U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 SIXTH AVENUE
SEATTLE, WASHINGTON 98101

File

JAN 26 1987

REPLY TO
ATTN OF: M/S 525

A.B. Berg, Executive Director
L-Bar Products
26000 Black Diamond-Ravensdale Road
Ravensdale, Washington

Dear Mr. Berg:

The Environmental Protection Agency (EPA), through our contractor Ecology and Environment, has completed the report of the site inspection at the L-Bar Products facility in Ravensdale. A copy of the report is enclosed. Photographs have not been included, but a photo identification sheet is provided for reference.

Based on this inspection, Ecology and Environment has made the recommendations outlined on page two of this report, with which EPA concurs. While cement kiln dust is exempt from regulation under the Resource Conservation and Recovery Act, EPA is concerned that the material exhibits characteristics which failed the EP toxicity test for lead. Further investigation is warranted, in particular, the use as a liming agent in Skagit County. EPA will be working with the Washington Department of Ecology and the Seattle-King County Health Department on appropriate follow-up. If you have any questions, please telephone me at (206) 442-2722.

Sincerely,

Deborah Flood

Deborah Flood
Environmental Protection Specialist
Superfund Program

Enclosures

cc: Emily Ray, Washington Department of Ecology, Olympia
John Conroy, Ecology, Redmond
Greg Bishop, Seattle-King County Health Department
Michael Cook, Burlington Northern
Dennis Erickson, Ecology, Olympia

ecology and environment, inc.

108 SOUTH WASHINGTON, SUITE 302, SEATTLE, WASHINGTON 98104, TEL. 206-624-9537

International Specialists in the Environmental Sciences

SITE INSPECTION REPORT FOR L-BAR PRODUCTS (INDUSTRIAL MINERAL PRODUCTS) RAVENSDALE, WASHINGTON

TDD F10-8611-06

Report Prepared By: Ecology and Environment, Inc.
Project Leader: Lynn Guilford
Report Date: November 1986

Submitted To: J.E. Osborn, Regional Project Officer
Field Operations and Technical Support Branch
U.S. Environmental Protection Agency
Region X
Seattle, Washington

ecology and environment, inc.

108 SOUTH WASHINGTON, SUITE 302, SEATTLE, WASHINGTON 98104, TEL. 206-624-9537

International Specialists in the Environmental Sciences

MEMORANDUM

DATE: November 26, 1986

TO: John Osborn, FIT-RPO, USEPA, Region X

FOR: Marcia Knadle, ESD-PO, USEPA, Region X

THRU: for David Buecker, FIT-OM, E&E, Seattle DAT

FROM: Lynn Guilford, E&E, Seattle

SUBJ: Recommendations
L-Bar Products

REF: TDD R10-8510-13 and TDD F10-8611-06

CC: Deborah Flood, HWD-SM, USEPA, Region X
Thomas Tobin, E&E, Seattle

Based on the site inspection of the abandoned sandstone mine of L-Bar Products by Ecology and Environment, Inc. and the review of sample data, it is recommended that:

- More extensive analysis of the cement kiln dust present at L-Bar Products be conducted to more accurately characterize lead concentrations.
- The lead concentration in the mine runoff, as it leaves the site, be determined. If it is above drinking water standards, then containment or dilution of the runoff is recommended.
- The leachate collection system requested by King County Health Department should be installed.
- The ground water monitoring program around Dale No. 4 should be continued.
- Determine if seasonal ground water fluctuations bring the water table into contact with the cement kiln dust at the base of the mine.
- The continued use of cement kiln dust as a liming agent in Skagit County, as well as other potential uses, should be evaluated.

LG:dlk

ABSTRACT

A file review and site inspection were conducted for an abandoned sandstone mine filled with cement kiln dust (CKD) at L-Bar Products, Ravensdale, Washington under EPA Technical Directive Document (TDD) R10-8510-13 to evaluate the site's status within the Agency's Uncontrolled Hazardous Waste Site Program. During this inspection two CKD samples were collected from a similar current disposal area near the site. These samples were analyzed for Hazardous Substance List inorganic elements and EP toxicity. Both samples failed the EP toxicity test for lead. However, other related CKD samples have passed other EP toxicity tests. It has not been determined if the CKD in the sandstone mine would pass or fail the EP toxicity tests because it was not sampled. It appears that the CKD in the sandstone mine is in a geologically safe repository and will not impact regional ground water supplies.

SITE INSPECTION REPORT
L-BAR PRODUCTS
(INDUSTRIAL MINERAL PRODUCTS)

TDD F10-8611-06

Site Name/Address:

L-Bar Products
(Industrial Mineral Products)
26000 Black Diamond-Ravensdale Road
Ravensdale, WA 98051

Investigation Participants:

Lynn Guilford, Project Manager, Ecology and Environment, Inc. (E&E), Seattle - (206) 624-9537

Richard Brooks, E&E, Seattle - (206) 624-9537

Lawrence Ashley, Washington Department of Ecology (Ecology) - (206) 885-1900

Shelly Kneip, Seattle-King County Health Department (SKCHD) - (206) 587-2722

Principal Site Contacts:

Frank Melfi, Owner, L-Bar Products - (505) 247-2384

A.B. "Bud" Berg, Executive Director, L-Bar Products - (206) 432-1286

Glenda McLucas, Geologist, L-Bar Products - (206) 432-1286

Lynn Jacobsen, Consultant, Energy & Mineral Resources - (505) 255-1765

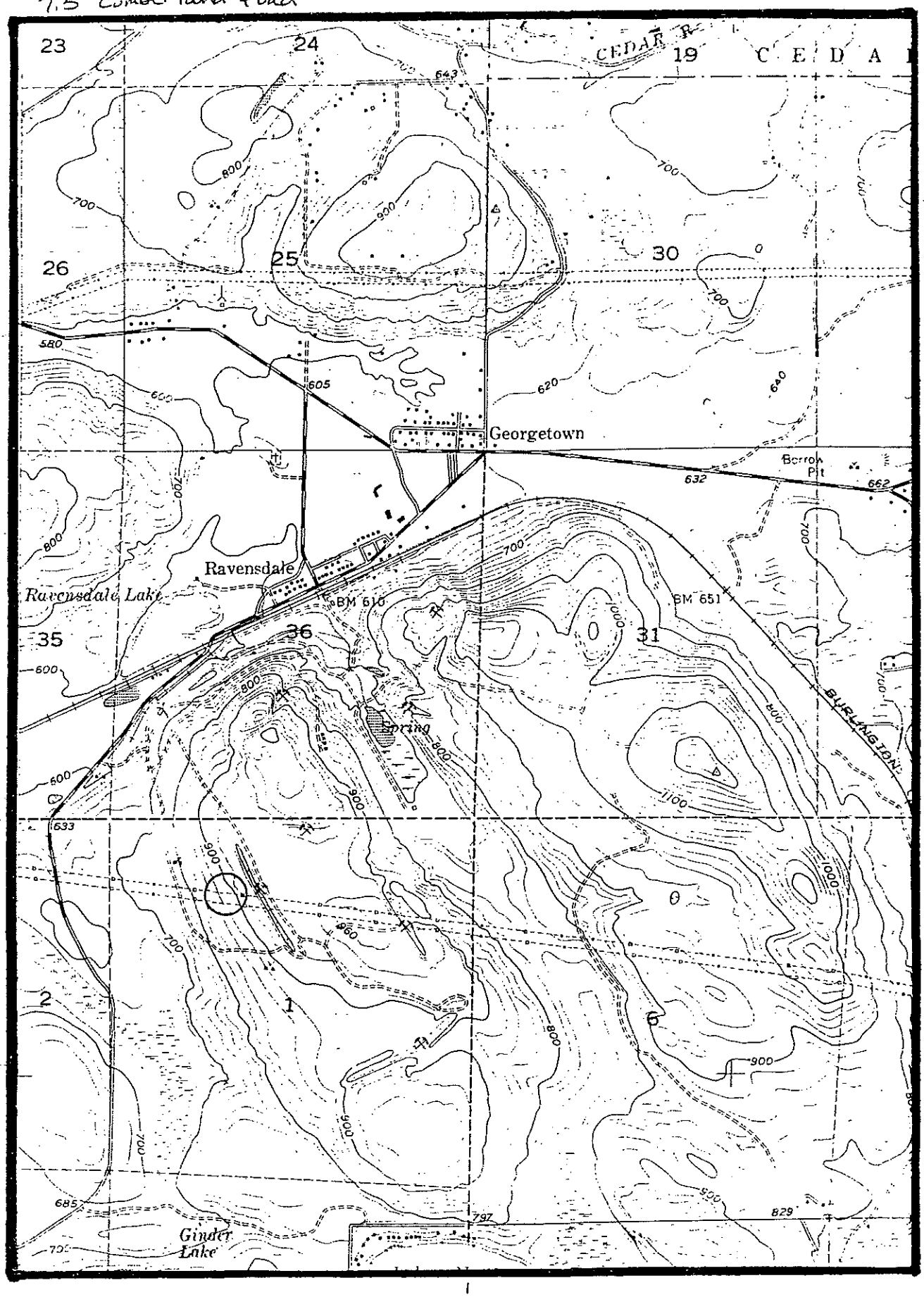
Edward J. Owens, Production Supervisor, Ideal Basic Industries - (206) 937-8025

Date of Inspection:

May 29, 1986 0900-1400 hours

Industrial Minerals King County Washington

7.5' Cumberland Quad



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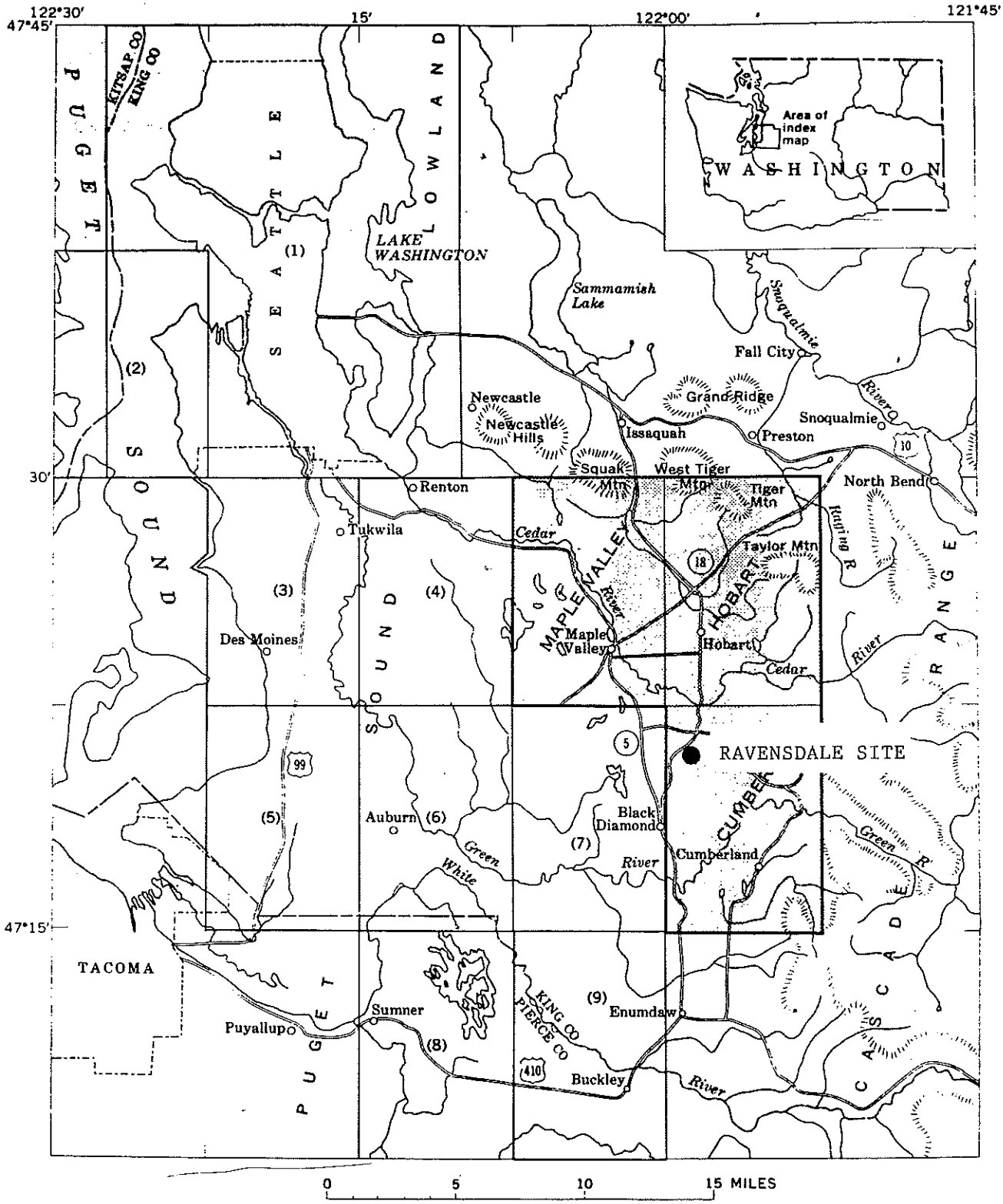


FIGURE 1.—Index map of western Washington, showing area of this report (heavy boundary) and areas of other recently published geologic maps. 1, Seattle and vicinity (Waldron and others, 1962); 2, Duwamish Head (Waldron, 1967); 3, Des Moines (Waldron, 1962); 4, Renton (Mullineaux, 1965a); 5, Poverty Bay (Waldron, 1961); 6, Auburn (Mullineaux, 1965b); 7, Black Diamond (Mullineaux, 1965c); 8, Sumner (Crandell, 1961); 9, Buckley (Crandell and Gard, 1959).

1.0 INTRODUCTION

L-Bar Products operates an active silica mine which has been identified from preliminary screening by the U.S. Environmental Protection Agency (EPA) Region X and Ecology as requiring additional information to accurately profile the nature and extent of past waste disposal activity at the site. The cement kiln dust (CKD) used as fill material in the abandoned sandstone strip mine was of primary concern. E&E was requested by the EPA under Technical Directive Document (TDD) Nos. and R10-8510-13 and F10-8611-06 to conduct a site inspection to evaluate the facility's status within the Agency's Uncontrolled Waste Program. This report summarizes the site inspection and is divided into the following sections:

- o Owner/Operator
- o Location
- o Surrounding Area and Site Description
- o Topography and Drainage
- o Geology and Hydrology
- o Ground Water and Surface Water Uses
- o Climate
- o Overview of Site Operations
- o Waste Stream Characterization
- o E&E Site Inspection
- o Sampling Results and Discussion
- o Conclusions

2.0 OWNER/OPERATOR

The silica strip mines currently operated by L-Bar Products were leased, along with their mineral rights, from Meridian Mineral, a subsidiary of Burlington Northern Railroad, in 1968 by Industrial Mineral Products. Industrial Minerals has operated the site since 1968. The Northwest Improvement Co. (a subsidiary of Northern Pacific Railroad) conducted underground coal mining and strip coal mining at the site from the early 1900s until 1947. Between 1947 and 1968 no operations were conducted at the site.

3.0 LOCATION

The L-Bar silica mines are located at 26000 Black Diamond-Ravensdale Road, southwest of Ravensdale at latitude $47^{o}20'27"$ and longitude $121^{o}59'24"$. The legal description of the facility is the NW 1/4 of section 1, Township 21N, Range 6E (1, 2). The abandoned sandstone mine occupies approximately 10 acres east of Highway 169 and south of Ravensdale, Washington (Figure 1) (1, 2).

4.0 SURROUNDING AREA AND SITE DESCRIPTION

L-Bar Products occupies approximately 380 acres containing three currently operated sandstone mines and an abandoned sandstone mine which is the area of interest in the site inspection (Figure 2). The north-south scale in Figure 2 is accurate, however, east-west distances appear shorter

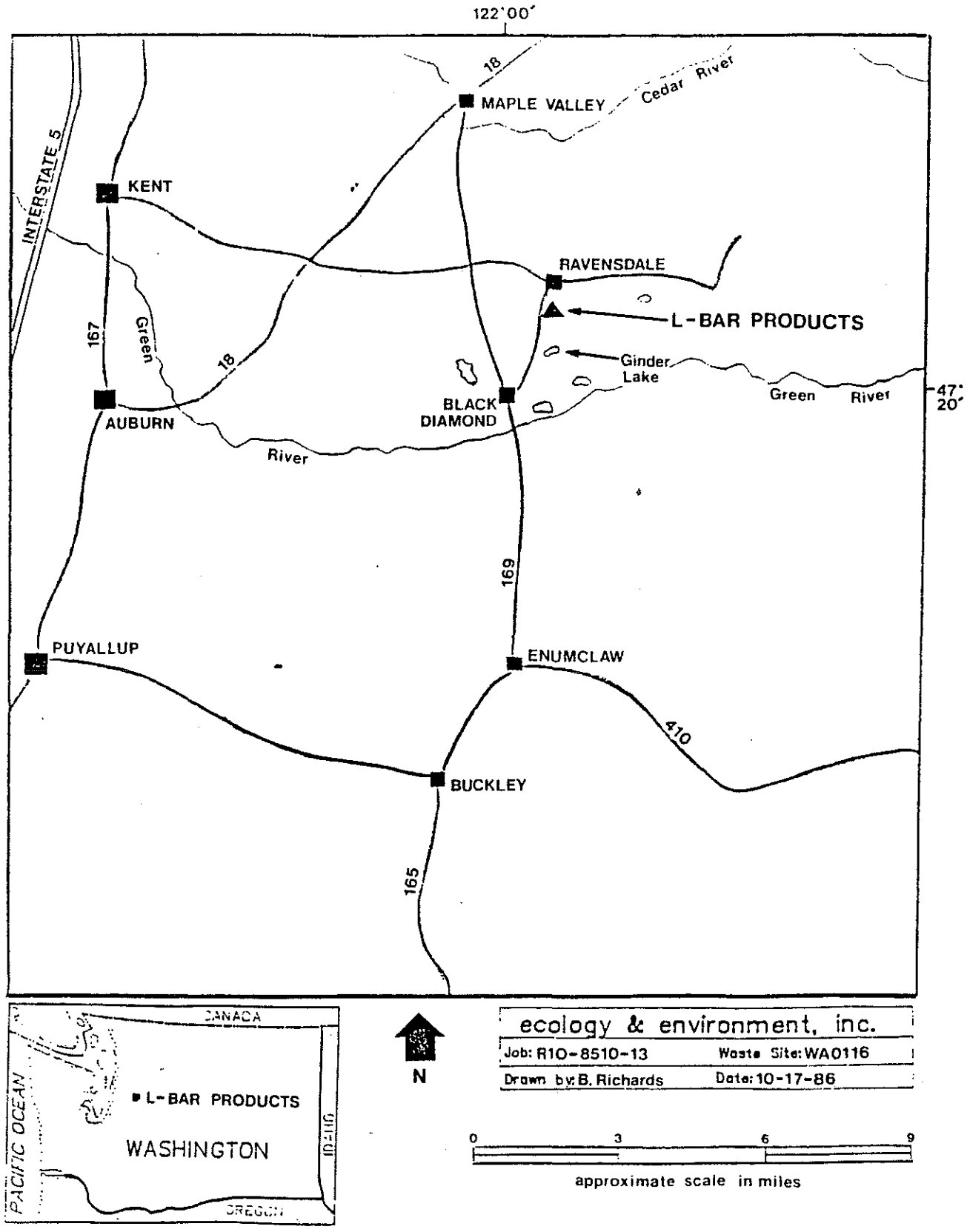
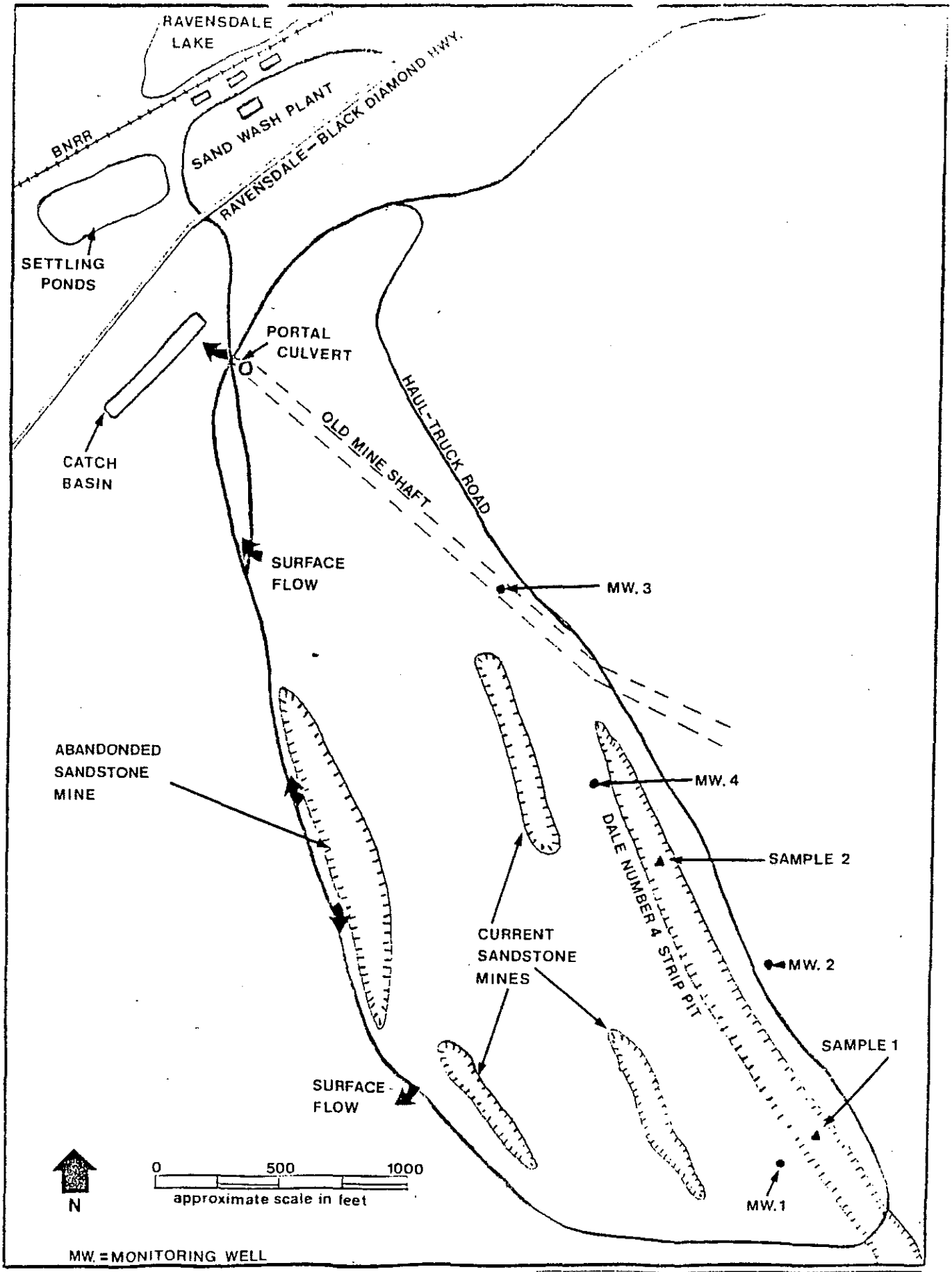


Figure 1. Location Map, L-Bar Products.



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Drawn by: B. Richards	Date: 10-17-86

Figure 2. Site Map, L-Bar Products.

than they actually are. "The old sandstone mine reclamation site was filled with 180,000 tons of cement kiln dust from 1979 until 1982. The surface of the cement kiln dust is now covered by two feet of clay followed by seven feet of soil and has since been revegetated" (3). The reclaimed area extends a short distance beyond the border of the abandoned sandstone mine.

The principal operations conducted by L-Bar are those associated with sandstone mining. The property leased by L-Bar not only contains the sandstone mines, but also a sandwashing plant, settling ponds, and abandoned coal mines, including the Dale No. 4. Dale No. 4 contains CKD and is surrounded by four monitoring wells which are regularly sampled by L-Bar.

A corrugated steel pipe (portal culvert) is located at the entrance of a mine shaft that drains ground water from the abandoned underground coal workings to a surface water catch basin. The catch basin also collects surface water runoff from the northern portion of the L-Bar property.

The town of Ravensdale is approximately one-half mile to the northeast of the site. The land surrounding the site is rural and thickly vegetated. The population within a one-mile radius of the site is 170. There are 300 buildings located within two miles of the site (Table 1). The nearest well is located about 2,500 feet from the site.

TABLE 1
DEMOGRAPHIC CHARACTERIZATION OF THE AREA
AROUND L-BAR PRODUCTS
RAVENSDALE, WASHINGTON

Radial Distance	Demographic Descriptor
0 - 1 mile	170 Residents 50 Buildings 3 Drinking Water Wells
1 - 2 miles	1,100 Residents 300 Buildings 55 Drinking Water Wells
2 - 3 miles	5,560 Residents 1,480 Buildings 159 Drinking Water Wells

5.0 TOPOGRAPHY AND DRAINAGE

The site lies in a broad, glacial drift plain with an undulating surface punctuated by bedrock knobs and incised by post-glacial river channels. The relatively level plain has elevations of 500 to 600 feet above mean sea level (AMSL). The bedrock knobs, many of which are east of the site, range from 800 to over 1,400 feet AMSL. Further east are the Cascade Mountain foothills with greater elevations.

Within the glacial drift are several depressions that contain lakes and marshes with no surface outlets. Most of these depressions were formed either by stagnant ice blocks or the deposition of glacial deposits that blocked natural drainage outlets.

L-Bar property is located on the west side of a northwest trending hill. Dale No. 4 strip pit is located at the crest of the hill at approximately 900 feet AMSL. The alluvial deposits located at the bottom of the hill are at approximately 600 feet AMSL. The abandoned sandstone mine is approximately 100 feet above the alluvial deposits.

Drainage from the abandoned sandstone mine takes more than one path, and most likely will include short stretches of subsurface flow. The drainage from the southern portion of the site flows south beside the road. The water crosses under the road and disappears into the alluvial deposits at the bottom of a hill. Surface water from the northern portion of the abandoned sandstone mine flows into a ditch beside the road. Water flows north and is combined with the portal culvert water, eventually entering the catch basin (Figure 2). The L-Bar catch basin is located in a valley filled with glacial materials. Ground water in the valley may flow west-southwest toward Lake Sawyer.

Runoff from the settling ponds and sandstone mines may infiltrate and then possibly enter marshes, bogs, and kettle hole lakes where further movement is restricted. Such bodies of water include Ginder Lake and a one-half mile long marsh approximately 300 feet north of Ginder Lake.

6.0 GEOLOGY AND HYDROLOGY

6.1 Geology

The Ravensdale area is located on the Covington Drift Plain, a relatively level surficial deposit of glacial origin that merges with the foothills of the Cascade Mountain Range. The drift plain, of Quaternary age, is over 1,000 feet thick in places.

Beneath the drift are two important bedrock formations. The lower formation is the highly folded and faulted Puget Group. The upper formation consists of a differentiated, yet unnamed, series of volcanic and intrusive rocks.

The Puget Group, of early Eocene to early Oligocene age, is composed of arkosic sandstone, siltstone, claystone, carbonaceous shale, and coal (4). These alternations reflect shifts in an ancient shoreline and the subsequent depositional environment. Coal beds are present at the site, as well as massive weathered sandstone beds commercially mined for their silica content (3).

The sandstone is very fine- to very coarse-grained, granular in places, poorly sorted, subangular to subrounded, and has a 10% to 20% clay content. Quartz comprises up to 65% of the constituents. The cementing material consists of silt and clay, calcite, ankerite, or quartz. The siltstone consists of medium to dark gray beds, usually no more than two feet in thickness, and is sandy.

The Puget Group is highly folded and faulted. The site is located on a steeply dipping synclinal fold. The dip of the limbs of the syncline ranges between 50^{0} and 80^{0}, with an axis trending slightly north of west. The sandstone units that are mined have a near-vertical orientation (steeply dipping). See the idealized cross-section (Figure 3). Also, the sandstone is a clay-cemented (3). Stratigraphically above the Puget Group lies a thick section of unnamed volcanic rocks that locally include volcanic sandstone, conglomerate, and tuff. The dip of volcanics ranges from gentle to almost none.

Above the volcanic sequence lies Vashon Drift of Pleistocene age, locally referred to as the Covington Drift Plain. These glacial materials vary greatly in grain size and degree of compaction. The deposit is thicker in the lower elevations, and forms a relatively thin mantle on the hilltops.

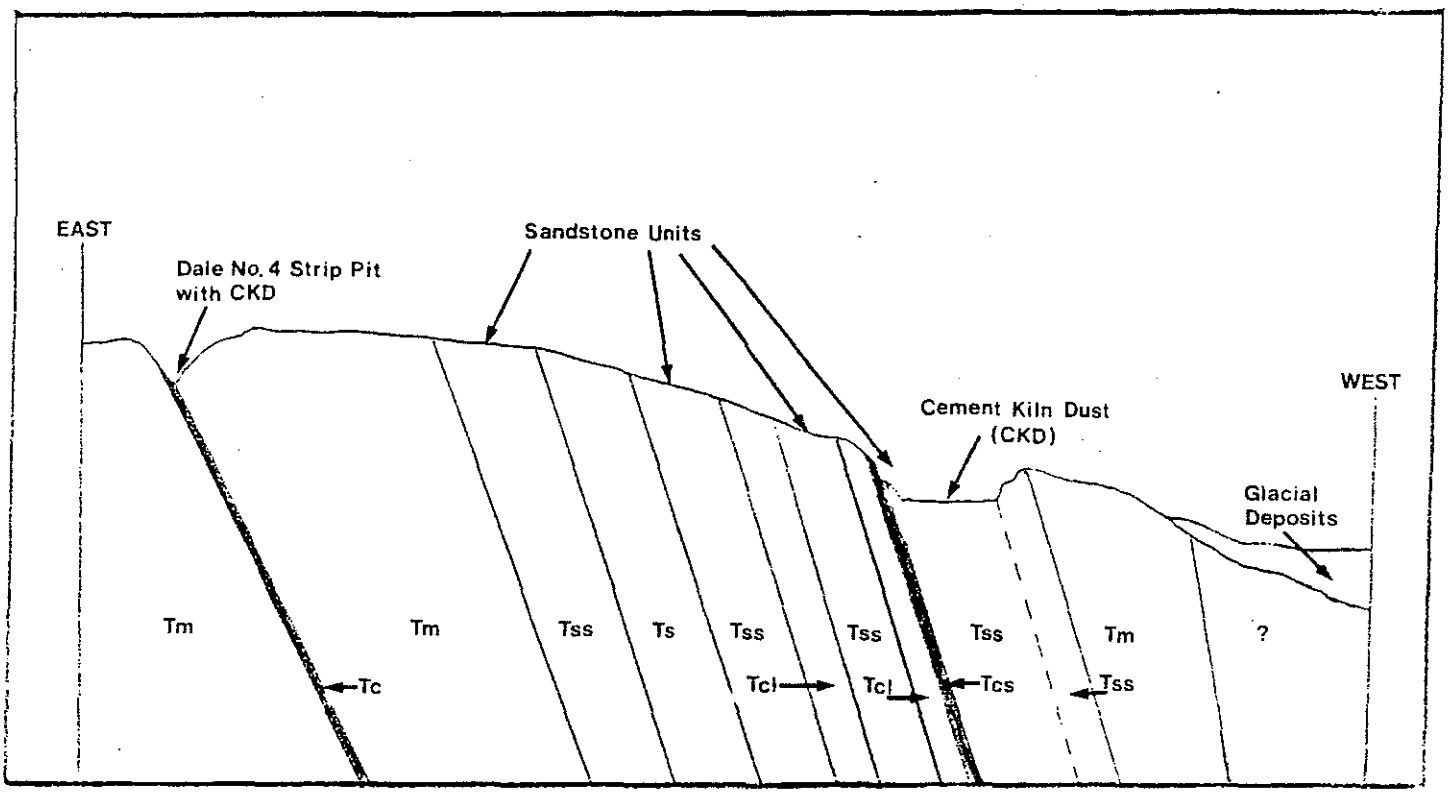
6.2 Hydrology

Regionally, ground water occurs in two types of deposits: the bedrock formations and the unconsolidated sediments of the glacial drift plain (5). Ground water movement in both types of deposits is influenced by topograhy and structure. Structural textures within the bedrock that commonly contain and channel groud water are open faults, fractures, and bedding planes (planar surfaces separating sedimentary layers). Generally, the Puget Group is too fine-grained to produce significant quantities of ground water (5). Ten wells are reported to be completed in these formations locally. They average more than 200 feet in depth and generally yield less than 15 gpm (5).

Near the site, fractures in coal seams are the primary water bearing units of the Puget Group (3). The local sandstone units are believed to contain and transport relatively small quantities of ground water (3). Observations made by an E&E geologist during the site inspection support these conditions. The high clay content which was noted in the sandstone will restrict ground water movement by blocking the intergranular openings. Significant ground water movement within the sandstone would most likely be restricted to fracture systems. No evidence of major fracturing was observed.

The highest water-producing sediments are localized deposits of Vashon Drift, including buried valley fill in the outwash sediments. These sediments are relatively uncompacted and have a low percentange of silts and clays. Wells less than 400 feet deep in these sediments may yield 200 to 300 gpm. Numerous springs from ice-contact and recessional outwash yield 1,000 to 20,000 gpm (5).

Ground water movement on the hill underlying the site is potentially complex. An exploratory boring, conducted by L-Bar, encountered ground water at 20 to 30 feet below the base of the abandoned sandstone mine (3).



Tm - Undifferentiated Sedimentary Deposits
Tc - Coal
Ts - Siltstone
Tss - Sandstone
Tcs - Carbonaceous Shale
Tcl - Clay

ecology and environment, inc. SEATTLE, WA	
JOB #: F10-8511-06	
B. Richards	11-20-86

Figure 3. IDEALIZED EAST-WEST CROSS-SECTION L-BAR PRODUCTS.

7.0 GROUND WATER AND SURFACE WATER USES

The primary aquifer of concern lies next to the site in the alluvial deposits, located at the bottom of the hill. This aquifer covers an extensive area and serves approximately 785 people within three miles of L-Bar property. There are several other aquifers of unknown extent, which serve a limited population within this area. The closest known well taps the aquifer of concern 2,500 feet northeast of the site (6).

Ravensdale Lake is the closest surface water to the site. L-Bar Products obtains their process water from this lake. Most other bodies of surface water within three miles of the site have surface water rights, including domestic use, irrigation, fish propogation, and mining. Drinking water for the site and for the town of Ravensdale is obtained from Lake Retreat, located approximately two miles to the northeast.

8.0 CLIMATE

The Ravensdale area is influenced by Pacific Maritime climate conditions, which affect all of Western Washington. Summers are cool, relatively dry and clear, while winters are mild, wet, and cloudy. Storms that develop over the Pacific Ocean are usually deflected north of Washington State during the summer by large high pressure systems offshore. These high pressure systems move south during the winter, allowing storms to move inland. The Olympic Mountains to the west serve to weaken the strength of these storms, while the Cascade Mountains and foothills east of the site collect clouds. The results are gentle persistent rainfalls, with increasing annual rainfall eastward towards the Cascade foothills.

Interpolations of temperature isoclines show average temperatures for the area of approximately $62^{o}F$ in July and $37^{o}F$ in January (7). The mean annual precipitation is approximately 56 inches per year (8). The temperatures and precipitation cited were recorded at Landsburg, Washington, approximately three miles northwest of the site. The mean lake evaporation is 24 inches per year, resulting in a net water surplus of 32 inches per year. Almost 80% of the annual precipitation falls between the months of October and April. The one-year 24-hour rainfall is 2.3 inches (8).

9.0 OVERVIEW OF SITE OPERATIONS

L-Bar Products operations include mining of sandstone and extraction of the sand. The sandstone is strip mined by bulldozer in elongated pits (Figure 2). The mined sandstone is then transported by truck to the sand-washing plant where it is mechanically broken up, washed, and segregated according to grain size. The clay that binds the sand is removed with water and settled out in the settling pond. The sand is mainly sold for glass manufacturing and cement production.

Ideal Basic Industries disposed of CKD (cement kiln dust) in L-Bar's abandoned sandstone mine from 1979 to 1982. The sandstone mine has now been reclaimed and CKD is currently disposed of in Dale No. 4 strip pit (Figure 2).

10.0 WASTE STREAM CHARACTERIZATION

CKD is generated by Ideal Basic Industries in Seattle, Washington. CKD is a by-product of Portland cement manufacturing. A large amount of dust is generated by grinding, conveying, and heating of the raw materials used in the cement process. The dust generated by the heating process (in a rotary kiln) cannot be fully recycled because it is often too alkaline (due to sodium and potassium content) for use in cement. Basically, however, CKD has a composition similar to cement.

The exhaust gases from the kilns carry away an average of 12% of the kiln feed. The CKD is removed from the exhaust gas by dust collectors and returned to the kiln when possible. The remainder is either sold for other purposes or disposed of.

Ideal has been attemping to identify other uses or markets for CKD. The largest market for Ideal kiln dust currently exists as a liming agent for agricultural lands in Skagit County. When Ideal first started disposing of CKD at L-Bar Products in 1979, they were despositing 60,000 tons per year. However, in 1985 only 13,000 tons were deposited, the result of engineering improvements and increased marketing.

Other materials reported to have been deposited at the abandoned sandstone mine were Asarco slag and lignin. Asarco slag was produced at a copper smelter and was used to increase traction on slippery road surfaces in the mine area. Lignin, a wood by-product, was also spread in the mine area to help bind the soil.

11.0 E&E SITE INSPECTION

The purpose of the E&E site inspection was to determine if CKD deposited in the abandoned sandstone mine poses a potential ground water contamination problem. The E&E inspection was conducted on May 29, 1986. E&E representatives were accompanied by Lawrence Ashley of Ecology; Shelly Kneip of SKCHD; Frank Melfi, Owner of L-Bar Products; A.B. "Bud" Berg, Executive Vice-President of L-Bar Products; Glenda McLucas, Geologist at L-Bar Products; Lynn Jacobsen, Consultant at Energy & Mineral Resources; and Edward Owens, Production Supervisor at Ideal Basic Industries.

The following information was provided by Glenda McLucas and Bud Berg regarding CKD disposal in the abandoned sandstone mine as well as the Dale No. 4 mine.

- The runoff from the abandoned sandstone mine is a brownish liquid. Mr. Berg claims the brown color is due to sodium in the clay cap reacting with organic compounds to form a non-toxic sodium carboxylate and lignin. No analytical data was supplied to support this claim.

- Surface drainage from the reclaimed sandstone mine takes several different paths. Runoff from the southern portion of the mine flows off the hill to the adjacent flatland. The remaining drainage flows north along the haul truck road until it combines with drainage from an abandoned mine portal. The portal drains the coal mine workings that underlie the site.

- King County Health Department has requested that L-Bar Products install a leachate collection system to collect all the runoff from the abandoned sandstone mine.

- Four monitoring wells have been installed around the Dale No. 4 strip pit. Water from these wells and the portal drainage are analyzed regularly by L-Bar.

Two CKD samples were collected from the surface of the Dale No. 4 strip pit during the site visit (Figure 2).

12.0 SAMPLING RESULTS AND DISCUSSION

Two CKD samples were collected by E&E and analyzed. Results of the analyses and comparison to previous analyses is discussed in this section.

12.1 Previous Sampling

12.1.1 Analyses of CKD

The U.S. Bureau of Mines has conducted extensive tests of CKD throughout the U.S. A summary of the results for 113 samples of CKD are included in Table 2 (3).

TABLE 2

SUMMARY OF ELEMENTAL VARIATION IN
U.S. CEMENT KILN DUST
(ppm)

Element	Range	Mean*	Median
Arsenic	1.3 - 518	24	9.3
Beryllium	< 2	< 2	<2
Cadmium	< 1.5 - 352	21	7.3
Chromium	11 - 172	41	34
Copper	7 - 206	30	24
Lead	17 - 1,750	253	148
Mercury**	< 0.13 - 1.0	< 0.13	<0.13
Nickel	< 12 - 91	22	29
Thallium	< 60 - 185	< 60	< 60
Zinc	< 32 - 8,660	< 462	167

* - A value of one-half the detection limit was arbitrarily used to calculate the mean for those elements having concentrations below the detection limit.

**- Mercury value based on 16 samples only.

Ideal Basic Industries contracted Biomed Research Laboratories to conduct an EP toxicity test on a sample of their kiln dust. Table 3 contains a summary of the results (3).

TABLE 3

SUMMARY OF EP TOXICITY TEST RESULTS FOR
IDEAL BASIC INDUSTRIES CEMENT KILN DUST
(ppm)

Element	Concentration	EP Toxicity Limits
Arsenic	<1.0	5
Barium	< 50	100
Cadmium	<0.1	1.0
Chromium	<0.5	5.0
Lead	<1.0	5.0
Mercury	<0.1	0.2
Selenium	<0.1	1.0
Silver	<0.1	5.0

12.1.2 Analysis of On-Site Water

The monitoring wells surrounding Dale No. 4 strip pit were sampled by L-Bar Products in June and September 1986. The ground water samples collected were analyzed for trace metals during each of two sampling episodes. Lead was detected in seven of the ten ground water samples collected in June 1986, above the detection limit of 0.1 ppm. However, no lead was detected in any of the ground water samples collected in September 1986.

One of a number possible sources for the lead detected in the initial ground water samples may be the CKD disposed of in the Dale No. 4 strip pit. Other sources may include sampling techniques or analytical procedures. However, it is not possible to determine the source based on the data available.

L-Bar has collected and analyzed surface runoff samples from the abandoned sandstone mine. The samples were analyzed for pH, cadmium, chromium, copper, lead, and zinc. The analyses indicate that pH is approximately 12 and lead concentrations vary from 1 to 2 ppm (9). The elevated pH of 12 is most likely caused by CKD.

12.2 E&E Sampling

During the initial site visit of L-Bar Products, Inc., E&E collected two CKD samples from the Dale No. 4 strip pit. The first sample (S1) was collected from CKD that had been deposited for approximately six months. The second sample (S2) was from material that had been deposited recently. These samples were analyzed for inorganic elements on the HSL and for EP toxicity (Tables 4 and 5).

TABLE 4

SAMPLE RESULTS FOR CEMENT KILN DUST
INORGANIC SAMPLE RESULTS, COLLECTED BY E&E
(mg/kg)

Element	S1	S2
Antimony	0.8	0.5
Arsenic	53.7	60.8
Beryllium	0.47	0.56
Cadmium	7.8	3.5
Chromium	13.7	17.9
Copper	41	58
Lead	1,480	556
Mercury	0.029	0.055
Nickel	15.3	14.3
Selenium	4.7	3.8
Silver	4.5	2.0
Thallium	3.1	2.7
Zinc	554	320

TABLE 5

EP TOXICITY TEST RESULTS FOR CKD SAMPLES COLLECTED BY E&E
(mg/l)

Element	S1	S2	EP Toxicity Limit
Arsenic	0.013	0.054	5
Barium	0.730	1.070	100
Cadmium	0.137	0.0057	1
Chromium	0.003	0.001U	5
Lead	15.470	5.750	5
Mercury	0.00005U	0.0003	0.2
Selenium	0.0031	0.0081	1
Silver	0.0002U	0.0187	5

U - The material was analyzed for, but not detected. The associated numerical value is an estimated quantitation limit.

The only element that exceeded the EP toxicity limit was lead, which was found at 5.75 ppm and 15.47 ppm. It is possible that limestone containing high lead was used at the cement plant during the time this cement kiln dust was produced. The elemental concentration in cement kiln dust will vary, depending on the raw material used.

It is not known if the CKD deposited at the sandstone mine has the potential to fail the EP toxicity limits, since no sample was collected.

CKD samples were collected from the surface of the Dale No. 4 strip pit during the site visit. Samples were not collected at the abandoned sandstone mine due to the thick cover material over the CKD. It is believed that the CKD material at both locations has similar characteristics because of the common manufacturer.

13.0 CONCLUSIONS

Based on the E&E site inspection and review of the chemical data collected, it is concluded that:

- The CKD samples from Dale No. 4 strip pit failed the EP toxicity test for lead. However, previous CKD samples passed the EP toxicity test. It has not been determined if the CKD deposited in the sandstone mine would fail or pass the EP toxicity tests.

- The most likely path of contamination from the CKD in the abandoned sandstone mine would be from surface leachate. A lesser possibility of contamination from CKD is through fractures in the sandstone.

The CKD disposed of in the abandoned sandstone mine around by L-Bar Products does not appear to be adversely affecting the environment. This conclusion is founded on the following information provided by L-Bar (3):

- the generally impervious nature of the sandstone;

- the existence of the water table at 20 to 30 feet below the base of the pit; and

- the clay and soil cap over the CKD.

REFERENCES

1. U.S. Geological Survey, Cumberland, Washington 7.5 Minute Series, Quadrangle Map, 1953. Photo Revised 1973.

2. _____, 1949. Black Diamond, Washington, 7.5 Minutes Series, Quadrangle Map, 1949. Photo revised 1973.

3. Ideal Basic Industries, Cement Division. Individual Exemption Petition to Washington State for Cement Kiln Dust Solid Waste Designation, 1984, 357p.

4. Vine, James D., "Geology and Coal Resources of the Cumberland, Hobart, and Maple Valley Quadrangles, King County, Washington." U.S. Geological Survey Professional Paper No. 624, 1969, 67p.

5. Luzier, J.E., "Geology and Ground Water Resources of Southwestern King County, Washington." U.S. Geological Survey Water Supply Bulletin No. 28, 1969, 260p.

6. Washington State Well Logs.

7. National Oceanic and Atmospheric Administration, 1974. Climates of the States, Volume II - Western States, Including Alaska and Hawaii.

8. U.S. Department of Commerce, 1963. Rainfall Freqency Atlas of the United States, Technical Paper No. 40.

9. L-Bar Products, Laboratory Test Results.

APPENDIX A

EPA FORM 2070-13