	0.1	ND
Bromochloromethane	0.1	ND
1,1,1-Trichloroethane (TCA)	0.1	ND
1,1-Dichloropropene	0.1	ND
Carbon Tetrachloride	0.1	ND
Benzene	0.1	ND
1,2-Dichloroethane	0.1	ND
Trichloroethene (TCE)	0.1	ND
1,2-Dichloropropane	0.1	ND
Bromodichloromethane	0.1	ND
Dibromomethane	0.1	ND
cis-1,3-Dichloropropene	0.1	ND
Toluene	0.3	ND
trans-1,3-Dichloropropene	0.1	ND
1,1,2-Trichloroethane	0.1	ND
Tetrachloroethene (PCE)	0.1	ND
1,3-Dichloropropane	0.1	ND

Analytes	MRL
Dibromochloromethane	0.1
1,2-Dibromoethane (EDB)	0.1
Chlorobenzene	0.1
Ethylbenzene	0.1
1,1,1,2-Tetrachloroethane	0.1
Styrene	0.1
Total Xylenes	0.3
Bromoform	0.1
Isopropylbenzene	0.1
1,1,2,2-Tetrachloroethane	0.1
1,2,3-Trichloropropane	0.1
Bromobenzene	0.1
n-Propylbenzene	0.1
1,3,5-Trimethylbenzene	0.1
2-Chlorotoluene	0.1
4-Chlorotoluene	0.1
tert-Butylbenzene	0.1
1,2,4-Trimethylbenzene	0.1
sec-Butylbenzene	0.1
4-Isopropyltoluene	0.1
1,3-Dichlorobenzene	0.1
1,4-Dichlorobenzene	0.1
n-Butylbenzene	0.1
1,2-Dichlorobenzene	0.1
1,2-Dibromo-3-chloropropane (DBCP)	0.2
1,2,4-Trichlorobenzene	0.2
Hexachlorobutadiene	0.2
Naphthalene	0.2
1,2,3-Trichlorobenzene	0.2

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by _____ Date 3-14-91

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Water

Date Received: 02/20/91
Date Analyzed: 02/28/91
Work Order #: K910908

Volatile Organic Compounds
EPA Method 524.2
µg/L (ppb)

Sample Name: LDW-1
Lab Code: K0908-3

Analytes	MRL	µg/L
Dichlorodifluoromethane (Freon 12)	0.1	ND
Chloromethane	0.1	ND
Vinyl Chloride	0.1	0.3
Bromomethane	0.1	ND
Chloroethane	0.1	2.8
Trichlorofluoromethane (Freon 11)	0.1	0.8
1,1-Dichloroethene	0.1	0.4
Methylene Chloride	3	41
trans-1,2-Dichloroethene	0.1	ND
2,2-Dichloropropane	0.1	ND
cis-1,2-Dichloroethene	0.1	12
1,1-Dichloroethane	0.1	*60
Chloroform	0.1	ND
Bromochloromethane	0.1	ND
1,1,1-Trichloroethane (TCA)	0.1	*110
1,1-Dichloropropene	0.1	ND
Carbon Tetrachloride	0.1	ND
Benzene	0.1	4.2
1,2-Dichloroethane	0.1	7.4
Trichloroethene (TCE)	0.1	18
1,2-Dichloropropane	0.1	ND
Bromodichloromethane	0.1	ND
Dibromomethane	0.1	ND
cis-1,3-Dichloropropene	0.1	ND
Toluene	0.3	*4,400
trans-1,3-Dichloropropene	0.1	ND
1,1,2-Trichloroethane	0.1	ND
Tetrachloroethene (PCE)	0.1	1.0
1,3-Dichloropropane	0.1	ND

Analytes	MRL
Dibromochloromethane	0.1
1,2-Dibromoethane (EDB)	0.1
Chlorobenzene	0.1
Ethylbenzene	0.1
1,1,1,2-Tetrachloroethane	0.1
Styrene	0.1
Total Xylenes	0.3
Bromoform	0.1
Isopropylbenzene	0.1
1,1,2,2-Tetrachloroethane	0.1
1,2,3-Trichloropropane	0.1
Bromobenzene	0.1
n-Propylbenzene	0.1
1,3,5-Trimethylbenzene	0.1
2-Chlorotoluene	0.1
4-Chlorotoluene	0.1
tert-Butylbenzene	0.1
1,2,4-Trimethylbenzene	0.1
sec-Butylbenzene	0.1
4-Isopropyltoluene	0.1
1,3-Dichlorobenzene	0.1
1,4-Dichlorobenzene	0.1
n-Butylbenzene	0.1
1,2-Dichlorobenzene	0.1
1,2-Dibromo-3-chloropropane (DBCP)	0.2
1,2,4-Trichlorobenzene	0.2
Hexachlorobutadiene	0.2
Naphthalene	0.2
1,2,3-Trichlorobenzene	0.2

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
* Result from analysis of a diluted sample performed on March 1, 1991

Approved by _____ Date _____

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Ecology & Environment
Submitted By: Bob Duffner
Project: E & E Landsburg Mine - SHA/#WD8023
Sample Matrix: Water

Date Received: 02/20/91
Date Analyzed: 03/01/91
Work Order #: K910908

Volatile Organic Compounds
EPA Method 524.2
µg/L (ppb)

Sample Name: LSEP
Lab Code: K0908-4

Analytes	MRL••	µg/L
Dichlorodifluoromethane (Freon 12)	10	ND
Chloromethane	10	ND
Vinyl Chloride	10	ND
Bromomethane	10	ND
Chloroethane	10	ND
Trichlorofluoromethane (Freon 11)	10	460
1,1-Dichloroethene	10	ND
Methylene Chloride	300	•42,000
trans-1,2-Dichloroethene	10	ND
2,2-Dichloropropane	10	ND
cis-1,2-Dichloroethene	10	680
1,1-Dichloroethane	10	20
Chloroform	10	ND
Bromochloromethane	10	ND
1,1,1-Trichloroethane (TCA)	10	240
1,1-Dichloropropene	10	ND
Carbon Tetrachloride	10	ND
Benzene	10	10
1,2-Dichloroethane	10	ND
Trichloroethene (TCE)	10	3,700
1,2-Dichloropropane	10	ND
Bromodichloromethane	10	ND
Dibromomethane	10	ND
cis-1,3-Dichloropropene	10	ND
Toluene	30	130
trans-1,3-Dichloropropene	10	ND
1,1,2-Trichloroethane	10	ND
Tetrachloroethene (PCE)	10	ND
1,3-Dichloropropane	10	ND

Analytes	MRL•
Dibromochloromethane	10
1,2-Dibromoethane (EDB)	10
Chlorobenzene	10
Ethylbenzene	10
1,1,1,2-Tetrachloroethane	10
Styrene	10
Total Xylenes	30
Bromoform	10
Isopropylbenzene	10
1,1,2,2-Tetrachloroethane	10
1,2,3-Trichloropropane	10
Bromobenzene	10
n-Propylbenzene	10
1,3,5-Trimethylbenzene	10
2-Chlorotoluene	10
4-Chlorotoluene	10
tert-Butylbenzene	10
1,2,4-Trimethylbenzene	10
sec-Butylbenzene	10
4-Isopropyltoluene	10
1,3-Dichlorobenzene	10
1,4-Dichlorobenzene	10
n-Butylbenzene	10
1,2-Dichlorobenzene	10
1,2-Dibromo-3-chloropropane (DBCP)	20
1,2,4-Trichlorobenzene	20
Hexachlorobutadiene	20
Naphthalene	20
1,2,3-Trichlorobenzene	20

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
•• Elevated MRLs because the sample required dilution
• Result from analysis of a diluted sample performed on March 1, 1991

Approved by _____ Date 3-14-91

3-29-91

DATE: March 29, 1991

TO: Lila Transue, Senior Chemist, E & E, Seattle

FROM: Mark Woodke, Chemist, E & E, Seattle MW

SUBJ: Data Review of Landsburg Mine

REF: WD8025

CC: Robert Duffner, Project Manager, E & E, Seattle

An evaluation of data for 22 samples, collected from Landsbur has beer completed. Three oil, three water, and sixteen soil sampl were analyzed for volatile (VOC) and semivolatile organic compound pesticides/polychlorinated biphenyls (PCBs), and inorganic element including cyanide, and one water sample was analyzed for VOCs, by Analytical Services of Kelso, Washington. The samples were numbere

LD-1	(Oil)	LSEP	(Water)	LS-2	(Soil)	LS-7	(Soil)	LPS-1 (S
LD-2	(Oil)	TB	(Water)	LS-3	(Soil)	LS-8	(Soil)	LPS-2 (S
LD-3	(Oil)	LDS-1	(Soil)	LS-4	(Soil)	LS-9	(Soil)	LPS-3 (S
LW-1	(Water)	LDS-2	(Soil)	LS-5	(Soil)	LS-10	(Soil)	
LDW-1	(Water)	LS-1	(Soil)	LS-6	(Soil)	LS-11	(Soil)	

The following assumptions were made by the data evaluator for this data package:

- -All calibrations were assumed for follow correct proced and have results within Quality Control (QC) guidelines
- -Instrument Detection Limits were assumed to be less than or equal to the detection limits listed in the rep
- -All internal standard recoveries were assumed to be acc
- -Columbia Analytical Services criteria for all QC analys were assumed to be acceptable.
- -All transcriptions and calculations made by the laborat were assumed to be correct.

The data evaluation consisted of a check of extraction and analysis times, surrogate recoveries, matrix spike (MS) and matrix spike duplicate (MSD) percent recoveries, and method blanks. Raw data was not checked as part of this data evaluation, except where a discrepancy was noted.

Data qualifiers were used to flag data when corresponding quality control criteria were not met. Data qualifiers may modify the usefulness of individual values.

Appendix D

LABORATORY DATA QUALITY ASSURANCE REVIEW

1) Timeliness

All samples met holding time criteria for all parameters.

2) Blanks

Frequency criteria was met for laboratory blank analysis.

The following compound was detected in a laboratory blank at a level above the Instrument Detection Limit:

Blank ID	Fraction	Compound	Matrix	Concentration (ug/L)	Associa Sample
Method Blank	Semivolatile	Isophorone	Water	56	LDW-1,LS

The isophorone quantitation limit was flagged as estimated (UJ) in sample LSEP. No action was taken based on the blank result with respect to sample LDW-1, as isophorone was detected at a level greater than five times the concentration found in the blank.

3) Surrogate Recovery

Recoveries (%R) for all surrogate compounds met QC criteria, except:

Sample Number	Fraction	Compound	Matrix	%R	QC Limits
LS-4	Pesticide/ PCB	Decachloro-biphenyl	Soil	61.6	65 - 130
LS-11	Pesticide/ PCB	Decachloro-biphenyl	Soil	62.4	65 - 130
LDW-1	Pesticide/ PCB	Decachloro-biphenyl	Water	118	22 - 102
LSEP	Pesticide/ PCB	Decachloro-biphenyl	Water	157	22 - 102
LS-8	VOC	Toluene-d8	Soil	75.4	81 - 117

Positive results and sample quantitation limits for sample LS-8 were flagged as estimated (J or UJ) for the volatile fraction. No action was taken based on the pesticide/PCB surrogate outliers as no pesticide/PCB compounds were detected in these samples.

4) Matrix Spike and Matrix Spike Duplicate

All MS and MSD percent recoveries met advisory QC guidelines, except:

Sample Number	Fraction	Compound	Matrix	%R	QC Limits
LS-11	Inorganic	Antimony	Soil	22	75 - 125
LS-11	Inorganic	Silver	Soil	62	75 - 125
LDW-1	Inorganic	Selenium	Water	140	75 - 125
LD-3	Inorganic	Antimony	Oil	60	75 - 125
LD-3	Inorganic	Arsenic	Oil	63	75 - 125
LD-3	Inorganic	Cadmium	Oil	73	75 - 125
LD-3	Inorganic	Silver	Oil	40	75 - 125
LD-3	Inorganic	Zinc	Oil	71	75 - 125
LSEP	Inorganic	Cyanide	Water	74	75 - 125
LW-1	Inorganic	Silver	Water	60	75 - 125

The antimony quantitation limit was rejected (R) for sample LS-11. The silver quantitation limit was flagged as estimated (UJ) for sample LS-11. The antimony, arsenic, cadmium, silver, and zinc quantitation limits were flagged as estimated (UJ) for sample LD-3. The silver quantitation limit was flagged as estimated (UJ) for sample LW-1. The cyanide quantitation limit was flagged as estimate (UJ) for sample LSEP.

Data Qualifiers

U - The material was analyzed for, but was not detected. The associated numerical value is a contractual quantitation limit, adjusted for sample weight/volume, extraction volume, percent solids, and sample dilution.

J - The analyte was analyzed for and was positively identified, bu the associated numerical value may not be consistent with the amount actually present in the environmental sample. The data should be seriously considered for decision-making and are usable for many purposes.

UJ - The material was analyzed for, but was not detected. The associated numerical value is an estimated/adjusted quantitation limit. The associated numerical value may not accurately or precisely represent the concentration necessary to detect the analyte in this sample.

Appendix E

GEOPHYSICS MEASUREMENT DATA

R - Quality control indicates that data are unusable for all purpo
The analyte was analyzed for, but the presence or absence of t
analyte has not been verified. Resampling and reanalysis are
necessary for verification to confirm or deny the presence of
analyte.

ND - The material was analyzed for, but was not detected at or abov
the Method Reporting Limit. This qualifier should be interpret
similarly to the "U" qualifier.

AVERAGE MAGNETOMER STATION MEASUREMENT
LANDSBURG MINE
RAVENSDALE, WASHINGTON
February 1991

Study Area Section	Station (feet)	Average Magnetomer Measurement (gammas)	Approximate Sample Location
A			
(Southwest)	400		
	350	55600.6	
	300	55609.1	
	250	55609.5	
	200	55587.2	
	150	55358.4	
	130	53028.6	LS-1
	100	54854.3	
	050	55616.3	
	000	54837.2	LS-2
B	000	52164.0	
	050	52190.6	LS-3
	100	52163.6	
	150	52260.0	
	200	52273.5	
	250	52107.6	LS-4
	300	51976.0	
	350	51976.0	LS-5
	400	52309.0	
	450	52249.3	LS-6
	500	52298.3	
	675	52931.0	
	700	55275.5	
	750	55580.2	
	800	55641.3	LS-7
	850	55563.2	
C	000	55636.8	
	050	56266.6	
	100	53720.6	LS-8
	150	56830.6	
	200	56642.7	
	250	57932.3	LS-10
	300	56279.3	
	350	57280.3	
	400	52109.3	
	450	57700.5	LS-9
(Northeast)	500	54597.5	

Appendix F

CONTACT REPORTS

Appendix F

LANDSBURG MINE SHA CONTACT REPORTS

1. Old Maple Valley Fire Station: No one currently working at station that may have responded to fires at Landsburg Mine in 1971. Files are archived.

2. PSAPCA (Ron Buzzbee): Did respond to fires in the trench. All files are "Dead Files" and need to request them through Stella Nehen, Librarian, 200 West Mercer Street, Seattle, Washington 98119.

3. Office of Surface Mining (Bob Flowers): Does have historical information.

4. DNR - Coal Mining (Bill Lingley): Recommended talking to Hank Schasse, who is most familiar with the geology in the area 459-6372.

5. DNR - Abandoned Mines (Steve Palmer): (303) 844-3067

6. Local Resident (Gary B. Habenicht): 27405 S.E. 256th, Ravensdale, Washington 98051 , (206) 432-9000. He is aware of dumping activities at the mine in the late 1950's and 1960's. His household water comes from a spring system that he believes is isolated from the mine area. Gary also recalls fires in the trench prior to 1971. Additionally, he says that recently, a small dog fell into an air shaft "near-by". The fire department responded, but refused to enter the shaft.

   Gary mentions that his neighbors across the street (north) have a 185-foot deep well. The house to the east of Gary's has a 202 foot deep water well. No contamination has been reported.

7. Washington Department of Health (Steve Hulsman): 464-7962. Has sampled many water wells in the vicinity of Landsburg Mine. No contamination has been detected.