FINAL REPORT

EPA Region 5 Records Ctr.
206932

Lenz Oil Settling Respondents

Remedial Investigation Report
Lenz Oil Service, Inc. Site
Lemont, Illinois

Volume 4 of 6

Revision 1

October 1992

Project No. 0252

Environmental Resources Management-North Central, Inc.
540 Lake Cook Road, Suite 300
Deerfield, Illinois 60015

ERM

ENVIRONMENTAL RESOURCES MANAGEMENT GROUP

FINAL REPORT

Lenz Oil Settling Respondents

Remedial Investigation Report
Lenz Oil Service, Inc. Site
Lemont, Illinois

Volume 4 of 6

Revision 1

October 1992

Project No. 0252

Environmental Resources Management-North Central, Inc.
540 Lake Cook Road, Suite 300
Deerfield, Illinois 60015

APPENDIX B

TECHNICAL MEMORANDUM NO. 1

TECHNICAL MEMORANDUM NO. 1
DESCRIPTION OF CURRENT SITUATION REPORT
REMEDIAL INVESTIGATION
PHASE I, TASK 1

LENZ OIL SERVICE, INC.
LEMONT, ILLINOIS

REVISION: 1

SUBMITTED BY:

LENZ OIL SETTLING RESPONDENTS

MAY 2, 1991

PREPARED BY:

ENVIRONMENTAL RESOURCES MANAGEMENT-NORTH CENTRAL, INC.
102 WILMOT ROAD, SUITE 300
DEERFIELD, IL 60015

ERM PROJECT NO. 0252

TABLE OF CONTENTS

		Page
List of Tables		
List of Figures		
1.0	INTRODUCTION	1-1
2.0	PHYSICAL CHARACTERISTICS OF THE SITE	2-1
2.1	Site Location	2-1
2.2	Site Description	2-1
2.3	Physiography	2-2
2.4	Land Use	2-3
2.5	Site Access	2-3
2.6	Surface Water Hydrology	2-4
2.7	Geology	2-5
2.7.1	Stratigraphy of Southeastern Dupage County	2-5
2.7.2	Stratigraphy of the Lenz Oil Site	2-7
2.7.3	Structural Geology and Regional Fracture Analysis	2-7
2.8	Hydrogeology	2-13
3.0	SITE BACKGROUND	3-1
3.1	History of Ownership	3-1
3.2	History of Waste Transport, Storage, and Disposal	3-1
3.3	History of Response Actions	3-5
3.4	Historical Aerial Photograph Analysis	3-12
3.4.1	1954 Aerial Photograph	3-12
3.4.2	1961 Aerial Photograph	3-13
3.4.3	1967 Aerial Photograph	3-13
3.4.4	1971 Aerial Photograph	3-14
3.4.5	1974 Aerial Photograph	3-14
3.4.6	1981 Aerial Photograph	3-14
3.4.7	1988 Aerial Photograph	3-15

TABLE OF CONTENTS
(Continued)

		Page
4.0	NATURE AND EXTENT OF CONTAMINATION	4-1
4.1	Preliminary Conceptual Site Model	4-1
4.2	Primary Contamination Sources	4-1
4.3	Primary Release Mechanisms	4-3
4.4	Secondary Contamination Sources	4-3
4.5	Secondary Release Mechanisms	4-5
4.6	Migration Pathways	4-5
4.7	Potential Receptors	4-7
4.7.1	Ground Water Users	4-8
4.7.2	Surface Water Users	4-13
4.7.3	Wetlands	4-13
4.7.4	Endangered or Threatened Species	4-14
5.0	CONCLUSIONS AND RECOMMENDATIONS	5-1
REFERENCES		
APPENDICES	A GEOLOGIC LOGS	
	B WELL CONSTRUCTION LOGS	

LIST OF TABLES

Number	Description
2-1	Vertical Joint Orientation
2-2	Water Level Measurements Measurements
3-1	1980-1981 Waste Stream
3-2	Non-Waste Materials Stored On Site
3-3	1984 Waste Stream
3-4	Total Reported Waste Stream Through 5/24/86
3-5	Aerial Photograph Information
4-1	Reported Contaminants in Drums, Tanks, and Tank Trucks
4-2	Reported Contaminants in Surface Impoundments
4-3	Reported Contaminants in On-Site Soil
4-4	Reported Contaminants in Incinerator Ash
4-5	Reported Contaminants in Tent Samples
4-6	Private Well Sampling Parameters
4-7	Reported Contaminants in Private Wells
4-8	Reported Contaminants in Monitoring Wells
4-9	Private Well Data

LIST OF FIGURES

Number	Description
2-1	Location Map
2-2	Base Map
2-3	Land Use Map
2-4	Generalized Stratigraphic Column for the Chicago Area
2-5	Soil Boring/Monitoring Well Location Map
2-6	Stratigraphic Cross Section A-A'
2-7	Stratigraphic Cross Section B-B'
2-8	USGS Vertical Joint and Lineament Orientation Data
2-9	Outcrop Location Map
2-10	ERM Vertical Joint Orientation Data
2-11	Water Table Map, January 29, 1991
2-12	Water Table Map, February 26, 1991
2-13	Water Table Map, March 20, 1991
3-1	Pre-Remediation Site Features Map
3-2	Site Investigation/Remediation Features Map
3-3	Post-Remediation Site Features Map
3-4	Annotated Aerial Photograph, October 7, 1954
3-5	Annotated Aerial Photograph, September 6, 1961
3-6	Annotated Aerial Photograph, September 30, 1967
3-7	Annotated Aerial Photograph, May 14, 1971

LIST OF FIGURES
(Continued)

Number	Description
3-8	Annotated Aerial Photograph, October 10, 1974
3-9	Annotated Aerial Photograph, November 7, 1981
3-10	Annotated Aerial Photograph, April 12, 1988
4-1	Preliminary Conceptual Site Model
4-2	Ground Water Analytical Results
4-3	Private Well Location Map

1.0 INTRODUCTION

This Technical Memorandum describes the results of the background study conducted as part of Phase I, Task 1 of the Lenz Oil Site Remedial Investigation/Feasibility Study (RI/FS). The background study consisted of compiling and analyzing existing data regarding the physical characteristics, history, and nature and extent of contamination at the site. The specific activities that were accomplished during the background study are described in Sections 5.1.1 through 5.1.9 of the Lenz Oil RI/FS Work Plan (ERM-North Central, Inc., 1990).

The background study was conducted to: (1) help determine what additional data are necessary to characterize this site, (2) develop a better conceptual understanding of the site, (3) better define the applicable or relevant and appropriate requirements (ARARs), and (4) narrow the range of remedial alternatives that have been identified. Most of the background study was performed prior to the development of the Lenz Oil RI/FS Work Plan and was used to determine the initial scope of the Lenz Oil Site RI/FS. The results of the initial background study are presented in Sections 2.0 and 3.0 of the Lenz Oil Site RI/FS Work Plan (ERM-North Central, Inc., 1990).

Supplemental background study activities were included in Phase I, Task 1 of the Lenz Oil RI/FS to evaluate the existing data more thoroughly and to better define the scope of Phase I, Task 2 and Phase II, Task 1 activities. Furthermore, these additional background study activities have resulted in a better characterization and conceptual understanding of this site.

Technical Memorandum No. 1 (TM1) is being submitted on behalf of the Lenz Oil Settling Respondents in accordance with Article IX, Part A of the Administrative Order by Consent (USEPA, 1989) and Section 5.1.10 of the Lenz Oil Site RI/FS Work Plan (ERM-North Central, Inc., 1990).

2.0 PHYSICAL CHARACTERISTICS OF THE SITE

2.1 Site Location

The Lenz Oil site is situated northeast of the intersection of Illinois Route 83 and Jeans Road in southeastern DuPage County, Illinois (Figure 2-1). The site is approximately 3.5 miles northeast of the center of Lemont, Illinois and is located in the southeast 1/4 of Section 11, T37N, R11E, of the Sag Bridge 7.5-minute quadrangle.

2.2 Site Description

The Lenz Oil site is bounded by the Atchison, Topeka, and Santa Fe Railroad to the northwest; Illinois Route 83 to the southwest; Jeans Road to the southeast; and a private residence/small business to the northeast. The site is legally described as follows:

> Lot 3 of Jacob J. Jeans plat of survey as part of the southeast quarter of Section 11, Township 37 North, Range 11 East of the 3rd principal meridian, in DuPage County, Illinois, according to the Plat thereof recorded October 7, 1950 as document 606585, except the part of Lot 3 lying northeast of a line perpendicular to Jeans Road from a point which is 202.0 feet southwest, as measured along the southeastern line of Lot 3, of the southeastern corner of Lot 3.

ERM-North Central, Inc. (ERM-North Central) retained Patrick Engineering to perform a boundary and topographic survey of the 4.9-acre Lenz Oil site and the area surrounding the site. A base map, illustrating the topography of the site and all pertinent site features, was produced from the survey data (Figure 2-2). A 100-foot grid was established on the site to ensure the accurate location of sample points. As illustrated on Figure 2-2, the site is currently a vacant grassy area containing a radio antenna, several monitoring wells, a fire hydrant, and two underground utility manways.

2.3 Physiography

The Lenz Oil site is located in the Wheaton Morainal Country Subsection of the Great Lakes Section of the Central Lowland Physiographic Provence (Willman, 1971). In general, the Wheaton Morainal Country is characterized by physiographic features sculpted by continental glaciers. It contains rough knob and kettle topography, kames, kame terraces, and eskers, all of which are among the youngest Wisconsinan drift deposits. This widespread mantle of glacial drift was deposited over an irregular bedrock erosional surface. The thickness of the drift varies, depending on the nature of the bedrock topography, the glacial history, and the amount of post-glacial erosion.

The physiography of the area immediately surrounding the Lenz Oil site is one of undulating uplands, which have been dissected by well-developed drainage channels and rivers. The uplands are characteristic of the rough-surfaced moraines of the Valparaiso Morainic System, portions of which contain pot-hole lakes and wetland areas. Erosion along the Des Plaines River has removed the glacial deposits along the river pathway, thereby exposing the underlying bedrock in a number of areas.

The Lenz Oil site is located in the flood plain of the Des Plaines River, where the river cuts through the rough knob and kettle topography of the Valparaiso Morainic System. As shown on Figure 2-1, the site is situated at the base of a 75-foot bluff that defines the northern boundary of the Des Plaines River Valley. The river valley is relatively smooth and flat compared to the adjacent moraine deposits. The Des Plaines River is approximately 600 feet southeast of the site, and the Chicago Sanitary and Ship Canal is an additional 800 feet beyond the Des Plaines River. On the north side of the Des Plaines River, the regional slope is toward the southeast (i.e., toward the river); however, the site topography has been modified, and part of the site now slopes toward the northwest, where a small ephemeral drainage ditch is situated. The elevation of the site is approximately 600 feet above sea level.

2.4 Land Use

The Lenz Oil site and most of the surrounding area are either idle and undeveloped or used for commercial, light industrial, or residential purposes (Figure 2-3). The site itself is currently vacant and idle. Immediately northwest of the site, the Atchison, Topeka, and Sante Fe Railroad operates an active railroad line. The land northwest of the railroad is primarily wooded open land with a few isolated residential and commercial properties. The areas immediately northeast and southeast of the Lenz Oil site are used for residential purposes; however, large portions of the land are undeveloped and idle. Further east of the site, the land is utilized for commercial and light industrial purposes (i.e., auto wrecking, fire wood cutting, and paving). The property southwest of the site is also used for commercial purposes (i.e., a large auto wrecking facility). The land south of the Lenz Oil site, between the Des Plaines River and the Chicago Sanitary and Ship Canal, consists of wetlands and idle woodland.

There are several notable land use features outside the immediate vicinity of the Lenz Oil site. The Argonne National Laboratory reservation is located approximately 1,400 feet northwest of the site. The southern border of the community of Downers Grove is situated approximately 3,500 feet north of the site. Much of the area southeast of the site, across the Des Plaines River and the Chicago Sanitary and Ship Canal, consists of forest preserve and wetlands. Finally, there are several large industrial complexes situated along the Des Plaines River, both upstream and downstream of the Lenz Oil site.

2.5 Site Access

Access to the Lenz Oil site is controlled by a combination of wire, chain-link, and wooden fencing. As shown on Figure 2-2, the fencing is continuous along the southeastern half of the site, but gaps in the fencing occur in the northern and western corners of the site. Two gates

in the fencing along Jeans Road, which are secured with chains and locks, serve as the primary entry points to the site. No on-site personnel control access to the property.

2.6 Surface Water Hydrology

The Lenz Oil site is located within the Des Plaines River subbasin of the Mississippi River watershed. It is situated within the Des Plaines River Valley, which contains the Chicago Sanitary and Ship Canal, the Illinois and Michigan Canal, and the Des Plaines River/Diversion Channel (Figure 2-1). The Des Plaines River and the Chicago Sanitary and Ship Canal merge into a single river approximately three miles north of Joliet. The Calumet Sag Channel, which is an extension of the Little Calumet River, discharges to the Chicago Sanitary and Ship Canal, approximately 3/4 miles southwest of the Lenz Oil site (Figure 2-1). All of surface water in the Des Plaines River Valley flows to the southwest and eventually empties into the Mississippi River. The Des Plaines River is approximately 200 feet wide at its closest approach to the Lenz Oil site; whereas the adjacent Chicago Sanitary and Ship Canal is approximately 150 feet wide at the same location. According to the Illinois State Water Survey (ISWS), the discharge of the Des Plaines River in the vicinity of the site (i.e., the Riverside gage) ranged from 147 cubic feet per second (cfs) to 3,720 cfs in 1989. The maximum flow recorded in Des Plaines River since installation of the Riverside gage in 1943 is 9,770 cfs. Based on measurements taken at the Romeoville gage, discharge in the Chicago Sanitary and Ship Canal ranged from 1,790 cfs to 12,800 cfs in 1989. The maximum flow recorded in the Chicago Sanitary and Ship Canal since 1974 is 16,300 cfs.

Surface water runoff from the Lenz Oil site and the immediate vicinity of the site either infiltrates the soil or discharges to the Des Plaines River. There are no permanent storm sewer or draining systems to direct surface water runoff from the site. However, a small ephemeral drainage ditch, situated along the northwest border of the site, is the recipient of surface water runoff from the northern half of the site and from the area northwest of the site. This drainage

ditch apparently meanders through the auto wrecking facility southwest of the site and eventually discharges to the Des Plaines River. Although pot-hole lakes are common in the upland areas surrounding the site and several wetland areas are located in the Des Plaines River Valley, no permanent surface water bodies are situated within the bounds of the Lenz Oil site.

2.7 Geology

2.7.1 Stratigraphy of Southeastern DuPage County

The geology of southeastern DuPage County consists of a thick sequence of Silurian bedrock overlain by Quaternary glacial drift and alluvial deposits. A generalized stratigraphic column for the Chicago area is shown on Figure 2-4. The uppermost bedrock in the study area is Silurian dolomite of the Racine Formation, which is the uppermost unit in the Niagaran Series (Willman, 1971). The Racine Formation is a light-gray, pure to silty, sometimes cherty, well-bedded dolomite. The formation crops out: (1) along the northern bluffs of the Des Plaines River Valley, (2) along the banks of the Des Plaines River and the Chicago Sanitary and Ship Canal, (3) on valley floors of large tributary streams, and (4) in quarries in the vicinity of the site.

Underlying the Racine Formation are the Sugar Run and Joliet Formations, which are also part of the Niagaran Series, and the Kankakee and Elwood Formations, which are part of the Alexandrian Series (Willman, 1971). The lithologies of these formations are similar to the overlying Racine Formation. The thickness of the Silurian dolomite varies across southeastern DuPage County because of differential pre-glacial and post-glacial erosion of the bedrock surface. A test boring drilled in the Palos Forest Preserve, which is across the Des Plaines River Valley from the Lenz Oil site, encountered 171 feet of Silurian dolomite before penetrating the underlying bedrock unit (Nicholas and Healy, 1988).

The bedrock surface in southeastern DuPage County is an irregular plain, most of which was shaped by Pleistocene glacial erosion (Willman, et al., 1975). Data from outcrops and borings show that the bedrock has a gently rolling, dissected surface with a well-integrated drainage pattern. A number of deep (up to 150 feet) paleo-river valleys were cut into the underlying bedrock during a major deglaciation event in the area. According to Zeizel and others (1962), the orientation of the paleo-river valleys in DuPage County is controlled by major joints sets in the underlying bedrock. Furthermore, preliminary interpretation of recently compiled seismic-refraction data collected by Nicholas and Healy (1988) suggests that the bedrock surface is a former karst plain. Outcrop and boring data support the karst plain interpretation by documenting the presence of a weathered zone, up to 5 feet thick, at the top of the Silurian dolomite.

Unconsolidated deposits of Quaternary age overlie the Silurian bedrock throughout southeastern DuPage County, except where it has been removed by man or erosion and the underlying bedrock is exposed (Willman, 1971). Most of the unconsolidated deposits consist of Pleistocene glacial drift. The glacial drift is generally of Wisconsinan age and consists primarily of the Wadsworth Till Member of the Wedron Formation, which is a silty and pebbly clay till with local beds of sandy to gravelly moraine deposits (Willman and Lineback, 1970). The Wadsworth Till Member is widespread in uplaid areas, but has been removed by erosion from the Des Plaines River Valley. A thin veneer of Holocene alluvium is present along portions of the Des Plaines River Valley. The alluvium consists of valley-train deposits of the Mackinaw Member of the Henry Formation (Willman and Lineback, 1970). The Mackinaw Member is a poorly sorted, silty sand with local deposits of sandy gravel.

2.7.2 Stratigraphy of the Lenz Oil Site

Eleven stratigraphic borings have been drilled during previous environmental investigations of the Lenz Oil site. The approximate locations of these borings are shown in Figure 2-5, and copies of the original geologic and well construction logs are included as Appendices A and B, respectively. As shown on Figures 2-6 and 2-7, the Racine Dolomite was encountered at the site at depths ranging from 6.0 to 24.5 feet below ground surface. The bedrock is rubbly at the top and fractured throughout the encountered interval. In general, the bedrock surface becomes shallower toward the southeast; however, on a small scale, the bedrock surface is extremely irregular.

The dolomitic bedrock is directly overlain by a bed of silty dolomitic gravel with varying amounts of sand and clay. This deposit was interpreted as glacial outwash by the IEPA physical measurement unit, but it is more likely a layer of weathered dolomite that has escaped erosion and redeposition. A bed of silt, containing variable amounts of sand, clay, and gravel, overlies the weathered dolomite. These poorly sorted deposits are either valley train sediments of the Mackinaw Member of the Henry Formation or, more likely, alluvial deposits associated with the Des Plaines River.

2.7.3 Structural Geology and Regional Fracture Analysis

All of northern Illinois, including the Lenz Oil site, is located within the Central Stable Region tectonic province of the North American continent. The region is characterized by a sequence of southward-thickening sedimentary strata overlying Precambrian basement rocks, which were subject to a series of vertical crustal movements that formed broad basins and arches during the Paleozoic and early Mesozoic time periods. The arches and basins subsequently have been modified by local folding and faulting activity. The major geologic structures in the vicinity of the Lenz Oil site include:

- Illinois Basin - an oval-shaped basin with a depocenter located south of the Lenz Oil site in South-Central Illinois. Strata in the basin rises gently toward the Kankakee Arch in the northeast.

- Kankakee Arch - a northwest-southeast trending extension of the Wisconsinan Arch. The Arch is a result of crustal uplift.

- Sandwich Fault Zone - a northwest-southeast trending vertical fault, approximately 85 miles in length. The fault has about 900 feet of vertical displacement, and all movement along the fault is post-Silurian and pre-Pleistocene.

The Lenz Oil site is located on the crest of the Kankakee Arch, near the northeastern edge of the Illinois Basin. The southeastern extent of the Sandwich Fault Zone is approximately 23 miles southwest of the Lenz Oil site at its closest approach. Although all of these structural features are presently inactive, past activity has strongly influenced the local character of bedrock. For example, in the vicinity of the Lenz Oil site, the Silurian strata dip slightly to the east and southeast because of the eastward plunge of the Kankakee Arch. Furthermore, tensile stress from subsidence of the Michigan and Illinois Basins and uplift of the Wisconsinan and Kankakee Arches has caused jointing in the brittle Silurian dolomite (Foote, 1982). Joints in the dolomite occur in three mutually orthogonal sets, two of which are vertical and one of which is horizontal (Nicholas and Healy, 1988). The vertical sets of joints were caused by structural deformation, as noted above; whereas the horizontal set was formed as a result of carbonate dissolution along bedding planes. According to Zeizel and others (1962), the orientation of bedrock valleys in DuPage County is controlled by these major joint sets.

The U.S. Geological Survey conducted research into the orientation and spacing of joint sets in the Silurian dolomite as part of their study to determine the geologic and hydrologic factors that

control migration of tritium from a closed, low-level radioactive waste disposal site, located approximately 1.5 miles southeast of the Lenz Oil site. The joint analyses included lineament mapping, bedrock surface mapping, and studies of joint orientations exposed in outcrops of the Silurian dolomite (Nicholas and Healy, 1988). The orientations of 156 vertical joints, measured in two quarries were plotted on a rose diagram by plotting 1-unit length per joint and grouping the joints into 5-degree sectors (Figure 2-8). A total of 106 linear structural features were mapped on aerial photographs of the 25-square-mile area surrounding the low-level radioactive waste disposal site and plotted on a rose diagram by using 1-unit length per 100 feet of lineament length and grouping the lineaments into 5-degree sectors (Figure 2-8). The rose diagram of the vertical joint orientations shows two orthogonal sets of joints: one set of joints with an azimuth of 40 degrees, and the other set with an azimuth of 130 degrees. The rose diagram of the lineaments reveals three major sets: two of which correspond to the vertical joint sets and one set, which is oriented at 20 degrees azimuth and has no apparent analogy among the vertical joint sets.

Zeizel and others (1962) and Foote (1982) have shown that the frequency and aperture of vertical joints in the vicinity of the Lenz Oil site decrease with depth below the bedrock surface. This interpretation is based on the assumption that private wells are generally set opposite the most productive portion of an aquifer, which in the case of the Silurian dolomite would be the most highly fractured portion of the aquifer. By plotting well frequency versus depth of penetration into the Silurian dolomite, Zeizel and others (1962) concluded that the upper 60 feet of the dolomite is the most productive portion of the aquifer. Although unconfirmed by direct field measurements, significant fractures probably extend at least 60 feet into the dolomite; however, this conclusion is preliminary and may not accurately describe the bedrock below the Lenz Oil site.

Because Nicholas and Healy (1988) collected their lineament and vertical joint orientation data from an area that included the Lenz Oil site, data from their study are considered applicable to

the Lenz Oil investigation. However, as proposed in Section 5.1.9 of the Lenz Oil RI/FS Work Plan (ERM-North Central, Inc., 1990), ERM-North Central conducted a regional fracture analysis to independently verify the findings of previous investigations. This field investigation was conducted between March 16 and April 7, 1991.

ERM-North Central performed reconnaissance of the area within approximately 1.5 miles of the site to locate outcrops of the Silurian dolomite to be used for the collection of fracture data. The Des Plaines River Channel, the Chicago Sanitary and Ship Canal, the Illinois and Michigan Canal, and the Calumet Sag Channel were all investigated for bedrock exposures. Silurian dolomite outcrops were observed in many areas along these canals and channels, but many of the outcrops appeared to have been disturbed by construction activities. The best undisturbed bedrock exposures were found at or near the Sag Quarries Recreation Area in the Palos Forest Preserve (T37N, R11E, Sections 13 and 14). This area contains abandoned quarries and extensive bedding plane exposures of the Silurian dolomite. The seven outcrops, selected for collection of joint data, are shown on Figure 2-9.

The distribution of the 278 joint orientation measurements, which were collected from the seven outcrops, are shown on Table 2-1 and Figure 2-10. The orientations of the joints were plotted on rose diagrams by grouping the joints into 5-degree sectors and plotting 1-unit length per joint (Figure 2-10). The rose diagram of all the joint measurements (Figure 2-10A) shows three discrete sets of joints: (1) a primary set exhibiting an average azimuth of 132°, (2) a secondary set exhibiting an average azimuth of 47°, and (3) a tertiary set exhibiting an average azimuth of 25°. Although these results closely approximate the results of Nicholas and Healy (1988), ERM-North Central's data show a bi-modal distribution of the primary joint set orientations (Figure 2-10A). The joint set exhibits two prominent orientation nodes, one at 115° to 125° and the other at 130° to 140°.

Because the bi-modal distribution may be a result of construction activities along the Calumet Sag Channel, ERM-North Central separated these data into two groups: measurements collected near the channel (i.e., Outcrops #1 through #5) and measurements collected away from the channel (i.e., Outcrops #6 and #7). Measurement data from each group were tabulated (Table 2-1) and plotted on rose diagrams (Figures 2-10B and 2-10C). The primary joint set measurements taken from outcrops near the channel (Figure 2-10B) show the same bi-modal distribution as the entire data set (Figure 2-10A). However, the primary joint set data collected from the outcrops away from the channel form a single node at 130° to 140° (Figure 2-10C). This suggests that joints exhibiting an orientation of 115° to 125° are only found along the Calumet Sag Channel and, thus, may be an artifact of blasting and construction along the channel and not representative of natural conditions.

The joint orientation data from outcrops away from the channel (Figure 2-10C) are the least likely to have been affected by man-made causes and, thus, are considered the most representative of regional vertical joint orientation patterns. These data suggest the presence of: (1) a primary joint set with an average azimuth of 135°, (2) a secondary joint set oriented at right angles to the primary joint set with an average azimuth of 45°, and (3) a minor tertiary joint set with an average azimuth of 20°. These results are very similar to the vertical joint orientation results reported by Nicholas and Healy (1988).

Because no information regarding the spacing and width of the vertical joints was found in the published literature, ERM-North Central collected these measurements from the seven outcrops described above. The width (or aperture) of the primary and secondary joints varies from tightly closed to approximately 4 inches. The exposed joints are generally wider than the unexposed joints, due to weathering. The spacing ranges from 0.5 to 36 inches and averages approximately 12 inches for the primary joints and from 8 to 24 inches and averages approximately 14 inches for the secondary joints. The length and depth of the joints could not be accurately discerned

because of limited bedrock exposure. Where present, the tertiary joints are prominent and laterally extensive, but they were infrequently observed.

According to Nicholas and Healy (1988), horizontal joints along bedding planes are evident in outcrops and from interpretation of borehole geophysical logs from borings drilled at the low-level radioactive waste disposal site. Outcrops along the northern side of the Des Plaines River Valley display prominent horizontal joints, hundreds of feet long. Many of the joints are weathered, and some are several inches wide. Correlation of horizonal joints between borings at the low-level radioactive waste disposal site is excellent, suggesting the joints are continuous for at least 1,600 feet in the subsurface (Nicholas and Healy, 1988). The apertures of subsurface horizonal joints were measured to be as wide as 2 feet. There is also evidence that many horizontal joints have been infilled with sediment ranging in size from clay to sand.

Nicholas and Healy (1988) have classified all horizontal joints into two groups, subregional and regional. Joints that are areally extensive are considered regional joints; whereas joints that are located in bedrock highs and are truncated at the bedrock surface are classified as subregional joints. Subregional joints are more commonly filled with glacial sediment than regional joints. Based on their interpretation of borehole geophysical logs, Nicholas and Healy (1988) have identified major regional joints at elevations of approximately 415, 440, 525, 550, and 565 feet above sea level.

Based on the geological data collected by the IEPA and its contractors, the bedrock surface below the Lenz Oil site occurs at elevations ranging from approximately 582 to 597 feet above mean sea level. This corresponds to approximately 15 feet of bedrock in which horizontal joints would be discontinuous. Therefore, subregional joints are expected to be encountered at elevations above approximately 582 feet, and regional joints are expected below that elevation. The uppermost regional joint reported by Nicholas and Healy (1988) occurred at an elevation

of 565 feet, which may be encountered in some of the deep monitoring well borings drilled during Phase I, Task 2 of the Lenz Oil RI/FS.

2.8 Hydrogeology

The regional hydrogeology of the area around the Lenz Oil site has been described by a number of authors, including Zeizel and others (1962), Walker (1964), Kraatz (1964), Gibb (1965), Sherman (1968), Smith (1946), Storm (1946), Olimpoi (1984), and Nicholas and Healy (1988). The regional hydrogeological information presented in this section is a summary of these previous reports. The hydrostratigraphic units used in this report are those of Zeizel and others (1962). Hydrostratigraphic units are geologic units, which on the basis of character, origin, stratigraphic position, and water-bearing properties, act as distinct hydraulic systems. From top to bottom, the hydrostratigraphic units defined in the vicinity of the Lenz Oil site are: (1) glacial drift aquifers, (2) the Silurian dolomite aquifer, (3) the Maquoketa Formation aquiclude, (4) the Cambrian-Ordovician aquifer, (5) the Eau Claire Formation aquiclude, and (6) the Mt. Simon aquifer.

The glacial drift and Silurian dolomite aquifers are hydraulically separated from the underlying Cambrian-Ordovician aquifer by the relatively impermeable shales of the intervening Maquoketa Formation. The Cambrian-Ordovician aquifer is further separated from the deeper Mt. Simon aquifer by the intervening impermeable beds of the Eau Claire Formation. A review of well logs from private wells, located within a two-mile radius of the Lenz Oil site, has shown that the Cambrian-Ordovician and the Mt. Simon aquifers are not utilized within the vicinity of the site. The Cambrian-Ordovician and the Mt. Simon aquifers are not considered pertinent to this investigation because of their lack of a receptor population and because they are isolated from the shallow glacial drift and Silurian dolomite aquifers by up to 200 feet of Maquoketa shales.

The aquifers pertinent to the investigation of the Lenz Oil site are the shallow glacial drift and the Silurian dolomite aquifers. The glacial drift aquifers consist of relatively clean, coarse-texture deposits of sand and gravel that occur erratically throughout the glacial drift. Three categories of glacial drift aquifers are recognized in DuPage County: (1) surficial, (2) interbedded, and (3) basal. Surficial glacial drift aquifers appear just below the land surface and consist of sand and gravel deposits of glacial outwash origin. These deposits are generally concentrated in the valleys of the major drainageways in the area. Because these deposits are not laterally extensive, few producing wells are completed in surficial glacial drift aquifers.

Interbedded glacial drift aquifers are deposits of sand and gravel, which occur as lenticular or sheet-like deposits, erratically distributed throughout the glacial drift. The sand and gravel beds are generally interbedded with fine-grained glacial till. Although numerous, these interbedded sand and gravel deposits are generally too thin and/or too discontinuous to yield producible volumes of water. The basal glacial drift aquifers consist of sand and gravel deposits at the base of the glacial drift, directly above the Silurian dolomite. These deposits are also extremely variable in terms of thickness and lateral continuity. Although the basal drift aquifers have relatively high permeabilities and produce sufficient volumes of water, they are generally bypassed in favor of completing the well in the underlying dolomite. Although glacial drift aquifers exceeding 40 feet in thickness are present within a two-mile radius of the Lenz Oil site, a review of private well logs in that area has demonstrated that few private drinking water wells are completed in the glacial drift aquifers.

The Silurian dolomite aquifer include rocks of the Niagaran and Alexandrian series. The depth to the top of the Silurian dolomite aquifer (and consequently the thickness of the Silurian dolomite aquifer) varies widely over short distances because of the irregular nature of the bedrock surface. According to an aquifer thickness map by Zeizel and others (1962), the thickness of the Silurian dolomite aquifer is between 150 and 200 feet thick below the Lenz Oil site.

Because the Silurian dolomite aquifer has a crystalline matrix rather than a granular matrix, ground water is primarily stored in secondary openings in the dolomite and moves through a complex network of these secondary openings. The primary porosity of the dolomite (i.e., microscopic joints and small pore spaces in the crystalline matrix of the dolomite) is extremely low and is considered insignificant in terms of ground water flow in this aquifer (Zeizel and others, 1962; Nicholas and Healy, 1988). However, primary porosity may represent a relatively large portion of the storage capacity of the aquifer. Most of the porosity and permeability in the Silurian dolomite aquifer has a secondary origin (i.e, it was formed after the deposition and consolidation of the rock). The most numerous types of secondary openings are joints and fractures that were produced in the dolomite by deformation forces and later enlarged by dissolution (Zeizel and others, 1962). According to Nicholas and Healy (1988), most ground water flow in the dolomite occurs in large joints, especially horizontal joints. However, the total void space represented by these fractures is relatively small compared with the total volume of the rock unit.

Both Nicholas and Healy (1988) and Zeizel and others (1962) report that the weathered zone at the top of the Silurian dolomite and the uppermost horizontal joints within the dolomite are the major conduits for ground water flow in the aquifer. Joints that have been enlarged by solution activity form the best conduits for migration of ground water. Surface and subsurface investigations of the dolomite show that, in general, enlargement of joints by solution activity has been greatest in the upper portion of the bedrock. Consequently, most wells in the vicinity of the Lenz Oil site are completed in the upper 60 feet of the Silurian dolomite aquifer. Below this depth, the unit has much less secondary porosity and a significantly reduced transmissivity. According to Zeizel and others (1962), the Silurian dolomite aquifer has an extensive network of interconnected joints, fractures, and solution cavities. The basis for this conclusion is: (1) the reliability of the dolomite as a source of ground water, (2) the high yields of wells drilled into the dolomite, and (3) the relatively uniform piezometric surface of shallow ground water in the dolomite. Nicholas and Healy (1988) determined that horizontal joints below an elevation

of approximately 570 feet form a regional ground water flow system that extends throughout the Palos Forest Preserve, which is located across the Des Plaines River Valley from the site. It is likely that the same set of horizontal joints extends below the Des Plaines River Valley and underlies the Lenz Oil site.

Vertical joints in the Silurian dolomite aquifer result in an areal anisotropic transmissivity in the aquifer. This conclusion was drawn by Nicholas and Healy (1988) after interpreting aquifer test data from a ground water study at the Argonne National Laboratory site by using the Papadopulos (1965) solution for anisotropic transmissivity. However, Nicholas and Healy (1988) further concluded that, because the location of individual vertical joints and joint sets was not known for their study area, the effect of vertical joints on ground water flow could not be assessed.

Stratigraphic and water level data collected during previous investigations of the Lenz Oil site show that the aquifer immediately below the site is composed of unconsolidated sand and gravel deposits of alluvial origin and Silurian dolomite. These two units are hydraulically interconnected via the intervening zone of weathered bedrock and a network of interconnected vertical and horizontal joints.

The aquifer is unconfined, and flow is controlled principally by topography. Topographic highs are usually areas of ground water recharge; and conversely, topographic lows are usually areas of ground water discharge. Water level data collected by Nicholas and Healy (1988) from the Palos Forest Preserve clearly demonstrate that ground water flows from the upland areas toward the Des Plaines River Valley. Static water level data from geologic logs of private wells within a two-mile radius of the Lenz Oil site further support the conclusion that ground water flow in the Silurian dolomite aquifer is principally controlled by topography.

Water level measurements were collected from the network of monitoring wells at the Lenz Oil site by the Illinois Environmental Protection Agency (IEPA) on June 4, 1986, November 17, 1986, January 6, 1988, and March 2, 1988 (Table 2-2). Of these four rounds of water level measurements, three rounds show that shallow ground water flows toward the southeast and northeast, and that monitoring wells in cluster G-101 are upgradient of the site. An anomalously high water level was recorded for cluster G-105 during the January 6, 1988 round of measurements, which indicated that ground water was mounded around location G-105, and flow was radial from the site. If the water level measurement from G-105 is eliminated from the January 6, 1988 data set, the resulting ground water flow direction is consistent with the other rounds of water level measurements.

ERM-North Central collected three rounds of water level measurements from the Lenz Oil monitoring wells on January 29, 1991, February 26, 1991, and March 20, 1991, respectively, these measurements, which are shown in Table 2-2, indicate that shallow ground water flow is toward the south, southeast, east, and northeast. As illustrated on the water table maps (Figures 2-9, 2-10, and 2-11) developed from the monthly water level data, the direction of ground water flow appears to vary significantly over time. Some of the variability may be related to changes in the set of monitoring wells from which data were collected. For example, because the shallow well at G-104 was frozen during the January 29, 1991 round of measurements, data from the deep well, which is only 5 feet deeper than the shallow well, was plotted with the shallow wells. Furthermore, water level measurements from three new wells (i.e., MW-01S, MW-04S, and MW-05S) were added to the March data set. Although the water level elevation data sets are not the same, each set indicates shallow ground water below the site flows to the south, southeast, east, and northeast. Final interpretations regarding water flow will be reserved until several rounds of water level measurements are collected from the complete Phase I, Task 2 monitoring well network.

Based on the regional topography and hydrogeology, the uplands northwest of the site are the primary recharge areas for shallow ground water below the site, and the Des Plaines River is probably the discharge area for shallow ground water flowing below the site. The horizontal gradient in the shallow aquifer, as measured from monitoring wells at the Lenz Oil site, is approximately 0.003. The potentiometric head measured in monitoring wells that straddle the water table is 0.17 to 2.62 feet higher than the head measured in monitoring wells screened several feet below the water table. These measurements indicate a downward vertical gradient of 0.013 to 0.444 and a potential for recharge from the water table to the base of the aquifer. Although it is likely that seasonal variations in the stage of the Des Plaines River affects the ground water flow rate below the Lenz Oil site, this has not yet been confirmed by seasonal water level measurements.

Nicholas and Shapiro (1986) conducted a preliminary hydraulic characterization of the Silurian dolomite aquifer beneath the low-level radioactive waste disposal site by using single-hole packer tests at 10-foot intervals in boreholes at their site. To characterize the hydraulic conductivity of the solution-enlarged joint sets, they assumed that each joint is hydraulically analogous to an infinite confined aquifer that is bounded above and below by an impervious dolomite matrix. The uppermost joint set did not fit this assumption because it is hydraulically interconnected with the weathered bedrock zone at the drift-dolomite contact and thus responded like an unconfined aquifer. Estimated values of the hydraulic conductivity for the joint sets range from 2.0×10^{-3} to 1.0×10^{-2} feet/second. The hydraulic conductivity of dolomite contains secondary porosity features, which are less well connected than the joint sets, is approximately 3.0×10^{-5} feet/second. The hydraulic conductivity of the dolomite matrix, if it contained only primary porosity, is estimated to be considerably less than 3.0×10^{-5} feet/second.

3.0 SITE BACKGROUND

3.1 History of Ownership

The following is a chronological summary of the ownership history of the Lenz Oil Service, Inc. property, located at Route 1, Lemont, Illinois 60439. The legal description of this property is presented in Section 2.2 of this Technical Memorandum.

- **1960 to 1980**
  Owner: Lenz Oil Service, Inc.
  President: Winston Lenz

- **1980 - present**
  Owner: Lenz Oil Service, Inc.
  President: Charles Russell

3.2 History of Waste Transport, Storage, and Disposal

Winston Lenz of Hinsdale, Illinois began operating Lenz Oil Service, Inc. in April 1961. The business originally collected waste oils from local service stations and other small businesses; temporarily stored the waste oils in tanks located at the Lenz Oil Service, Inc. facility; and then shipped the waste oils to local recycling facilities. It also supplied oils and construction materials for roadwork projects. In 1980, Charles Russell purchased the Lenz Oil Service, Inc. stock and took over the operation of the facility. Sometime prior to December 1980, the waste oil collection, storage, and transport operation was expanded to include waste solvents. This portion of the operation involved: (1) collecting spent solvents from local commercial and industrial facilities, (2) transporting the waste solvents in tank trucks licensed for hauling special

waste, (3) temporarily storing the solvents in permanent tanks at the Lenz Oil Service, Inc. facility, and (4) transporting the waste solvents to a local recycling facility.

The waste transport, storage, and disposal activities conducted at the Lenz Oil Service, Inc. facility are not documented in regulatory files for the time period between April 1961 and October 1980. Based on the aerial photograph analysis, which is described in further detail in Section 3.4, the on-site storage capacity for waste oils and spent solvents expanded considerably from 1961 through 1981. No further expansion occurred after 1981. Records describing the types and quantities of waste oils and solvents handled by the Lenz Oil Service, Inc. facility during 1980 and 1981, which are probably the peak years of operation for the facility, are summarized on Table 3-1. Non-waste materials that were stored at the site during 1980 and 1981 are summarized on Table 3-2. These records document the relatively small volume of waste solvents handled by Lenz Oil Service, Inc. compared to the volume of waste oils handled by the facility. Although the waste oils included transformer oil (which may have contained PCBs), the oils were not tested or segregated at the Lenz Oil facility. These mixed waste oils were shipped via tanker truck to a local waste oil recycler on a weekly basis. Spent solvents were allegedly tested by the generator prior to collection by Lenz Oil Service, Inc. According to a letter from Charles Russell to IEPA, the spent solvents were shipped out to a recycler as soon as they were received. However, it is unclear whether or not the solvents were temporarily stored at the Lenz Oil Service, Inc. facility and whether or not the solvents were mixed.

IEPA began keeping records of the waste stream handled at the Lenz Oil Service, Inc. facility sometime after 1983. The 1984 waste stream of the Lenz Oil Service, Inc. facility is summarized on Table 3-3. This summary, which is based on an IEPA report, suggests that the types of wastes accepted by the Lenz Oil Service, Inc. facility were the same as those accepted in 1980 and 1981, but that the volume of waste handled in 1984 was approximately 50 percent less than the volume handled in 1980 and 1981. IEPA used waste manifest records to calculate the approximate total volume of waste transported to and from the Lenz Oil Service, Inc. facility

between the time that manifest records were first required and May 24, 1986, which is after the Lenz Oil Service, Inc. facility ceased operation. A summary of the total waste stream for the Lenz Oil Site during that period is presented on Table 3-4.

According to the IEPA (1985), Lenz Oil Service, Inc. ceased to operate in November 1985. In April 1986, Charles Russell filed for bankruptcy and abandoned the facility completely (IEPA, 1985). At the time the facility was abandoned, the following features were located on the site: a wood-frame office building, a concrete-block maintenance building, a concrete parking shed, a metal structure, two monitoring wells (OW-1 and OW-2), a number of aboveground and underground tanks, several tank trucks, a former surface impoundment area, and a cinder pile (Figure 3-1). A fence with two access gates along Jeans Road enclosed the active portion of the facility. The following storage vessels were located at the Lenz Oil Service, Inc. facility in early 1985:

- Three high-capacity (30,000- to 80,000-gallon) underground, unlined, concrete storage tanks.

- Fourteen (14) low- to moderate-capacity aboveground or partially buried steel tanks.

- Six low-capacity underground steel tanks.

- Nine tanker trucks with a total capacity of over 30,000 gallons.

- A drum storage area containing approximately 200 drums.

- Three surface impoundments constructed of porous cinder-type material that were used for hazardous waste storage.

Beginning in 1980, Lenz Oil Service, Inc. attempted to acquire the necessary permits required to operate a waste oil and spent solvent storage and transfer facility in the State of Illinois. In response to an IEPA inspection of the facility on October 2, 1980, and the subsequent notification that the facility was operating without the required permits, Lenz Oil Service, Inc. applied for a permit to operate a waste management site at their facility. The IEPA issued the necessary permit to operate a storage and transfer facility for waste oils and solvents on July 5, 1981. Because of reported ground water contamination at the site, special conditions in the IEPA permit required Lenz Oil Service, Inc. to assess the extent of ground water contamination caused by oils and grease at the site and submit a plan to: (1) limit further degradation, and (2) upgrade the quality of ground water in the area (IEPA, 1981). Although Lenz Oil Service, Inc. installed two monitoring wells on the site, there is no evidence indicating that a ground water contamination study was conducted or that ground water remediation activities were undertaken.

On November 19, 1980, Lenz Oil Service, Inc. submitted an application to the USEPA for a RCRA Part A Permit to store hazardous material in tanks at their facility. In December 1982, USEPA issued a Consent Agreement and Compliance Order stating that Lenz Oil Service, Inc. was operating their facility without an interim status permit. The site continued to operate and was required to obtain the appropriate hazardous waste permits. During November of 1984, Lenz Oil quit accepting hazardous waste (i.e., spent solvents); and on November 13, 1984, they requested the withdrawal of the facility's Part A Permit, stating that the site no longer handled hazardous waste. On February 5, 1985, Noble and Associates, on behalf of Lenz Oil Service, Inc., submitted a closure plan for that portion of the facility (Tank #1) that handled hazardous waste. IEPA confirmed that solvents were no longer being handled by the facility on February 6, 1985; and on July 22, 1985, IEPA approved a partial closure plan for Tank #1. However, the tank was not closed before the facility ceased operations.

After numerous permit violations involving: (1) manifest infractions, (2) inadequate waste handling practices, and (3) reported releases of hazardous waste to local ground water and

surface water systems, the IEPA referred a law suit to the Illinois Attorney General's Office alleging mismanagement of hazardous waste at the Lenz Oil Service, Inc. facility. In May 1985, a complaint was filed in the Circuit Court of DuPage County, Illinois against Lenz Oil Service, Inc. and Charles Russell. An Order, agreed upon by the parties, was entered by the Circuit Court in May 1985. The Order required Lenz Oil Service, Inc. and Charles Russell to initiate immediate clean-up actions and to file a closure and compliance plan. After failing to carry out major portions of the court order, Lenz Oil Service, Inc. ceased operations; and its owner, Charles Russell, filed for bankruptcy in April 1986.

3.3 History of Response Actions

In response to the November 19, 1980 application to develop and operate a waste management facility at the Lenz Oil Service, Inc. site, IEPA outlined several tasks that Lenz Oil Service, Inc. had to complete prior to the issuance of the requested operating permit. Several of these tasks were conducted by Soil Testing Services, Inc. (STS), on behalf of Lenz Oil Service, Inc. The tasks conducted by STS included the preparation of a contingency plan, leak testing of the three high-capacity underground storage tanks, installation of two monitoring wells (OW-1 and OW-2), collection of ground water samples from the monitoring wells, and preparation of a plan to limit further ground water degradation resulting from the operation of the Lenz Oil Service, Inc. facility.

Ground water samples were collected from monitoring wells OW-1 and OW-2 on April 8, 1981, October 23, 1981, and September 22, 1982. Oil and grease were detected in ground water samples collected from both monitoring wells during each round of sampling. The downgradient monitoring well (OW-2) exhibited the highest concentration of oil and grease each time. IEPA records indicate that both monitoring wells were sampled on a quarterly basis and that the samples were analyzed for a selected set of organic and inorganic constituents. Lenz Oil Service, Inc. made no additional attempt beyond installing and sampling OW-1 and OW-2, to

assess the extent of ground water contamination at their facility or to initiate a program to upgrade the ground water quality in the vicinity of the site, as required under the operating permit. However, in an attempt to prevent future degradation of the ground water quality by the Lenz Oil Service, Inc. operation, Lenz Oil paved the area where waste oils and solvents were transferred between tank trucks and underground storage tanks. This measure was approved by IEPA and was completed by Lenz Oil Service, Inc. during the first quarter of 1982.

In response to reports that Lenz Oil Service, Inc. was discharging waste material from surface impoundments at their facility to the drainage ditch north of their facility, IEPA notified Lenz Oil Service, Inc. on February 7, 1985, that these discharges were an apparent violation of Illinois statues. Lenz Oil Service, Inc. informed IEPA that the company was in the process of pumping the liquid from the impoundments into on-site storage tanks where it would be held until proper disposal could be arranged. The material in the surface impoundment was reportedly crankcase oil with 10 to 20 percent water and was allegedly pumped into the impoundments as an emergency measure following the malfunction of oil lines at the facility. IEPA collected samples from the surface impoundment and the drainage ditch north of the facility. The analysis of these samples revealed elevated concentrations of organic compounds and metals in both samples. Pursuant to an anonymous complaint on April 24, 1985, IEPA inspected the Lenz Oil Service, Inc. site again and noted the presence of a milky white substance with a petroleum odor being discharged from the surface impoundments to the drainage ditch north of the site.

Later in April 1985, IEPA referred a law suit to the Illinois Attorney General's Office alleging illegal operation of surface impoundments by Lenz Oil Service, Inc. The parties quickly reached an agreement order; and on May 30, 1985, an immediate clean-up plan was filed by Hamman & Benn on behalf of Lenz Oil Service, Inc. Concurrent with the submittal of the immediate clean-up plan, Lenz Oil Service, Inc.: (1) pumped all contaminated liquids on the site into tanks for storage until approval for final disposal of the material was granted by IEPA, (2) recontoured

the surface of the site to halt the spreading of potentially hazardous liquid, and (3) blocked the flow of surface runoff to the drainage ditch north of the site. Arrangements were also made to sample the soil in the surface impoundments and the ground water in the on-site wells. Changes in operational procedures were also made to ensure that the use of the surface impoundments as an emergency containment area was no longer necessary. A further clean-up plan was filed by Hamman & Benn on behalf of Lenz Oil Service, Inc. on June 13, 1985.

In November 1985, the IEPA inspected the Lenz Oil Service, Inc. facility and observed that the facility was in general disarray and appeared abandoned. During their inspection, the IEPA was informed by Lenz Oil Service, Inc. personnel that the company was preparing to file for bankruptcy later in the month. According to the inspection report, 25 percent of the facility grounds were covered with standing oily water. Storage tanks were filled to the overflow point, and it did not appear that the facility had adequate spill or leak containment structures. After confirming the operating status of the facility and assessing the hazardous nature of the site, the IEPA prepared a Record of Decision (ROD) for the Remedial Action required at the Lenz Oil Service, Inc. site. The ROD was filed January 17, 1986 and amended January 15, 1987. The amended ROD stated that the Remedial Action activities at the Lenz Oil Service, Inc. site would be conducted in the following three phases: Phase I - Remedial Investigation, Phase II - Emergency Remedial Action, and Phase III - Site Remediation.

Phase I Remedial Investigation activities were conducted by IEPA and its contractors (Wehran Engineering Corp. and Petrochem Services, Inc.) between April 15, 1986 and November 30, 1986. The following tasks were completed during the Phase I Remedial Investigation:

- On-site drums, tanks, and tank trucks were inventoried, sampled, and secured. Sample analyses indicated that the contents of the drums were predominantly oils, solvents, and tar waste and that the contents of the tanks and tank trucks were oils and solvents.

- The site was surveyed with a magnetometer and a metal detector to identify buried objects such as piping systems and drums. A few small anomalies were identified, but the precise dimensions of the anomalies could not be determined and the buried objects were not identified.

- Numerous surface and subsurface soil samples were collected and analyzed for organic compounds. Organic contaminants including solvents and petroleum-based products were detected in the soils at concentrations up to 2,000 ppm.

- Eleven (11) monitoring wells, arranged in five-well clusters, were installed to evaluate the hydrogeology of the site and to assess the ground water quality at several intervals, ranging from 8 to 38 feet below ground level. Ground water samples contained various volatile organic compounds, semivolatile organic compounds, and some PCBs.

- Potentially explosive storage tanks were blanketed with nitrogen, all tank penetrations were sealed, berms were constructed to reduce off-site drainage, and a local contractor was hired to conduct weekly inspections of the site to ensure that these emergency measures were maintained.

Based on the results of the Phase I investigation, the IEPA defined the scope of the Emergency Remedial Actions to be conducted under Phase II of the ROD. According to the ROD addendum, the scope of the proposed Emergency Remedial Action activities was not intended to result in complete restoration of the site. The activities were instituted to reduce the gross

immediate environmental hazards presented by the liquids, drummed waste, and leaking underground storage tanks at the site and, therefore, would result in remediation of approximately 100 percent of the on-site liquids, 100 percent of the drummed waste, and 60 percent of the contaminants in the soil.

During Phase II, a mobile rotary kiln incinerator operated by ENSCO was set up at the site to incinerate on-site liquids, drummed waste, and contaminated soil. According to Janssen (1988), the following tasks were conducted as part of the Phase II Emergency Remedial Action Program:

- All drum, tank, and tank truck contents were incinerated.
- The drums were shredded and incinerated, and the tanks and tank trucks were emptied, decontaminated, and transported off site.
- All aboveground and underground structures were removed.
- Soil in the vicinity of the underground storage tank farms and buried drums was excavated to a depth of 9 to 11 feet (i.e., the top of bedrock) and incinerated (see main excavation area, Figure 3-3).
- Hot spots in the area of the former surface impoundments were excavated and incinerated.
- In April 1988, municipal water was made available to residences on Jeans Road and all residences formally using private wells in the immediate vicinity of the site.

A total of 21,000 tons of contaminated soil was excavated and incinerated, and the ash was returned to the excavation area (Figure 3-3). The quantities of soil removed from the main excavation area and from hot spots outside the main excavation area are unknown. Excavation of contaminated soil was reportedly carried out until bedrock was encountered in the vertical direction and until the native soil lateral to the excavation area was found to contain less than 5 ppm total volatile organic compounds. This was achieved in most places at a depth of 9 to 11 feet below ground surface, which corresponds with the top of bedrock. During remediation of soil in the main excavation area, the IEPA had a 10-mil (0.0001-inch) layer of pond-liner-grade visqueen installed above the bedrock, at the base of the excavation pit. Visqueen was installed manually, and overlapping layers of the visqueen were solvent welded. The liner covers the entire main excavation area, including the floor, sidewalls, and approximately one (1) foot of the level ground surrounding the excavated area. Incinerator ash was then placed above the visqueen as backfill material. The hot spot excavation areas were not lined with visqueen, but were backfilled with clean material rather than incinerator ash. Information concerning the soil excavation, liner installation and incineration activities was gathered from Janssen (1988), Janssen (1990), IEPA (1990) and Gardenour (1990).

According to the amended ROD, IEPA had intended to construct a slurry wall dividing and segregating the highly contaminated portion of the Lenz Oil Service, Inc. facility (the southwest one-half of the operating site) from the less contaminated (northeast) portion of the site. There is no indication in the Phase II records that this slurry wall was constructed. The amended ROD also calls for the design and installation of a permanent cap over the portion of the Lenz Oil Service, Inc. site that met clean-up objectives. Other than covering the site with top soil and planting grass, there is no indication that a permanent cap was constructed at the site (Figure 3-3). Phase II activities were completed in July 1988.

Phase III of the amended IEPA ROD was to be conducted simultaneously with Phase II and was to include placing the Lenz Oil Service, Inc. site on the CERCLIS list and conducting the required screening activities to score the site for the National Priorities List (NPL). Assuming the site scored high enough to be placed on the NPL, an RI/FS would be conducted at the site, an appropriate remedy would be designed and constructed, and the IEPA would petition the USEPA for the State's cost-share reimbursement of non-federal expenditures.

On October 23, 1984, the IEPA identified the Lenz Oil Service, Inc. site as a potential hazardous waste site to the USEPA in the form of a Preliminary Assessment (USEPA, 1984). A site inspection was conducted by Wehran Engineering, and a potential hazardous waste site inspection report was submitted on August 14, 1987. On October 2, 1987, a Hazard Ranking Score (HRS) report for the Lenz Oil Service, Inc. site was filed with USEPA Region V. The USEPA proposed that the Lenz Oil site be included on the National Priorities List (NPL) in June 1988 with a HRS score of 42.33 (USEPA, 1987). The score was based on conditions at the facility that existed prior to the IEPA's Emergency Remedial Activities. The NPL listing became final in September 1989. On November 28, 1989, the USEPA and the Lenz Oil Service, Inc. Participating Respondents signed an Administrative Order by Consent to perform an RI/FS of the Lenz Oil Service, Inc. site. In accordance with the Consent Order, ERM-North Central, on behalf of the Lenz Oil Service, Inc. Participating Respondents, submitted an RI/FS Work Plan for the Lenz Oil Service, Inc. site to the USEPA on January 22, 1990. The Work Plan was approved by USEPA Region V and the IEPA on December 18, 1990.

On March 30, 1988, the Lenz Oil Service, Inc. Participating Respondents entered into a judicial Consent Decree with the IEPA and the State of Illinois that constitutes a full settlement of certain current and future site clean-up costs (DuPage County Circuit Court, 1988). The Consent Decree provides that in the event the USEPA requires additional remedial activities at the site, other than ground water remediation, such additional remediation "shall be dealt with by the State."

3.4 Historical Aerial Photograph Analysis

ERM conducted an analysis of historical and current aerial photographs of the Lenz Oil site to better assess the history of operations at the site. All of the aerial photographs of the site available from the U.S. Department of Agriculture were reviewed. These photographs document the physical conditions and the expansion of operations at the Lenz Oil site. Seven black and white photographs representing a period of 34 years (1954-1988) were used as part of this analysis. Photographs from 1954, 1961, 1967, 1971, 1974, 1981, and 1988 were reviewed and interpreted. Table 3-5 provides summary information on the aerial photographs used for analysis.

Topics addressed in the photo analysis include: (1) operations expansion, (2) storage areas, (3) waste disposal areas, and (4) drainage patterns. The results of the analysis are shown on seven annotated figures (Figures 3-4 to 3-10), each representing a interpretation of an aerial photograph.

3.4.1 1954 Aerial Photograph

The 1954 photograph (Figure 3-4) shows the condition of the site prior to the establishment of the Lenz Oil facility. The site was mainly an open field with portions of the east side of the site covered with woods. The vegetation on the east half of the site was a darker shade than the vegetation on the west half of the site. The reason for the variation in vegetation color is unknown.

Two buildings existed at the east corner of the site. The westernmost building may be a residence or former residence; the other is a garage or large shed. A drainage ditch and railroad

tracks were adjacent to the northwest boundary of the site. A farm was located to the south, across Jeans Road from the site. The site was bound by State Route 83 to the west and a wooded area (future Corwin Lenz residence) to the east.

3.4.2 1961 Aerial Photograph

Based on changes in site features shown on the 1954 and 1961 photographs, it is clear that Lenz Oil Services, Inc. began operating between 1954 and 1961. By 1961 (Figure 3-5), a maintenance building had been constructed at the south-central portion of the site, and the underground tank farm immediately north of the maintenance building was in place. Aboveground tanks, tankers, and possibly drums were located in an area west of the underground tank farm. Immediately west of this location was a cleared area or a cement pad. At least three tank trucks were parked on the site. The house noted on the 1954 photograph may have been converted to an office building by the time the 1961 photograph was taken.

3.4.3 1967 Aerial Photograph

Between 1961 and 1967 (Figure 3-6), another underground tank farm was constructed north of the underground tank farm noted in the 1961 photograph, and a cluster of aboveground tanks was established west of the underground tank farm. An area of disturbed soil and/or unidentified objects was located to the east of the southern underground tank farm. A parking shed, located in the western portion of the site, was also constructed between 1961 and 1967. The south half of the parking shed was covered with a roof in 1967, but the north half of the shed was not yet covered. A trailer or mobile home was situated just east of the property, and an area of scattered unknown objects was located immediately northeast of the mobile home. Several tank trucks were parked on the site.

3.4.4 1971 Aerial Photograph

Three aboveground tanks were installed around the maintenance building between 1967 and 1971 (Figure 3-7). A metal shed was constructed between the three underground tank farms north of the maintenance building. Another underground tank farm was built immediately west of the aboveground tank farm located on the western portion of the site. The north half of the parking shed was covered by 1971. A surface impoundment, containing liquid, was present for the first time in the 1971 photograph. Two large areas of disturbed ground and/or unidentified objects surrounded the impoundment. Several tank trucks were parked around the site, which may have been partially enclosed with a fence.

3.4.5 1974 Aerial Photograph

Two large cylindrical aboveground tanks were added near the center of the property between 1971 and 1974 (Figure 3-8). A large rectangular aboveground tank was installed north of the cylindrical tanks. Another tank farm was constructed north of this large rectangular aboveground tank. The surface impoundment was still present in 1974 and still contained liquid. Several tank trucks were parked around the site. A mobile home or tank truck was located just east of the site, on the Corwin Lenz property.

3.4.6 1981 Aerial Photograph

Additional aboveground tanks were added to the tank farm north of the cylindrical tanks (Figure 3-9). A small underground tank farm was added east and adjacent to the aboveground tank farm, located east of the parking shed. The surface impoundment noted in previous photographs may have been present in 1981, but it is not clear from the photograph. Because of the apparent absence of water in the area (as shown on the 1981 photograph), this feature may be the

previously identified surface impoundment or a cinder pile. Several tank trucks were parked around the site.

3.4.7 1988 Aerial Photograph

It is clear from the 1988 photograph (Figure 3-10) that operations had ceased at the Lenz Oil Service, Inc. facility by that time and that remedial activities had begun. An incinerator and a support area were established on the east side of the site. Approximately 75 percent of the site appeared to have been excavated to various degrees. However, the site's main structures (i.e., the maintenance building, parking shed, and office building) were still present.

4.0 NATURE AND EXTENT OF CONTAMINATION

4.1 Preliminary Conceptual Site Model

A preliminary conceptual site model has been developed for the Lenz Oil site that represents the contaminants present, their routes of migration, and potential receptors (Figure 4-1). The purpose of the conceptual model is to aid in the selection of sampling locations and to help identify and evaluate potential remedial alternatives. Information obtained during the RI activities will be used to fine tune the model.

The model was developed by considering and evaluating: (1) the documented history of activities conducted at the Lenz Oil site, and (2) the data collected during the remedial activities undertaken by IEPA and its contractors (see Section 3.3). Because some remedial activities have already been conducted at the site, this model attempts to reflect both pre- and post-remediation conditions at the site. The following subsections describe each aspect of the conceptual model in further detail.

4.2 Primary Contamination Sources

Four primary sources of contamination were identified at the Lenz Oil site: drums, tanks, tank trucks, and surface impoundments. According to IEPA records, a total of 197 drums, 27 tanks, 8 tank trucks, and 3 surface impoundments were located at the site. Although the contents of some of these sources were sampled and analyzed prior to 1986, a coordinated sampling effort was not conducted until the summer and fall of 1986. The permanent locations of the tank farms and drum storage areas are shown on Figures 3-1 and 3-2. An approximate location of the surface impoundment area is also indicated on these figures; however, the impoundments were

allegedly moved several times during the operation of the Lenz Oil facility and were not present during the time the IEPA conducted remedial activities.

ERM-North Central divided the laboratory analytical results for the primary sources into groups representing drums, tanks, tank trucks, and surface impoundments. The analytical results show that the drums, tanks, and tank trucks contained similar types and concentrations of contamination. Because of their similar contaminant characteristics and their proximity to each other, the drums, tanks and tank trucks are considered a single homogenous primary source. As shown in Table 4-1, the drums, tanks, and tank trucks contained elevated concentrations of metals, cyanide, semivolatile organic compounds, volatile organic compounds, and, to a lesser degree, PCB contamination.

The surface impoundment located in the northeastern section of the site was inspected by the IEPA on April 24, 1986 and according to the IEPA inspection report, the contents of the impoundment consisted of a milky white substance with a petroleum odor. ERM-North Central reviewed the limited analytical data describing the contents of this impoundment area; these data indicate elevated concentrations of organics and metals (Table 4-2). Although the contaminant characteristics are similar to those of the drums, tanks, and tank trucks, the surface impoundment will be considered a separate primary source because of its separate location and potential differences in primary release mechanisms.

Because the foregoing primary sources were incinerated by the IEPA in 1986, they have not contributed to further contamination at the site. However, due to poor operating procedures and inadequate housekeeping practices by Lenz Oil Service, Inc., contaminants were released to the on-site soil prior to the IEPA remedial activities. Because the analytical results discussed in this section represent only a small portion of the waste handled by Lenz Oil Service, Inc., these data may not fully describe the types and concentration ranges of contaminants released to the environment.

4.3 Primary Release Mechanisms

The primary release mechanisms of contaminants at the Lenz Oil site include surface water runoff, infiltration, volatile emissions, and transport by dust and other particulate matter (see Figure 4-1). An IEPA site inspection conducted in November 1985 indicated that 25 percent of the facility grounds were covered with standing oily water. Storage tanks were reported to be at the overflow points and did not appear to have adequate spill or leak protection. Also, as noted previously, the contents of the surface impoundment were directly discharged into the drainage ditch on the north side of the facility.

Based on IEPA's records and the characteristics of contaminants in the primary sources, all of the aforementioned primary release mechanisms contributed to the release of contamination. Perhaps the most significant release mechanisms were spillage and leakage from drums, tanks, and tank trucks resulting in subsequent contaminated surface water runoff and infiltration into the area soils.

4.4 Secondary Contamination Sources

Surface and subsurface soils on the Lenz Oil site were sampled and analyzed by the IEPA and its contractors in 1986 (Wehran Engineering, 1987). Although the majority of the soil samples were taken from the northeastern side of the site, samples were collected from various locations and depths across the entire site (Figure 3-2). Insufficient data exist to characterize soil contamination around some of the primary sources, and the analytical results that do exist generally show similar contaminant types and concentration ranges regardless of proximity to individual primary sources areas. Furthermore, the soil samples contained many of the same contaminants detected in the primary sources, but at lower concentrations (Table 4-3). Only a few soil samples contained higher concentrations of contaminants than the primary sources.

As indicated in Section 3.3, approximately 21,000 tons of on-site contaminated soils were excavated and incinerated. The relative quantities of soil removed from the main excavation and areas considered as hot spots are, however, not known. Incinerated ash was used as backfill material in the main excavation areas and, thus, represents another potential secondary source of contamination. Samples of incinerated ash were collected by the IEPA and/or its contractor to evaluate the effectiveness of the incinerator in reducing soil contamination and to document the quality of the ash used to backfill the excavation area. Based on available analytical data, it appears that samples of the ash were analyzed for semivolatile organic compounds and occasionally volatile organic compounds. There is no record of metal analyses for the ash. As indicated in Table 4-4, only a few samples of the ash contained semivolatile or volatile organic contaminants at concentrations above the detection limits. It is unclear whether or not the contaminated ash was further incinerated or if it was used as backfill. Analytical data from "tent samples" show considerable organic contamination (Table 4-5), but the origin and final destination of the "tent sample" material is unknown.

The analytical results for the incinerated ash are a measure of the post-remediation site conditions in the main excavation area. Unfortunately, because the ash was analyzed for an incomplete set of analytical parameters, the actual quality of the backfilled ash is unknown. While the analytical results for the surface and subsurface soils are a measure of the pre-remedial site conditions, only soils exhibiting a total volatile organic concentration greater than 5 ppm were excavated and incinerated. Thus, some contaminated soil remained at the site after remediation. The IEPA is currently collecting soil samples from the incinerated ash backfill, the native soil around the main excavation area, and the soil around the former surface impoundment area. Analytical results from these soil samples will be used to re-evaluate the contaminant characteristics of the secondary sources.

4.5 Secondary Release Mechanisms

The release mechanisms for the secondary sources are similar to those identified for the primary sources. The significant mechanisms in this case are infiltration/percolation, surface water runoff, and dust and other particulate emissions. Infiltration/percolation releases contaminants in the secondary sources (i.e., on-site soil and/or incinerated ash) directly to the ground water migration pathway. Surface water runoff releases contaminants found in the surface soil and incinerated ash directly to the surface water migration pathway and indirectly (i.e., through infiltration/percolation as well) to the ground water migration pathway. Surface soil contaminants may also be released to the air migration route via dust or other particulate emissions.

Surface water runoff from the site appears to drain in a westerly direction along a well-defined ditch on the north side of the facility. The drainage ditch directs flow towards the Des Plaines River. Judging from the proximity of the river, the length of overland flow is estimated as 1,000 to 1,500 feet. Because of the generally flat terrain on and around the site, ponding during rainfall events may occur, resulting in a natural attenuation of contaminants reaching the Des Plaines River. Conversely, areas in which ponding occurs may act as short-term detention ponds for conservative contaminants. During rainfall events, these areas may result in a "first flush" of contamination in the runoff ultimately discharging into the Des Plaines River.

4.6 Migration Pathways

The ground water and surface water pathways are the most likely routes of migration for contamination at the Lenz Oil site. Significant airborne contaminant migration is not considered likely since all of the primary contaminant sources have been eliminated, which leaves dust and other particulates generated from secondary contaminant sources as the only potential airborne

material. Any direct contact and fire/explosion risks were probably eliminated by the IEPA remediation of on-site soils. However, because not all of the on-site soils were remediated and the composition of the backfill is unknown, secondary sources of contamination may still release contamination to the air and pose a minor risk of direct contact.

The local ground water system is the primary migration pathway from the Lenz Oil site. Samples collected from local monitoring wells and residential wells have documented the presence of volatile organics, semivolatile organic, metals, and PCBs in the ground water system. The PCBs were only detected in on-site monitoring wells near the source area. Table 4-6 shows the private wells sampled by IEPA, their locations, sampling dates, and the parameters analyzed. The types of contaminants and ranges of concentrations detected in ground water samples from private and monitoring wells are indicated in Tables 4-7 and 4-8, respectively.

The highest concentration of ground water contamination is centered around the G-105 monitoring well cluster, which is located between the former northern tank farm and drum storage area (Figure 4-2). Lesser amounts of contamination were detected to the south and southeast, in well clusters G-102, G-104, and G-106. Several common laboratory contaminants, were detected in the upgradient well cluster, G-101. Because all but one of these contaminants were detected in the laboratory method blank, the upgradient samples are considered free of site-related contamination.

The distribution of contaminants in ground water suggests the presence of a southeastward migrating plume containing a variety of volatile organics, semivolatile organics, and metals. The wells furthest from the site containing ground water contamination are G-102L, G102D, and the Williams Bait Shop Residential Well. Low concentrations of several volatile organic compounds and one semivolatile organic compound have been detected in all of these wells.

Based on the IEPA ground water data from July 29, 1986 and June 30, 1987, the plume is present at 30.8 feet below the ground surface and extends at least 60 feet downgradient of the site.

Surface water and sediment in the drainage ditch adjacent to the Lenz Oil site are also potential pathways of contaminant migration from the site. The drainage ditch flows into the Des Plaines River southwest of the site. Based on our review of available site data, the potential effects of contamination from the Lenz Oil site on the water and sediment in the drainage ditch have not been previously evaluated.

4.7 Potential Receptors

One of the objectives of the Lenz Oil Service, Inc. RI, as stated in the Work Plan, is to identify potential receptors of contamination migrating from the site. In an initial evaluation of potential receptors, conducted prior to the preparation of the Work Plan, the following groups of potential receptors were identified: ground water and surface water users, wetlands, and endangered/threatened species. Subsequently, fish in the Des Plaines River have been added to this list of potential receptors. These groups of potential receptors have been evaluated in greater detail as part of Phase I, Task 1, and the results of that evaluation are discussed in the following subsections. This information will be used to reevaluate the preliminary conceptual site model and help direct sampling efforts toward the migration pathways most likely to affect the identified potential receptors. Receptor data will also become part of the Lenz Oil site Risk Assessment.

4.7.1. Ground Water Users

According to the HRS package for the Lenz Oil site (USEPA, 1987), ground water users are the primary receptors of concern. The USEPA estimates that 11,335 people use drinking water obtained from wells located within three miles of the Lenz Oil site (USEPA, 1987). All of the wells allegedly draw water from the Silurian dolomite aquifer, and supposedly no alternative water supplies (i.e., municipal water obtained outside the three-mile radius) exist in the area (USEPA, 1987). Because the HRS model, by which these estimates were derived, does not take into account ground water flow direction, ground water divides/discharge areas, or remedial activities, the USEPA estimate is not an accurate indication of the number of ground water users potentially receiving contamination from the site.

Accordingly, ERM-North Central has conducted a ground water usage survey for the area within two miles of the Lenz Oil site. The survey included a review of all of the water well records available from the Illinois Geological Survey and the Illinois State Water Survey for the area of interest as well as water usage records for local water systems. These ground water usage data were then analyzed in terms of the actual hydrogeologic system operating at the Lenz Oil site. The purpose of the water usage survey was to determine: (1) the usable aquifers in the area; (2) the number, type, and location of wells in the vicinity of the site; (3) the construction (i.e., depth, casing, screen materials, and screened intervals) of the wells in the area; (4) the number and location of wells that pump water from the potentially contaminated aquifer; and (5) the wells that are suitable candidates for sampling during Phase II of the RI.

A total of 310 residential, commercial, and industrial wells were identified from the well construction records as being located within approximately two miles of the Lenz Oil site. To facilitate an evaluation of these wells, each well was placed into one of the following three categories: (1) individual wells within one mile of the site, (2) individual wells between one and

two miles of the site, and (3) groups of wells within two miles of the site. The third category was necessary because high well density in some areas made it impractical to accurately locate individual wells. Exact locations of individual wells within each group will be determined, if necessary.

As shown on Figure 4-3, well records indicate, 22 individual wells are located within a one-mile radius of the site and 73 individual wells are situated between one and two miles of the site. Eight groups containing a total of 198 wells are located within two miles of the site; most of these wells (approximately 160) are located between one and two miles from the site. Seventeen wells, located just outside the two-mile radius, were also included in the survey. Table 4-9 lists the following information for each well identified within a two-mile radius of the site: location, installation owner, date, total depth, screen material, screened interval, static water level, and geologic material opposite the screened interval. Each well was also given a unique number, which is listed on Table 4-9 and shown with the corresponding well location on Figure 4-3.

A careful review of the water well logs has shown that only seven wells are completed in the glacial drift aquifer and that all of the remaining 303 wells are completed in the Silurian dolomite aquifer (Table 4-9). Some of the wells completed in the Silurian dolomite aquifer extend a few feet into the underlying Maquoketa shale, but none of the wells penetrate the Maquoketa shale and draw water from the underlying Cambrian-Ordovician aquifer. As discussed in Section 2.8, most wells that utilize the Silurian dolomite aquifer are completed within the upper 65 feet of the aquifer. In general, a steel casing is used to seal off the overlying glacial drift or alluvial deposits, and the rest of the borehole is left open.

Although the static water levels reported on water well records are of limited use for a detailed analysis of ground water flow, they can be used to identify regional ground water flow trends. The static water level data included on Table 4-9, support the interpretation that ground water

in the Silurian dolomite aquifer flows from upland areas, where the aquifer is recharged, toward the Des Plaines River Valley and the Calumet Sag Channel Valley, where the aquifer discharges. Because ground water flows toward the southeast on the north side of the Des Plaines River Valley, all of the private wells located northwest of the Lenz Oil site are upgradient of the site, and should not be considered potential ground water receptors. Additionally, the wells located southeast of the Des Plaines River Valley are hydraulically isolated from ground water passing under the Lenz Oil site by the Des Plaines River discharge area and, therefore, should not be considered potential ground water receptors.

The area potentially impacted by ground water contamination from the Lenz Oil site is, thus, confined to the south one-half of Section 11, T37N, R11E. This area includes all of the wells between the Lenz Oil site and the Des Plaines River, and a few wells lateral to the site. The following private wells have been identified as potential candidates for sampling during Phase II of the RI, pending the results of Phase I Task 2:

- ERM Well No. 235
  Owner: Dupage County Forest Preserve, Well No. 83-2
  Location: T37N, R11E, Sec. 11, NW 1/4 of NW 1/4 of SW 1/4
  Well depth: 200 feet.

- ERM Well No. 233
  Owner: Corwin Lenz
  Location: T37N, R11E, Sec. 11, SE 1/4 of NW 1/4 of SE 1/4
  Well Depth: 125 Feet

- ERM Well No. 232
  Owner: Thomas Redichs

Location: T37N, R11E, Sec. 11, NE 1/4 of NW 1/4 of SE 1/4
Well Depth: 100 Feet

- ERM Well No. 217
  Owner: Richard Flacs
  Location: T37N, R11E, Sec. 11, SE 1/4
  375 Jeans Road
  Well Depth: 100 Feet

- ERM Well No. 234
  Owner: Nick Batistich
  Location: T37N, R11E, Sec. 11, SE 1/4 of NE 1/4 of SW 1/4
  16W 115 99th Street
  Well Depth: 165 Feet

The previous list represents all of the wells in the south half of Section 11 for which water well records exist. The IEPA previously collected ground water samples from the well owned by Corwin Lenz (ERM Well No. 233) and from several other wells in the vicinity of the site. Because water well records are not available for the other wells that IEPA sampled, pertinent information regarding the location and construction of these wells is limited or missing. Nonetheless, each of these wells is considered a potential candidate for sampling and will be investigated further. The following is a list of the private wells sampled by IEPA for which water well records no not exist:

- Well Owner: Schuster
  Location: 11 S. 305 Jackson Street

- Well Owner: Gruber
  Location: Jeans Road

- Well Owner: Williams Bait Shop
  Location: Jeans Road

- Well Owner: Kempa
  Location: 16W 414 99th Street

- Well Owner: Flacks
  Location: 97th Street

- Well Owner: Mason
  Location: Jeans Road

- Well Owner: Stein Haus
  Location: None Given

- Well Owner: Knollwood
  Location: None Given

Because municipal water service was provided to all residences in the vicinity of Lenz Oil site as part of the IEPA remedial activities conducted in 1988, it is likely that many, if not all, of the previously mentioned candidates for private well sampling are no longer in use. Thus, all of the potential candidate wells will be further investigated prior to proposing the final private well sampling locations in the Work Plan for Phase II activities.

4.7.2 Surface Water Users

As discussed in Section 2.6, runoff from the Lenz Oil site enters the drainage ditch northwest of the site and eventually infiltrates the soil or discharges to the Des Plaines River southwest of the site. ERM-North Central conducted an assessment of water usage for a two-mile stretch of the Des Plaines River, downstream of the Lenz Oil site. Inquiries were made to the Metropolitan Water Reclamation District and the Illinois State Water Survey regarding the types and locations of potential water users along the Des Plaines River, downstream of the site. Neither Agency was aware of any water users in the target area that withdrew water from the Des Plaines River, the Chicago Sanitary and Ship Canal, or the Illinois and Michigan Canal for drinking water purposes. However, several industries in the area obtained their process water from the Chicago Sanitary and Ship Canal. Prominent industrial users include the Union Oil Refinery at Romeoville and the Commonwealth Edison Power Plant, located directly across the Des Plaines River Valley from the Lenz Oil site. No other surface water users that have been identified.

4.7.3 Wetlands

Wetlands have been identified in the vicinity of the Lenz Oil site from an interpretation of aerial photographs and topographic maps of the area. Wetlands were defined as low-lying marshy areas and were not classified according to biota. As shown on Figure 2-3, several wetlands are present within a one-mile radius of the site. All of the wetlands are located within the Des Plaines River Valley, and all appear to be perched above isolated layers of impermeable soil material. Field inspections of the wetlands closest to the site revealed that they have been reduced in size by filling activity. For example, the area mapped as a wetland to the northeast of the Lenz Oil site and south of the Atchison, Topeka, and Santa Fe Railroad appears to be completely covered with fill, with the exception of a low area on the northern portion of Corwin

Lenz's property (Figure 2-1). The relatively large marshy area southeast of the site, across Jeans Road, appears to be partially occupied by an auto scrap yard (Figure 2-3). The extent to which this wetland has been altered by the activities of the scrap yard has not been established. Extensive, undisturbed wetlands exist at two locations on the strip of land between the Des Plaines River and the Chicago Sanitary and Ship Canal, one approximately 1,000 feet southeast of the site and the other approximately 5,000 feet southwest of the site (Figure 2-1). An extremely large wetland area is located along the Calumet Sag Channel, approximately two miles southeast of the site (Figure 2-1).

4.7.4 Endangered or Threatened Species

The Illinois Department of Conservation's Natural Heritage Database was accessed to determine the presence of Federal- and State-listed endangered/threatened species in the immediate vicinity of the Lenz Oil site. The database shows no record of Federal- or State-listed threatened/endangered species within a one-mile radius of the site; however, the following State-listed threatened/endangered species have been sighted within a five-mile radius of the site.

Common Name	Status
Pied-billed grebe	Endangered
Red-shouldered hawk	Endangered
Veery	Threatened
River otter	Endangered
Blazing star	Threatened
Hairy marsh yellow cress	Endangered
Awned sedge	Endangered
Crawe sedge	Threatened

In addition to the State-listed species presented above, three nature preserves and five high-quality nature areas are legally protected by the State of Illinois. These protected areas include:

Name	Location
Cap Sauers Holding Nature Preserve	T37N, R12E, Sec. 18
Paw Paw Nature Preserve	T37N, R12E, Sec. 5
Sagawau Canyon Nature Preserve	T37N, R11E, Sec. 13
Waterfall Glen Nature Area	T37N, R11E, Sec. 9
Cap Sauers Holding Nature Area	T37N, R12E, Sec. 12
Lemont East Geological Area	T37N, R11E, Sec. 15
Paw Paw Woods Nature Area	T37N, R12E, Sec. 5
Sagawau Canyon Nature Area	T37N, R11E, Sec. 13

This information is a summary of the existing data available to the Division of Natural Heritage.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The overall objective of the activities conducted during Phase I, Task 1 of the Lenz Oil Service, Inc. RI, and described herein, was to refine the investigative effort for Phase I, Task 2 and Phase II, Task 1. Specifically, data generated during Phase I, Task 1 were intended to fine tune the preliminary conceptual site model and assist in identifying additional sampling locations, or modifying the existing sampling plan. As a result of Phase I, Task 1 activities, the following changes were made to the preliminary conceptual site model presented in the Lenz Oil Service, Inc. Work Plan:

- The surface impoundment area was added to the list of primary contamination sources,
- Spillage and leakage were added to the list of primary release mechanisms, and
- Incinerator ash was added to the list of secondary contamination sources.

Although the preliminary conceptual site model has been revised, the scope of sampling described in the Work Plan for RI Phase I, Task 2 was designed in anticipation of these changes to the model. Specifically, the source characterization activities were designed to include sampling the incinerator ash and the soil in the area of the former surface impoundments to evaluate the nature and extent of contamination in these two secondary sources. The addition of spillage and leakage to the list of primary release mechanisms also has no affect on the proposed sampling plan. Therefore, no additional sampling locations or modifications to the existing Phase I, Task 2 activities are proposed as a result of the revised conceptual site model.

A secondary objective of the Phase I, Task 1 activities was to re-evaluate the locations and depths of proposed monitoring wells after reassessing the ground water flow direction at the site and conducting a regional fracture analysis. As discussed in Section 2.8 of this document, water level data collected by ERM-North Central in January, 1991 confirmed that shallow ground water below the Lenz Oil site flows toward the Des Plaines River. This is consistent with the ground water flow direction presented in the Work Plan, which was used as the basis for selecting the original monitoring well locations.

The results of the regional fracture analysis, as described in Sections 2.7 and 2.8 of this document, pointed out the presence of: (1) laterally extensive, solution-enlarged, horizontal joints, and (2) two orthogonal sets of vertical joints, in the Silurian dolomite aquifer below the site. According to Nicholas and Healy (1988), the primary conduits for ground water flow in the dolomite aquifer are: (1) a rubbly and highly permeable weathered zone at the top of the dolomite, and (2) the uppermost set of solution-enlarged horizontal joints in the dolomite. The shallow horizontal joints are located at elevations of 550 and 565 feet above sea level, which correspond to approximate depths of 35 and 50 feet below ground surface at the Lenz Oil site. The Work Plan requires that monitoring well borings be drilled at least 30 feet below the water table, which corresponds to an approximate total depth of 40 feet below the ground surface. Thus, the monitoring well installation program proposed in the Work Plan and Sampling and Analysis Plan is sufficient to allow placement of: (1) shallow monitoring well screens opposite the weathered zone at the top of the dolomite aquifer, and (2) deep monitoring well screens opposite of the uppermost horizontal joint set. The program is also flexible enough to permit placement of the deep well screen at a deeper more transmissive interval, if the upper joint set is shown to be a poor conduit for ground water migration. Therefore, both of the primary conduits for ground water flow in the Silurian dolomite aquifer can be monitored without changing the monitoring well installation procedure outlined in the Work Plan.

Although Nicholas and Healy (1988) identified two orthogonal sets of vertical joints in the Silurian dolomite aquifer, the location of individual vertical joints is not a predictable feature, but one that has to be confirmed by observation. Because no lineaments transecting the site were observed in the aerial photograph analysis and no outcrops are present on the site or between the site and Des Plaines River, there is presently no useful vertical joint data available to guide the placement of the monitoring well clusters. However, Nicholas and Healy (1988) suggest that ground water, and presumably contaminant, migration occurs primarily through solution-enlarged horizontal joints; therefore, the inability to place monitoring wells at vertical joint locations is probably of lesser significance to the ground water investigation. In conclusion, no changes to the monitoring well locations, depths, or installation procedures are recommended as a result of the re-evaluation of the ground water flow direction and analysis of regional bedrock fracture trends. However, revised monitoring well locations are being proposed as a result of the soil gas investigation. The soil gas investigation results and the proposed monitoring well location changes are presented in Technical Memorandum No. 2.

A third objective of the Phase I, Task 1 activities was to identify potential candidate wells for private well sampling during Phase II, Task 1 activities. As discussed in Section 4.7.1 of this document, 13 private wells have been identified as potential candidates for sampling during Phase II of the RI. Nine of the wells have been previously sampled by IEPA, but only one of the sampled wells has sufficient information regarding the location and construction of the well. Four other wells were identified through a review of water well records available from the Illinois Geological Survey and the Illinois State Water Survey. Because information regarding the location and construction of many of these candidate private wells is limited or missing, further evaluation of all the wells is necessary prior to proposing the final private well sampling locations. Furthermore, municipal water service was provided to all of the residences in the vicinity of the Lenz Oil site as part of the IEPA remedial activities conducted in 1988; therefore, it is likely that many, if not all, of the candidate wells are no longer in use. All of the candidate

wells identified in Section 4.7.1 for sampling during Phase II of the RI will be carefully screened prior to proposing final private well sampling locations in the Work Plan for Phase II activities.

REFERENCES

DuPage County Circuit Court, 1988, State of Illinois vs. Lenz Oil Service, Inc., et al., Partial Consent Decree Between Plaintiffs and Certain Defendants, dated March 30, 1988.

ERM-North Central, Inc., 1990, Remedial Investigation/Feasibility Study Work Plan, Lenz Oil Service, Inc., Lemont, Illinois, Revision 3; November 12, 1990.

Foote, G.R., 1982, Fracture Analysis in Northeastern Illinois and Northern Indiana; M.S. Thesis, University of Illinois, 193 p.

Gradenour, K.E., 1990, Signed statement describing responsibilities and observations during previous Lenz Oil remedial activities.

Gibb, J.P., 1965, Report on Ground Water Conditions in Section 3, T37N, R11E, DuPage County, Illinois, Illinois State Geological Survey, 2 p.

IEPA, 1981, letter to Lenz Oil Service, Inc., written by Thomas E. Cavanagh, Jr., Manager Residual Management Section, Division of Land/Noise Pollution Control, RE: Development Permit No 1981-36-DE, dated July 5, 1981.

IEPA, 1985, Memorandum to Jim Janssen and Jim Frank, written by Steve Colantino, RE: Lenz Oil Service, Inc., dated November 18, 1985.

IEPA, 1990, Sampling Plan for the Lenz Oil Site, prepared by EBASCO Services, Inc., dated January 5, 1990.

Janssen, J., 1988, telephone conversation, IEPA project manager for Lenz Oil site remediation, conducted by David P. Edwards, ERM-North Central, Inc., RE: Lenz Oil Site Remediation.

Janssen, J., 1990, Memorandum to David Dollins, written by James Janssen, IEPA, RE: Lenz Oil Site, Liner Installation, dated July 26, 1990.

Kraatz, P., 1964, Geologic Report on the Ground-Water Conditions for a Domestistic Supply in Section 2, T37N, R11W, DuPage County, Illinois; Illinois State Geological Survey, 2 p.

Nicholas, J.R. and Healy, R.W., 1988, Tritium Migration from a Low-Level Radioactive-Waste Disposal Site near Chicago, Illinois; U.S. Geological Survey Water-Supply Paper 2333. 46 p.

Nicholas, J.R. and Shapiro, A.M., 1986, Hydraulic Characteristics of a Jointed Dolomite Beneath a Low-Level Radioactive-Waste Disposal Site: American Geophysical Union Transaction, V. 67, No. 160.

Olimpio, J.C., 1984, Low-Level Radioactive-Waste Burial at the Palos Forest Preserve, Illinois: Geology and Hydrology of the Glacial Drift, as Related to the Migration of Tritium; U.S. Gelogical Survey Water-Supply Paper 2226, 34 p.

Papadopulos, I.S., 1965, Nonsteady Flow to a Well in an Infinite Anisotropic Aquifer: International Association of Scientific Hydrology, Dubrovnik Symposium on Hydrology of Fractured Rock, Proceedings, v. 1, p 21-31.

Sherman, F.B., 1968, Geologic Report on the Ground-Water Conditions for a Municipal Supply in Section 3, T37N, R11E, DuPage County, Illinois; Illinois State Geological Survey, 2 p.

Smith, H.F., 1946, Report on Ground Water Resources in Section 5, T37N, R11E, DuPage County; Illinois State Geological Survey, 1 p.

Storm, R.R., 1946, Geological Report on the Ground Water Possibilities in Section 5, T37N, R11E, DuPage County; Illinois State Geological Survey, 1 p.

USEPA, 1984, Potential Hazardous Waste Site Preliminary Assessment for Lenz Oil Service, Inc., dated October 23, 1984.

USEPA, 1987, Hazard Ranking System Score and Documentation for Lenz Oil Service, Inc., dated October 2, 1987.

USEPA, 1989, Administrative Order by Conent, RE: Remedial Investigation and Feasibility Study, in the Matter of Lenz Oil Service, Inc., et al., November 23, 1989.

Walker, W.H., 1964, Report on Ground-Water Availability in Section 2, T37N, R11E, DuPage County, Illinois; Illinois State Geological Survey, 2 p.

Wehran Engineering, 1987, Summary Report of the Sampling Activities at the Lenz Oil Service Site, prepared for IEPA, dated March 5, 1987.

Willman, H.B., 1971, Summary of the Geology of the Chicago Area, Illinois State Geological Survey Circular 460, 77 p.

Willman, H.B.; Atherton, E.; Buschbach, T.C.; Collinson, C.; Frye, J.C.; Hopkins, N.E.; Lineback, J.A.; and Simon, J.A.; 1975, Handbook of Illinois Stratigraphy, Illinois State Geological Survey Bulletin 95, 261 p.

Willman, H.B. and Lineback, J.A., 1970, "Surficial Geology Map of the Chicago Region," in Summary of the Geology of the Chicago Area, Illinois State Geological Survey Circular 460, 77 p.

Zeizel, A.T.; Walton, W.C.; Sasman, R.T.; and Prickett, T.A.; 1962, Ground Water Resources of DuPage County, Illinois; Illinois State Water Survey and Illinois State Geological Survey Cooperative Ground Water Report 2.

TABLE 2-1
VERTICAL JOINT ORIENTATION MEASUREMENTS

Lenz Oil Service, Inc. Site
Lemont, Illinois

Joint Azimuth	All Outcrops	Outcrops #1-#5[1]	Outcrops #6 and #7[2]
0-5°	1	1	
5-10°	1	1	
10°-15°	3	2	1
15-20°	3	1	2
20-25°	5	3	2
25-30°	2	2	
30-35°	3	2	1
35-40°	4	3	1
40-45°	11	6	5
45-50°	24	15	9
50-55°	20	15	5
55-60°	19	16	3
60-65°	6	5	1
65-70°	1	1	
70-75°	1		1
75-80°			
80-85°	1	1	
85-90°			
90-95°	2	2	
95-100°	1	1	

TABLE 4-1

REPORTED CONTAMINANTS IN LENZ OIL DRUMS, TANKS, AND TANK TRUCKS

Contaminant	Range of Concentrations Detected			
Antimony	<0.5	-	26.2	mg/kg
Aroclor 1016	<5.0	-	25.0	mg/kg
Aroclor 1242	<5.0	-	85.0	mg/kg
Aroclor 1248	<5.0	-	62.0	mg/kg
Aroclor 1260	<5.0	-	26.0	mg/kg
Arsenic	0.35	-	33.94	mg/kg
Barium	<200	-	1020.0	mg/kg
Beryllium	<2.0	-	2.5	mg/kg
Cadmium	<20	-	30.0	mg/kg
Chromium	<20	-	1235.0	mg/kg
Copper	<10	-	345.0	mg/kg
Cyanide, Reactive	<5	-	349.0	mg/kg
Cyanide, Total	<5	-	165.0	mg/kg
Lead	<4.6	-	2030.0	mg/kg
Mercury	<1.0	-	4.06	mg/kg
Nickel	<1.9	-	350.0	mg/kg
PCBs, Total	<5	-	85.0	mg/g
Selenium	<0.6	-	0.14	ug/l
Zinc	<20.0	-	6310.0	mg/kg
Naphthalene	N/A	-	9100.0	ug/g
Methyl Naphthalene	N/A	-	4700.0	ug/g
Dimethyl Naphthalene	N/A	-	3000.0	ug/g
Trimethyl Naphthalene	N/A	-	1920.0	ug/g
Anthracene	N/A	-	510.0	ug/g
1,1-dichloroethane	N/A	-	93.0	ug/g
1,1,1-Trichloroethane	N/A	-	11,000.0	ug/g
Trichloroethylene	N/A	-	5,100.0	ug/g
Benzene	N/A	-	16,000.0	ug/g
Tetrachloroethylene	N/A	-	7,900.0	ug/g
Toluene	N/A	-	45,000.0	ug/g
Ethyl Benzene	N/A	-	33,000.0	ug/g
Xylene	N/A	-	77,100.0	ug/g
Phenol	N/A	-	54,000.0	ug/l
2,4-dimethylphenol	N/A	-	4,800.0	ug/l

NOTE: N/A - Not Available

TABLE 4-3
REPORTED CONTAMINANTS IN ON SITE SOILS
(Page 2 of 3)

Trichloroethene	<5 - 140000
Benzene	<5 - 8500
4-Methyl-2-pentanone	<10 - 15000
Tetrachloroethene	<5 - 32000
Toluene	<5 - 890000
Ethylbenzene	<5 - 26000
Total Xylenes	<5 - 2000000

Semi-Volatile Organics	**(ug/kg)**
1,2-Dichlorobenzene	<330 - 34000
4-Methylphenol	<330 - 11000
Isophorone	<330 - 9200
2,4-Dimethylphenol	<330 - 5000
Naphthalene	<330 - 30000
2-Methylnaphthalene	<330 - 65000
Acenaphthlene	<330 - 2400
Phenol	<330 - 10000
Dibenzofuran	<330 - 1700
Fluorene	<330 - 3500
Phenanthrene	<330 - 12000
Anthracene	<330 - 2100
Di-n-butylphthalate	<330 - 3500
Fluoranthene	<330 - 7500
Pyrene	<330 - 5500
Butylbenzylphthalate	<330 - 2400
Benzo(a)anthracene	<330 - 3300
Chrysene	<330 - 3400
bis(2-Ethylhexyl)phthalate	<330 - 27000

TABLE 4-4

REPORTED CONTAMINANTS IN INCINERATOR ASH

Analyte	Concentration Range (ug/lg)
Isophorone	<115 - 1800
Naphthalene	< 115
2-Methylnaphthalene	<1,000
Phenanthrene	<1,000
Pyrene	< 115
bis (2-ethylhexyl) phethalate	<1,000
Fluoranthene	< 115

Note: No volatile organic analysis available.

TABLE 4-6

PRIVATE WELL SAMPLING PARAMETERS

RESIDENCE	ADDRESS	METALS	NITRATES	VOLATILES	SEMI-VOLATILES	PCBs/PEST.	CYANIDE
Schuster	11 S. 305 Jackson Street	X	X	X	X	X	X
Gruber	Jeans Road	X	X	X	X	X	X
Williams	Jeans Road	X	X	X	X	X	X
Kempa	16 W 415 99th Street			X	X	X	
Flaks	97th Street			X	X	X	
Lenz	Route 2, Box 208	X	X	X	X	X	X
Mason	Jeans Road	X	X				
Stein Haus	Not Recorded	X					
Knowlwood	Not Recorded	X					

TABLE 4-7

REPORTED CONTAMINANTS IN PRIVATE WELLS
(ALL RESULTS IN mg/l)

	RESIDENCE/SAMPLING DATE						
	WILLIAMS (11/6/86)	BOWLES (11/6/86)	GRUBER (11/6/86)	MASON (11/6/86)	WILLIAMS (3/5/85)	WILLIAMS (6/3/87)	WILLIAMS (7/29/86)
Metals							
Barium	0.080	<0.050	<0.050	<0.050	<0.1	0.063	N/A
Chromium	0.015	<0.010	0.013	<0.010	N/A	N/A	N/A
Copper	0.173	2.99	0.052	0.021	N/A	N/A	N/A
Iron	2.03	0.257	0.563	2.13	1.80	1.55	N/A
Lead	0.008	0.021	0.008	0.005	<0.05	1.55	N/A
Manganese	0.048	0.022	0.038	0.072	<0.04	0.007	N/A
Silver	0.070	0.188	0.040	0.011	<0.010	0.016	N/A
Vanadium	0.010	<0.010	<0.010	<0.010	<0.010	<0.010	N/A
Zinc	0.110	0.585	0.239	0.053	<0.010	0.056	N/A
Volatile Organics							
Acetone	<0.005	<0.005	0.012	<0.005	0.710	<0.005	<0.005
Chloroethane	<0.005	<0.005	<0.005	<0.005	Trace	0.011	0.010
Benzene	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	<0.005
Ethylbenzene	<0.005	<0.005	<0.005	<0.005	Trace	<0.005	<0.005
Xylene	<0.005	<0.005	<0.005	<0.005	Trace	<0.005	<0.005

Note: N/A = Not Applicable

TABLE 4-8

REPORTED CONTAMINANTS IN LENZ OIL GROUND WATER

Contaminant	Range of Concentrations Detected			
Chloroethane	<10	-	112.0	ug/l
C-1,2dichloroethene	<5	-	460.0	ug/l
1,2-dichloroethane	<5	-	215.0	ug/l
1,1,1-trichloroethane	<5	-	252.0	ug/l
Benzene	<5	-	110.0	ug/l
Vinyl Chloride	<10	-	22.0	ug/l
Tetrachloroethene	<5	-	7.4	ug/l
1,1-dichloroethane	<5	-	200.0	ug/l
Toluene	<5	-	1,000.0	ug/l
2-butanone(methyl ethyl ketone)	<10	-	13,700.0	ug/l
Ethylbenzene	<5	-	43.0	ug/l
Xylene, Total	<5	-	180.0	ug/l
PCBs, Total	N/A		200.0	ug/l
Naphthalene	<10	-	13.0	ug/l
Methyl Naphthalene	<10	-	47.0	ug/l
Dimethyl Naphthalene	N/A		100.0	ug/l
Trimethyl Naphthalene	N/A		80.0	ug/l
Anthracene	<10	-	45.0	ug/l
1,2-dichloroethylene	<5	-	61.0	ug/l
Isophorone	<10	-	32.0	ug/l
Phenol	<10	-	Trace	ug/l

NOTE: N/A - Not Applicable

TABLE 4-9
LENZ OIL SITE
PRIVATE WELL DATA

ERM NO.	COUNTY NO.	TOWN-SHIP	RANGE	SEC(1/4)	LOCATION	OWNER	DATE COMPLETED	TOTAL DEPTH	SCREEN MATL.	SCREENED INTERVAL	STATIC WATER	GEOLOGIC MATERIAL
1		38N	11E	36 (SE)	15 W 218 87TH ST.(SE,SW,SE)	BURR OAK DEVLP.	6/13/89	220	OPEN	106-220	99	ROCK
2	26532	38N	11E	36 (SE)	5025 S. SEELEY (SW,SE,SE)	ROBERT NERI	4/24/81	180	OPEN	90-180	100	LIMESTONE
3	2910	38N	11E	36 (SW)	JAROS RESUB LOT #4	RELIABLE CONST.	7/27/72	170	OPEN	146-170	100	ROCK
4	1723	38N	11E	35 (SE)	DOWNER'S GROVE TWP. (SE,SE,SE)	TORRICK	1941	160	OPEN?	114-160		ROCK
5	23670	38N	11E	35 (SE)	9 S 666 MEADOWBROOK DR.	RELIABLE CONST.	3/20/74	170	OPEN	148-170	48	LIMESTONE
6	27892	38N	11E	35 (SE)	8421 MEADOWBROOK DR.	RICHARD PATTON	8/3/87	240	OPEN	154-240	140	LIMESTONE
7	28261	38N	11E	35 (SE)	10 S 131 LEONARD (SE,SE,SE)	HAMLET STEPHENS	8/20/88	190	OPEN	125-190	50	LIMESTONE
8		38N	11E	35 (SW)	8425 MEADOWBROOK (LOT #10)	GENE VINEYARD	8/10/76	150	OPEN		119	LIMESTONE
9	960	38N	11E	35 (SW)	TLE #66 (S/2,SW,SW)	JOHN HUINER	1/29/68	180	OPEN?	138-180	75	LIMESTONE
10	1717	38N	11E	35 (SW)	TRI-STATE VILLAGE (E/2,SW)	CASINO BELLOTA	1948	25	CEMENT	10-25		SAND/CLAY
11	1719	38N	11E	35 (SW)	(TSV) 279 ROSE ST.(E/2,SW)	STANLEY FRYZA	1948	36	CEMENT	10-36		SAND
12	1720	38N	11E	35 (SW)	(TSV) 407 JANET AVE.(E/2,SW)	LESTER LARSON	1948	26	CEMENT	10-26		SAND/CLAY
13	1721	38N	11E	35 (SW)	(TSV) JANET AVE.(E/2,SW)	FRANK POLKA	1948	32	CEMENT	10-32		SAND
14	1798	38N	11E	35 (SW)	(TSV) LOT #8 (SE,SW)	TSV DEVELOPMENT	1941	206	OPEN?	136-206		LIMESTONE
15	2910	38N	11E	35 (SW)	JAROS RE-SUB.	RELIABLE CONST.	3/7/72	170	OPEN	146-170	100	ROCK
16	24482	38N	11E	35 (SW)	TLE LOT #70 (SW,SW)	THOMAS JANSKY	11/25/75	220	OPEN	120-220	120	LIMESTONE
17	24589	38N	11E	35 (SW)	(TSV) LOT #1 (E/2,SW)	JOSEPH GAREST,JR.	6/22/76	165	OPEN	112-165	85	LIMESTONE
18	24812	38N	11E	35 (SW)	TIMBERLAKE ESTATES LOT #62	PARRISH CONST.	9/15/76	160	OPEN	125-160	28	LIMESTONE
19	25811	38N	11E	35 (SW)	9 S 750 WILLIAM DR.(SE,SW,SW)	HENRY PAETSCH	9/23/76	235	OPEN?	180-235	85	LIMESTONE
20	26526	38N	11E	35 (SW)	8627 MEADOWBROOK (SW,NW,SE)	CLIFF WARTHEN	8/2/80	205	OPEN	141-205	129	LIMESTONE
21	26527	38N	11E	35 (SW)	9 S 274 BROOKBANK (SW,SW,SW)	CHARLES ZAK	6/24/82	220	OPEN	122-220	79	LIMESTONE
22	27078	38N	11E	35 (SW)	17 W 155 W.87TH (TLE #61)	GEORGE SKUNDRNA	6/24/85	200	OPEN	150-200	99	LIMESTONE
23	28299	38N	11E	35 (SW)	207 BONNIE BRAE (SW,SE,SW)	CHRIS SALAMOUSKI	10/4/88	185	OPEN	108-185	89	LIMESTONE
24	3105	38N	11E	34 (E/2)	TLE LOT #81 (E/2,E/2)	JAS RAY	2/13/73	180	OPEN	108-180	100	ROCK
25	3366	38N	11E	34 (E/2)	(TLE #8) 7946 TENNESSEE(E/2,E/2)	FRANK ZELIP	9/15/73	180	OPEN	106-180	100	LIMESTONE
26	24358	38N	11E	34 (E/2)	8220 CLARENDON HILLS RD.	RICHARD CECHOWSKI	10/15/75	190	OPEN	130-190	80	LIMESTONE
27		38N	11E	34 (SE)	NW 16 FRONTAGE RD.(SE,SE,SE)	ART SALLNER?	10/9/74	165	OPEN	94-165	74	LIMESTONE
28		38N	11E	34 (SE)	TIMBER LAKE ESTS. LOT #47	PARRISH CONST.	2/15/72	140	OPEN	120-140	58	ROCK
29		38N	11E	34 (SE)	350 MEADOW CT. (TLE #67)	MIKE YAO	9/9/75	160	OPEN	115-160	83	LIMESTONE
30	84	38N	11E	34 (SE)	DU PAGE CO. (SW,SW,SE)	A.F. BUILDERS	1957	170	OPEN	112-170	58	LIMESTONE
31	85	38N	11E	34 (SE)	DU PAGE CO.(SE,SE)	A.F. BUILDERS	1955	185	OPEN	145-185	75	LIMESTONE
32	2280	38N	11E	34 (SE)	9 S 580 CLARENDON HILLS(NE,SE,SE)	KETTELL CONST.	10/20/71	127	STL CAS?	100-127	89	GRAVEL
33	24254	38N	11E	34 (SE)	(TLE) 9 S 709 LORRAINE (SE,SE)	ROBERT ZINTAK	10/7/75	180	OPEN	138-180	108	LIMESTONE
34	24809	38N	11E	34 (SE)	(TLE)9 S 642 LORRAINE(S/2,SE,SE)	ACCURATE DESIGN	9/13/76	200	OPEN	148-200	80	LIMESTONE
35	26518	38N	11E	34 (SE)	(TLE LOT #47) 8015 ALABAMA	ALBERT SUCHA	10/19/79	195	OPEN	123-195	100	LIMESTONE

TABLE 4-9
LENZ OIL SITE
PRIVATE WELL DATA

ERM NO.	COUNTY NO.	TOWN-SHIP	RANGE	SEC(1/4)	LOCATION	OWNER	DATE COMPLETED	TOTAL DEPTH	SCREEN MATL.	SCREENED INTERVAL	STATIC WATER	GEOLOGIC MATERIAL
36	26519	38N	11E	34 (SE)	(TLE) 8035 TENNESSEE (NW,NE,SE)	ROBERT SVATEK	10/9/80	185	OPEN	116-185	84	LIMESTONE
37	26525	38N	11E	34 (SE)	8425 MEADOWBROOK DR.	GENE VINEYARD	4/1/76	220?	OPEN	150-220?	119	LIMESTONE
38		38N	11E	34 (SW)	1033 FRONTAGE RD. (SW,SE,SW)	CHESTER GASAWAY	2/24/84	200	OPEN	97-200	79	LIMESTONE
39	905	37N	12E	6 (NW)	87TH & COUNTY LINE RD.(NW,NE,NW)	CATALINA CONST.	3/2/68	160	OPEN	84-160	36	LIMESTONE
40	25841	37N	12E	6 (NW)	8901 COUNTY LINE RD.(SW,NW,NW)	WILLIAM JOHNSTON	11/23/77	160	OPEN	103-160	98	LIMESTONE
41	29367	37N	12E	6 (NW)	NE 1/4 OF SW 1/4 OF NW 1/4	GEORGE MATOCHA	8/19/79	140	OPEN	90-140	58	LIMESTONE
42	29368	37N	12E	7 (NW)	133 E. OGDEN AVE.? (NW,NW)	ROWELL CHEMICAL	10/13/83	100	OPEN	40-100	8?	LIMESTONE
43	25394	37N	12E	7 (SW)	FOREST PRESERVE (NW,NW,SW)	ARGONNE LAB	9/23/76	173	OPEN	128-173	140	LIMESTONE
44	25395	37N	12E	7 (SW)	FOREST PRESERVE (NW,NW,SW)	ARGONNE LAB	9/28/76	280	OPEN	116-280	99	LS/SHALE
45	25396	37N	12E	7 (SW)	FOREST PRESERVE (NW,NW,SW)	ARGONNE LAB	9/20/76	201	OPEN	160-201	98	LIMESTONE
46	2144	37N	12E	18 (NW)	U. OF C. EXP. STA. (NW,NW,NW)	IL WATER SURVEY	1/44	308	OPEN	171-308	153	LIMESTONE
47	25397	37N	12E	18 (NW)	FOREST PRESERVE (NW,NW,NW)	ARGONNE LAB	9/17/76	215	OPEN	175-215	160	LIMESTONE
48		37N	11E	1 (NE)	11519 ROSEMERE (NE,NE,NE)	EDWARD OTTO	11/28/69	180	OPEN	100-180	115	LIMESTONE
49		37N	11E	1 (NE)	87TH ST. S. OF HINSDALE (SW,NE)	ED MALICK		150	OPEN	56-150		ROCK
50		37N	11E	1 (NE)	15 W 051 87TH (NE,NW,NE)	CARL LAUDONDO	11/18/83	185	OPEN	77-185	59	LIMESTONE
51		37N	11E	1 (NE)	15 W 620 89TH (SW,NW,NE)	VAL ADAMKUS	10/2/79	220?	OPEN	133-220?	136	LIMESTONE
52	1111	37N	11E	1 (NE)	CVE (NE,SE,NE)	TERRY HECTOR	1/30/68	71	OPEN	44-71	18	LIMESTONE
53	1118	37N	11E	1 (NE)	CVE #33 (E/2,NE)	TERRY HECTOR	5/68	80	OPEN	52-80	31	SHALE?
54	1119	37N	11E	1 (NE)	CVE #20 (E/2,NE)	TERRY HECTOR	5/68	80	OPEN	52-80	21	SHALE?
55	1120	37N	11E	1 (NE)	CVE #1 (E/2,NE)	TERRY HECTOR	5/68	75	OPEN	48-75	24	SHALE?
56	1121	37N	11E	1 (NE)	CVE #44 (E/2,NE)	TERRY HECTOR	5/68	79	OPEN	42-79	27	SHALE?
57	1122	37N	11E	1 (NE)	CVE #38 (E/2,NE)	TERRY HECTOR	5/68	75	OPEN	46-75	26	SHALE?
58	1123	37N	11E	1 (NE)	CVE #18 (E/2,NE)	TERRY HECTOR	6/68	80	OPEN	46-80	28	LIMESTONE
59	1564	37N	11E	1 (NE)	SE 1/4 OF SW 1/4 OF NE 1/4	KOTELLA		120	OPEN?	75-120?		ROCK
60	3430	37N	11E	1 (NE)	NE 1/4 OF SE 1/4 OF NE 1/4	DIORIO BLDRS.	10/18/73	213	OPEN	80-213	59	ROCK
61	23693	37N	11E	1 (NE)	11 S 420 DREW (NW,NE,NE)	RICHARD SOMOLIK	1/7/74	113	OPEN	74-113	19	LIMESTONE
62	23863	37N	11E	1 (NE)	15 W 101 87TH ST.(NE,NE,NE)	RONALD CHOCHOLA	9/23/74	200	OPEN	70-200	60	LIMESTONE
63	23908	37N	11E	1 (NE)	15 W 101 87TH ST.(NE,NE,NE)	RONALD CHOCHOLA	12/4/74	160	OPEN	68-160	60	LIMESTONE
64	24228	37N	11E	1 (NE)	8750 S. COUNTY LINE(SW,NW,NE)	JOHN PARTEPELO	7/22/75	200	OPEN	60-200	38	ROCK
65	25015	37N	11E	1 (NE)	NW 1/4 OF SE 1/4 OF NE 1/4	PAT ALDERTINI	12/2/76	205	OPEN	136-205	138	LIMESTONE
66	25220	37N	11E	1 (NE)	15 W 101 87TH ST.(NE,NE,NE)	RONALD CHOCHOLA	11/2/78	180	OPEN	60-180	98	LIMESTONE
67	28428	37N	11E	1 (NE)	15 W 305 91ST ST. (S/2,NE)	CAM KRAUSE	7/20/84	200	OPEN	97-200	70	LIMESTONE
68		37N	11E	1 (NW)	8900 S. MADISON (NW,SW,NW)	EDWARD PRINER	1/4/82	200	OPEN	126-200	60	ROCK
69		37N	11E	1 (NW)	15 W 620 89TH ST (PAYNE'S #1)	RICHARD REDIEHS	9/10/79	220	OPEN	125-220	130	LIMESTONE

TABLE 4-9
LENZ OIL SITE
PRIVATE WELL DATA

ERM NO.	COUNTY NO.	TOWN-SHIP	RANGE	SEC(1/4)	LOCATION	OWNER	DATE COMPLETED	TOTAL DEPTH	SCREEN MATL.	SCREENED INTERVAL	STATIC WATER	GEOLOGIC MATERIAL
70	2129	37N	11E	1 (NW)	SPACE VALLEY SUBD. LOT #19	CHATEAU HOMES	6/28/71	130	OPEN	100-130	70	ROCK
71	3128	37N	11E	1 (NW)	10 S 245 MADISON ST.(NW,SW,NW)	G. RODRIGUEZ	3/3/73	180	OPEN	120-180	130	LIMESTONE
72	3480	37N	11E	1 (NW)	OAKDALE LOT #19 (SW,NW)	JACK WHEELER	11/5/73	200	OPEN	130-200	112	ROCK
73	25221	37N	11E	1 (NW)	(OD #37)10 S 230 GRANT(NE,SW,NW)	GARY HERMES	8/24/78	188	OPEN	120-188	120	LIMESTONE
74	25222	37N	11E	1 (NW)	ERICKSON MANOR SUBD. LOT #1	PONSTERN BLDRS.	10/31/78	190	OPEN	110-190	38	LIMESTONE
75	27169	37N	11E	1 (NW)	15 W 720 89TH ST. (SW,NW,NW)	WILLIAM NORRIS	11/5/85	250	OPEN	126-250	125	LIMESTONE
76		37N	11E	1 (SE)	87TH ST. S. OF HINSDALE (NW,SE)	WILLIAM WASHER		120	OPEN	94-120		ROCK
77		37N	11E	1 (SE)	87TH ST. S. OF HINSDALE (SW,SE)	CRADEVILL		54	OPEN	40-54		ROCK
78	1565	37N	11E	1 (SE)	W/2 OF NE 1/4 OF SE 1/4	JOHN RACEK	5/37	160	OPEN?	60-160	60	SIL DOL
79		37N	11E	1 (SW)	1818 S. CLARENCE (OAK RIDGE #3)	TONY SARACCO	8/26/82	200	OPEN	124-200	69	ROCK
80	1032	37N	11E	1 (SW)	10 S 441 MADISON ST.(NW,NW,SW)	KETTEL CONST.	5/14/68	140	OPEN	105-140	94	LIMESTONE
81	1061	37N	11E	1 (SW)	10 S 445 GLENN (SV LOT #3)	SEFARA BLDRS.	11/15/68	160	OPEN	85-160	50	LIMESTONE
82	1185	37N	11E	1 (SW)	SPACE VALLEY LOT #1	SEFARA BLDRS.	5/10/69	160	OPEN	100-160	90	LIMESTONE
83	1241	37N	11E	1 (SW)	SPACE VALLEY LOT #4	SEFARA BLDRS.	10/15/69	160	OPEN	100-160	80	LIMESTONE
84	2033	37N	11E	1 (SW)	10 S 580 GLENN DR.(SW,NW,SW)	SEFARA BLDRS.	5/24/71	180	OPEN	85-180	65	ROCK
85	2120	37N	11E	1 (SW)	91ST & MADISON (NW,NW,SW)	THOMAS BEURSKEN	7/3/71	170	OPEN	110-170	59	ROCK
86	2130	37N	11E	1 (SW)	SPACE VALLEY #6 (NW,SW,SW)	SEFARA BLDRS.	7/27/71	265	OPEN	133-265	138	ROCK
87	2309	37N	11E	1 (SW)	(AD#40)11 S 344 MADISON(W/2,SW)	ROBERT NEWMAN	11/23/71	130	OPEN	45-130	10	LIMESTONE
88	2430	37N	11E	1 (SW)	10 S 607 GLENN DR. (NW,SW,SW)	KETTEL CONST.	3/22/72	165	OPEN	120-165	104	LIMESTONE
89	2472	37N	11E	1 (SW)	SW 1/4 OF SW 1/4 OF SW 1/4	RELIABLE CONST.	4/28/72	120	OPEN	105-120	78	ROCK
90	3129	37N	11E	1 (SW)	(SV #5)10 S 675 GLENN(NW,SW,SW)	SWANSON	3/3/73	190	OPEN	118-190	130	LIMESTONE
91	3228	37N	11E	1 (SW)	SPACE VALLEY SUBD. LOT #31	CASTLE BLDRS.	7/2/73	160	OPEN	100-160	50	ROCK
92	3229	37N	11E	1 (SW)	10 S 581 MADISON ST.(SV #35)	LEROY SKRIDEN	5/25/73	180	OPEN	116-180	110	LIMESTONE
93	3431	37N	11E	1 (SW)	NORTH 100', LOT #61	RELIABLE CONST.	7/22/73	135	OPEN	120-135	53	LIMESTONE
94	3479	37N	11E	1 (SW)	SPACE VALLEY LOT #20	PAUL SMITH	11/6/73	160	OPEN	102-160	115	LIMESTONE
95	24318	37N	11E	1 (SW)	15 W 531 89TH (SW,SE,SW)	STEVENS BLDRS.	10/16/75	190	OPEN	125-190	80	LIMESTONE
96	24579	37N	11E	1 (SW)	SPACE VALLEY SUBD. LOT #32	ALEX McCRACKEN	5/17/76	180	STL CAS?	0-180	58	LIMESTONE
97	24747	37N	11E	1 (SW)	SE 1/4 OF NE 1/4 OF SW 1/4	DAVE ERICKSON	10/15/76	150	OPEN	90-150	60	LIMESTONE
98	24748	37N	11E	1 (SW)	(SV #2)10 S 526 GLENN(SW,NW,SW)	DONALD HALL	11/3/76	185	OPEN	130-185	130	LIMESTONE
99	25093	37N	11E	1 (SW)	SANITARY DIST. (AD LOT #61)	EDWARD McCLUSKY	5/27/77	190	OPEN	126-190	75	LIMESTONE
100	25094	37N	11E	1 (SW)	(SV #11)9532 HENNITTA(W/2,SW)	CARL RUMER	5/27/77	180	OPEN	126-180	78	LIMESTONE
101	25949	37N	11E	1 (SW)	NW 1/4 OF SW 1/4 OF SW 1/4	JOE DePAULO	7/6/79	160	OPEN	103-160	69	LIMESTONE
102	27215	37N	11E	1 (SW)	10 S 601 GARFIELD RD.(NE,NW,SW)	ROBERT BIAGETTI	10/22/85	125	OPEN	66-125	29	LIMESTONE
103	23616	37N	11E	1 (SW?)	ASSESSMENT DIVISION LOT #40	JERUTIS BLDRS.	2/11/74	125	OPEN	41-125	20	LIMESTONE
104	23617	37N	11E	1 (SW?)	ASSESSMENT DIVISION LOT #7	JERUTIS BLDRS.	2/18/74	150	OPEN	80-150	60	LIMESTONE
105	1112	37N	11E	1? (NE)	CVE #27 (SE,SE,NE)	TERRY HECTOR	1/30/68	74	OPEN	46-74	20	LIMESTONE

TABLE 4-9
LENZ OIL SITE
PRIVATE WELL DATA

ERM NO.	COUNTY NO.	TOWN-SHIP	RANGE	SEC(1/4)	LOCATION	OWNER	DATE COMPLETED	TOTAL DEPTH	SCREEN MATL.	SCREENED INTERVAL	STATIC WATER	GEOLOGIC MATERIAL
106		37N	11E	2 (NE)	16 W 140 89TH ST.(SE,NW,NE)	GARY KNOLBLOCH	10/12/82	220	OPEN	163-220	119	LIMESTONE
107	897	37N	11E	2 (NE)	9012 SKYLINE DR.(SW,SW,NE)	VIOLA WOLFF	8/14/67	192	OPEN	126-192	108	ROCK
108	1972	37N	11E	2 (NE)	(TSV) SKYLINE DR. (SW,NE)	HAZEL POKALL	1948	34	CEMENT	10-34		SAND/GVL
109	2131	37N	11E	2 (NE)	TSV LOT #13	PARK LANE REALTY	6/27/71	200	OPEN	150-200	78	ROCK
110	2310	37N	11E	2 (NE)	TRI-STATE VILLAGE LOT #12	W. WILLIAMSON	11/23/71	200	OPEN	158-200	88	ROCK
111	2357	37N	11E	2 (NE)	(TSV #24)8915 PALISADES(W/2,NE)	R. ZIMA	11/15/71	225	OPEN	170-225	149	ROCK
112	2963	37N	11E	2 (NE)	TSV LOT #4	BALDUCCI	9/19/72	160	OPEN	143-160	65	ROCK
113	3038	37N	11E	2 (NE)	TSV LOT #3	JOHN BRETZ	11/6/72	195	OPEN	175-195	78	ROCK
114	3211	37N	11E	2 (NE)	TRISTATE VILLAGE LOT #13	BALDUCCI	5/22/73	155	OPEN	118-155	80	ROCK
115	3275	37N	11E	2 (NE)	TSV LOT #5	PHIL BIESEMEYER	6/19/73	180	OPEN	144-180	60	ROCK
116	3276	37N	11E	2 (NE)	TSV LOT #6	PHIL BIESEMEYER	6/19/73	180	OPEN	138-180	60	ROCK
117	23566	37N	11E	2 (NE)	40 CUSTER ST. (NE,SE,NE)	ED JEANS	12/18/73	225	OPEN	137-225	160	LIMESTONE
118	23802	37N	11E	2 (NE)	143 HILLSIDE LANE (NW,NE)	JURE POZEK	8/27/74	220	OPEN	155-220	130	LIMESTONE
119	24059	37N	11E	2 (NE)	TSV LOT #15	EARL CLYDE	4/1/75	180	OPEN	125-180	33	LIMESTONE
120	24060	37N	11E	2 (NE)	8805 PALISADES (TSV #32)	RONALD MAROUSEK	4/2/75	205	OPEN	155-205	125	LIMESTONE
121	24319	37N	11E	2 (NE)	SE 1/4 OF SW 1/4 OF NE 1/4	JZ CONST.	11/20/75	180	OPEN	115-180	80	LIMESTONE
122	24450	37N	11E	2 (NE)	10 S 330 MADISON (SE,SE,NE)	DIORIO BLDRS.	3/29/76	175	OPEN	115-175	130	LIMESTONE
123	24580	37N	11E	2 (NE)	534 OGDEN (TSV LOT #19)	PARK LANE REALTY	5/4/76	180	STL CAS?	0-180	124	LIMESTONE
124	25015	37N	11E	2 (NE)	8700 S. COUNTY LINE (NW,SE,NE)	PAT ALDERTINI	12/2/76	205	OPEN	139-205	138	LIMESTONE
125	25225	37N	11E	2 (NE)	16 W 310 91ST (SW,SW,NE)	R.T. CHADNER	11/15/78	205	OPEN	150-205	115	LIMESTONE
126	25227	37N	11E	2 (NE)	16 W 184 89TH (SW,NE,NE)	LEAHY HOME BLDRS.	11/18/77	250	OPEN	153-250	147	LIMESTONE
127	25228	37N	11E	2 (NE)	10950 URSULA DR.(NW,NE,NE)	ST. & ASSOCS.	12/19/77	165	OPEN	155-165	98	LIMESTONE
128		37N	11E	2 (NW)	8101 COUNTY LINE RD.(W/2,NW)	GEORGE REDIEHS	4/15/77	125	OPEN	40-125	4	LIMESTONE
129		37N	11E	2 (NW)	17 STIRRUP CT. (TLE #47)	ROBERT DELMASTRO	7/18/79	220	OPEN	138-220	118	LIMESTONE
130	24749	37N	11E	2 (NW)	9053 O'NEIL (TLE #15)	RUDY DURHAM	9/30/76	200	OPEN	147-200	85	LIMESTONE
131	3230	37N	11E	2 (NW)	10 S 60 LAKEWOOD (TLE #55)	FRANK GAWEL	5/29/73	190	OPEN	137-190	90	LIMESTONE
132	3101	37N	11E	2 (NW)	TSV LOT #13	TOM FISHER	3/30/73	180	OPEN	160-180	80	ROCK
133	1147	37N	11E	2 (NW)	16 W 466 91ST ST. (S/2,NW)	JOSEPH BOBEK	3/14/69	190	OPEN	150-190	138	LIMESTONE
134	23995	37N	11E	2 (NW)	10 S 070 RTE.83 (NE,NE,NW)	GEORGE MATOCHA	2/5/75	205	OPEN	160-205	100	LIMESTONE
135	23996	37N	11E	2 (NW)	16 W 471 HILLSIDE (SE,NE,NW)	FRANK RUZICKA	2/6/75	205	OPEN	160-205	100	LIMESTONE
136	24750	37N	11E	2 (NW)	16 W 556 HILLSIDE (SE,NE,NW)	MELVIN MILLER	9/16/76	190	OPEN	135-190	80	LIMESTONE
137	83	37N	11E	2 (NW)	NE 1/4 OF SE 1/4 OF NW 1/4	A.J. BUILDERS	1957	175	OPEN	125-175	70	LIMESTONE
138	1062	37N	11E	2 (S/2)	SPACE VALLEY LOT #2	SEFARA BLDRS.	5/23/68	100	STL CAS?	0-100	90	SAND/GRAVEL
139	2356	37N	11E	2 (SE)	SPACE VALLEY LOT #24	CREATIVE BLDRS.	1/19/72	260	OPEN	119-260	88	ROCK
140	2473	37N	11E	2 (SE)	16 W 125 89TH (SE,NE,SE)	JOSEPH DACKA	3/11/72	240	OPEN	142-240	79	ROCK

TABLE 4-9
LENZ OIL SITE
PRIVATE WELL DATA

ERM NO.	COUNTY NO.	TOWN-SHIP	RANGE	SEC(1/4)	LOCATION	OWNER	DATE COMPLETED	TOTAL DEPTH	SCREEN MATL.	SCREENED INTERVAL	STATIC WATER	GEOLOGIC MATERIAL
141	2480	37N	11E	2 (SE)	SPACE VALLEY SUBD. LOT #7	BOLT BROS.	5/31/72	126	OPEN	120-126	60	ROCK
142	25224	37N	11E	2 (SE)	NE 1/4 OF SE 1/4 OF SE 1/4	ROBERT BAKER	8/24/77	200	OPEN	147-200	34	ROCK
143	25226	37N	11E	2 (SE)	10 S 934 MADISON (SE,SE,SE)	HANDCRAFTED HOMES	11/28/78	200	OPEN	127-200	115	LIMESTONE
144	27540	37N	11E	2 (SE)	10420 S. KNOX (SW,SE,SE)	ROBERT SWAYKA	1/27/87	180	OPEN	130-180	85	ROCK
145	1161	37N	11E	2 (SE)	CENTER OF NW 1/4 OF SE 1/4	FRED LENZ	7/15/68	205	OPEN	140-205	90	NIAG LS
146	1162	37N	11E	2 (SE)	CENTER OF NW 1/4 OF SE 1/4	WINSTON LENZ	8/1/68	205	OPEN	140-205		NIAG LS
147	2069	37N	11E	2 (SE)	94TH & JACKSON (SW,SW,SE)	RELIABLE CONST.	3/23/71	180	OPEN	162-180	79	ROCK
148	2132	37N	11E	2 (SE)	16 W 375 94TH ST.(SW,SW,SE)	RELIABLE CONST.	7/16/71	180	OPEN	160-180	139	ROCK
149	2474	37N	11E	2 (SE)	16 W 185 89TH S..(SE,NW,SW)	JOSEPH SERAFIN	5/23/72	240	OPEN	138-240	79	ROCK
150	3039	37N	11E	2 (SE)	OAK HILL ESTATES LOT #14	RELIABLE CONST.	10/27/72	190	OPEN	150-190	28	ROCK
151	3095	37N	11E	2 (SE)	94TH & OAK HILL (OH LOT #9)	NICK BATISTICH	1/19/73	140	OPEN	111-140	89	ROCK
152	3167	37N	11E	2 (SE)	OAK HILL ESTATES LOT #25	RELIABLE CONST.	4/19/73	180	OPEN	166-180	60	ROCK
153	3394	37N	11E	2 (SE)	OAK HILL LOT #19	PARRISH CONST.	10/5/73	160	OPEN	147-160	60	ROCK
154	23618	37N	11E	2 (SE)	16 W 253 94TH ST (OH #12)	JAMES McGUIRE	12/10/73	200	OPEN	147-200	129	ROCK
155	23694	37N	11E	2 (SE)	16 W 302 W 94TH ST.(SE,NW,SE)	TIM ZANGRI	5/10/74	180	OPEN	137-180	58	ROCK
156	23741	37N	11E	2 (SE)	510 DOWNERS DR.(OAK HILL #7)	NICK BATISTICH	5/24/74	190	OPEN	128-190	75	LIMESTONE
157	23864	37N	11E	2 (SE)	OAK HILL ESTS. LOT #3 (NW,SW,SE)	DENNIS BUMBER	9/6/74	170	OPEN	160-170	78	LIMESTONE
158	24229	37N	11E	2 (SE)	(OH #1) 93RD PLACE (SW,SE)	BLDG. & CONST.	9/23/75	190	OPEN	130-190	115	LIMESTONE
159	27472	37N	11E	2 (SE)	16 W 300 94TH PL.(SE,SW,SE)	NEDELJKO NIHOLIC	8/29/86	205	OPEN	145-205	139	LIMESTONE
160	27473	37N	11E	2 (SE)	382 LORCH (SE,SW,SE)	RICHARD SABLICK	2/12/87	180	OPEN	126-180	79	ROCK
161	27653	37N	11E	2 (SE)	OAK HILL #10 (SW,SW,SE)	WARTHEN PUMP	5/1/87	205	OPEN	153-205	109	LIMESTONE
162	27701	37N	11E	2 (SE)	2650 BREWER LANE (SE,SW,SE)	CALLAHAN & ASSOC.	4/13/87	180	OPEN	120-180	79	ROCK
163	27791	37N	11E	2 (SE)	16 W 267 94TH S..(SE,SW,SE)	DEBBIE ROCKABRAND	6/3/87	180	OPEN	148-180	79	ROCK
164	28092	37N	11E	2 (SE)	16 W 267 93RD (SE,NW,SE)	BILL ALLEN BLDRS.	2/22/83	180	OPEN	132-180	99	ROCK
165	28204	37N	11E	2 (SE)	2927 S. 48TH AVE.(NW,SW,SE)	BILL CARSTEN	6/16/88	200	OPEN	145-200	89	LIMESTONE
166		37N	11E	2 (SW)	10 S 731 JACKSON ST.(SE,NW,SW)	CHESTER GASAWAY	5/7/80	220	OPEN	160-220	130	LIMESTONE
167	63	37N	11E	2 (SW)	NW 1/4 OF NW 1/4 OF SW 1/4	RAMLIN ROSE SOUTH	7/18/67	1610	OPEN	512-1610	594	LS/SH/SS
168	907	37N	11E	2 (SW)	NW 1/4 OF NW 1/4 OF SW 1/4	RAMLIN ROSE SOUTH	1967	249	OPEN	108-249	78	LIMESTONE
169	2058	37N	11E	2 (SW)	NW 1/4 OF NE 1/4 OF SW 1/4	RAMBLIN ROSE	10/4/70	300	OPEN	120-300	77	LS/SH
170	2339	37N	11E	2 (SW)	16 W 301 94TH ST. (S/2,S/2)	ROBERT HABADA	1/3/72	220	OPEN	156-220	78	ROCK
171	25223	37N	11E	2 (SW)	9454 S. JACKSON	DENNIS ANDRYSIAK	9/14/78	180	OPEN	150-180	45	LIMESTONE
172		37N	11E	3 (NE)	16 W 451 HILLSIDE (SW,NW,NE)	HANS DEV. CO.	7/1/89	220	OPEN	140-220	100	LIMESTONE
173	503	37N	11E	3 (NE)	TIMBERLAKE ESTS. #94 (NE,NE,NE)	HENRY JOUKEMA	1959	191	OPEN	153-191	90	LIMESTONE
174	1567	37N	11E	3 (NE)	10 S. 140 LEONARD (SW,NW,NE)	IVAN PUMMEL	1966	150	OPEN	115-150	55	LIMESTONE
175	2088	37N	11E	3 (NE)	TIMBERLAKE ESTS. #38 (NE,NE,NE)	CHESTER GASAWAY	7/13/71	150	OPEN	130-150	40	ROCK
176	23803	37N	11E	3 (NE)	17 W 268 HILLSIDE (SW,NE,NE)	WILLIAM CALABRETTA	8/22/74	190	OPEN	136-190	75	LIMESTONE
177	25230	37N	11E	3 (NE)	4736 MAIN ST. (TLE #88)	KELLOG-BENET BLDR.	5/20/78	160	OPEN	147-160	78	LIMESTONE
178	27078	37N	11E	3 (NE)	17 W 155 W. 87TH ST. (NE,NE)	GEORGE SKUDRNA	6/24/85	200	OPEN	150-200	99	LIMESTONE
179	28002	37N	11E	3 (NE)	4741 CUMNOR RD. (NE,NE,NE)	JACK SPINNEY	10/26/87	200	STL CAS?	0-200	89	LIMESTONE
180	28429	37N	11E	3 (NE)	NE 1/4 OF NW 1/4 OF NE 1/4	DAVE KELLEY	12/4/84	245	OPEN	145-245	50	LIMESTONE
181	24320	37N	11E	3 (NW)	10 S 020 LORRAINE (N/2,NE,NW)	ACCURATE DESIGN	11/5/75	200	OPEN	148-200	90	LIMESTONE

TABLE 4-9
LENZ OIL SITE
PRIVATE WELL DATA

TABLE 4-9
LENZ OIL SITE
PRIVATE WELL DATA

ERM NO.	COUNTY NO.	TOWN-SHIP	RANGE	SEC(1/4)	LOCATION	OWNER	DATE COMPLETED	TOTAL DEPTH	SCREEN MATL.	SCREENED INTERVAL	STATIC WATER	GEOLOGIC MATERIAL
182	25229	37N	11E	3 (NW)	16 W 424 HILLSIDE (SE,NE,NW)	NICK BATISTICH	10/20/77	220	OPEN	147-220	150	LIMESTONE
183	27543	37N	11E	3 (NW)	NW 1/4 OF NW 1/4 OF NW 1/4	DU PAGE CO.	10/20/86	325	OPEN	101-325		LS/SH
184		37N	11E	3 (SE)	87TH ST. S. OF HINSDALE (NW,SE)	MAXWELL HOWARD	1932	138	OPEN	126-138		ROCK
185	24381	37N	11E	3 (SE)	NW 1/4 OF NW 1/4 OF SE 1/4	DU PAGE CO. FOREST	4/28/76	150	OPEN	105-150		LIMESTONE
186		37N	11E	3 (SW)	87TH ST. S. OF HINSDALE (NE,SW)	LOUIS REDIEHS		103	OPEN	86-103		ROCK
187		37N	11E	3 (SW)	DU PAGE CO. (SE,SW)	ARNOLD REDISH	1924	91	OPEN	69-91		ROCK
188		37N	11E	3 (SW)	DU PAGE CO. (SE,SW)	MALIKOWSKI	1914	85	OPEN	63-85	13	ROCK
189		37N	11E	3 (SW)	DU PAGE CO. (NE,SW)	SMITH		100	OPEN	96-100		ROCK
190	654	37N	11E	3 (SW)	NE 1/4 OF SW 1/4 OF SW 1/4	ARGONNE LAB		110	OPEN?	80-110	37	LIMESTONE
191	1566	37N	11E	3 (SW)	SW 1/4 OF SW 1/4 OF SW 1/4	ARGONNE LAB	1950	1595	OPEN?	64-1595		LS/SH/SS
192		37N	11E	4 (NE)	ARGONNE LAUNCHER AREA (NE,NE)	U.S. ARMY	1955	230	OPEN	140-230		
193		37N	11E	4 (NE)	881 W ST CHARLES RD.(NE,SE,NE)	FOREST PRESERVE	11/15/78	150	OPEN	110-150	58	LIMESTONE
194	1568	37N	11E	4 (NE)	DOWNER'S GROVE TWP. (NW,NW,NE)	WELCH		115				ROCK
195	218	37N	11E	4 (SE)	NE 1/4 OF SW 1/4 OF SE 1/4	ARGONNE LAB	2/59	341	OPEN	115-341	84	SIL/ORD DOL
196	656	37N	11E	9 (NE)	SW 1/4 OF SE 1/4 OF NE 1/4	ARGONNE LAB		186	OPEN	86-186		LIMESTONE
197	1571	37N	11E	9 (NE)	NE 1/4 OF NW 1/4 OF NE 1/4	ARGONNE LAB	6/64	331	OPEN	110-331	88	LS/SH
198	1572	37N	11E	9 (NE)	NE 1/4 OF NW 1/4 OF NE 1/4	ARGONNE LAB	6/64	331	OPEN	108-331	85	LS/SH
199	658	37N	11E	9 (SE)	SW 1/4 OF NW 1/4 OF SE 1/4	ARGONNE LAB		141	OPEN	86-141	101	LIMESTONE
200	659	37N	11E	9 (SE)	NE 1/4 OF NE 1/4 OF SE 1/4	ARGONNE LAB	1940	240	OPEN?	95-240	60	LIMESTONE
201	660	37N	11E	9 (SE)	NE 1/4 OF SE 1/4 OF SE 1/4	ARGONNE LAB	1921	148	OPEN?	86-148	111	LIMESTONE
202	661	37N	11E	9 (SE)	NE 1/4 OF SE 1/4 OF SE 1/4	ARGONNE LAB	1934	111	OPEN?	91-111		LIMESTONE
203	662	37N	11E	10 (NW)	NW 1/4 OF SE 1/4 OF NW 1/4	ARGONNE LAB	1934	97	OPEN?	63-97	22	LIMESTONE
204	664	37N	11E	10 (NW)	SE 1/4 OF SE 1/4 OF NW 1/4	ARGONNE LAB		160	OPEN	160-168		LIMESTONE
205	665	37N	11E	10 (NW)	NW 1/4 OF SW 1/4 OF NW 1/4	ARGONNE LAB		168	OPEN?	160-168	52	LIMESTONE
206	1509	37N	11E	10 (NW)	SW 1/4 OF NE 1/4 OF NW 1/4	ARGONNE LAB	1948	300	OPEN	61-300	70	SIL/ORD LS/SH
207	1510	37N	11E	10 (NW)	NE 1/4 OF SE 1/4 OF NW 1/4	ARGONNE LAB	1948	284	OPEN	75-284	75	SIL/ORD LS
208	2395	37N	11E	10 (NW)	SW 1/4 OF SW 1/4 OF NW 1/4	ARGONNE LAB		202	OPEN?	140-202	69	LIMESTONE
209	26215	37N	11E	10 (SE)	12 W LAKE ST.(SE,NW,SE)	DU PAGE CO.	3/5/81	200	OPEN	77-200	59	ROCK/SH
210	26216	37N	11E	10 (SE)	12 W LAKE ST.(SE,NW,SE)	DU PAGE CO.	1/23/81	160	OPEN	70-160	59	ROCK
211	663	37N	11E	10 (SW)	NW 1/4 OF SE 1/4 OF SW 1/4	ARGONNE LAB		95	OPEN?	50-95	72	LIMESTONE
212	714	37N	11E	10 (SW)	SW 1/4 OF SW 1/4 OF SW 1/4	ARGONNE LAB	1949	155	OPEN	115-155	107	LIMESTONE
213	510	37N	11E	11 (NE)	ASSESSMENT DIV. (SW,SW,NE)	ALLAN BECKMAN	1959	155	OPEN	105-155	80	LIMESTONE
214	1262	37N	11E	11 (NE)	11519 ROSEMERE (NE,NE,NE)	EDWARD OTTO	11/29/69	180	OPEN	100-180	115	LIMESTONE
215	1276	37N	11E	11 (NE)	16 W 220 97TH (SE,NW,NE)	CARL PETERSON	9/10/69	150	OPEN	115-150	90	LIMESTONE

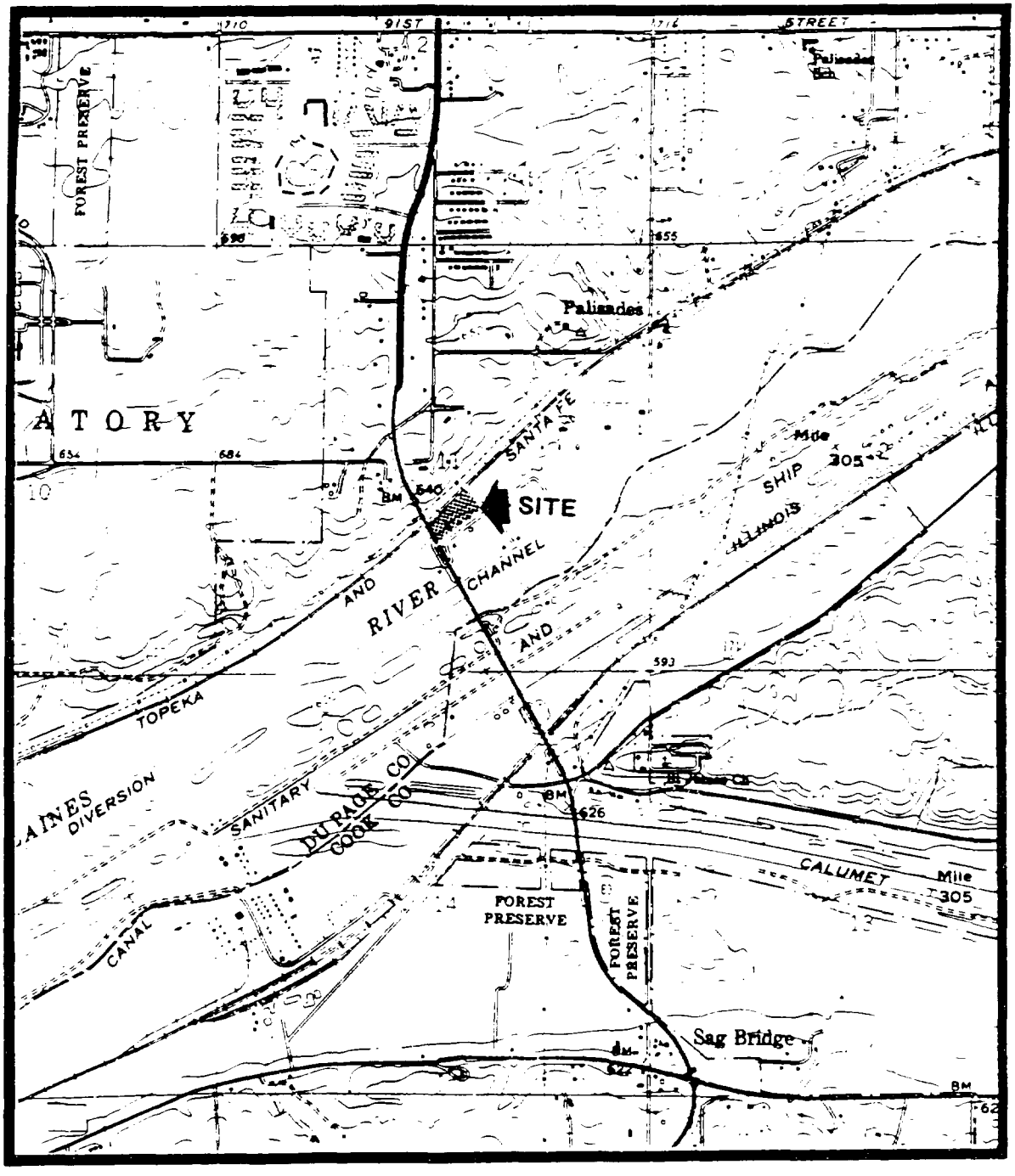
TABLE 4-9
LENZ OIL SITE
PRIVATE WELL DATA

ERM NO.	COUNTY NO.	TOWN-SHIP	RANGE	SEC(1/4)	LOCATION	OWNER	DATE COMPLETED	TOTAL DEPTH	SCREEN MATL.	SCREENED INTERVAL	STATIC WATER	GEOLOGIC MATERIAL
251	10 - 16	37N	11E	14 (NW)	CAL-SAG CHANNEL:7 SITES (S/2,NW)	CORPS OF ENGRS.	<10/1/46	22-26	BORINGS			LIMESTONE
252		37N	11E	14 (S/2)	CHICAGO-JOLIET RD.(S/2,S/2)	AL ALBRECHT	3/10/75	120	OPEN	63-120	50	LIMESTONE
253		37N	11E	14 (SE)	111TH & ARCHER	MRS. RUPERT	1913	60	OPEN	22-60		ROCK
254	28597	37N	11E	15 (NE)	5925 BENTLEY (NE,SE,NE)	JAMES TILLEY	8/21/84	240	OPEN	132-240	129	ROCK
255		37N	11E	15 (SE)	JOESEPH N. PEW'S SUBD. (LOT #3)	JIM ADCOCK	12/20/78	105	OPEN	40-105	3	LIMESTONE
256	26981	37N	11E	15 (SE)	LEMONT HIGHWAY RD. (SE,SE,SE)	JOHN DEYOUND	8/22/85	145	OPEN	40-145	19	LIMESTONE
257	786-792	37N	11E	15 (SE?)	DU PAGE CO.? - 7 SITES	N. IL GAS CO.	10/62	28-90	BORINGS?			LIMESTONE
258		37N	11E	15 (SW)	BURR RIDGE (NW,SW,SW)	GENE VINEYARD	3/20/81	105	OPEN	42-105	9	LIMESTONE
259	1457	37N	11E	16 (SE)	SW 1/4 OF SW 1/4 OF SE 1/4	RICHMOND BUILDERS	12/13/70	160	OPEN	127-160	18	ROCK
260		37N	11E	22 (NE)		JOHN McGRAW	1916	100	OPEN	65-100		ROCK
261		37N	11E	22 (NE)	1598 MAIN ST. (SE,NW,NE)	COUNTRY CLUB	5/17/77	151	OPEN	77-151	65	LIMESTONE
262	27102	37N	11E	22 (NW)	NW 1/4 OF NW 1/4 OF NW 1/4	PATRICIA STRADER	8/5/85	100	OPEN	40-100	19	ROCK
263	29293	37N	11E	22 (NW)	1134 KOTLEN (NW,NW)	RONALD BUSHMAN	9/18/84	180	OPEN	40-180	39	ROCK
264	29294	37N	11E	22 (NW)	114TH ST & WALKER RD.(SW,SW,NW)	NEIL LINDBERG	10/17/79	180	OPEN	50-180	19	ROCK
265	29296	37N	11E	22 (NW)	1349 MAGIN ST. (NW,SW,NW)	EMITY McCUTCHEON	9/17/81	225	OPEN	42-225	39	LS/SH
266		37N	11E	23 (NE)	LEMONT TWP.	P.J. RUPERT	1907	200	OPEN	77-200	>75	ROCK
267		37N	11E	23 (NE)	LEMONT TWP.(NE,NE)	CONWAY	11/3/47	200				
268		37N	11E	23 (NE)	16 ARTESIAN-AG #16 (E/2, NE)	NICK BATISTICH	11/16/72	140	OPEN	88-140	79	ROCK
269	766	37N	11E	23 (NE)	ARCHER & BELL (E/2, NE)	E. BELGRAVE	10/8/68	115	OPEN	81-115	59	ROCK
270	1374	37N	11E	23 (NE)	AG LOT #28 (SW,SE,NE)	RAY RUDIS BLDRS.	9/6/71	150	OPEN	85-150	59	ROCK
271	1523	37N	11E	23 (NE)	RTE. 1 WOODLANE AVE.(SW,SW,NE)	KETTELL CONST.	3/24/72	135	OPEN	85-135	74	LIMESTONE
272	1644	37N	11E	23 (NE)	CAMPBELL ST LOT #30 (NE,SE,NE)	JAMES DEMPSEY	11/17/71	160	OPEN	84-160	59	ROCK
273	4416	37N	11E	23 (NE)	ARCHER GARDENS LOT #51	CHESTER GASAWAY	8/3/73	120	OPEN	80-120	40	ROCK
274	25384	37N	11E	23 (NE)	BELL & CAMPBELL RDS.(NE,SE,NE)	ALLEN HULL BLDRS.	6/7/76	100	OPEN	70-100	49	ROCK
275	25812	37N	11E	23 (NE)	AG LOT #50 (E/2, NE)	ROBERT KOLODMNSKI	7/28/77	215	OPEN	82-215	59	ROCK
276	26306	37N	11E	23 (NE)	ARCHER GARDENS LOT #2(NW,SE,NE)	FRANK PICK	9/19/77	185	OPEN	90-185	82	LIMESTONE
277		37N	11E	23 (NE?)	ARCHER GARDENS LOT #38	WOHEAD BLDRS.	6/27/73	130	OPEN	70-130	55	LIMESTONE
278		37N	11E	23 (NW)	113TH PL. & BELL RD.(E/2,NW)	K.V. BLDRS.	11/2/74	170	OPEN	100-170	64	ROCK
279	2087	37N	11E	23 (NW)	SE 1/4 OF SE 1/4 OF NW 1/4	COUNTRY CLUB	7/63	297	OPEN	87-297	52	LS/SH
280	2088	37N	11E	23 (NW)	SW 1/4 OF SW 1/4 OF NW 1/4	COUNTRY CLUB	10/20/66	300	OPEN	60-200	43	LS/SH
281		37N	11E	23 (SW)	LEMONT TWP.	JOHN DOMINICK	1915	150	OPEN	115-150	50	ROCK
282	585	37N	11E	23 (SW)	SE 1/4 OF NW 1/4 OF SW 1/4	COUNTRY CLUB	10/20/67	335	OPEN	112-335	73	LIMESTONE
283	29297	37N	11E	23 (SE)	BELL RD. (SE,NE,SE)	JOE KEIM BLDRS.	1/10/80					

SAG BRIDGE QUADRANGLE

ILLINOIS

7.5 MINUTE SERIES (TOPOGRAPHIC)
1963
PHOTOREVISED 1973
PHOTOINSPECTED 1978



SCALE 1:24000

1 .5 0 1 MILE

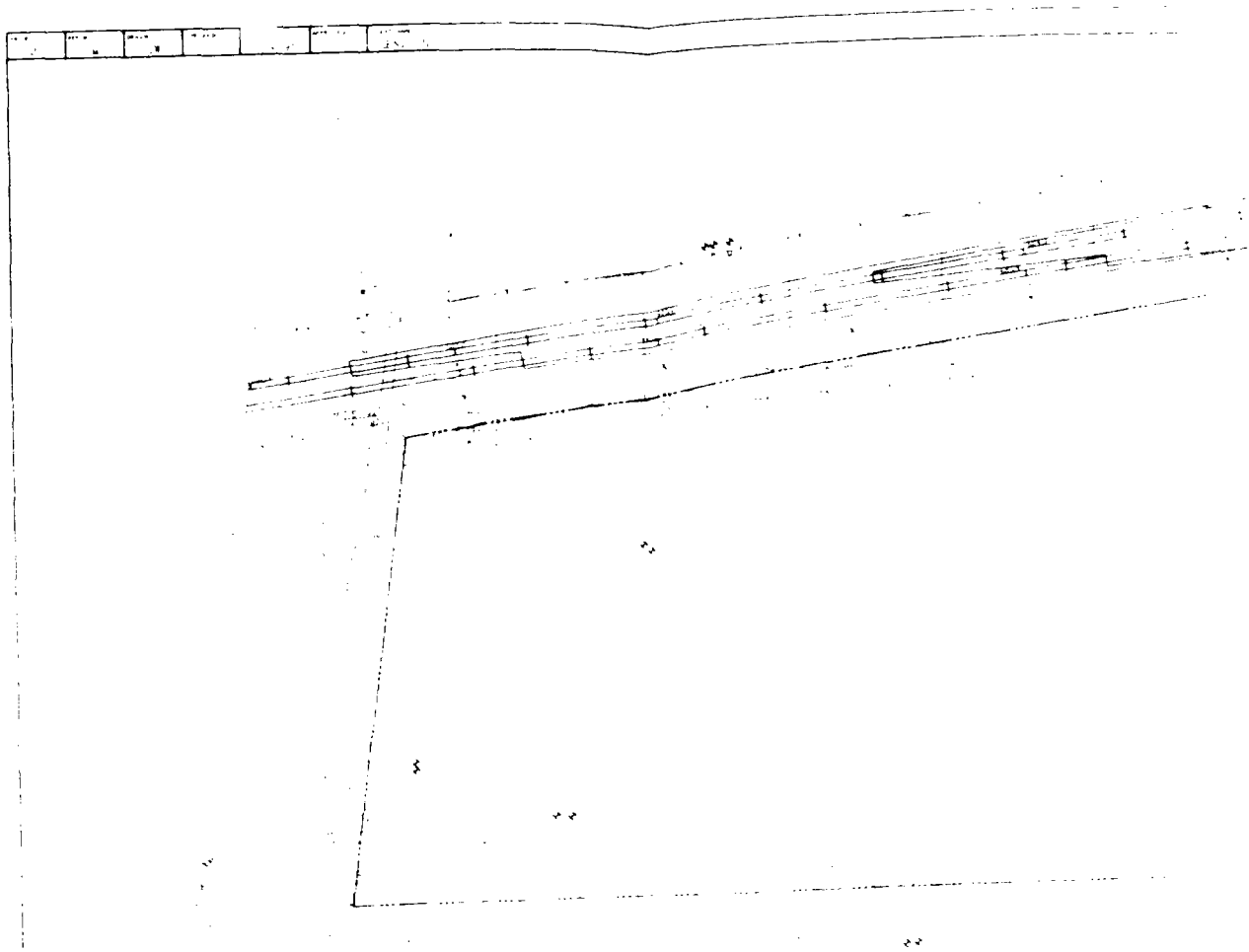
CONTOUR INTERVAL 5 FEET

FIGURE 2-1

SITE LOCATION MAP
LENZ OIL SITE

PROJECT:	0262
REVISED:	TWI
DRAWN:	BLAS
CHECKED:	
DATE:	6/1/91
APPROVED:	
CLIENT NAME:	LENZ OIL

ERM



ERM

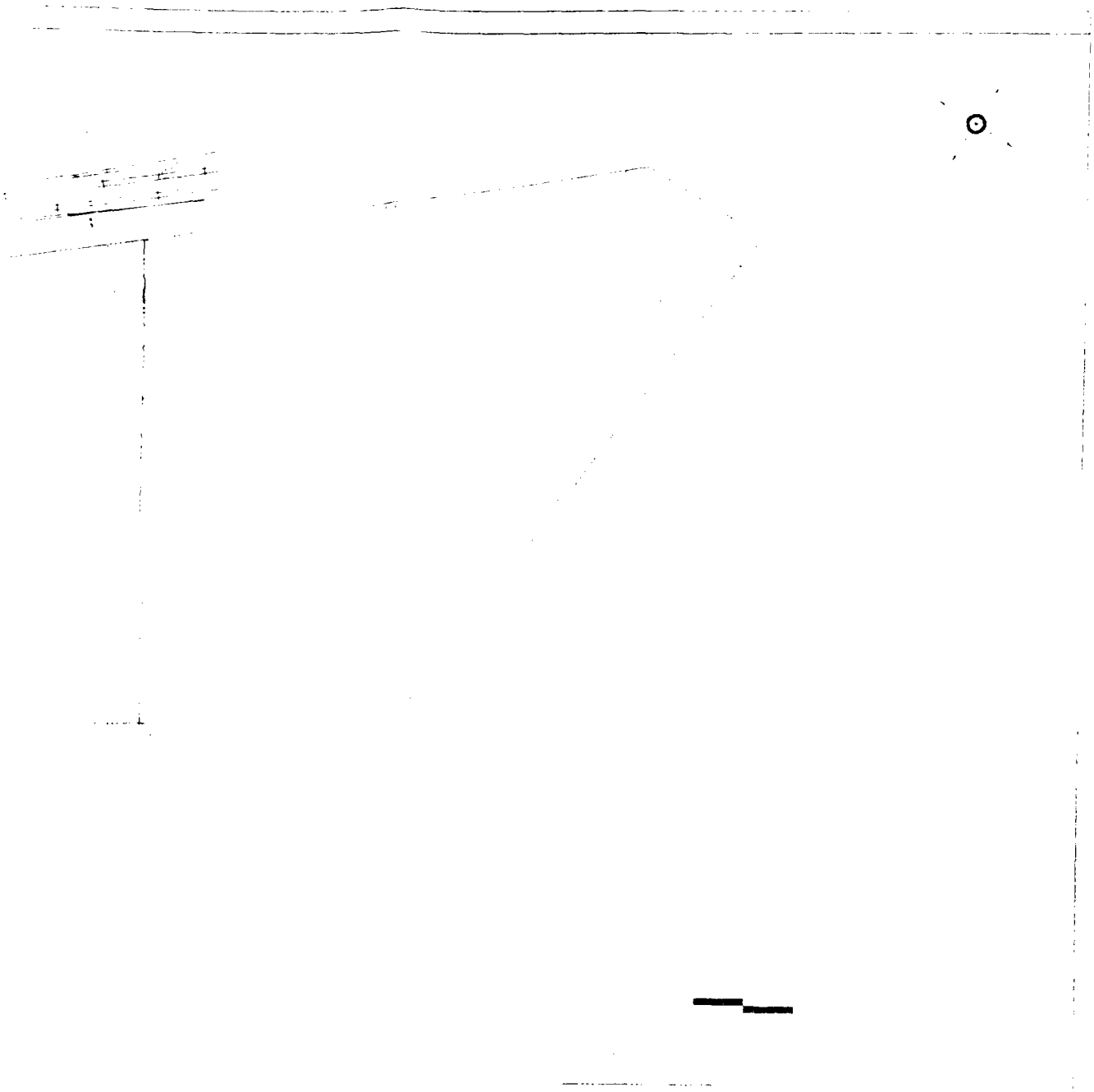
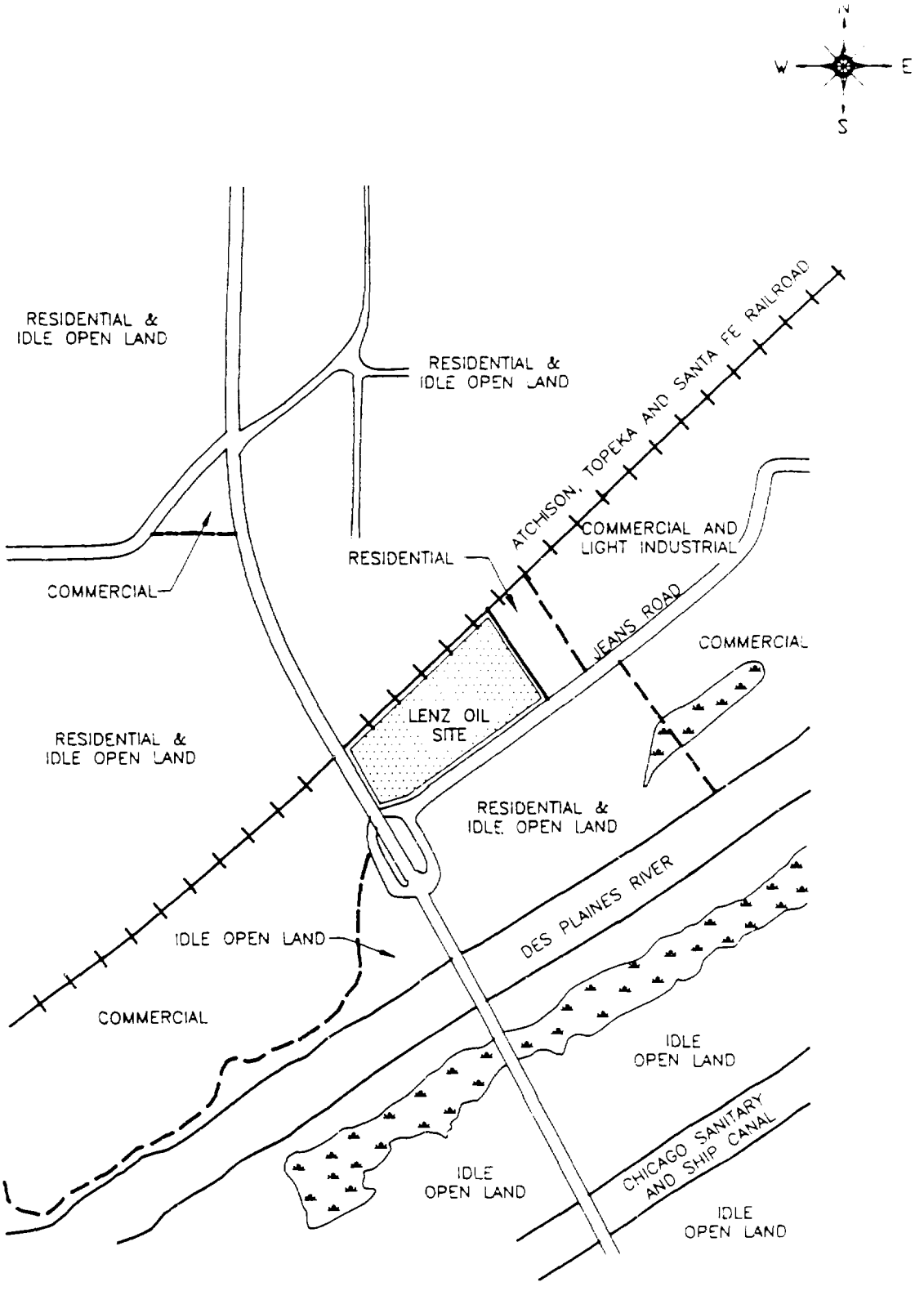


FIGURE 2-2

BASE MAP
LENZ OIL SITE

FIGURE 2-2

BASE MAP
LENZ OIL SITE



APPROX. SCALE (ft.)

0 500

SYMBOL LEGEND:

LAND USE BOUNDARY

WET LANDS

FIGURE 2-3

LAND USE MAP
LENZ OIL SITE

PROJECT: 0252 | REPORT: TM1 | DRAWN: MO- | CHECKED: | DATE: 2/1/91 | APPROVED:

ERM

GEOLOGY OF THE CHICAGO AREA

Time Stratig. System	Series	Stage	Rock Stratigraphy Mega Group	Group	Formation	Graphic Column	Thickness Feet	Kinds of Rock
QUAT	PLEIS				(See fig. 15)		0-350	Till, sand, gravel, silt, clay, peat, marl, loess
PENN	DESM			Kewanee	Carbondale		0-125	Shale, sandstone, thin limestone, coal
					Spoon		50-75	As above, but below No. 2 Coal
MISS	VAL.				Burl.-Keokuk		0-700	Limestone — Only in Des Plaines Disturbance
	KIND.				Hannibal			Shale, siltstone
DEV	UP				Grassy Creek		0-5	Shale in solution cavities in Silurian
SILURIAN	NIAGARAN		Hunton		Racine		0-300	Dolomite, pure in reefs; mostly silty, argillaceous, cherty between reefs
					Wauseso		0-30	Dolomite, even bedded, slightly silty
					Joliet		40-60	Dolomite, shaly and red at base; white, silty, cherty above; pure at top
	ALEX				Kankakee		20-45	Dolomite; thin beds; green shale partings
					Edgewood		0-100	Dolomite, cherty, shaly at base where thick
ORDOVICIAN	CIN.	RICH		Maquoketa	Neda		0-15	Oolite and shale, red
					Brainard		0-100	Shale, dolomitic, greenish gray
					Ft. Atkinson		5-50	Dolomite, green shale, coarse limestone
		MAY ED.			Scales		90-120	Shale, dolomitic, gray, brown, black
	CHAMPLAINIAN	TRENT	Ottawa	Galena	Wise Lake		170-210	Dolomite, buff, pure
					Dunleith			Dolomite, pure to slightly shaly; locally limestone
					Guttenberg		0-15	Dolomite; red specks and shale partings
		BLACKRIVERAN		Platteville	Nachusa		0-50	Dolomite and limestone, pure, massive
					Grand Detour		20-40	Dolomite and limestone; medium beds
					Mifflin		20-50	Dolomite and limestone, shaly, thin beds
					Pecatonica		20-50	Dolomite, pure, thick beds
				Ancell	Glenwood		0-80	Sandstone and dolomite, silty; green shale
					St. Peter		100-600	Sandstone, medium and fine grained; well rounded grains, chert rubble at base
	CANADIAN		Knox	Prairie du Chien	Shakopee		0-70	Dolomite, sandy; oolitic chert; algal mounds
					New Richmond		0-35	Sandstone, fine to coarse
					Oneota		190-250	Dolomite, pure, coarse grained; oolitic chert
					Gunter		0-15	Sandstone, dolomitic
CAMBRIAN	CROIXAN	TREMP.			Eminence		50-150	Dolomite, sandy
					Potosi		90-220	Dolomite; drusy quartz in vugs
		FRAN			Franconia		50-200	Sandstone, glauconitic; dolomite; shale
					Ironton		80-130	Sandstone, partly dolomitic, medium grained
		DRESBACHIAN			Galesville		10-100	Sandstone, fine grained
					Eau Claire		370-570	Siltstone, dolomite, sandstone and shale, glauconitic
			Potsdam		Mt. Simon		1200-2900	Sandstone, fine to coarse; quartz pebbles in some beds
PRE-CAM.								Granite

FIGURE 2-4

GENERALIZED STRATIGRAPHIC COLUMN FOR THE CHICAGO AREA FROM WILLMAN, 1971

ERM

PROJECT: 0252 | REPORT: TM1 | DRAWN: MO | CHECKED: | DATE: 1/30/91 | APPROVED: | CLIENT NAME: LENZ OIL

PROJECT	REPORT	DRAWN	CHECKED	DATE	APPROVED	CLIENT NAME
0252	TM1	GW		2\4\91		LENZ OIL

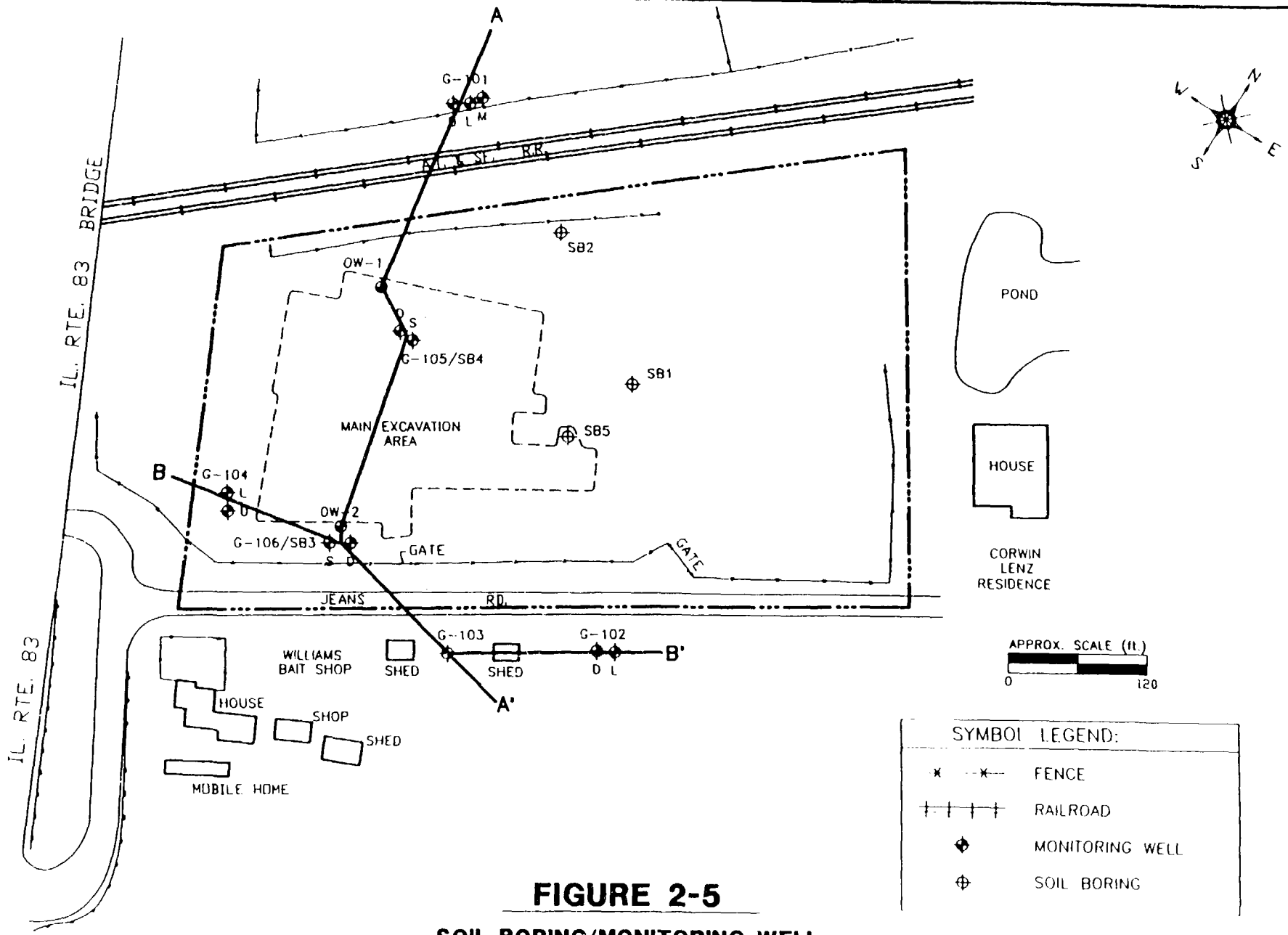
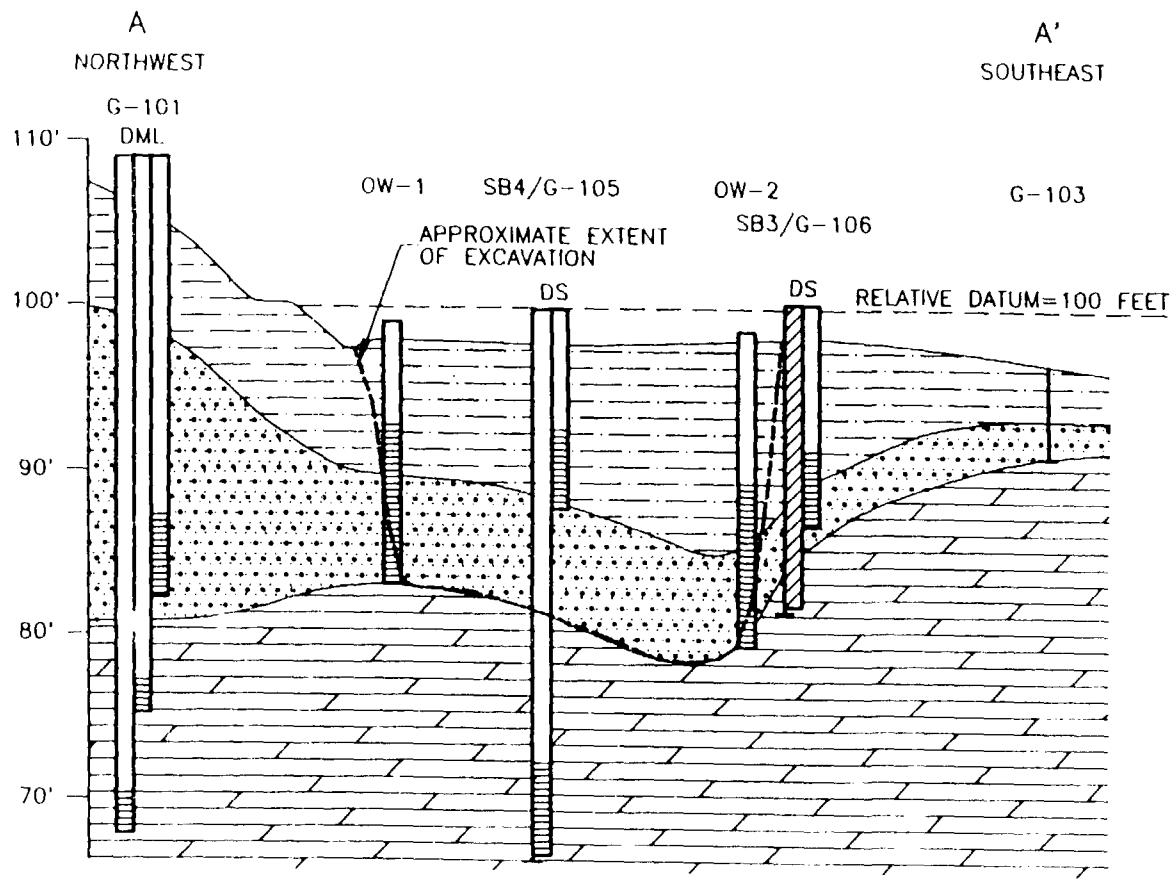


FIGURE 2-5

SOIL BORING/MONITORING WELL LOCATION MAP
LENZ OIL

ERM

PROJECT	REPORT	DRAWN	CHECKED	DATE	APPROVED
0252	TM1	MO		2/4/91	



APPROX. SCALE (ft.)

0 100

SYMBOL LEGEND:

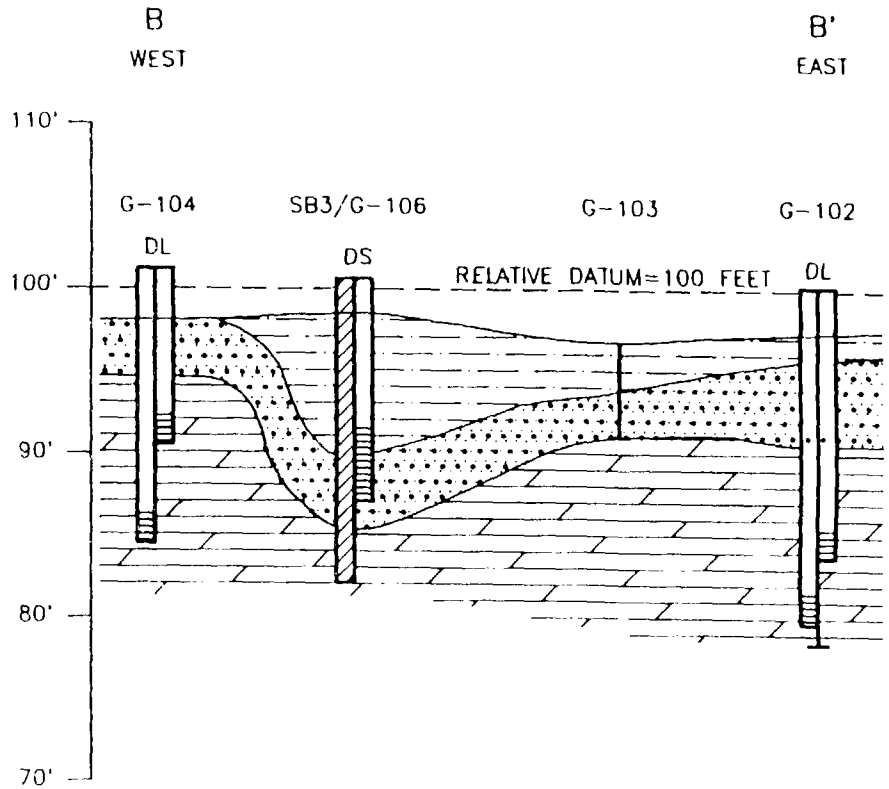
- SILT, CLAYEY SILT AND SILTY SAND
- WEATHERED DOLOMITE
- RACINE FORMATION (DOLOMITE)

FIGURE 2-6

STRATIGRAPHIC CROSS SECTION A-A'
LENZ OIL SITE

ERM

PROJECT	REPORT	DRAWN	CHECKED	DATE	APPROVED
0252	TM1	MO		2/1/91	



APPROX. SCALE (ft.)

0 100

SYMBOL LEGEND:

- SILT, CLAYEY SILT AND SILTY SAND
- WEATHERED DOLOMITE
- RACINE FORMATION (DOLOMITE)

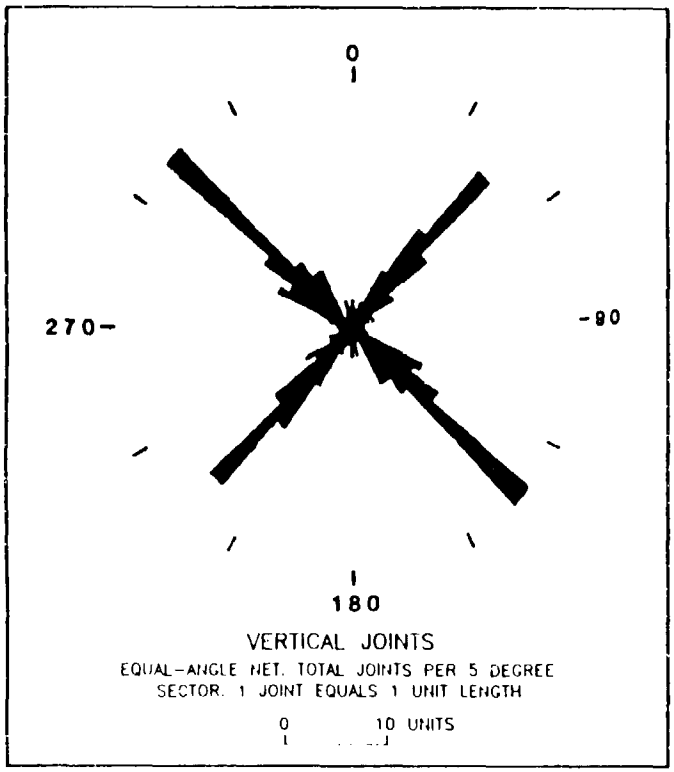
FIGURE 2-7

STRATIGRAPHIC CROSS SECTION B-B'
LENZ OIL SITE

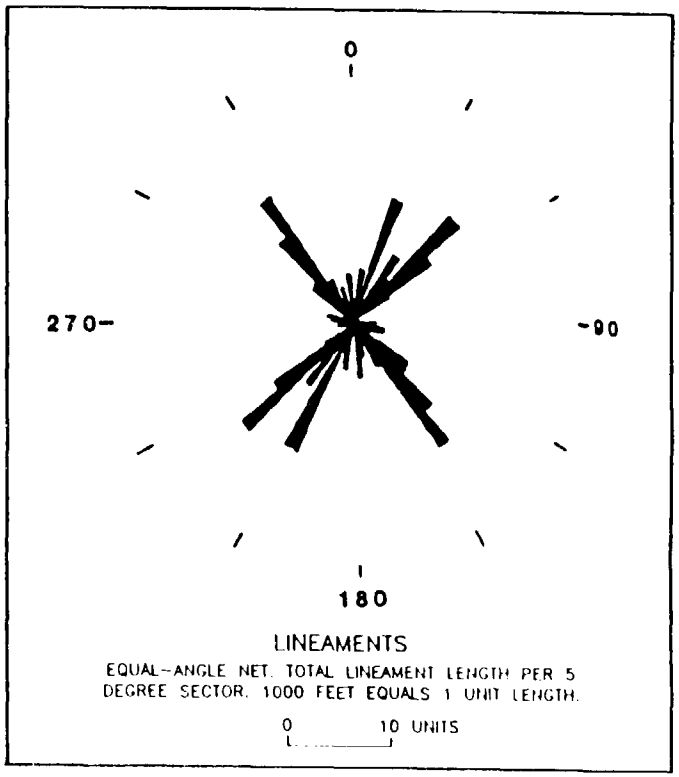
ERM

PROJECT:	REPORT:	DRAWN	CHECKED	DATE:	APPROVED	CLIENT NAME:

PROJECT:	REPORT:	DRAWN	CHECKED	DATE:	APPROVED
0252	TM1	MO		4/29/91	



A



B

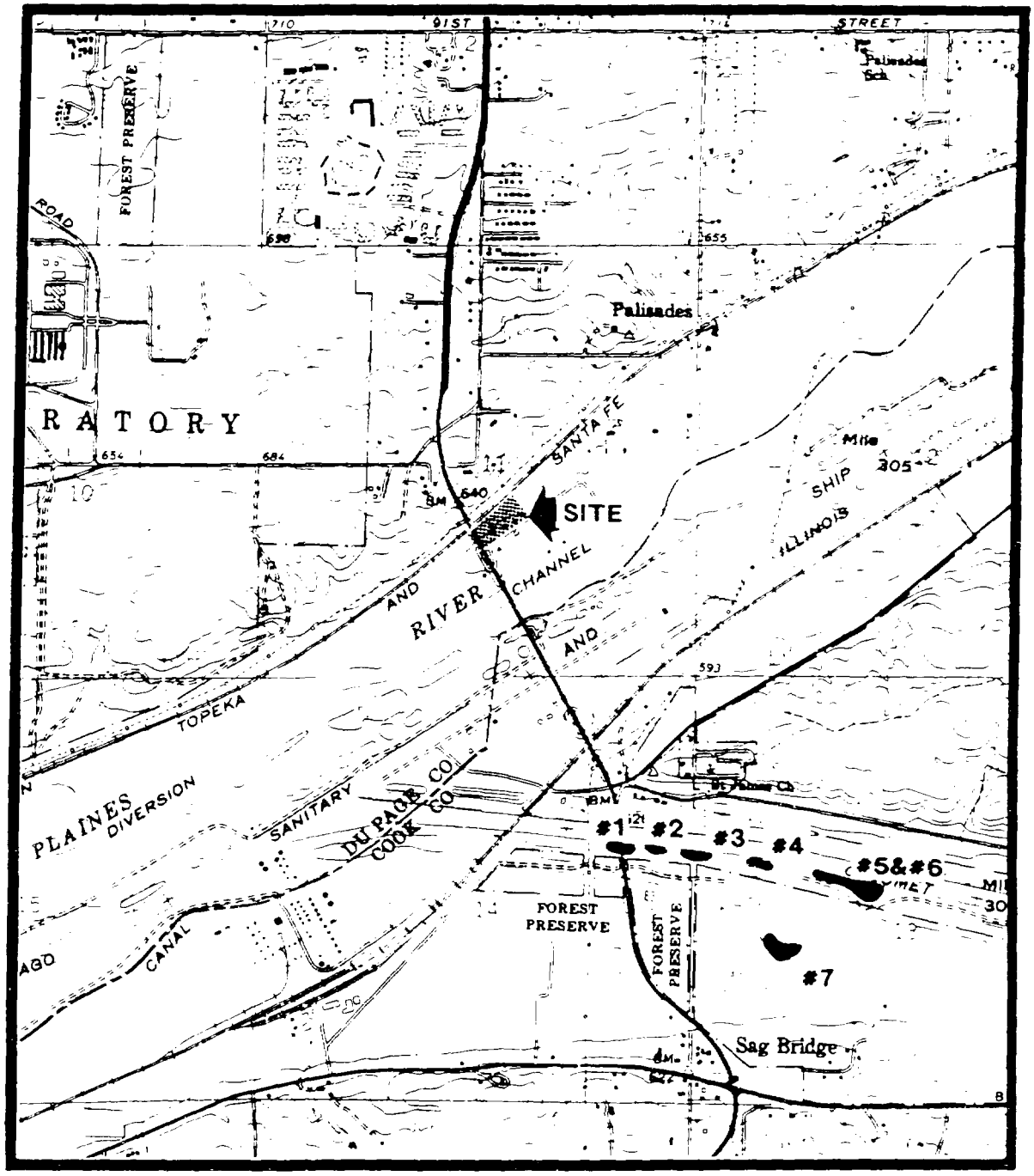
NOTE: ORIENTATIONS ARE IN DEGREES AZIMUTH; ZERO DEGREES IS TRUE NORTH. MODIFIED FROM NICHOLAS AND HEALY (1968)

FIGURE 2-8

U.S.G.S.

VERTICAL JOINT AND LINEAMENT

SAG BRIDGE QUADRANGLE
ILLINOIS
7.5 MINUTE SERIES (TOPOGRAPHIC)
1963
PHOTOREVISED 1973
PHOTOINSPECTED 1978



SCALE 1:24000

1 .5 0 1 MILE

CONTOUR INTERVAL 5 FEET

FIGURE 2-9

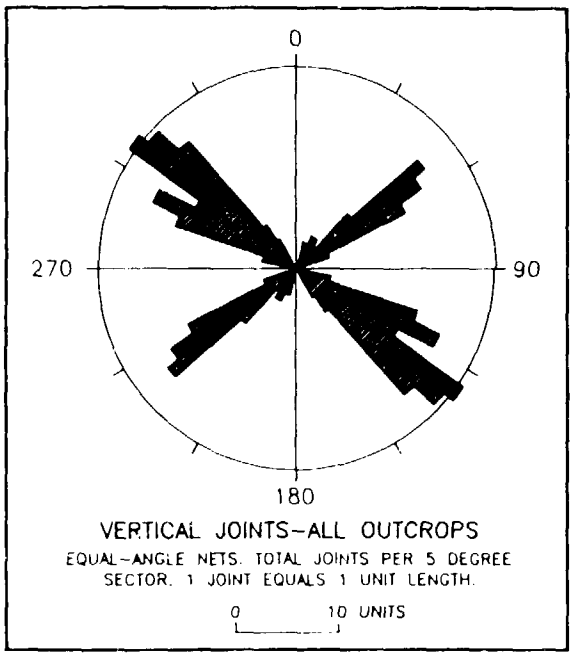
OUTCROP LOCATION MAP
LENZ OIL SITE

SYMBOL LEGEND:
OUTCROP USED FOR JOINT MEASUREMENTS

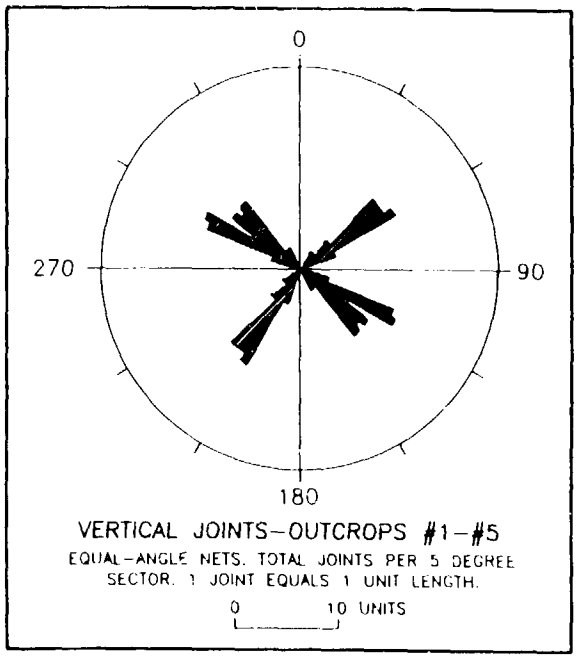
CLIENT NAME:	LENZ OIL
APPROVED:	
DATE:	5/1/91
CHECKED:	
DRAWN:	BLAS
REPORT:	TM1
PROJECT:	0252

ERM

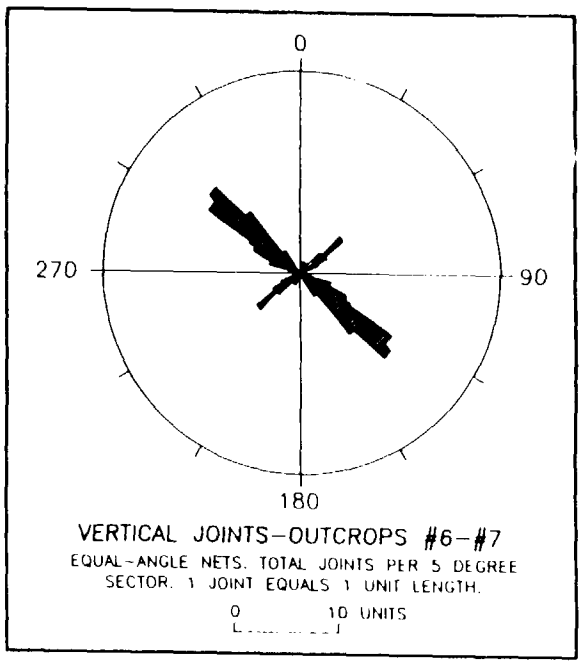
PROJECT:	REPORT:	DRAWN	CHECKED	DATE:	APPROVED
0252	TM1	MO		4/30/91	



A



B



C

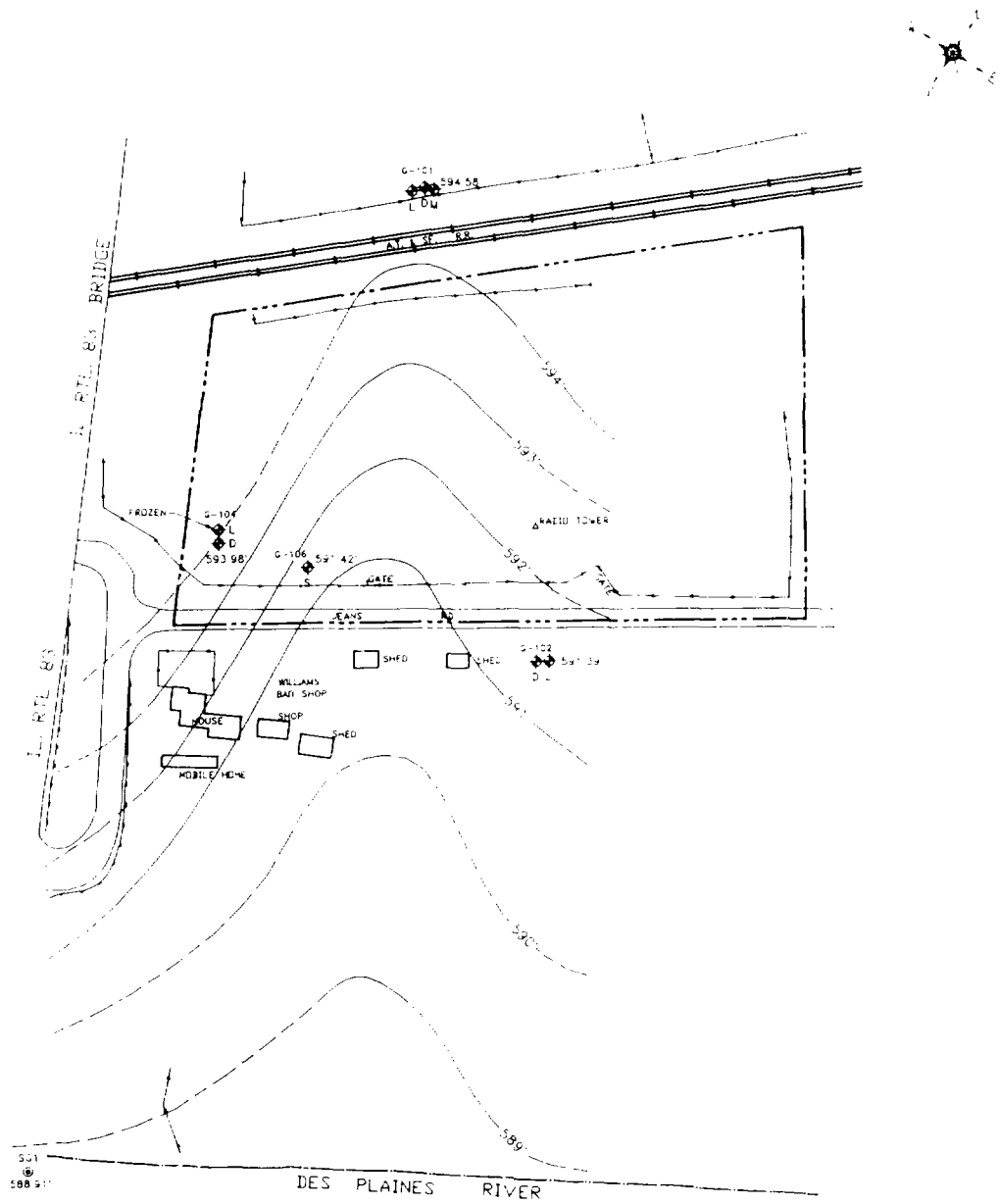
NOTE: ORIENTATIONS ARE IN DEGREES AZIMUTH.
ZERO DEGREES IS TRUE NORTH.

FIGURE 2-10

ERM VERTICAL JOINT ORIENTATION DATA LEMONT, ILLINOIS AREA

ERM

PROJECT	REPORT	DRAWN	CHECKED	DATE	APPROVED	CLIENT NAME
0252	TM2	MO-		4/29/91		LENZ OIL



APPROX SCALE (ft)

0 120

SYMBOL LEGEND

PROPERTY LINE

FENCE LINE

RAILROAD

WATER SURFACE

EXISTING MONITORING WELL

SURFACE WATER GAGE

WELL DEPTH INDICATION

DEEP WELL

INTERMEDIATE DEPTH WELL

SHALLOW WELL

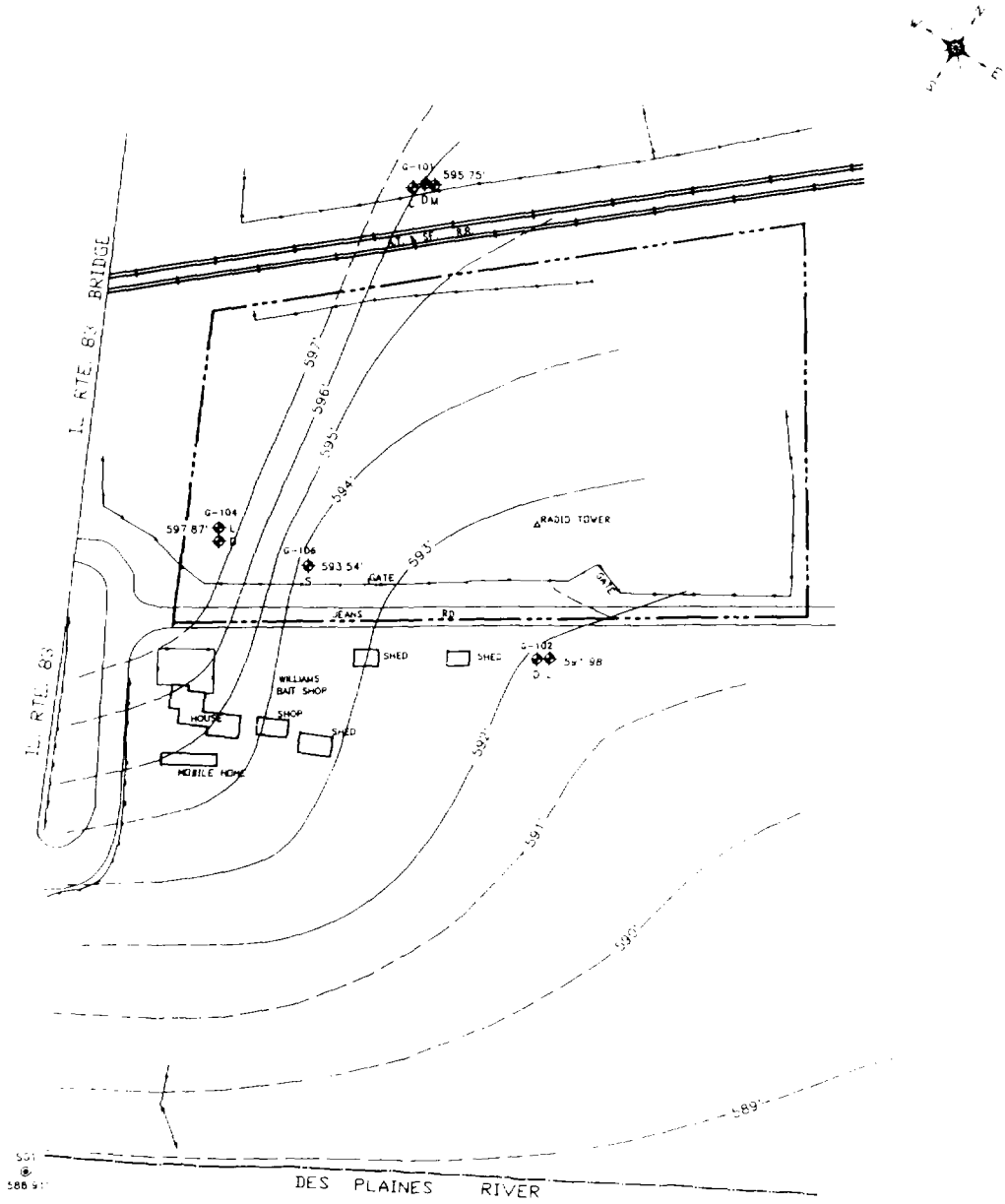
NOTE:
SOUNDING OF WELLS ON 1/29/91
INDICATED THAT WELLS G-101M, G-102L
G-104L, G-104D AND G-106S ARE OF
COMPARABLE DEPTH

FIGURE 2-11

WATER TABLE MAP
SHALLOW WELLS
JANUARY 29, 1991
LENZ OIL SITE

ERM

PROJECT	REPORT	DRAWN	CHECKED	DATE	APPROVED	CLIENT NAME
0252	TM1	MO-		4/29/91		LENZ OIL



APPROX SCALE (ft)
0 120

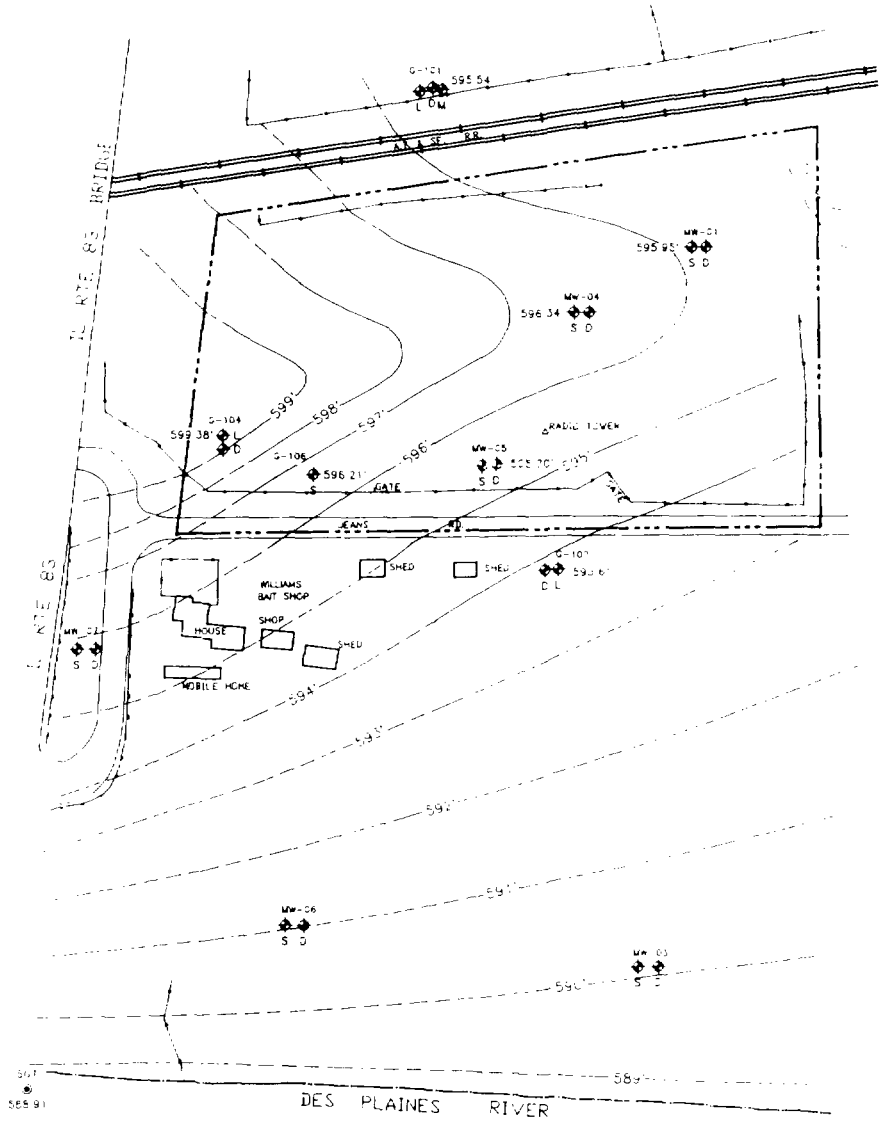
SYMBOL LEGEND
PROPERTY LINE
FENCE LINE
RAILROAD
WATER SURFACE
EXISTING MONITORING WELL
SURFACE WATER GAGE
WELL DEPTH NOTATION
D DEEP WELL
M INTERMEDIATE DEPTH WELL
S SHALLOW WELL

NOTE:
SOUNDING OF WELLS ON 1/29/91 INDICATED THAT WELLS G-101M, G-102, G-104L, G-104D AND G-106S ARE OF COMPARABLE DEPTH

FIGURE 2-12

WATER TABLE MAP
SHALLOW WELLS
FEBRUARY 26, 1991
LENZ OIL SITE

ERM



APPROX. SCALE (FT.)

SYMBOL LEGEND

PROPERTY LINE

FENCE LINE

RAILROAD

WATER SURFACE

EXISTING MONITORING WELL

SURFACE WATER GAGE

WELL DEPTH DESIGNATION

DEEP WELL

INTERMEDIATE DEPTH WELL

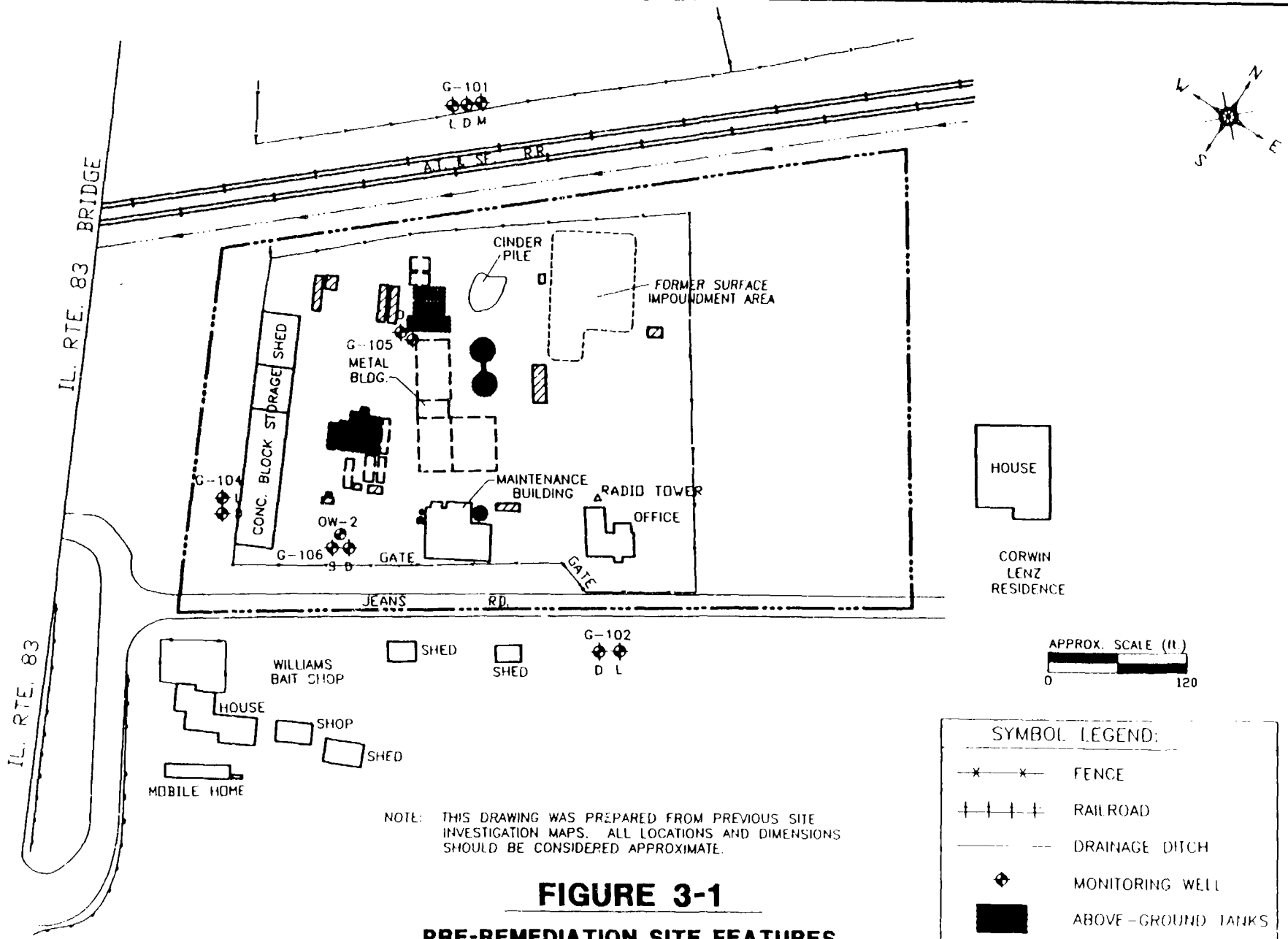
SHALLOW WELL

FIGURE 2-13

WATER TABLE MAP
SHALLOW WELLS
MARCH 20, 1991
LENZ OIL SITE

ERM

PROJECT	REPORT	DRAWN	CHECKED	DATE	APPROVED	CLIENT NAME
0252	TM1	GW		2\4\91		LENZ OIL



NOTE: THIS DRAWING WAS PREPARED FROM PREVIOUS SITE INVESTIGATION MAPS. ALL LOCATIONS AND DIMENSIONS SHOULD BE CONSIDERED APPROXIMATE.

FIGURE 3-1

PRE-REMEDIATION SITE FEATURES
LENZ OIL SITE

ERM

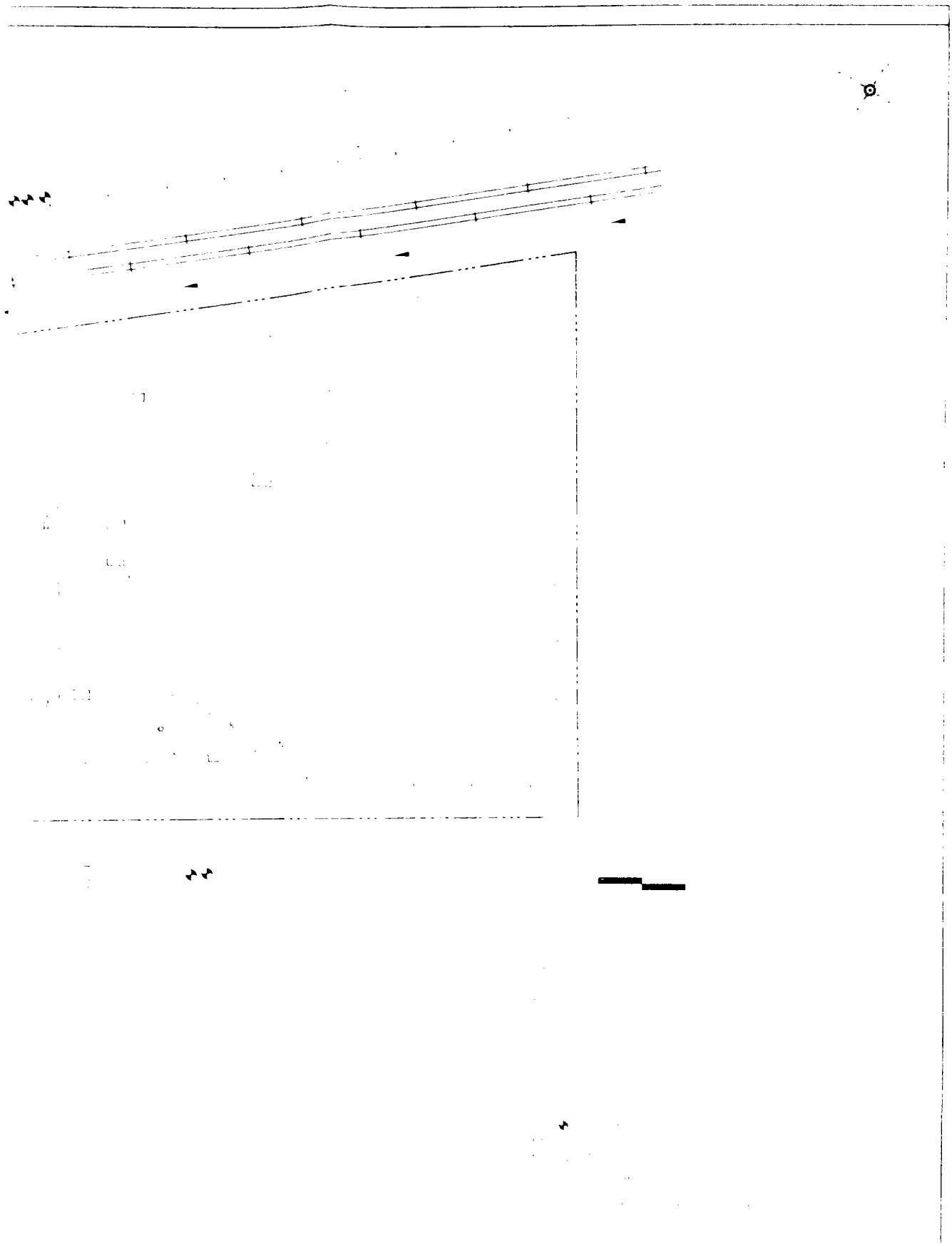
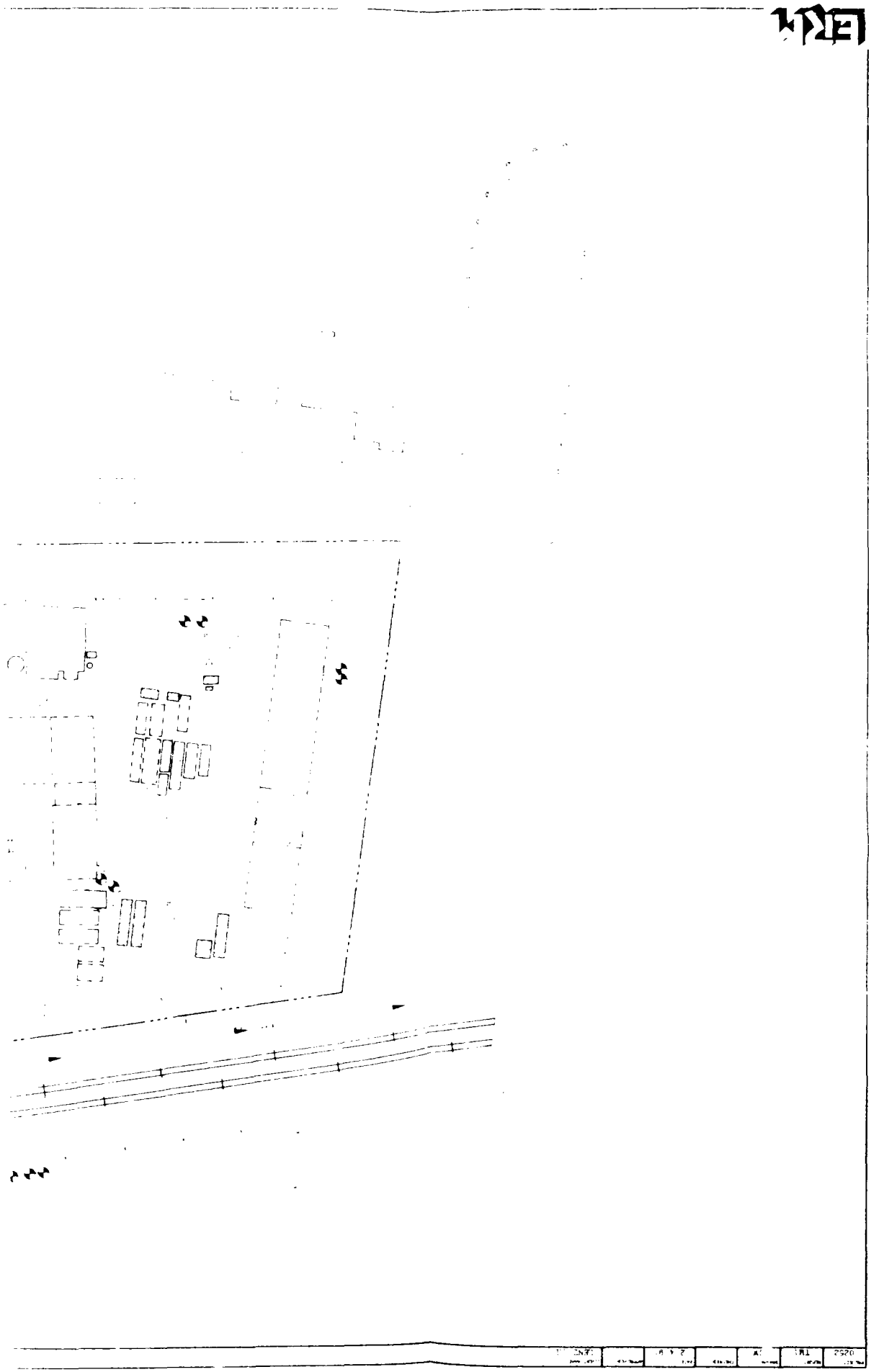


FIGURE 3-2

SITE INVESTIGATION/REMEDIATION
FEATURES MAP
LENZ OIL SITE



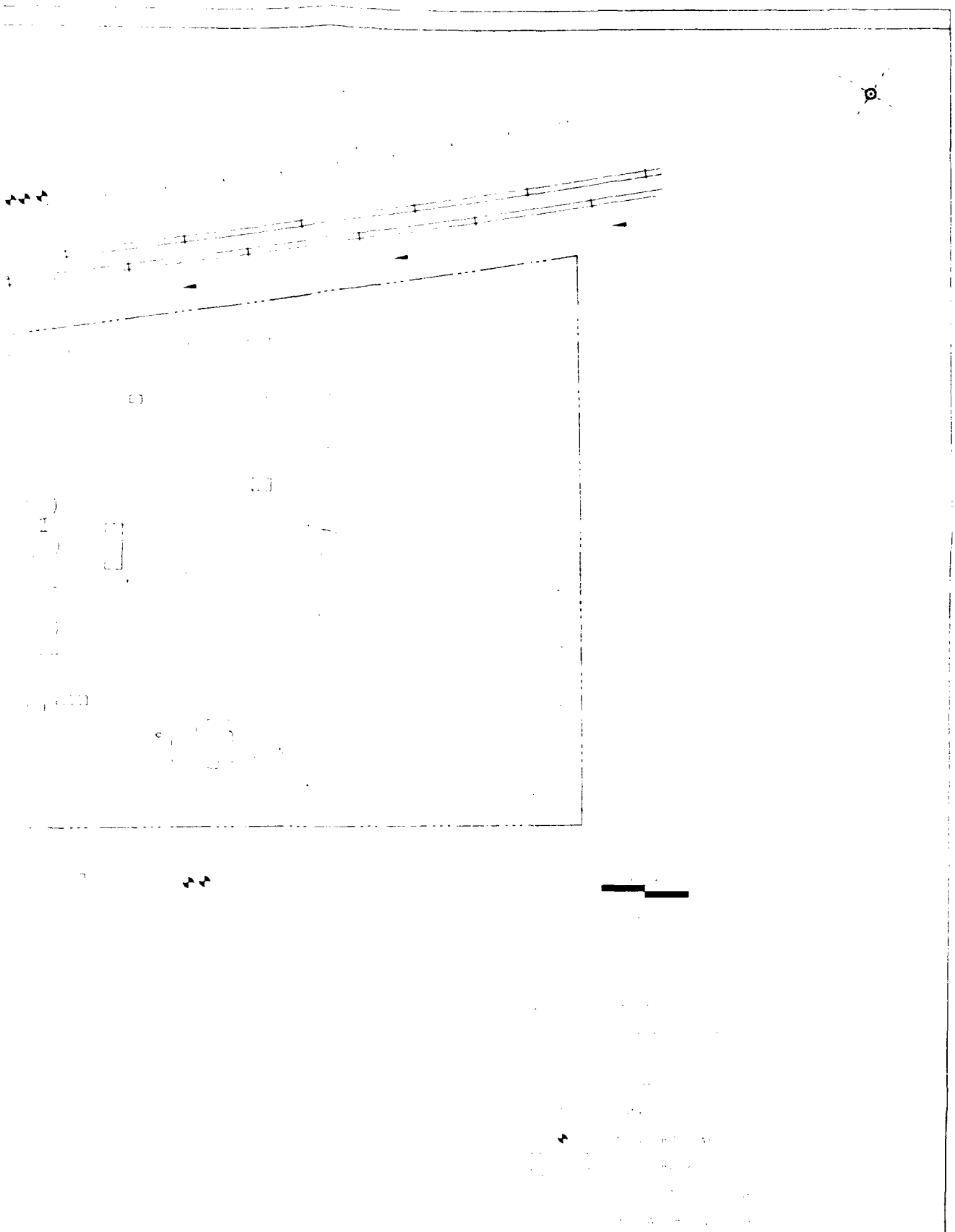


FIGURE 3-2

SITE INVESTIGATION/REMEDIATION FEATURES MAP LENZ OIL SITE

PROJECT	REPORT	DRAWN	CHECKED	DATE	APPROVED	CLIENT NAME
0252	TM1	GW		2\4\91		LENZ OIL

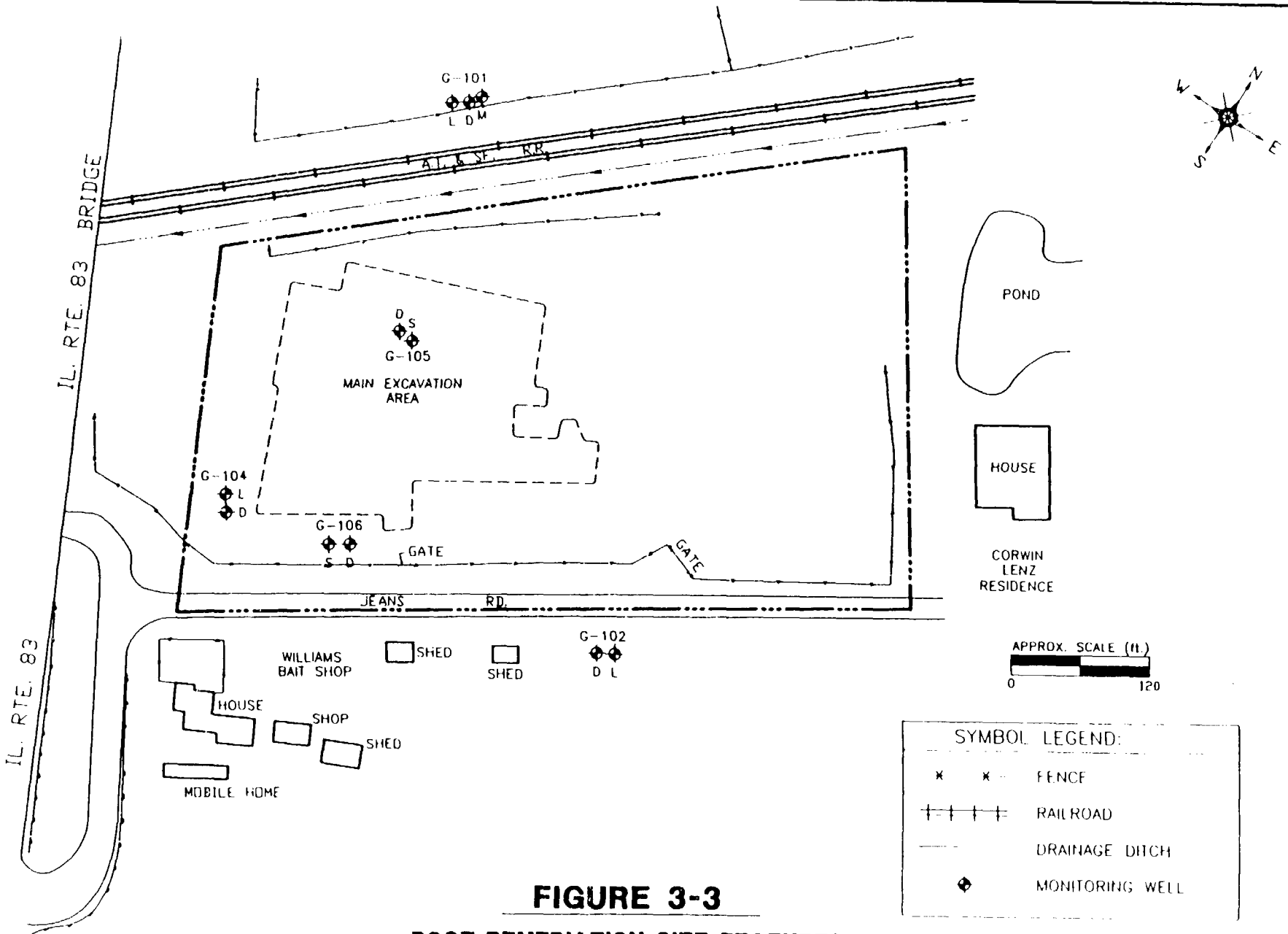


FIGURE 3-3

POST-REMEDIATION SITE FEATURES
LENZ OIL SITE

ERM

PROJECT	REPORT	DRAWN	CHECKED	DATE	APPROVED	CLIENT NAME
0252	TM1	GW		2\4\91		LENZ OIL

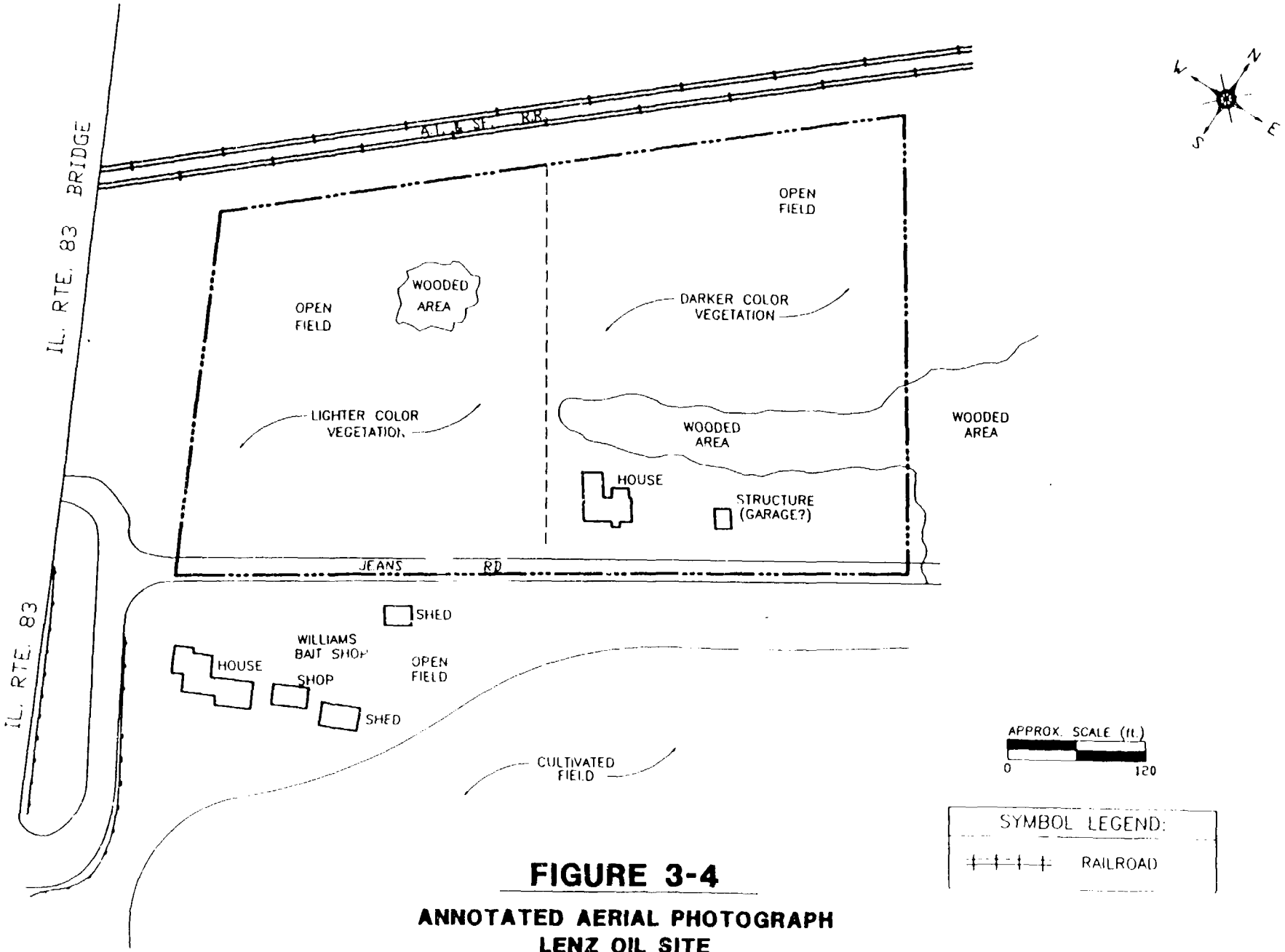


FIGURE 3-4

ANNOTATED AERIAL PHOTOGRAPH
LENZ OIL SITE
OCTOBER 7, 1954

ERM

PROJECT	REPORT	DRAWN	CHECKED	DATE	APPROVED	CLIENT NAME
0252	TM1	GW		2\4\91		LENZ OIL

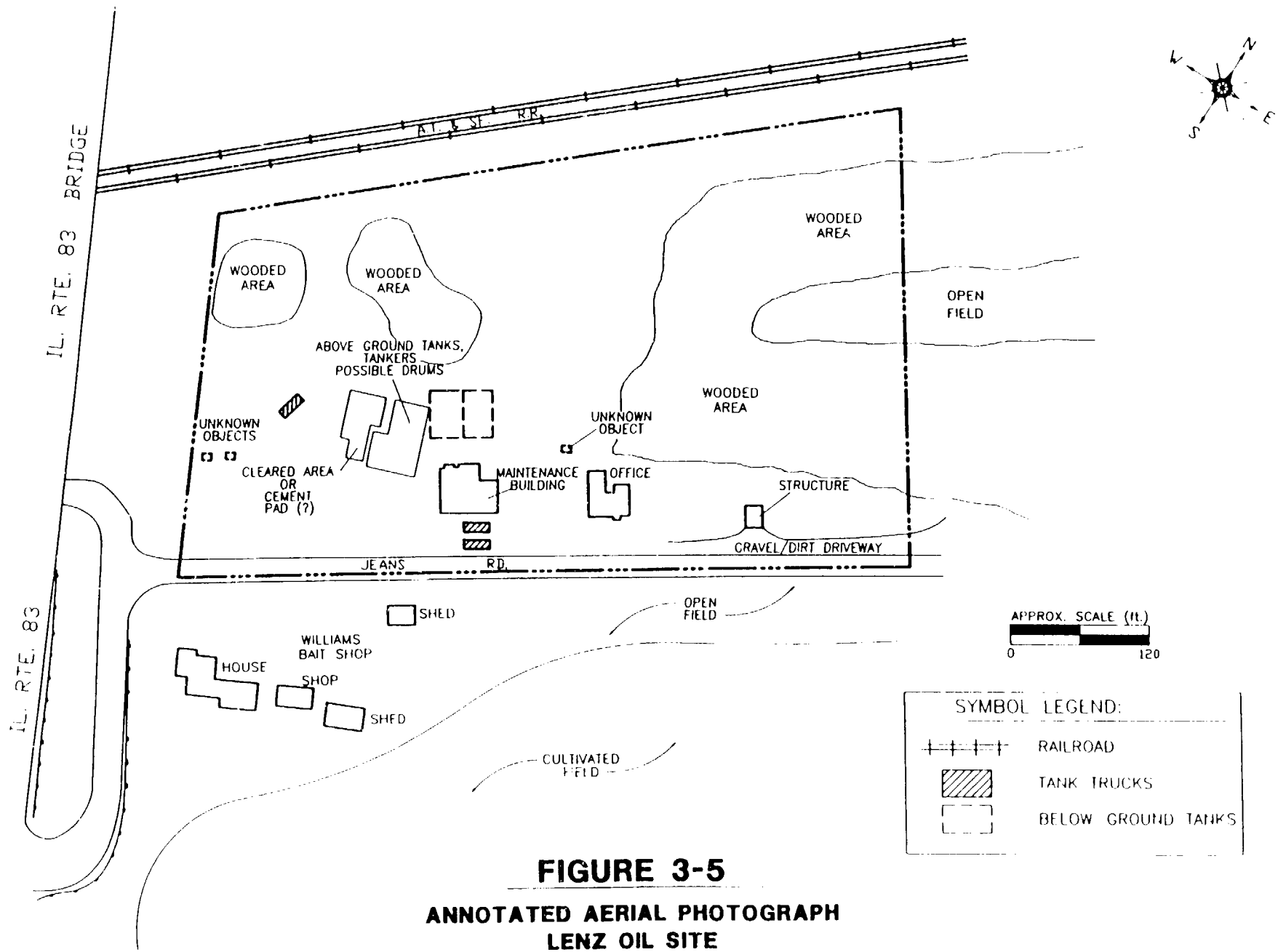


FIGURE 3-5

ANNOTATED AERIAL PHOTOGRAPH
LENZ OIL SITE
SEPTEMBER 6, 1961

ERM

PROJECT:	REPORT:	DRAWN:	CHECKED:	DATE:	APPROVED:	CLIENT NAME:
0252	TM1	GW		2\4\91		LENZ OIL

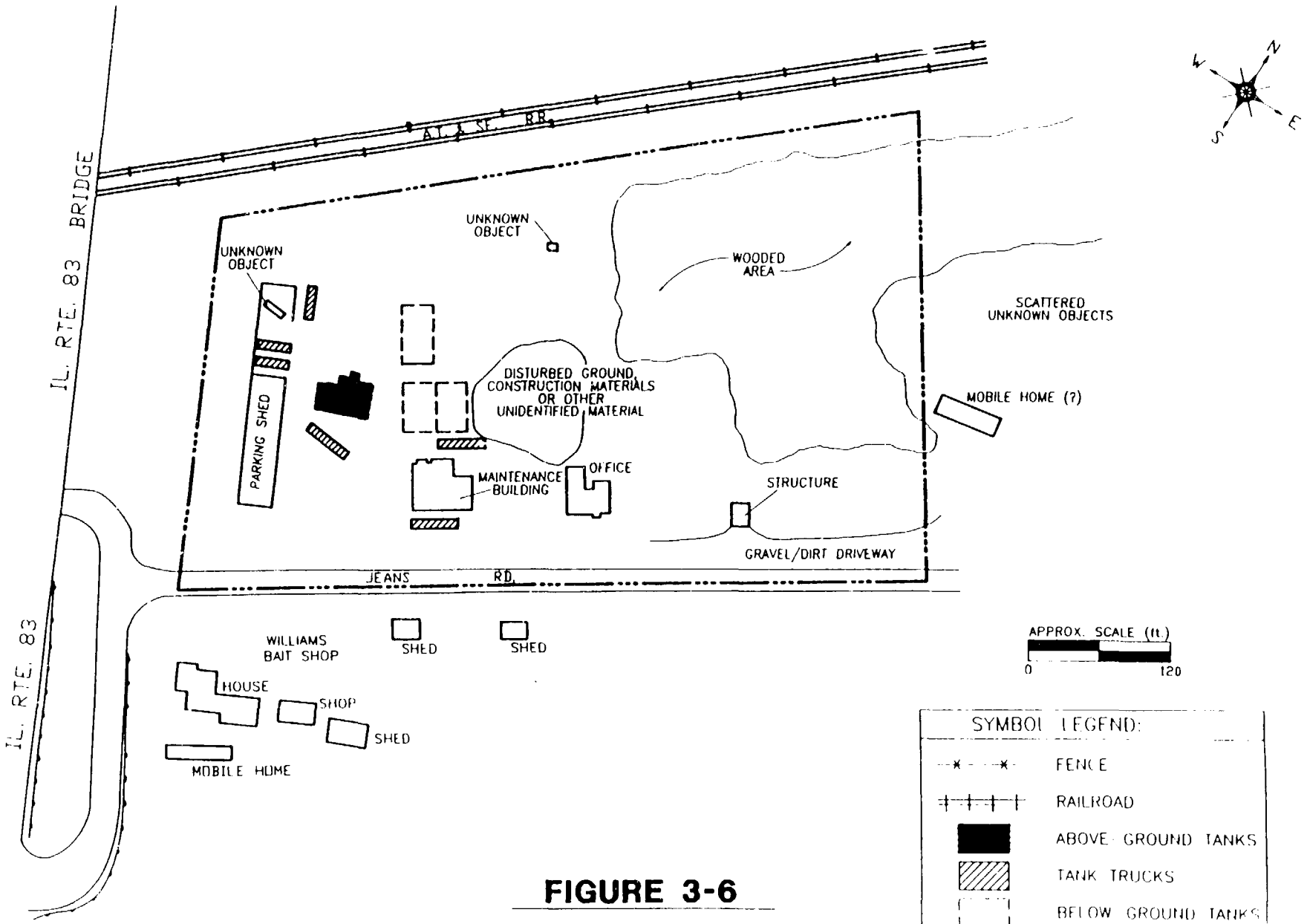


FIGURE 3-6

ANNOTATED AERIAL PHOTOGRAPH
LENZ OIL SITE
SEPTEMBER 30, 1967

ERM

PROJECT	REPORT	DRAWN	CHECKED	DATE	APPROVED	CLIENT NAME
0262	TM1	GW		2\4\91		LENZ OIL

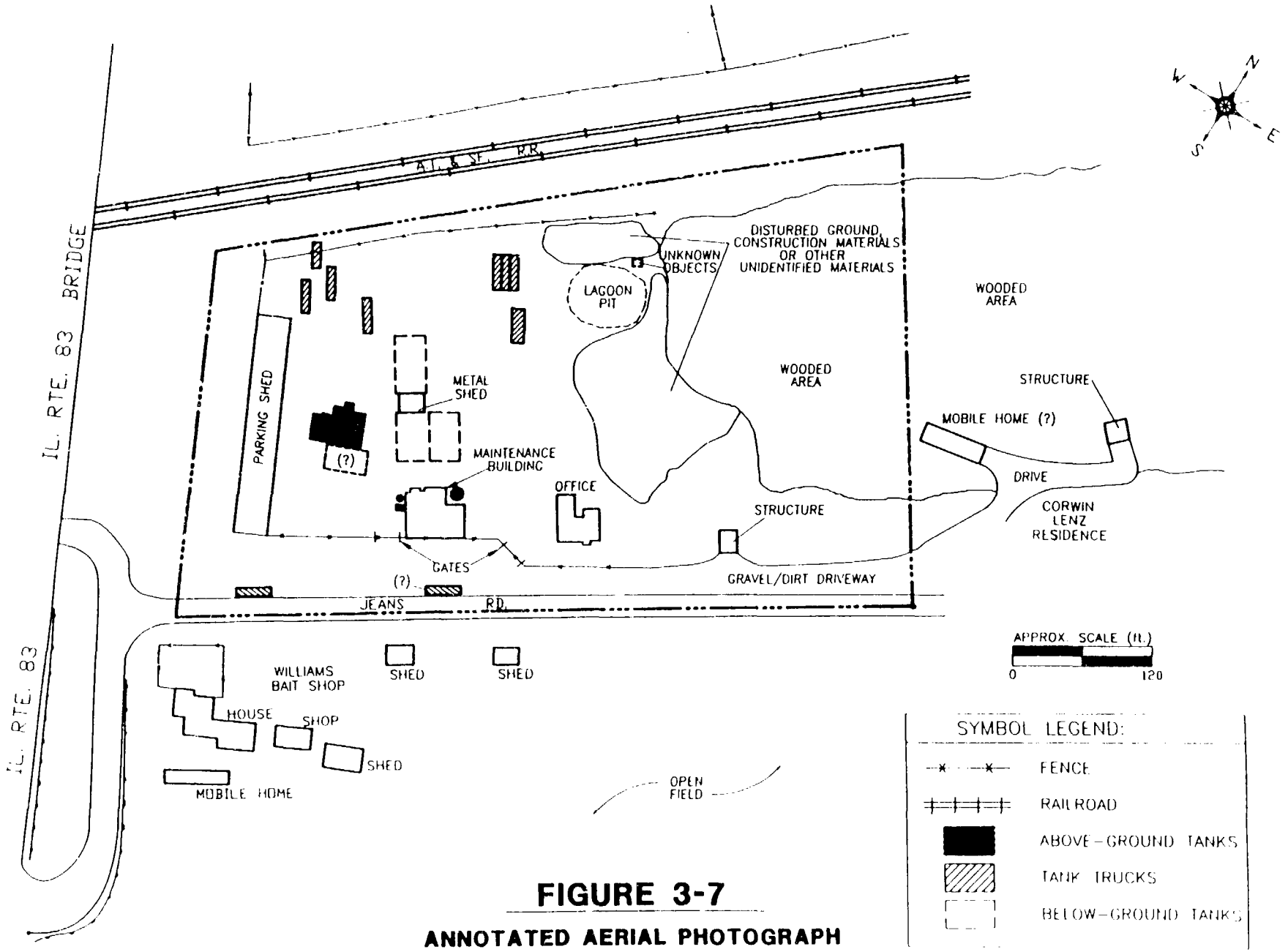


FIGURE 3-7

ANNOTATED AERIAL PHOTOGRAPH
LENZ OIL SITE
MAY 14, 1971

ERM

PROJECT	REPORT	DRAWN	CHECKED	DATE	APPROVED	CLIENT NAME
0252	TM1	GW		2\4\91		LENZ OIL

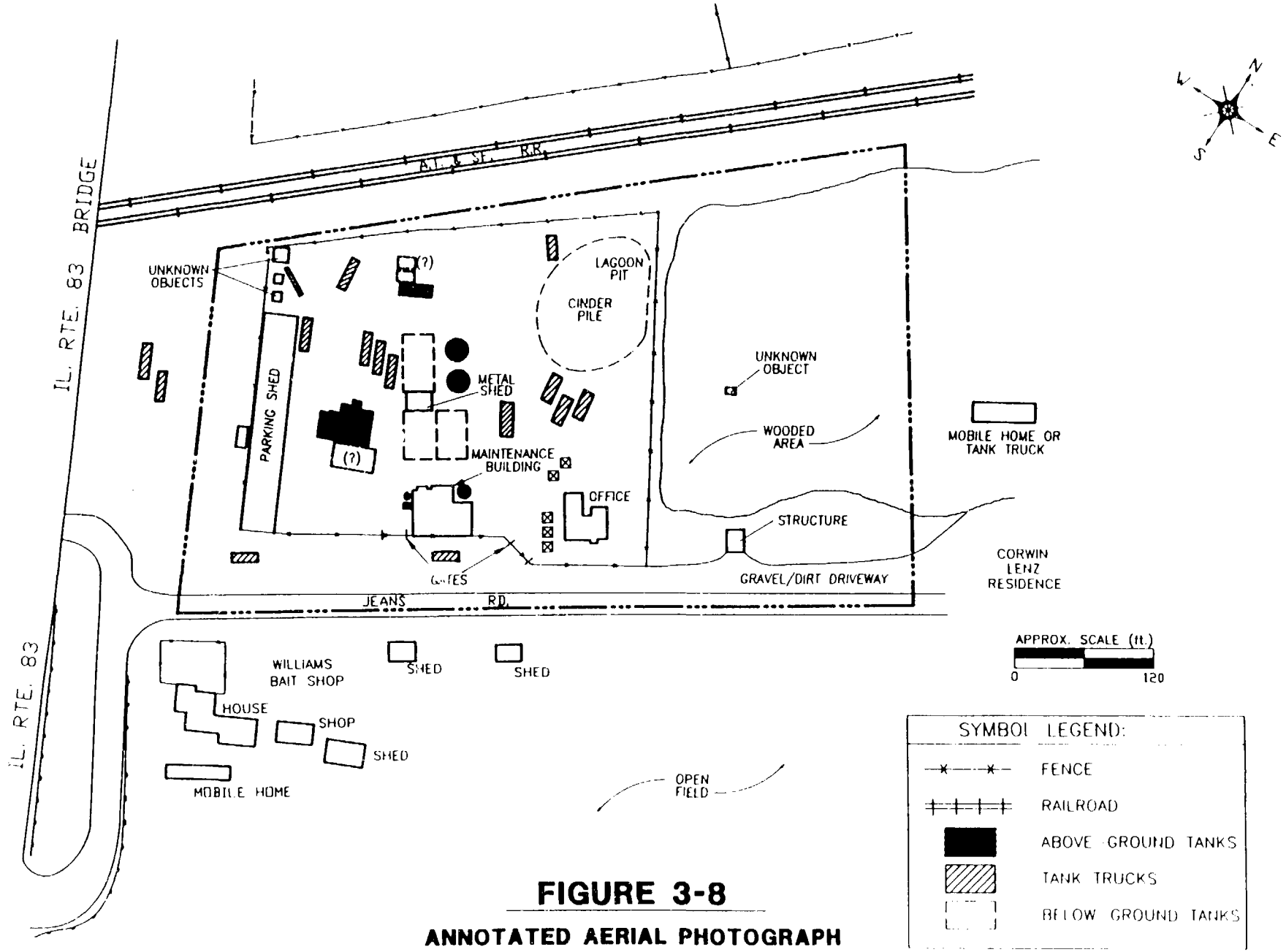


FIGURE 3-8

ANNOTATED AERIAL PHOTOGRAPH
LENZ OIL SITE
OCTOBER 10, 1974

ERM

PROJECT	REPORT	DRAWN	CHECKED	DATE	APPROVED	CLIENT NAME
0252	TM1	GW		2\4\91		LENZ OIL

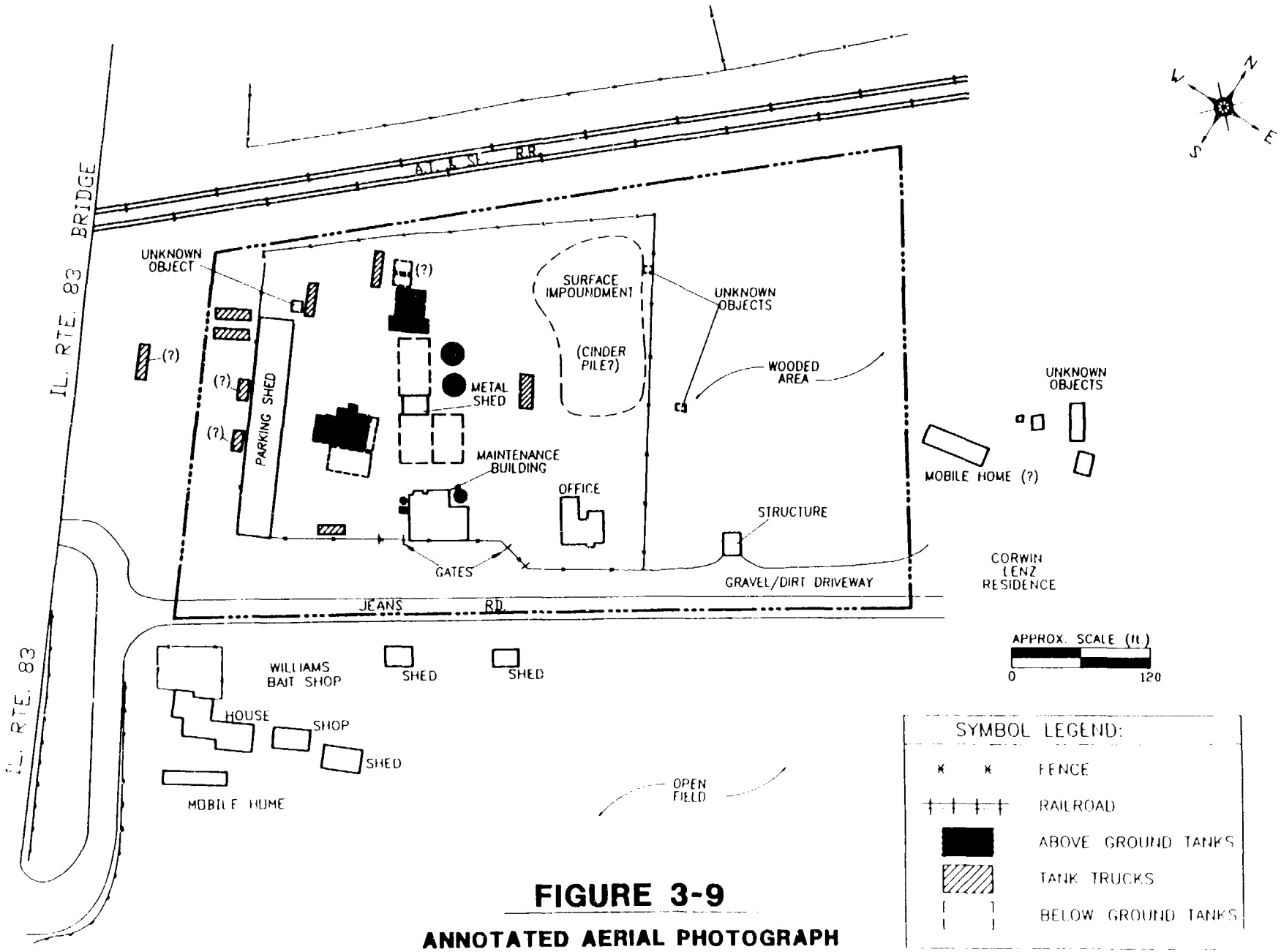


FIGURE 3-9

ANNOTATED AERIAL PHOTOGRAPH
LENZ OIL SITE
NOVEMBER 7, 1981

ERM

PROJECT	REPORT	DRAWN	CHECKED	DATE	APPROVED	CLIENT NAME
0262	TM1	GW		2\4\91		LENZ OIL

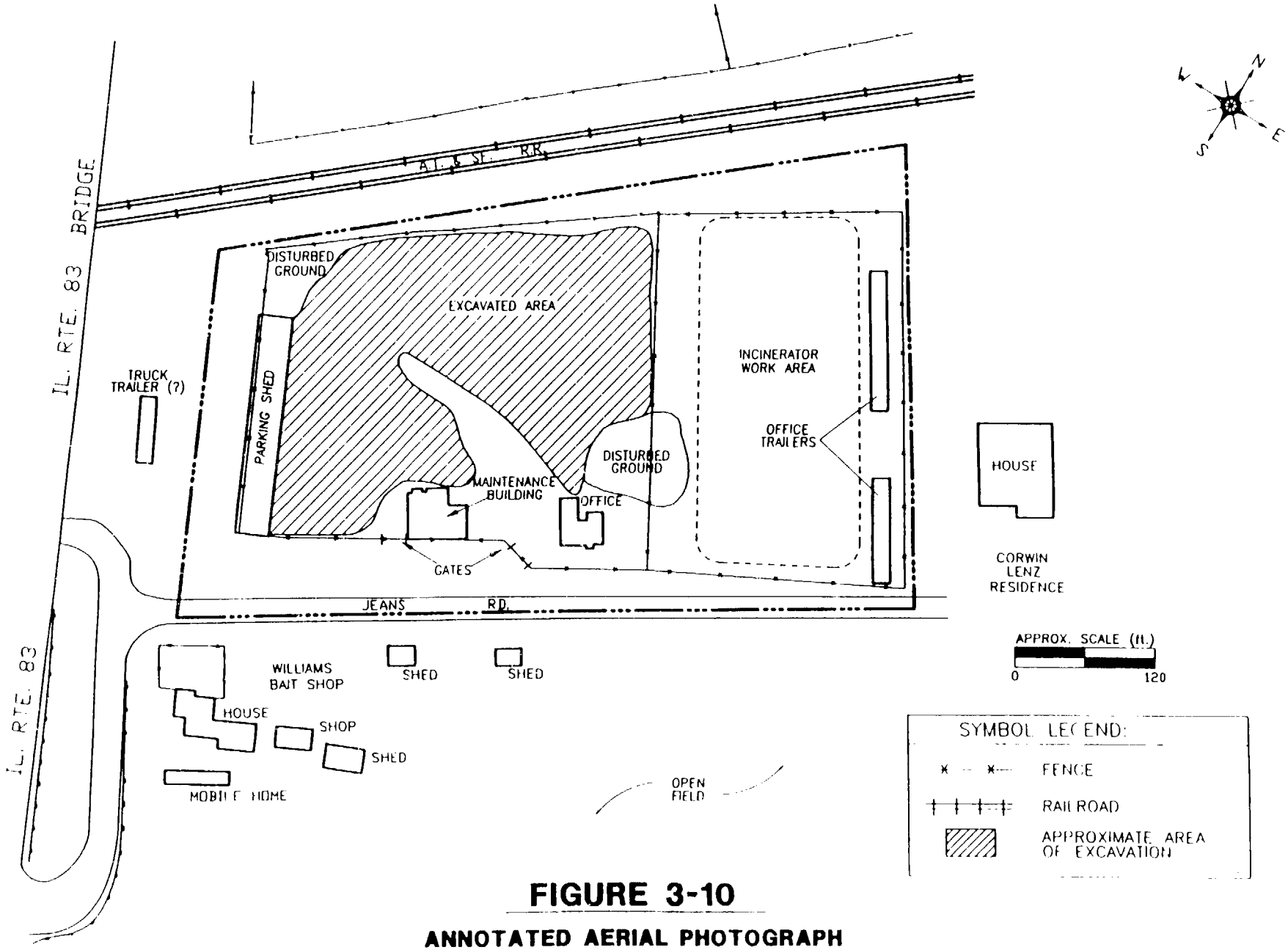
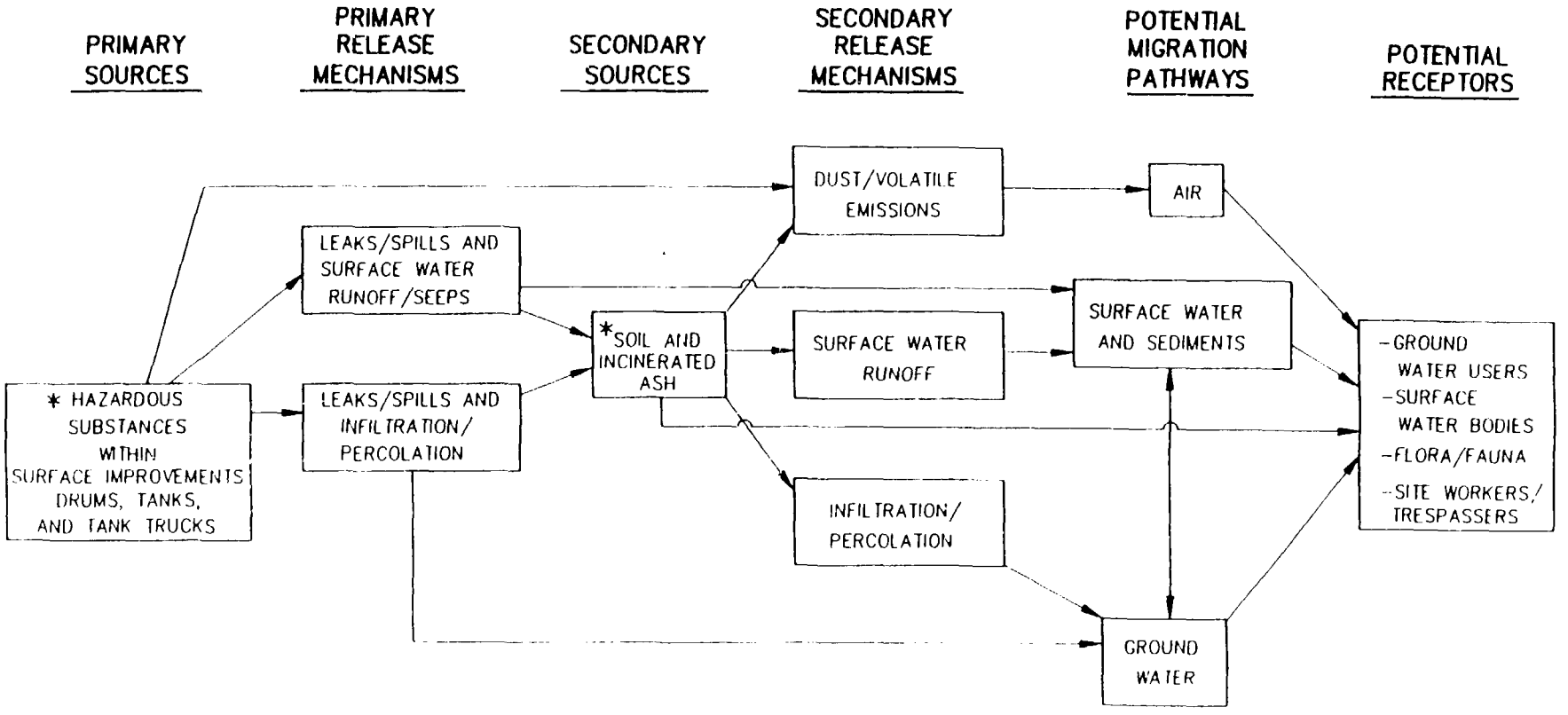


FIGURE 3-10

ANNOTATED AERIAL PHOTOGRAPH
LENZ OIL SITE
APRIL 12, 1988

ERM

PROJECT	REPORT	DRAWN	CHECKED	DATE	APPROVED	CLIENT NAME
0252	TM1	GW		2/4/91		LENZ OIL



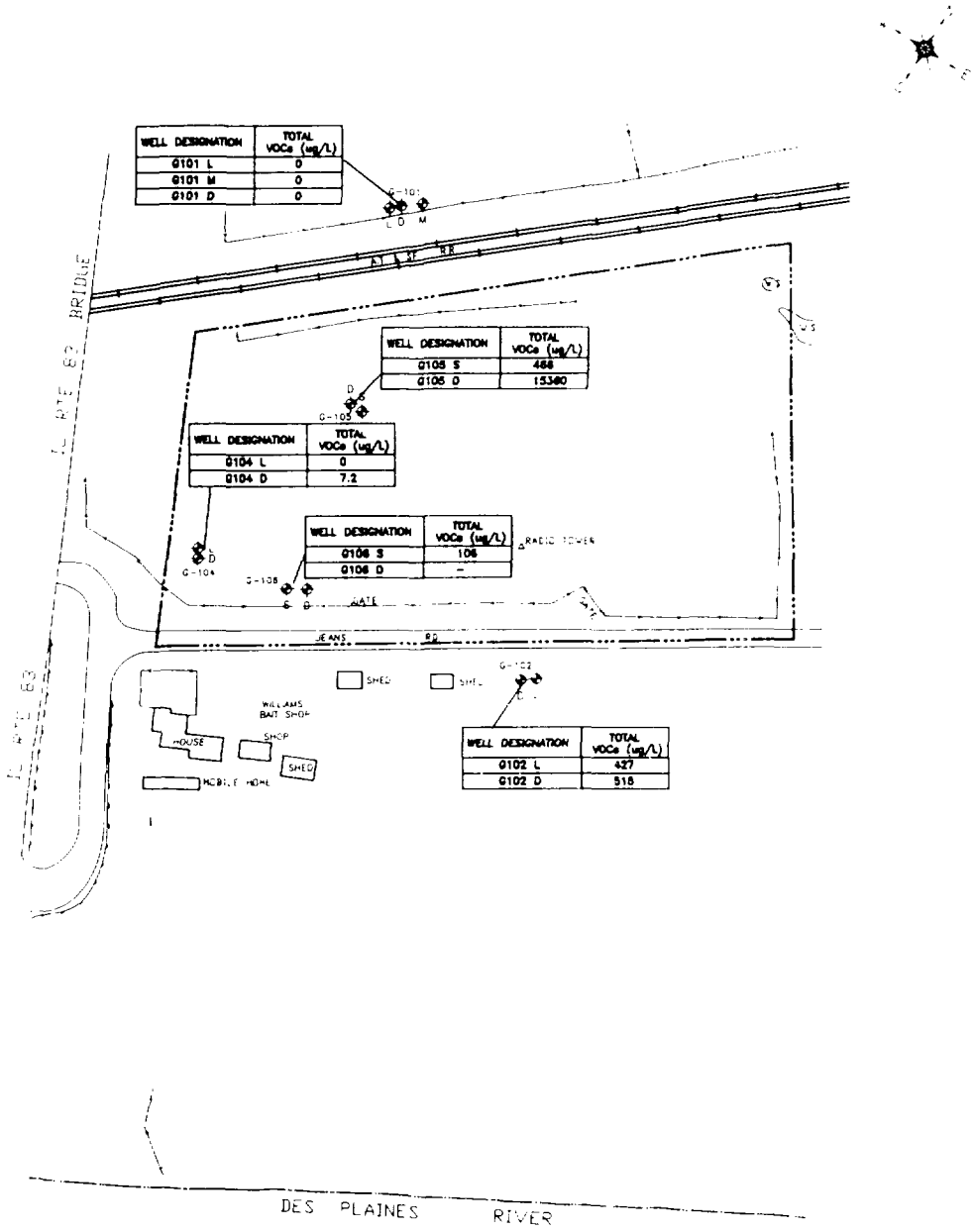
* SOURCES REMEDIATED BY IEPA BETWEEN 1986 AND 1988, RESIDUAL CONTAMINATION MAY REMAIN IN SOIL.

FIGURE 4-1

PRELIMINARY
CONCEPTUAL SITE MODEL
LENZ OIL SITE

ERM

PROJECT	REPORT	DRAWN	CHECKED	DATE	APPROVED	CLIENT NAME
0252	TM1	GW		2/4/91		LENZ OIL



SYMBOL LEGEND

FENCE LINE

RAILROAD

MONITORING WELL

WELL DEPTH INDICATION

DEEP WELL

DEEP WELL REPLACEMENT

INTERMEDIATE DEPTH WELL

SHALLOW WELL

FIGURE 4-2

GROUND WATER ANALYTICAL RESULTS
LENZ OIL SITE

ERM

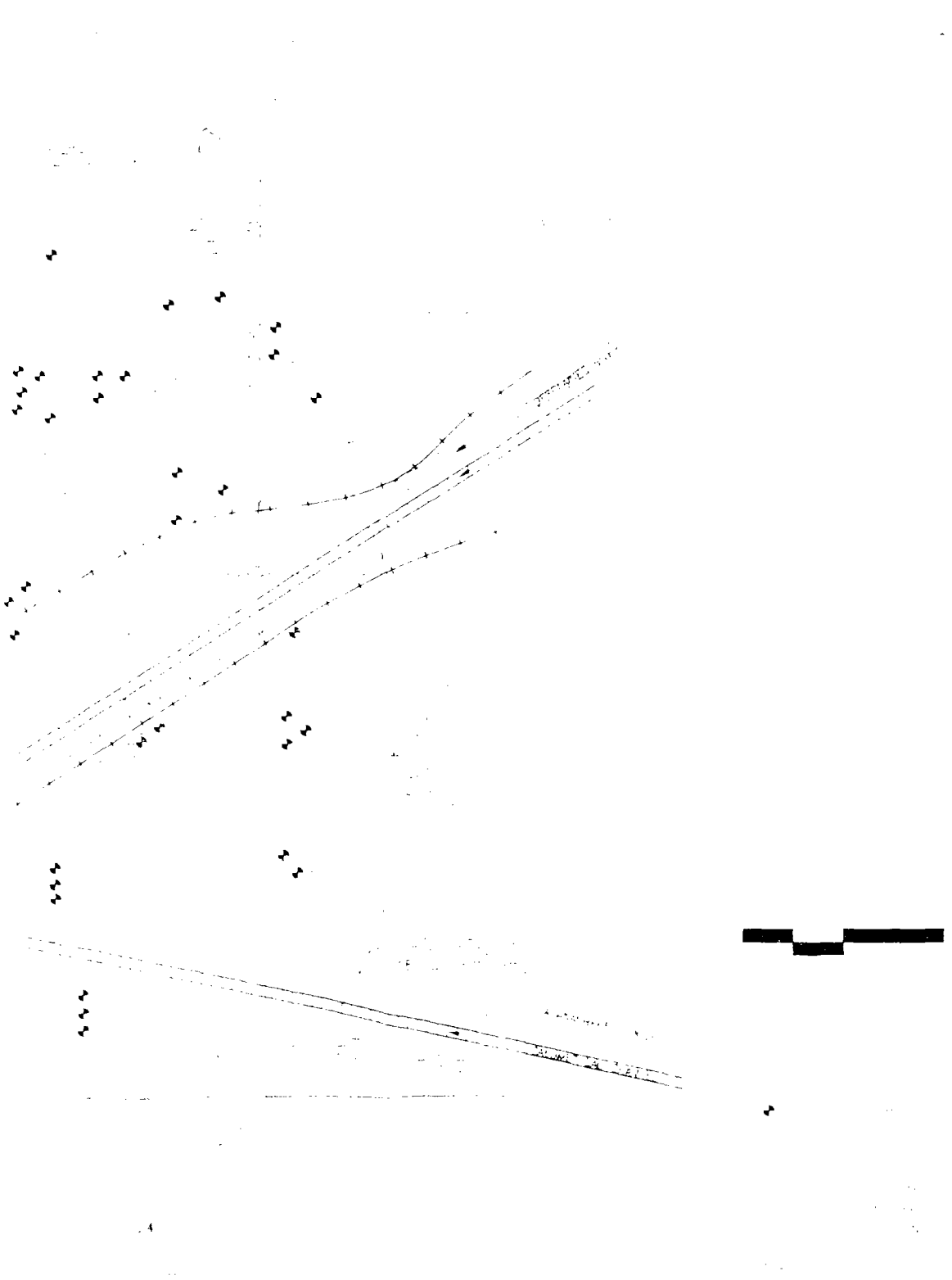
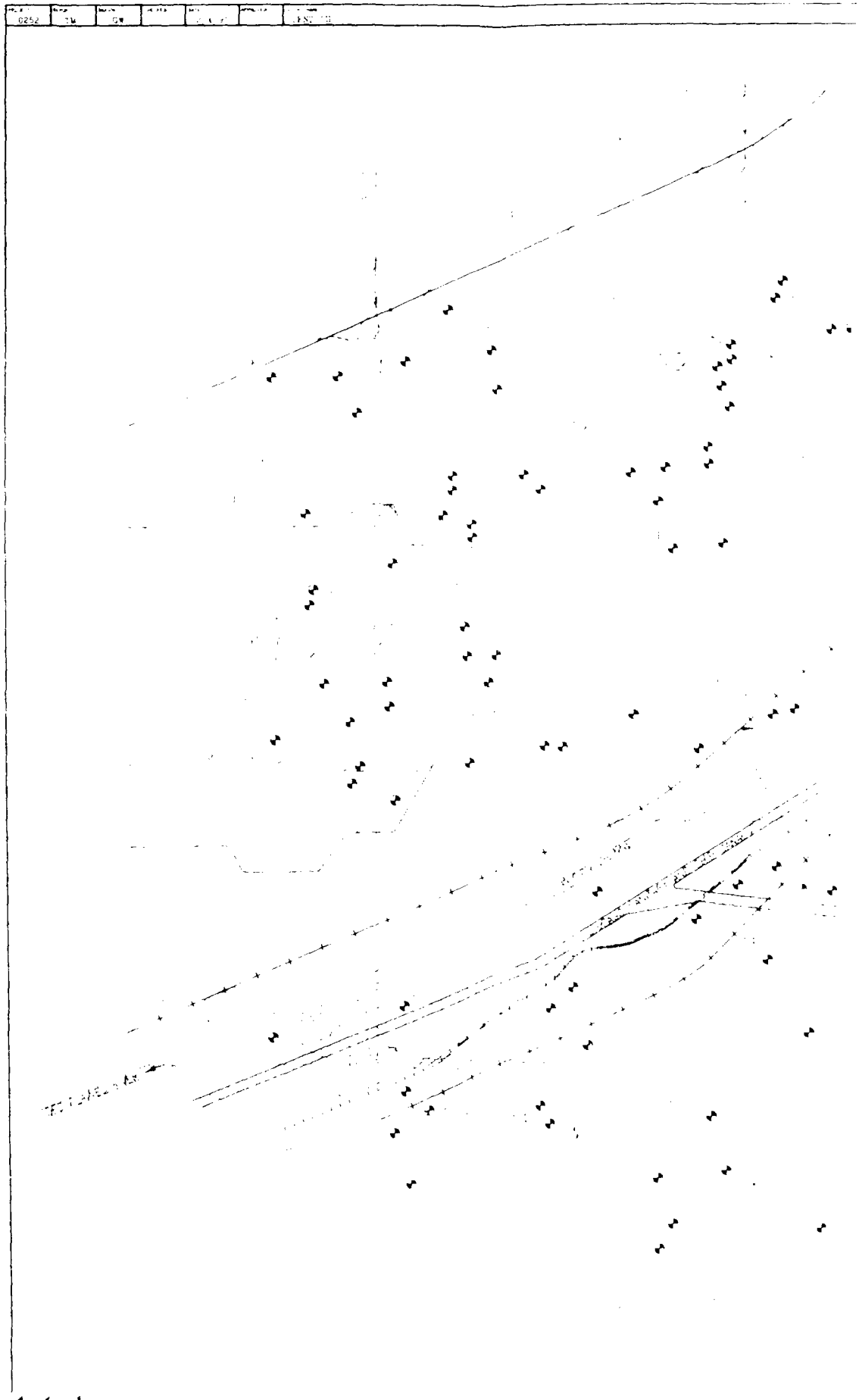
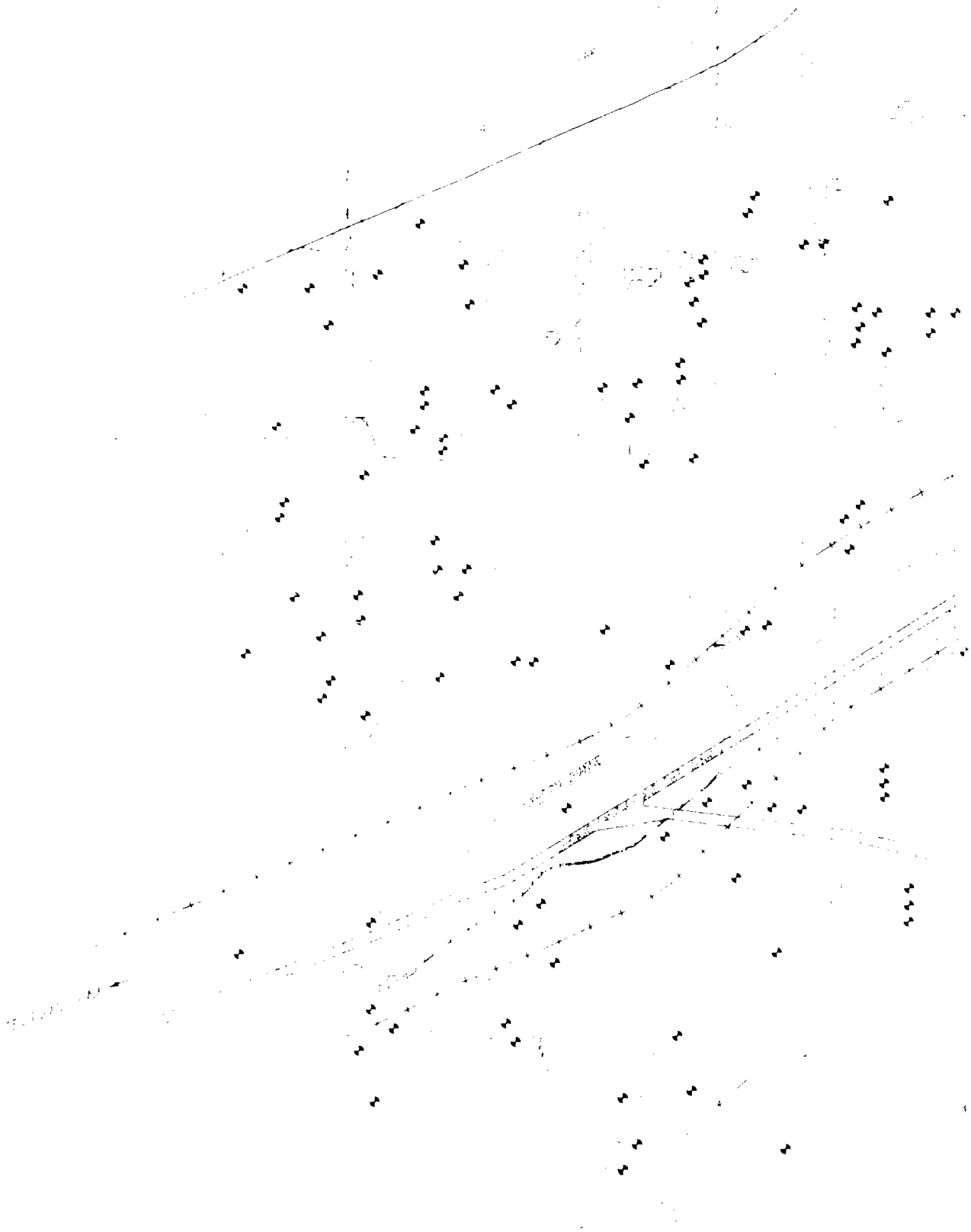


FIGURE 4-3

PRIVATE WELL LOCATION MAP
LENZ OIL SITE



ERM



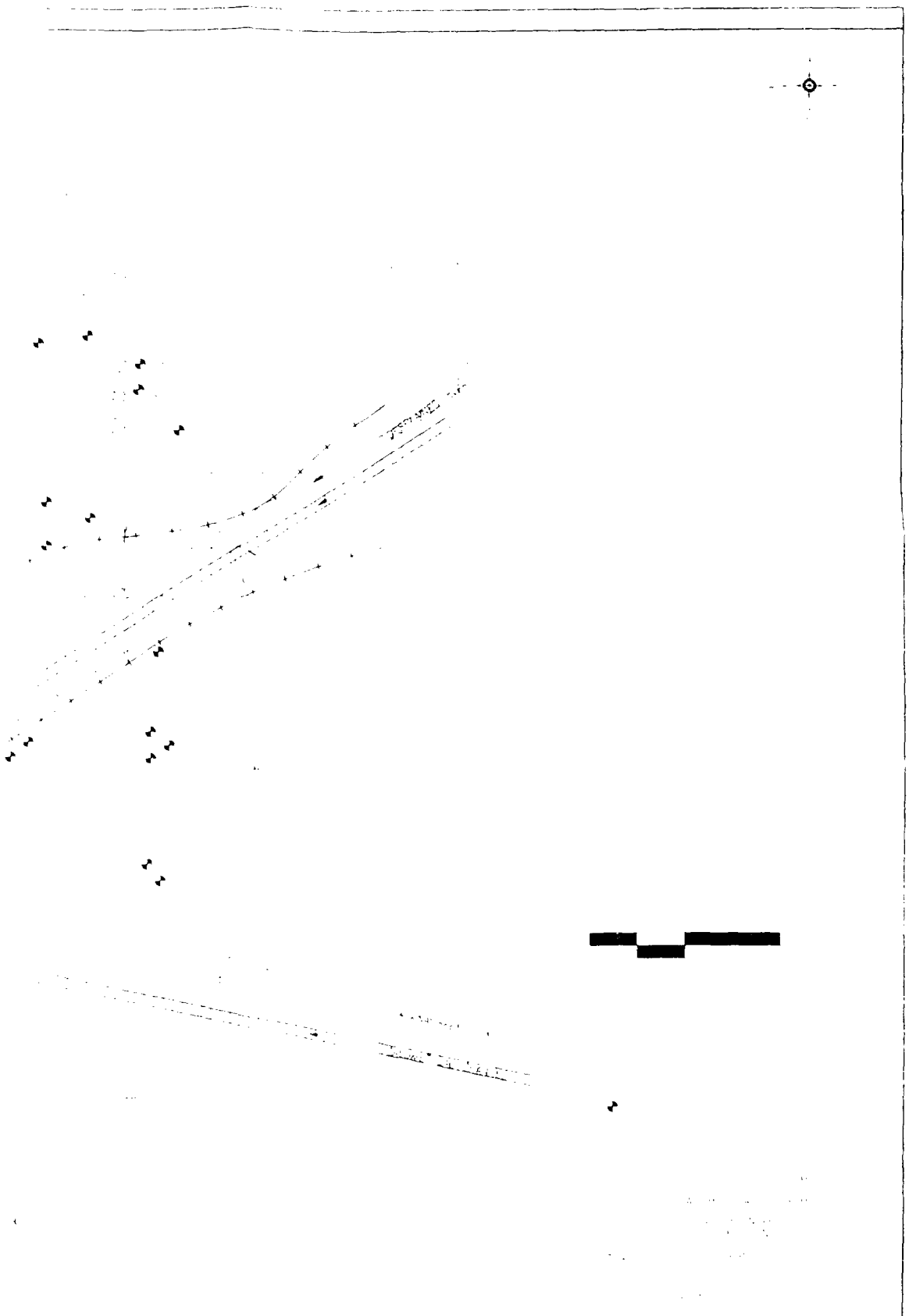


FIGURE 4-3

PRIVATE WELL LOCATION MAP
LENZ OIL SITE

APPENDIX A

GEOLOGIC LOGS

OWNER	LOG OF BORING NUMBER
Lent Oil Service, Inc.	OW-1
PROJECT NAME	**ARCHITECT-ENGINEER**
Ground-Water Monitoring Well Installation	

SITE LOCATION
Route 83, Lemont, Illinois

ELEVATION / DEPTH	SAMPLE NO	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT LBS/FT³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT² (1 2 3 4 5) / PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10 20 30 40 50) / STANDARD PENETRATION BLOWS/FT (10 20 30 40 50)
					SURFACE ELEVATION 98.23		
		PA			Crushed limestone, cinder fill & little clay lumps -lt. gray, dk. gray & sl. brown- moist (Fill) Strong chemical odor		
	1	ST					
	2	SS			Clayey topsoil and asphalt waste - dk. gray- very loose - wet (OH-Fill) Strong odor		2
	3	SS					9
	4				Organic clay, little silt, trace roots & cinders -dk. brown- stiff (OH-Fill, Possible topsoil - Strong chemical odor		
		PA					
	5	SS			Sandy fine to med. limestone gravel little clay & silt -brownish gray to dk. gray- dense - saturated (GC) Strong chemical odor, becoming moderate with depth		42
		PA					
					Refusal to power auger at 15.0 ft		
					END OF BORING		
					Installed 2" monitoring well at 15'		

*CALIBRATED PENETROMETER

AL [illegible] WS AO	BORING STARTED [illegible]	SOIL TESTING SERVICES INC
AL BCR ACR	BORING COMPLETED [illegible]	[illegible] PRINGSTEN ROAD NORTHBROOK ILLINOIS 60062
AL [illegible]	RIG [illegible] FOREMAN [illegible]	APP'D BY [illegible] STS JOB NO [illegible]

OWNER	LOG OF BORING NUMBER
Lenz Oil Service, Inc.	OW-2
PROJECT NAME	**ARCHITECT-ENGINEER**
Ground-Water Monitoring Well Installation	
SITE LOCATION	
Route #1, Lemont, Illinois	

UNCONFINED COMPRESSIVE STRENGTH TONS/FT² (1, 2, 3, 4, 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10, 20, 30, 40, 50)

STANDARD PENETRATION BLOWS/FT (10, 20, 30, 40, 50)

ELEVATION / DEPTH	SAMPLE NO	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT LBS/FT³
					SURFACE ELEVATION 98.59	
		PA			Crushed stone (Fill)	
	1	SS			"A"	
		PA			Sandy silt, trace clay & gravel - lt. brown- dense - saturated (ML) Strong chemical odor	
	2A	SS				
		PA			Clayey silt, little sand, trace gravel - lt. brown & lt. gray- very dense - moist (ML-CL) moderate chemical odor	
	3	SS				
		PA				
	4	SS			Sandy silt, trace clay & gravel - gray- very dense to extremely dense - moist (ML) Moderate chemical odor - highly cemented at 10 ft	
		PA				
	5	SS				
		PA				
		PA			Sandy fine to med. limestone gravel little clay & silt -lt. gray- dense - saturated (GC) Strong chemical odor	
	6	SS				
		PA				
					Refusal to power auger at 19.3 ft	

END OF BORING

"A" - Silty fine to coarse sand, little gravel, trace clay -light brown- dense - moist (SM) Strong chemical odor

Installed 2" monitoring well at 19.3'

WL [illegible]	WS or WD	BORING STARTED [illegible]	SOIL TESTING SERVICES INC 111 PFINGSTEN ROAD NORTHBROOK ILLINOIS [illegible]
[illegible]	BOR	BORING COMPLETED [illegible]	
WL [illegible]		RIG Auger FOREMAN Denis	APP'D BY [illegible] STS JOB NO [illegible]

Illinois Environmental Protection Agency

BORING NO 101	WELL NO 101-D	GROUNDLEVEL ELEV	PAGE 1 of 3
COUNTY Dupage	SITE NO	DATE START 4/29/86 FINISH 4/29/86	ABOVE PACKING See well construction diagram
SITE Lenz Oil			
BORING LOCATION See Map		TIME START 900a FINISH 400pm	PACKING
DRILLING EQUIPMENT CME 73 SIZE 3 3/4" TYPE Hollow Stem Augers			
COMPLETION DEPTH 38.00	BEDROCK DEPTH 25.3	TOP OF CASING +3.00	SCREEN
WELL CASING TYPE AND QUANTITY 316 Stainless Steel See well construction diagram.			PERSONNEL G. Grede D. Beise T. Murphy Hdelinkian
SCREEN INTERVAL TYPE AND QUANTITY See well construction Diagram			

ELEV	DESCRIPTION	DEPTH	Sample No	Sampler Type	Sample Recovery Ft	Penetrometer (Strength)	N Value (Blows)	REMARKS
	0-0.6 Dark brown silt grass roots.	0						
	0.6-1.9 Brown clayey sandy silt with small gravel pebbles, some cobble size dolomite pieces.	1		SS	0.7		3 6	
	1.9-6.6 Brown silt with some pebbles and gravel. Iron staining, blocky texture. Few spots of gray (unweathered) material	2		SS	0.4		3 6	
		3		SS	1.1		7 8	
		4		SS	1.1		7 8	
		5		SS	1.2		7 8	
	6.6-9.2 Silty sand with pebbles and gravel light tan. Moist. Dolomite majority of gravel pieces, some sandstone also in pebble size pieces	6		SS	0.0		15 23	
		7		SS	1.4		30 41	
	9.2-11.8 Silty gravel slight amount of sand light tan to light brown. Blocky texture.	8		SS	1.5		37 47	
		9		SS	1.2		50 47	
	11.8-12.9 Silty dolomitic gravel-gray. Slight clay, and $CaCO_3$ cemented blocky texture, well consolidated	10						
	12.9-17.6 Brown silty sand with pebbles and gravel, light brown. Slight $CaCO_3$ cement. Fine to coarse sand.	11						
		12						
		13						
		14						

Illinois Environmental Protection Agency

BORING NO	WELL NO	GROUNDLEVEL ELEV	PAGE	OF
101	101-D		2	3

COUNTY	SITE NO	DATE START	DATE FINISH	ANNULUS FILL MATERIAL
Dupage		4/29/86	4/29/86	ABOVE PACKING

SITE: Lenz 0.1

BORING LOCATION: See Map

DRILLING EQUIPMENT: CME 75 — SIZE: 3 3/4" Hollow — TYPE: Stem Auger

TIME START: 9a — FINISH: 4p

PACKING

COMPLETION DEPTH: 38.00 — BEDROCK DEPTH: 25.3 — TOP OF CASING: +3.00

SCREEN

WELL CASING — TYPE AND QUANTITY: See well construction diagram

SCREEN INTERVAL — TYPE AND QUANTITY

PERSONNEL: - Greile; D- Boise; H- Murphy, Mid-[illegible]

ELEV	DESCRIPTION	DEPTH	Sample No	Sampler Type	Sample Recovery Ft	Penetrometer (Strength)	N Value (Blows)	REMARKS
		14		SS	1.0		44 - 29	wet.
		15		SS	1.0		— 15 - 13	
		16						
		17		SS	1.1		— 10 - 9	
	17.6-21.7 Dolomite cobbles and boulders in silty gravel. Gray to off white in fresh fractures. Some sand at 19.8 to 20.1 ft.	18		SS	0.7		— 14 - 8	
		19						
		20		SS	1.2		— 13 - 15	
		21						
	21.7-21.9 Brown silty gravel with some sand			SS	1.3		— 18 - 28	
	21.9-25.3 Brown fractured dolomite cobbles boulders and gravel. Sand zone 22.5 to 22.8. Silty clay at 23.4 to 23.6	22						
		23		SS	1.1		— 22 - 31	
		24						
				CS	1.3			
	25.3-38.0 Dolomite - slightly fractured light gray to off white. clay filling horizontal fractures. Competent, consolidated rock.	25						Bedrock surface at 25.3 feet
		26						
		27						
		28						

Illinois Environmental Protection Agency

BORING NO	WELL NO	GROUNDLEVEL ELEV	PAGE
101			3 3

COUNTY	SITE NO	DATE START	DATE FINISH	ANNULUS FILL MATERIAL
Dupage		4/24/86	4/29	ABOVE PACKING

SITE	BORING LOCATION	DRILLING EQUIPMENT	SIZE	TYPE	TIME START	TIME FINISH	PACKING
Lenz Oil	See Map	See first page			9a	4p	

COMPLETION DEPTH	BEDROCK DEPTH	TOP OF CASING	SCREEN

WELL CASING	TYPE AND QUANTITY	SAMPLES	PERSONNEL
			L. Grade
SCREEN INTERVAL	TYPE AND QUANTITY		D. Boise
			H. Murphy Adelphi

ELEV	DESCRIPTION	DEPTH	Sample No	Sampler Type	Sample Recovery Ft	Penetrometer (Strength)	N Value (Blows)	REMARKS
	see previous page for bedrock description	28						
		29						
		30						
		31						
		32						
		33						
		34						
		35						
		36						
		37						
		38						EOB

Illinois Environmental Protection Agency

BORING NO	102
WELL NO	
GROUNDLEVEL ELEV	
PAGE	1 of 2
COUNTY	Dupage
SITE NO	
SITE	Lemont - Lane Oil
BORING LOCATION	~25' E of SE corner of Lane Property, across road
DATE START	4/15/86
DATE FINISH	4/15/86
ANNULUS FILL MATERIAL ABOVE PACKING	
PACKING	
TIME START	1000
TIME FINISH	400p
SCREEN	
DRILLING EQUIPMENT	CME 75
SIZE	3 1/4
TYPE	H.S.A.
COMPLETION DEPTH	19.2
BEDROCK DEPTH	6.7
TOP OF CASING	—
WELL CASING	—
TYPE AND QUANTITY	—
SCREEN INTERVAL	—
TYPE AND QUANTITY	—
PERSONNEL	J. Grede D. Bazile M. Murphy, Adlinbsc...

ELEV	DESCRIPTION	DEPTH	Sample No	Sampler Type	Sample Recovery Ft	Penetrometer (Strength)	N Value (Blows)	REMARKS
	0-0.55 Dark brown silt, grass, roots, little clay	0						
	0.55-0.75 Sandy silt with gravel - brown							
	0.75-6.1 Silty gravel (dolomite and sandstone) with varying concentrations of sand, gravel and silt. Dry. $CaCO_3$ present. Cobbles and boulders of dolomite (2.4 to 2.6, 5.0 to 5.4) Light tan to light brown. Iron stains present from 2.6 to 3.9	1		SS	1.1		3	
							19	
							37	
		2						
		3		SS	1.9			
		4						
		5		SS	1.9		36	
							53	
							55	
	6.1-6.7 Grey gravelly clayey silt dolomite gravel, small amounts of sand	6						
	6.7-19.2 Dolomite - light gray, secondary porosity from fractures and solutioning. Silt nodules prominent from 17.1 to 19.2. Vertical (high angle) and horizontal fractures	7		SS	1.0			
		8						augered to 7.3, to set augers for coring.
		9			N.R.			
		10		CORE BARREL				
		11			9.9			
		12						
		13						
		14						

Illinois Environmental Protection Agency

BORING NO	WELL NO	GROUNDLEVEL ELEV	PAGE	OF
102			2	2

COUNTY	SITE NO	DATE START	DATE FINISH	ANNULUS FILL MATERIAL
Dupage		4/15/86	4/15	ABOVE PACKING

SITE: Lemont Lenz Oil

BORING LOCATION: -25' E of SE corner of Lenz Property, across road

DRILLING EQUIPMENT	SIZE	TYPE	TIME START	TIME FINISH	PACKING
CME 75 3 3/4" HSA 3 1/4 core barrel Christensen			1000	400p	

COMPLETION DEPTH	BEDROCK DEPTH	TOP OF CASING	SCREEN
19.2	6.7	–	

WELL CASING	TYPE AND QUANTITY	SAMPLES	PERSONNEL
–	–		Grele
			B. [illegible]
SCREEN INTERVAL	TYPE AND QUANTITY		Murphy, Adolphson
–	–		

ELEV	DESCRIPTION	DEPTH	Sample No	Sampler Type	Sample Recovery Ft	Penetrometer (Strength)	N Value (Blows)	REMARKS
	See previous page for description	14						
		15						
		16						
		17						
		18						
		19						EOB 19.2'
		20						

Illinois Environmental Protection Agency

BORING NO	WELL NO	GROUNDLEVEL ELEV	PAGE
103			1 / 1

COUNTY	SITE NO	DATE START	DATE FINISH	ANNULUS FILL MATERIAL ABOVE PACKING
Dupage		4/16/86	4/16/86	—

SITE	BORING LOCATION	DRILLING EQUIPMENT	SIZE	TYPE	TIME START	TIME FINISH	PACKING
Lemont Lenz Oil	Williams Bolt Shop	CME 75	3 3/4	H.S.A 24" Split Spoon Sampler	920a	1100a	—

COMPLETION DEPTH	BEDROCK DEPTH	TOP OF CASING	SCREEN
5.7	5.6	—	

WELL CASING	TYPE AND QUANTITY	SCREEN INTERVAL	TYPE AND QUANTITY
—	—	—	—

PERSONNEL: J. Grede, D. Bosie, H. Murphy, Adolphson

ELEV	DESCRIPTION	DEPTH	Sample No	Sampler Type	Sample Recovery Ft	Penetrometer (Strength)	N Value (Blows)	REMARKS
	0-0.4 Dark brown silt, with organics, roots. moist	0						
	0.4-2.0 Light brown sandy silt medium grained sand, some pebbles. Moist Few gravel pieces. Roots	1		SS	0.9		1, 3, 3	
	2.0-3.0 Light tan silty sand Small pebbles and some gravel, dry Fine to medium gr sand Light brown 2.6 to 3.0, same composition.	2						
	3.0-5.6 Light brown sandy silt, $CaCO_3$ abundant dolomite pebbles and gravel. Faint chemical odor at 4.4 dry Hard. Dolomite boulder at 4.0 to 4.3	3		SS	1.6		19, 40, 84	
		4						
		5		SS	1.7		48, 95, 100	
	5.6-5.7 Light gray dolomite, fine grained, no fractures apparent Split spoon refusal at 5.7.	6						EOB 5.7

IL 532-1112

Illinois Environmental Protection Agency

BORING NO 104	WELL NO	GROUNDLEVEL ELEV	PAGE 1 OF 1
COUNTY Dupage	SITE NO	DATE START 5/13/86 FINISH 5/15/86	ANNULUS FILL MATERIAL ABOVE PACKING
SITE Lemont - Lenz Oil			
BORING LOCATION See map		TIME START 900a FINISH 1030a	PACKING
DRILLING EQUIPMENT CME 75 SIZE 6 1/4" TYPE Hollow Stem Augers			
COMPLETION DEPTH 3.9	BEDROCK DEPTH 3.4	TOP OF CASING	SCREEN
WELL CASING —	TYPE AND QUANTITY —		
SCREEN INTERVAL —	TYPE AND QUANTITY —		

PERSONNEL
L. Grade
D. Adolphson
K. Murphy

ELEV	DESCRIPTION	DEPTH	Sample No.	Sampler Type	Sample Recovery ft	Penetrometer (Strength)	N Value (Blows)	REMARKS
	0-0.4 Dark brown silt with gravel, very oily smell.	0						
	0.4-1.6 Dolomite cobble in med to fine grained sand, tan.	1		SS	0.6		7 7	
	1.6-3.4 Clayey silt with gravel and cobbles. very light brown. 1.6-1.9 layer of pea gravel with silt.	2		SS	1.0		14 28	
	3.4 Dolomite - light gray where fresh, buff where not. dry.	3		SS	0.4		100	EOB.
		4						

WEHRAN ENGINEERING
CONSULTING ENGINEERS

Field Borehole Log

CLIENT IEPA
PROJECT LENZ OIL, LEMONT ILLINOIS
SITE
LOCATION (LATITUDE) (DEPARTURE) BEARING
CONTRACTOR CANONIE DRILLING
METHOD OF BORING: SOIL 6.25 INCH I.D. HOLLOW STEM
ROCK NX CORE, REAM TO 3 7/8"

JOB NO. 06369 HOLE NO. SB4 SHEET NO. 1 OF 2
WEATHER HOT, HUMID INSPECTOR A. [illegible]
TEMP. ~90 °F STARTED 6:00 A.M. 7/19 19[illegible]
DIP ° FINISHED 9:00 A.M. 7/21 19[illegible]
ELEVATIONS: DATUM
CASING DIAM. 6 I.D. DRILL PLATFORM
GROUND SURFACE
CORE DIAM. NX WATER LEVELS

LOG LEGEND: SILT, SAND, CLAY, GRAVEL
* SAMPLE CONDITION: GOOD, DISTURBED, FAIR, LOST
** SAMPLING METHOD: A - SPLIT TUBE, B - THIN WALL TUBE, C - PISTON SAMPLER, D - CORE BARREL, E - AUGER, F - WASH, K - SLOTTED SAMPLER
** SHIPPING CONTAINER: N - INSERT, O - TUBE, P - WATER CONTENT TIN, Q - GLASS JAR, R - CLOTH BAG, S - PLIOFILM BAG, Y - CORE BOX, Z - DISCARDED

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE *	** TYPE	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	0-6" SM BROWN SILTY SAND							36	
	6-8" SM BLACK SILTY SAND	1.0		AQ	401	24	10	FOR	
	8-10" PEA GRAVEL WITH SILT							1.5 FT	WHITE
	0-[illegible]" ML BROWN-GRAY SILT	2.0			402				OVA SPOON = 0 PPM, OVA AT CASING >1000
	TO [illegible] PEBBLES			AQ			10	34	NO OBVIOUS OIL STAINING
	DRY VERY STIFF	3.0							PICTURE (P) #18
	0-[illegible]" ML SAME AS				403		4	PUSHED	
	ABOVE	4.0		AQ					
									P=19
	0-[illegible]" ML DARK BROWN SILT	5.0			404		11	PUSHED	OVA AT HOLE >1000 PPM, OVA B.B. = [illegible]
	CLAY, MOIST, STIFF			AQ				PUSHED	40 PPM, OVA JAR SAMPLE >1000
	WOOD FRAGMENTS (FILL?)	6.0						22	P=20
	0-6" ML GRAY CLAY SILT				405		6		OVA HOLE >1000, OVA JAR = 600
	NO PEBBLES PIECE OF WOOD	7.0		AQ				31	NO OBVIOUS OIL STAINING
	AT BOTTOM OF SPOON, STIFF								P=2[illegible]
	0-2" [illegible] POORLY SORTED	8.0			406		2		OVA HOLE >1000, OVA JAR >1000
	[illegible] WITH PEBBLES AND			AQ				30	BLACK LIQUID IN SPOON [illegible]
	[illegible]	9.0							OF WATER
	0-3" ML SAMPLED BROWN SILTY CLAY				407		8		OVA HOLE >1000, OVA SPOON = 40, B.B. =
	TOPSOIL (?)	10		AQ				48	30 PPM. LIQUID IN SEPARATE INTO
	0-8" GRAY PEBBLES WITH PIECE OF WOOD								MED BROWN LIQUID AND BLACK LIQUID [illegible]
									IN COMPOSITE SAMPLE
	[illegible]" ML GRAY SILTY CLAY	11			408		4	60	OVA HOLE >1000, OVA JAR >1000 P=[illegible]
	WITH PEBBLES			AQ					LIQUID MED. BROWN TO BLACK
	0-4" ML GRAY SILTY CLAY	12			409		10		P=[illegible]
	4-10" DOLOMITE ROCK FRAGMENTS	13		AQ				57	OVA HOLE >1000, OVA [illegible] = [illegible] PPM
	BEDROCK (?)								NO OBVIOUS STAINING ON ROCK FRAGMENTS

WEHRAN ENGINEERING
CONSULTING ENGINEERS

Field Borehole Log

JOB NO [illegible] HOLE NO [illegible] SHEET NO [illegible] OF [illegible]

Depth	Description	Core	Bit	Core	Recovery	Rock Type	Remarks
	[illegible]		AQ	4 1 0		3	82	OVA HOLE = 700 OVA [illegible] = 30 [illegible] NO OBVIOUS [illegible]
15	[illegible]		AQ	4 1 1		2	[illegible]	OVA HOLE 1000 [illegible]
16								OVA JAR = 740
	[illegible]		SET [illegible]					
17.5	FIRST RUN 5.4' (17.5-22.9) 30% RECOVERY							OVA HOLE >1000 PPM OVA BREATHING [illegible] = [illegible] PPM
	GRAY LIMESTONE WITH ARGILLACEOUS PARTINGS							PEAKING [illegible] PPM NO OBVIOUS [illegible]
	HIGHLY FRACTURED [illegible] SOLID PIECE		DY			80% RECOVERY		ROCK. ROCK STAINED RUSTY ORANGE [illegible]
20	6" FRAGMENTS RANGE [illegible] FROM FINE							LEFT IN CORE [illegible] OVERNIGHT (?)
21	GRAVEL TO 2" LONG							100% WATER LOSS
22	17.5-20.0 SURFACE OF [illegible] FRAGMENTS							
23	[illegible]							
24	[illegible]							
25	[illegible] ROCK FRAGMENTS		DY			≈80% RECOVERY		
26	SECOND RUN 5.7' (22.9-23.6) ≈80% RECOVERY							OVA HOLE = 200 PPM NO OBVIOUS [illegible]
27	22.9-23.4 SAME AS ABOVE 23.4-26.2 4" PIECES							100% WATER LOSS BREATHING ZONE = [illegible] PPM
28	[illegible] EVENLY SPACED HORIZONTAL PARTINGS STAINED							ROUGH WITH BLACK MINERALIZATION [illegible]
29	BLACK 26.2-27.0 HIGHLY FRACTURED		DY			≈90% RECOVERY		BLACK HORIZONTAL PARTINGS WITH WHITER NODULES
30	PIECES RANGE FROM 0.5-3.0" ~0.3 INCH DIAM BLACK NODULES							≈0.3 INCH DIAM
31	IN ROCK. 27.2-28.6 SOLID CORE BROKEN IN 4 PLACES							
32	ALONG STEEPLY INCLINED FRACTURES. 1 FRACTURE SMOOTH [illegible]		END OF HOLE					
	PLANAR, NO STAINING [illegible]							

WEHRAN ENGINEERING
CONSULTING ENGINEERS

Field Borehole Log

JOB NO. [illegible] HOLE NO. SB4 SHEET NO. 3 OF 3

[illegible] 29 (286-315)	END OF HOLE		OVA HOLE = 70 PPM
[illegible]			TOP OF BARREL > 1000 PPM
[illegible]			NO [illegible]
[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]			

WEHRAN ENGINEERING
CONSULTING ENGINEERS

Field Borehole Log

CLIENT [illegible] EPA
PROJECT [illegible]
SITE
LOCATION (LATITUDE) (DEPARTURE) BEARING
CONTRACTOR [illegible]
METHOD OF BORING: SOIL [illegible] HOLLOW STEM AUGER
ROCK [illegible] OVER DRILL [illegible]

JOB NO. 06[illegible] HOLE NO. SB[illegible] SHEET NO. 1 OF [illegible]
WEATHER HOT, HUMID INSPECTOR A. BLACKMAN
TEMP. ~90 °F STARTED 11:00 A.M. 7/16 19[illegible]
DIP ° FINISHED 9:30 A.M. 7/18 19[illegible]
ELEVATIONS: DATUM
CASING DIAM. DRILL PLATFORM
GROUND SURFACE
CORE DIAM. WATER LEVELS

LOG LEGEND: SILT, SAND, CLAY, GRAVEL
* SAMPLE CONDITION: GOOD, DISTURBED, FAIR, LOST
** SAMPLING METHOD: A - SPLIT TUBE, B - THIN WALL TUBE, C - PISTON SAMPLER, D - CORE BARREL, E - AUGER, F - WASH, K - SLOTTED SAMPLER
** SHIPPING CONTAINER: N - INSERT, O - TUBE, P - WATER CONTENT TIN, Q - GLASS JAR, R - CLOTH BAG, S - PLIOFILM BAG, Y - CORE BOX, Z - DISCARDED

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	SAMPLE *	SAMPLE ** TYPE	SAMPLE NO.	SAMPLE SIZE (IN.)	SAMPLE RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	0-11" GP POORLY SORTED FINE SAND TO FINE GRAVEL, FRAGMENTS ARE SUBANGULAR. BOTTOM 2" MOIST	1	X	AQ	5 8 3 1	24	11	10 9 9 6	OVA HOLE >1000 PPM, OVA JAR 400 PPM NO PICTURE, DROPPED CAMERA
	0-3" GP SAME AS ABOVE SATURATED 3-7" ML DARK BROWN CLAY SILT, STIFF, MOIST; 7-12" SANDY DOLOMITE ROCK FRAGMENTS	2 3 4	X	AQ	5 8 3 2		12	28 14 14 6	OVA HOLE >1000 PPM, BREATHING ZONE 1 PPM, SAMPLE JAR = 160 PPM
TILL?	0-19" ML GRAY TO YELLOW-BROWN MOTTLED SILT WITH SOME CLAY, SUBANGULAR SMALL TO MED PEBBLES, 19" ROCK FRAGMENTS	5 6	X	AQ	3		19	13 19 43 26	OVA HOLE >1000, BZ = 1 PPM FLUID IN SPOON, SILT IS MOIST, NO OBVIOUS STAINING
TILL?	0-3" ML YELLOW-BROWN SILT WITH ROCK FRAGMENTS 3-15" ML GRAY SILT WITH ROCK FRAGMENTS, SUBROUNDED	7 8	X	AQ	4		15	16 38 29 35	OVA B.Z. = 1 PPM; OVA JAR = 460 PEBBLES, SHARP CONTACT BETWEEN YELLOW-BROWN AND GRAY SILTS, NO VISIBLE STAINING, DAMP
	0-14" ML GRAY SILT WITH LARGE WEATHERED, HIGHLY FRACTURED COBBLE, OBVIOUS OIL STAINING, MOIST	9 10	X	AQ	5		14	24 20 27 31	BLACK OILY LIQUID MIXED WITH WATER DRAINED FROM SPOON OVA HOLE >1000, BZ = 5-8 PPM OVA JAR > 1000
	0-3" ML GRAY SILT WITH ROCK FRAGMENTS; 3-9" DARK GRAY ROCK FRAGMENTS; 9-17" DOLOMITE (?) ROCK FRAGMENTS	11 12	X	AQ	6		17	46 18 25 33	OVA HOLE >1000 PPM; OVA JAR = 240 SOME SILT; MOIST, NO OBVIOUS STAINING; OILY PHASE APPARENT IN AUGERED CUTTINGS
BEDROCK (?)	0-4" ROCK FRAGMENTS WITH SOME SILT SAMPLE MOIST REFUSAL ⇒ BEDROCK(?)	13	X	AQ	7		4"	46 100 for 3 inch	OVA JAR = 120 PPM, B.Z. = 8 PPM

WEHRAN ENGINEERING
CONSULTING ENGINEERS

Field Borehole Log

JOB NO. 05369 HOLE NO. SB3/ SHEET NO. 2 OF 2

Depth	Description	Symbol	Remarks
	[illegible]		
	[illegible]		
	[illegible]		
	[illegible] 6.1 FEET		
6	[illegible] 5.3' (6.1' TO 11.4')		DRILLING [illegible]
7	[illegible] COMPETENT LIMESTONE		UNKNOWN [illegible]
	[illegible] JOINT WITH IRON STAINING. TWO HORIZONTAL	DY	100% RECOVERY — BROKEN
8	BREAKS, FRESH [illegible], COLOR GRAY; [illegible]		
9	[illegible] RECOVERY EXCEPT FOR A FEW LARGE PEBBLES.	DY	1-2% RECOVERY — DURING CORING RATE INCREASED DRAMATICALLY [illegible]
10	PEBBLES ARE ROUNDED BUT SOURCE OF ROUNDING NOT KNOWN. COULD		
11	BE DUE TO TRANSPORT OR CORING PROCESS		
12	ROCK HIT AGAIN AT 11.8'		BLACK STAINING ON MANY FRACTURE SURFACES. ONE
13	SECOND RUN 4.7' (11.8 TO 16.5')		OBVIOUS SUBVERTICAL FRACTURE AT ~15' [illegible]
14	11.8-16.5' HIGHLY FRACTURED; PIECES RANGE IN LENGTH FROM APPROX. 4" TO FINE	DY	≈60% RECOVERY — BLACK MINERALIZATION [illegible]
15	GRAVEL SIZE FRAGMENTS MATERIAL APPEARS TO BE		ROCK (NODULES [illegible])
16	ARGILLACEAL LIMESTONE, DOLOMITE (?), LIGHT GRAY		OVA OF CORE = 0 PPM
17		END OF BORING	

[illegible] (?)

[illegible] (?) HIGHLY FRACTURED ROCK (?)

WEHRAN ENGINEERING
CONSULTING ENGINEERS

Field Borehole Log

JOB NO 06369 HOLE NO SG1 SHEET NO 2 OF 2

[illegible] FRAGMENTS							40	SATURATED
[illegible] NO OBVIOUS	15	X	AQ	8		11	12	
STRUCTURE							12	
	16						11	
[illegible]		X					12	SATURATED
[illegible] SILT, NO STRUC-	17	X	AQ	9		~7	11	
TURE							12	
	18						12	
			END OF HOLE					

WEHRAN ENGINEERING
CONSULTING ENGINEERS

Field Borehole Log

CLIENT [illegible]
PROJECT [illegible]
SITE
LOCATION (LATITUDE) (DEPARTURE) BEARING
CONTRACTOR
METHOD OF BORING: SOIL 3 3/4 INCH HOLLOW STEM AUGERS
ROCK

JOB NO. 06369 HOLE NO. SB2 SHEET NO. 1 OF
WEATHER RAINY WARM INSPECTOR [illegible]
TEMP. 70 °F STARTED 7:00 A.M. 7/25 19[illegible]
DIP ° FINISHED [illegible] A.M. 7/25 19[illegible]
ELEVATIONS: DATUM
CASING DIAM. DRILL PLATFORM
GROUND SURFACE
CORE DIAM. WATER LEVELS

LOG LEGEND: SILT, SAND, CLAY, GRAVEL
* SAMPLE CONDITION: GOOD, DISTURBED, FAIR, LOST
** SAMPLING METHOD: A - SPLIT TUBE, B - THIN WALL TUBE, C - PISTON SAMPLER, D - CORE BARREL, E - AUGER, F - WASH, K - SLOTTED SAMPLER
** SHIPPING CONTAINER: N - INSERT, O - TUBE, P - WATER CONTENT TIN, Q - GLASS JAR, R - CLOTH BAG, S - PLIOFILM BAG, Y - CORE BOX, Z - DISCARDED

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC.	ELEV. — DEPTH	*	** TYPE	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING; TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
	0-18" (GW) BLACK COURSE SAND TO FINE GRAVEL SIZE MATERIAL CINDERS (?); 18"-24" LIGHT GRAY WEATHERED [illegible] (?)	1	X	AQ	SB2 1	24	24"	PUSH PUSH PUSH 49	OVA JAR = 500 PPM DAMP [illegible]
FILL	0-8" (?) WHITE FRAGMENTS [illegible] VERY STIFF BLACK MATRIX 8-16" (ML) DARK BROWN MOIST MATERIAL SAMPLE [illegible] BLACK	2 3 4	X	AQ	2		16	41 29 22 35	OVA HOLE >1000; OVA B.Z. = 0-1 PPM LIQUID OVA JAR = 300 PPM
TILL	0-18" (ML) BLACK VERY STIFF MATERIAL WITH ROCK FRAGMENTS MATRIX SILTY CLAY; LOOKS LIKE OIL [illegible] TILL	5 6	X	AQ	3		18	40 45 45 17	OVA HOLE >>1000 PPM; OVA JAR = [illegible] COLLECT WORST CASE SAMPLE: X109
TILL	0-9" (OL/ML) DARK BROWN, MODERATELY SOFT SILTY CLAY TILL? TOP PORTION LOOKS OIL STAINED BRICK RED ROCK OR BRICK FRAGMENT	7 8	X	AQ	4		9	7 9 9 7	OVA HOLE >>1000 PPM; BZ = 0-1 PPM FILL(?)
	NO RECOVERY, DRILLER THOUGHT HE MAY HAVE BEEN PUSHING PEBBLE	9 10	X	A	5		NO RECOVERY	5 5 7 9	OVA HOLE >1000 B.Z. = 3 PPM
	0-4" (MH) DARK BROWN, SILTY CLAY SOFT - VERY SOFT 0-5" (MH) SAME AS ABOVE	11 12	X	AQ	6		4	3 3 3 5	OVA B.Z. = 0 PEAKING AT 4 PPM
	5-13" (SM) LIGHT BROWN, LAMINATED FINE SAND AND SILT BEDS VERY THIN LAMINA, NO OBVIOUS [illegible] MOIST	13	X	AQ	7		14	3 4 5 103	REFUSAL AT BOTTOM; LIMESTONE FRAGMENT IN SPOON SAMPLE COLLECTED FOR CHEMICAL ANALYSIS: X110

WEHRAN ENGINEERING
CONSULTING ENGINEERS

Field Borehole Log

CLIENT [illegible]
PROJECT [illegible]
SITE
LOCATION (LATITUDE) (DEPARTURE) BEARING
CONTRACTOR
METHOD OF BORING: SOIL [illegible] HOLLOW STEM AUGERS
ROCK

JOB NO. [illegible] HOLE NO. SB5 SHEET NO. 1 OF [illegible]
WEATHER HOT SUNNY INSPECTOR A. BLACKMER
TEMP. 90 °F STARTED 10:00 A.M. 7/26 19[illegible]
DIP ° FINISHED ~2:00 P.M. 7/[illegible] 19[illegible]
ELEVATIONS: DATUM
CASING DIAM. DRILL PLATFORM
GROUND SURFACE
CORE DIAM. WATER LEVELS

LOG LEGEND: SILT, SAND, CLAY, GRAVEL
* SAMPLE CONDITION: GOOD, DISTURBED, FAIR, LOST
** SAMPLING METHOD: A - SPLIT TUBE, B - THIN WALL TUBE, C - PISTON SAMPLER, D - CORE BARREL, E - AUGER, F - WASH, K - SLOTTED SAMPLER
** SHIPPING CONTAINER: N - INSERT, O - TUBE, P - WATER CONTENT TIN, Q - GLASS JAR, R - CLOTH BAG, S - PLIOFILM BAG, Y - CORE BOX, Z - DISCARDED

LOG	DESCRIPTION: COLOR; CONSISTENCY DENSITY; TEXTURE; STRUCTURE; SHAPE AND SURFACE CONDITION OF GRAINS; ODOR; ETC	ELEV. — DEPTH	*	** TYPE	NO.	SIZE (IN.)	RET'D (IN.)	BLOWS PER 6 INCH	NOTES: BORING, TESTING AND SAMPLING PROCEDURES; WATER LOSS AND GAIN; DRILLING AND TESTING EQUIPMENT; ETC.
FILL	0-13" BLACK CINDERS		X	AQ	S B 5 1	24	13	PUSH	DRY
								PUSH	PICTURES
								PUSH	▼
		2						PUSH	
FILL	0-[illegible]" SC/SM SILT CLAY LOAM WITH [illegible]	3	X	AQ	2		16	7	DRY
								13	
								17	
		4						15	
FILL?	0-20 ML DARK BROWN TO YELLOW BROWN, CLAY SILT	5	X	AQ	3		20	6	MOIST
								7	NO OBVIOUS STAINING
								8	
		6						12	
FILL	0-20" ML SAME AS ABOVE	7	X	AQ	4	APPROX ▼ ?	20	2	VERY MOIST (SATURATED ?)
								2	NO OBVIOUS STAINING
								4	
		8						8	
	0-20 ML-CL SAME AS ABOVE WITH A HIGHER CLAY CONTENT	9	X	AQ	5	WATER TABLE	20	4	
								5	
								6	
		10						8	
	0-7" ML-CL SAME AS ABOVE 7-14" ML YELLOW BROWN SILT CLAY WITH WELL ROUNDED PEBBLES 14-20" ML GRAY SILT WITH →	11	X	AQ	6		20	4	ONE INCH LAYER OF FINE SAND
								5	SATURATED; SHELL FRAGMENT IN
								9	YELLOW BROWN SILT/CLAY (SNAIL)
		12						20	(GRAY SILT SAPPOROLITE ?)
	0-16" ML GRAY, CLAY SILT WITH SMALL TO COARSE GRAVEL SIZE, WELL ROUNDED MATERIAL	13	X	AQ	7		16	9	SATURATED
								9	COLLECT SAMPLE X113 FOR
								20	CHEMICAL ANALYSIS
		14						16	

WEHRAN ENGINEERING
CONSULTING ENGINEERS

Field Borehole Log

JOB NO. 06369 HOLE NO. SB5 SHEET NO. __ OF __

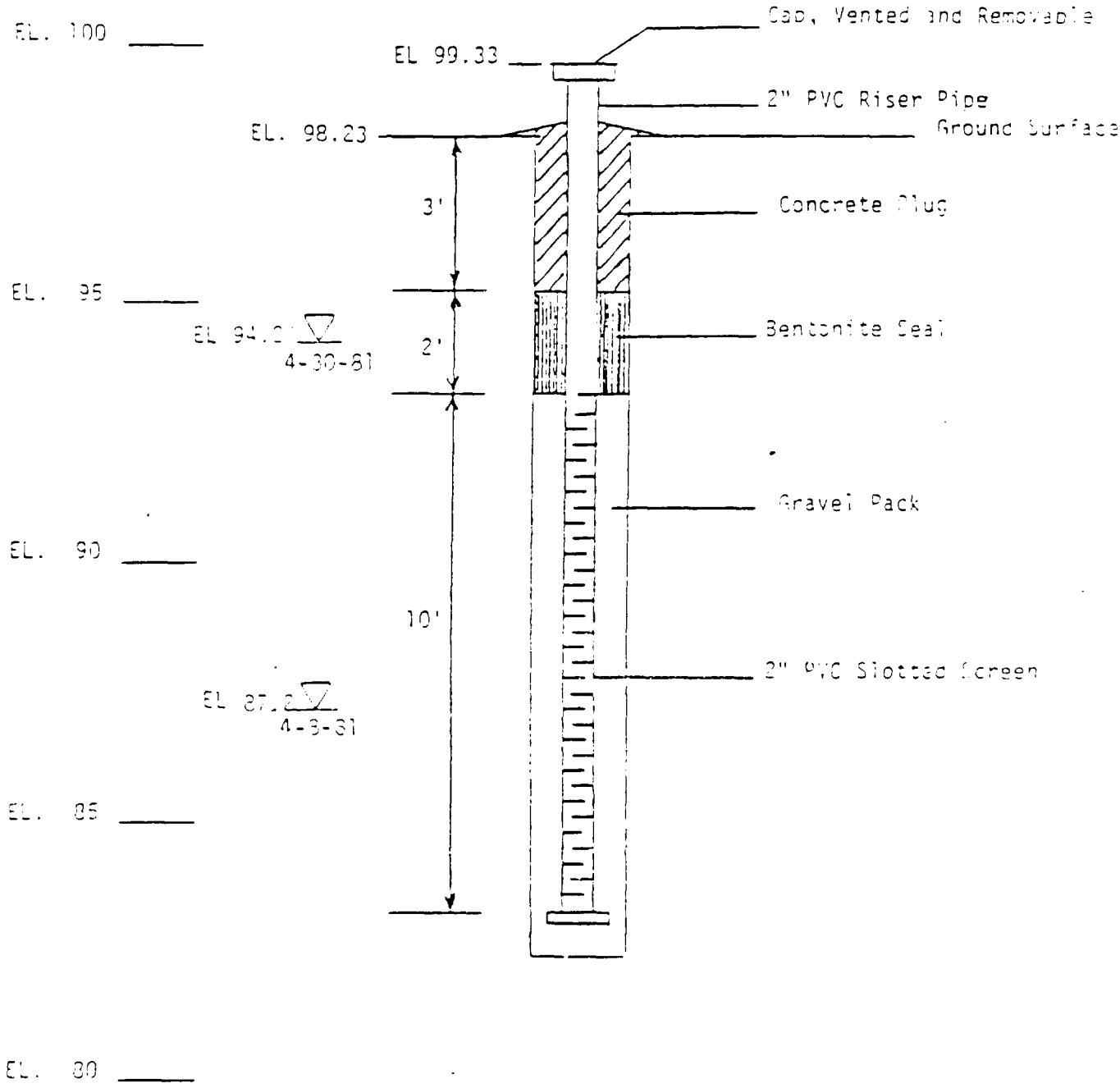
[illegible] GRAY SILT							9	SATURATED
[illegible] MEDIUM [illegible]							9	
WELL SORTED SAND	15	X	AQ	8		9	10	
	16						13	
STOP [illegible]			END OF HOLE					
THERE IS NO EVIDENCE								
OF OBVIOUS CONTAMINATION								
OUTSIDE OF LAGOON AREA								
NOTE: BORING ORIGINALLY								
LOCATED SOUTH OF								
TANKER [illegible] AND NEXT								
DUMP TRUCK. SOLID OBJECT								
HIT AT [illegible] BELOW								
GROUND [illegible] GROUND								
VIBRATED WHEN OBJECT								
TAPPED WITH SAMPLER								
HOLE REPRIMED AND								
SB5 MOVED TO NEW								
LOCATION								

APPENDIX B

WELL CONSTRUCTION LOGS

STS Job No. 22132

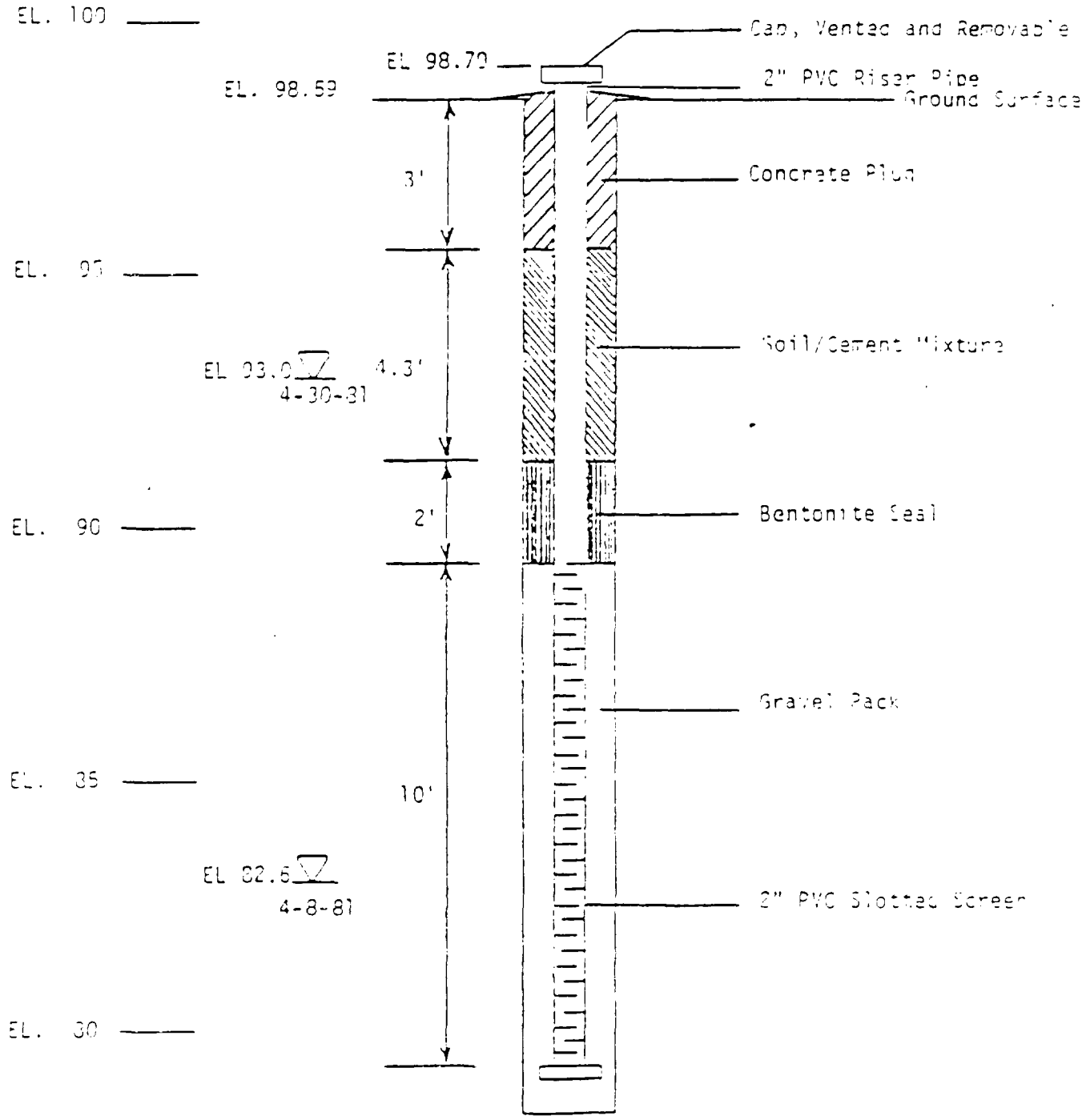
Lenz Oil Service
Jeans Road
Lemont, Illinois



OW-1

CONSTRUCTION DETAILS

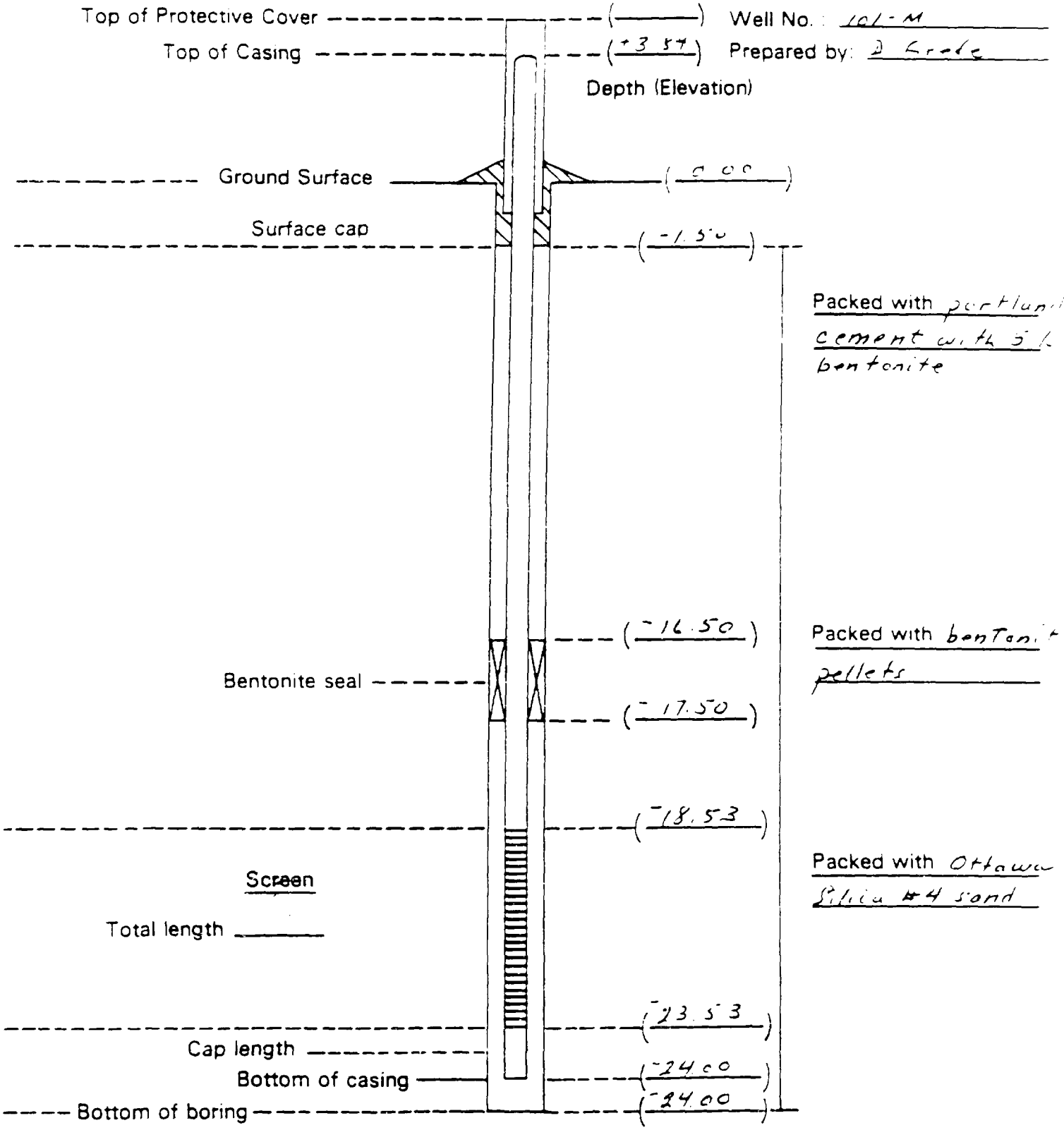
Lonz Oil Service
Lems Road
Lemont, Illinois



CONSTRUCTION DETAILS

MONITOR WELL CONSTRUCTION

Location: Lemont
Site No.: Lenz C.1
Well No.: 101-M
Prepared by: D Grade

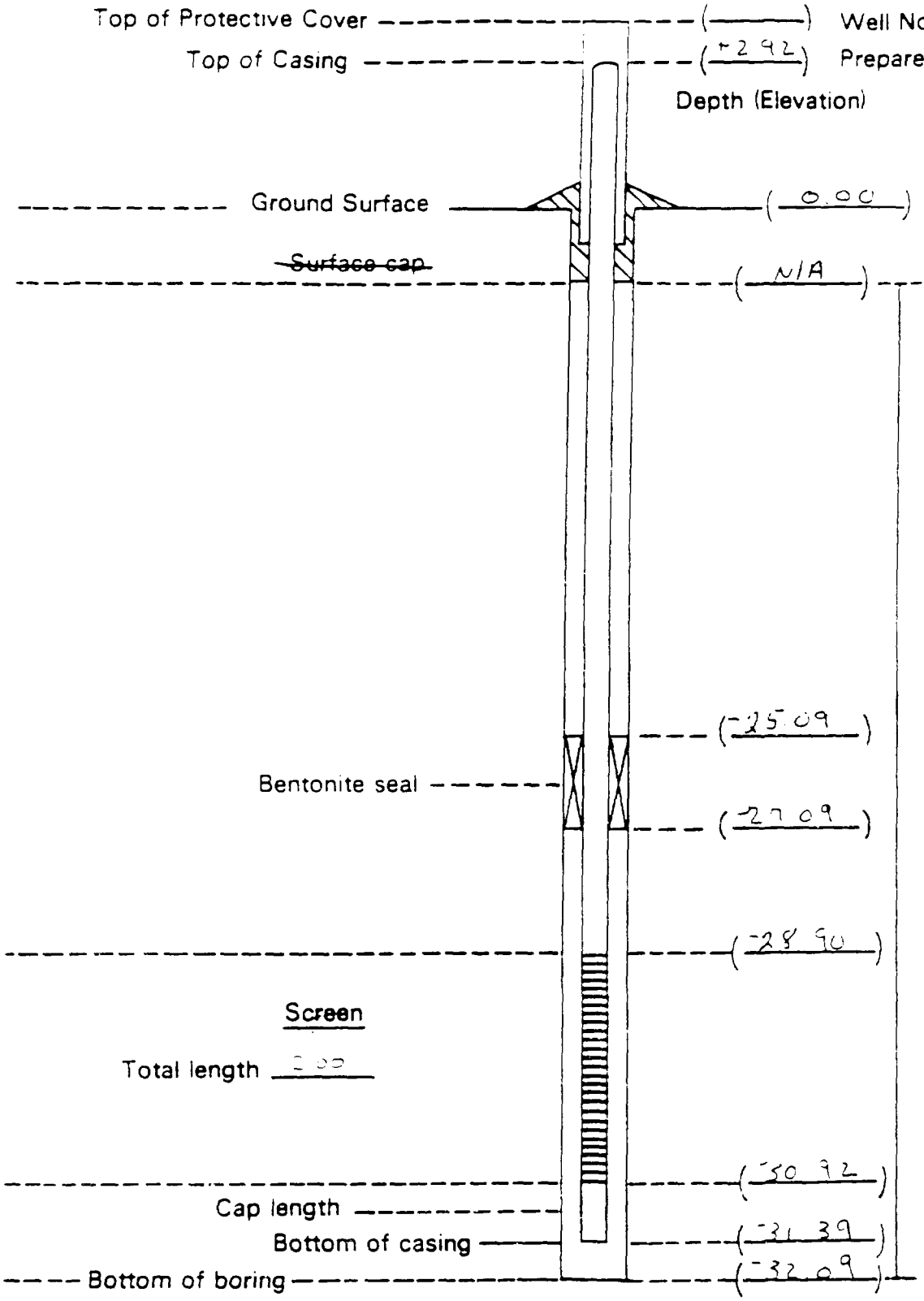


Pipe: Type and quantity 2" 316 Stainless Steel, flush threaded, .01" continuous wire wound screen. 3-10' risers, 1-2' riser, 1-5' screen, 1 cap and plug.

IL 532-1952
LPC 222 1/86

MONITOR WELL CONSTRUCTION

Location: Lemont
Site No.: Lenz Oil
Well No.: G101L
Prepared by: D Grede

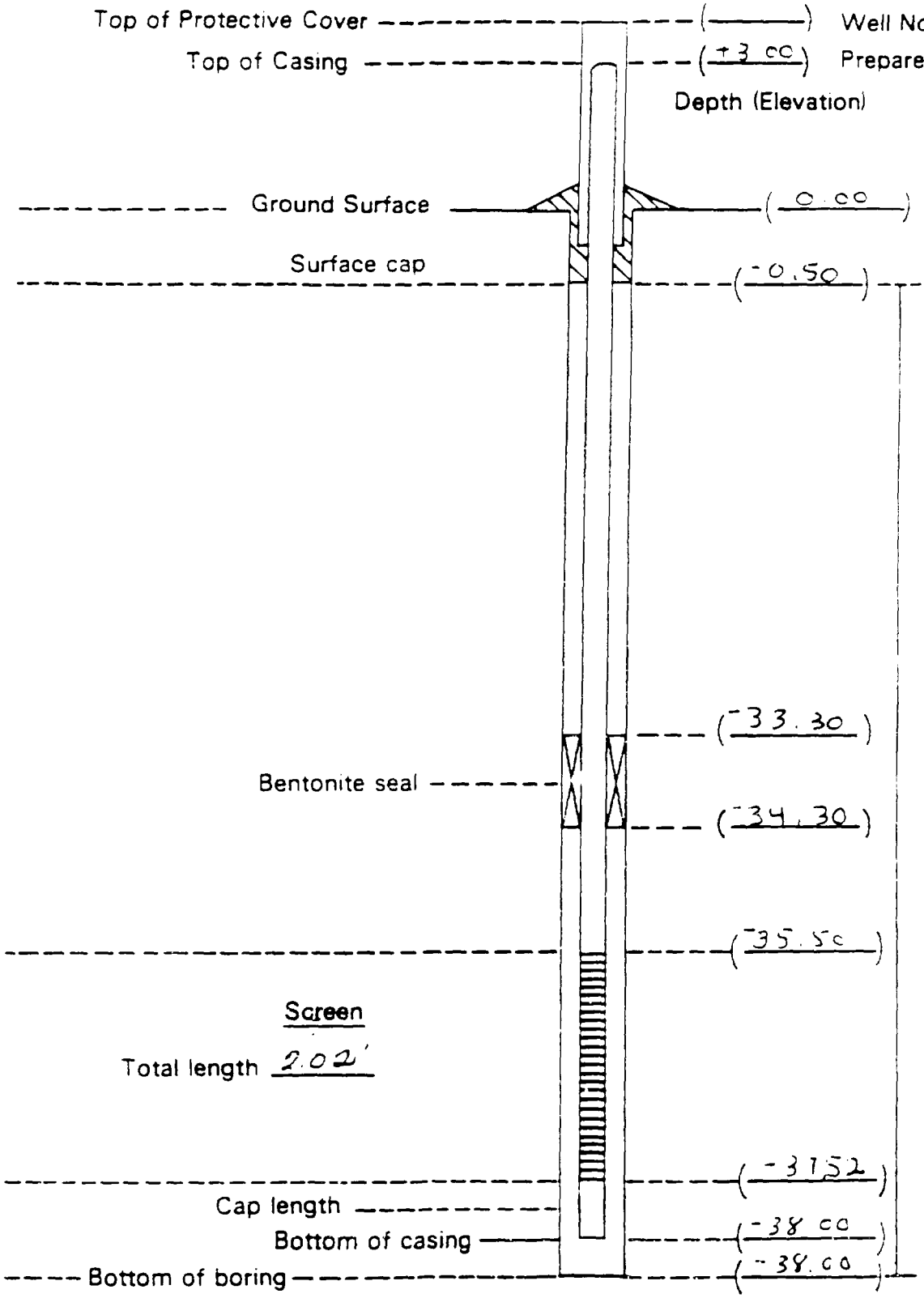


Pipe: Type and quantity 2" 316 Stainless Steel, flush threaded, .01 Continuous wire wrapped screen - 316 Stainless steel, 1 cap, 1-3' screen 1-3' Riser and 3-10' risers

IL 532-1452
IPC 222 1/88

MONITOR WELL CONSTRUCTION

Location: Lemont
Site No.: Lenz Oil
Well No.: 101 D
Prepared by: J Grede



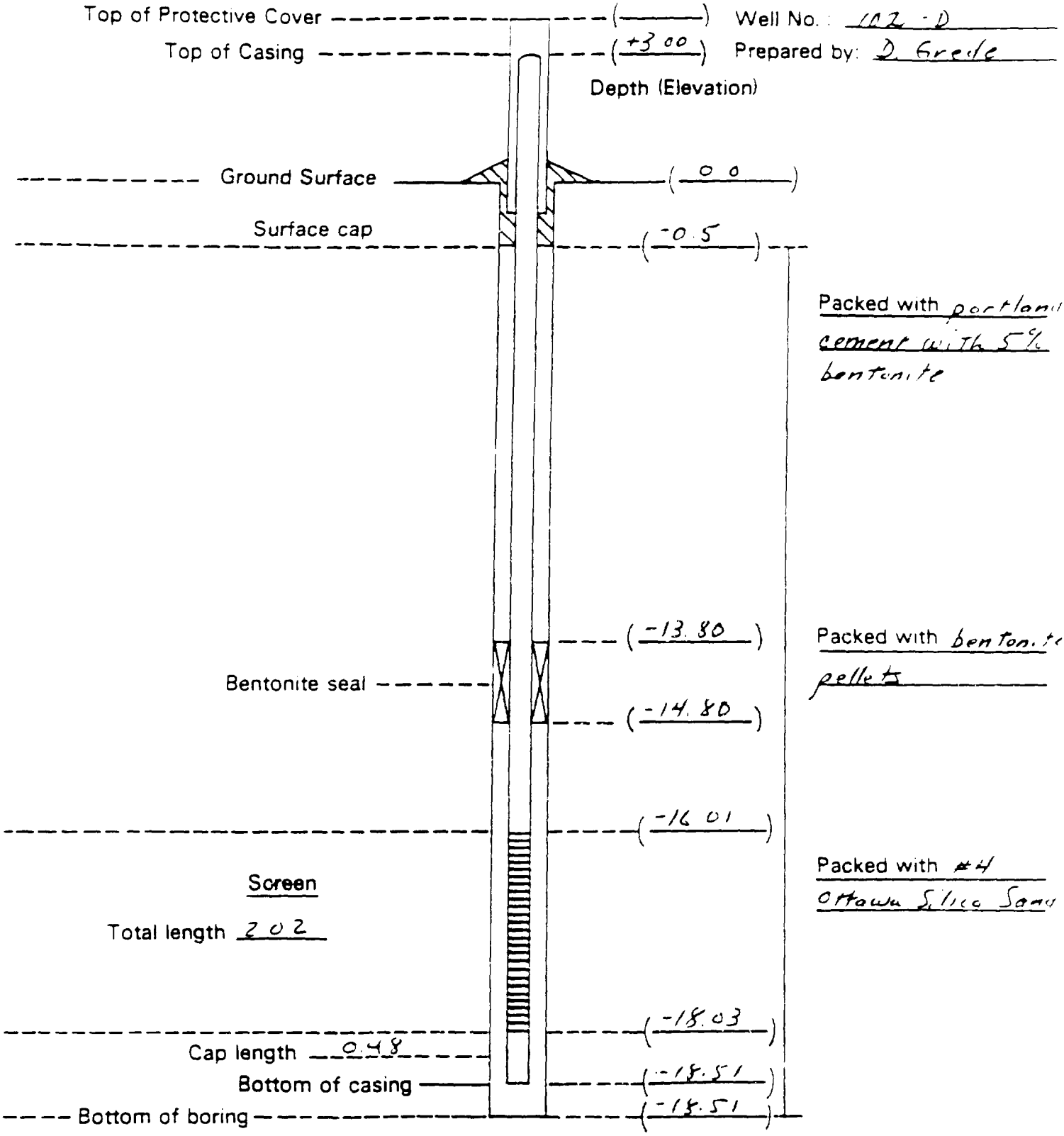
Top of Protective Cover	( )
Top of Casing	(+3.00)
Ground Surface	(0.00)
Surface cap	(-0.50)
Bentonite seal	(-33.30)
	(-34.30)
Screen	(-35.50)
Cap length	(-37.52)
Bottom of casing	(-38.00)
Bottom of boring	(-38.00)

Pipe: Type and quantity 316 Stainless steel - flush jointed with 01" wire - wound screen 4-10' risers, 1-2' screen, plug Removed 1.76' from top riser.

IL 532-1952
LPC 222 1/88

MONITOR WELL CONSTRUCTION

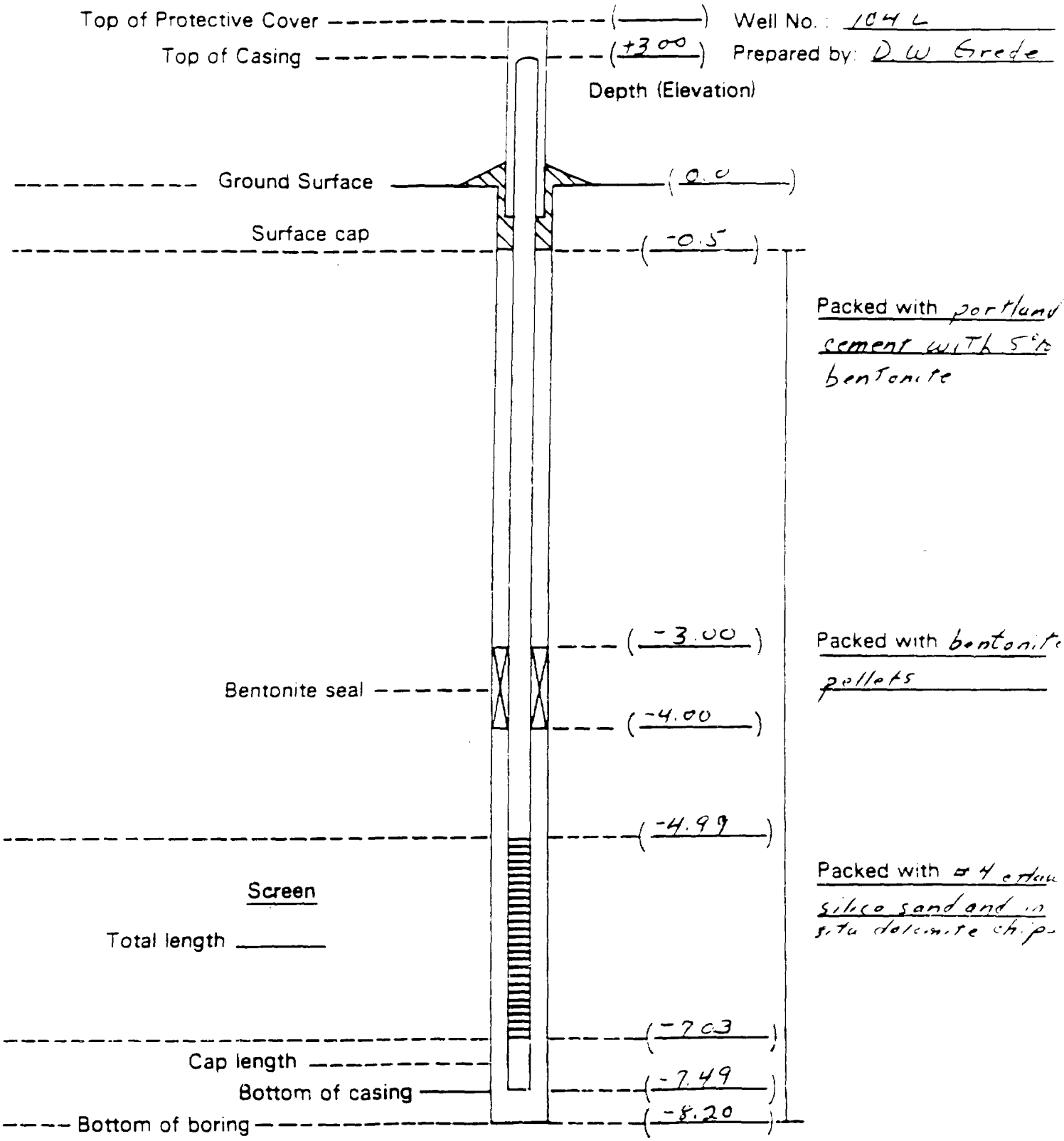
Location: Lemont
Site No. Lenz Oil
Well No.: 102-D
Prepared by: D. Grede



Pipe: Type and quantity 316 Stainless Steel, flush jointed, .01" continuous wire wraped screen 5/28/86 1-Plug, 1-2' screen, 2-10' risers

MONITOR WELL CONSTRUCTION

Location: Lemont
Site No.: Lenz Oil
Well No.: 104 L
Prepared by: D. W. Grede

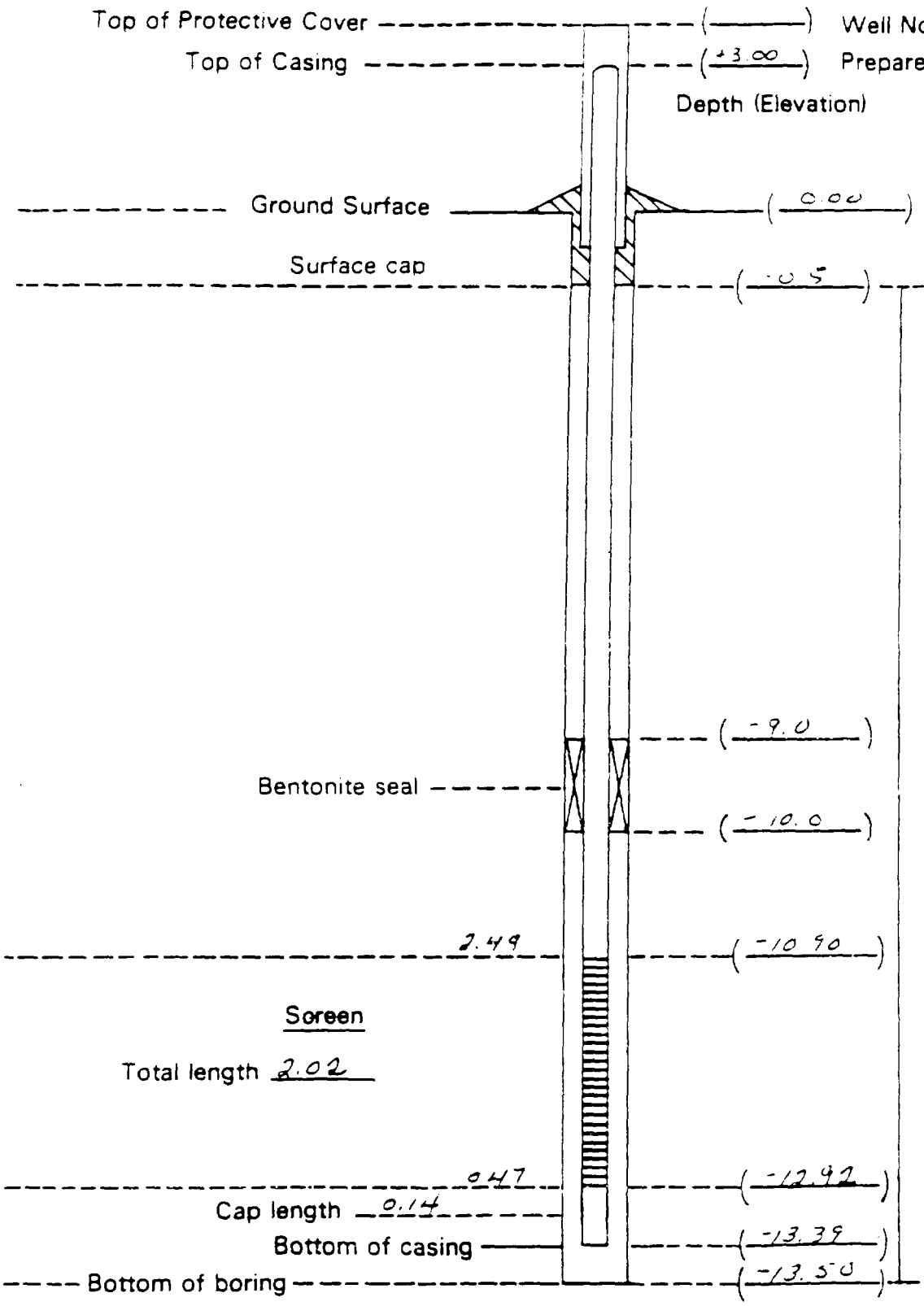


Pipe: Type and quantity 316 Stainless steel, flush jointed, .01" continuous wire wound screen. 1 cap, 1-2' screen, 1-2' riser, 1-5' riser, 1-8' cutoff piece.

IL 532-1952

MONITOR WELL CONSTRUCTION

Location: Lemont-Lane [illegible]
Site No.:
Well No. 104D
Prepared by: DWGrade 5/14/86



SACRETE

Packed with Portland cement with 5% bentonite

Packed with bentonite pellets

Packed with #4 Ottawa Silica Sand and in gravel chips

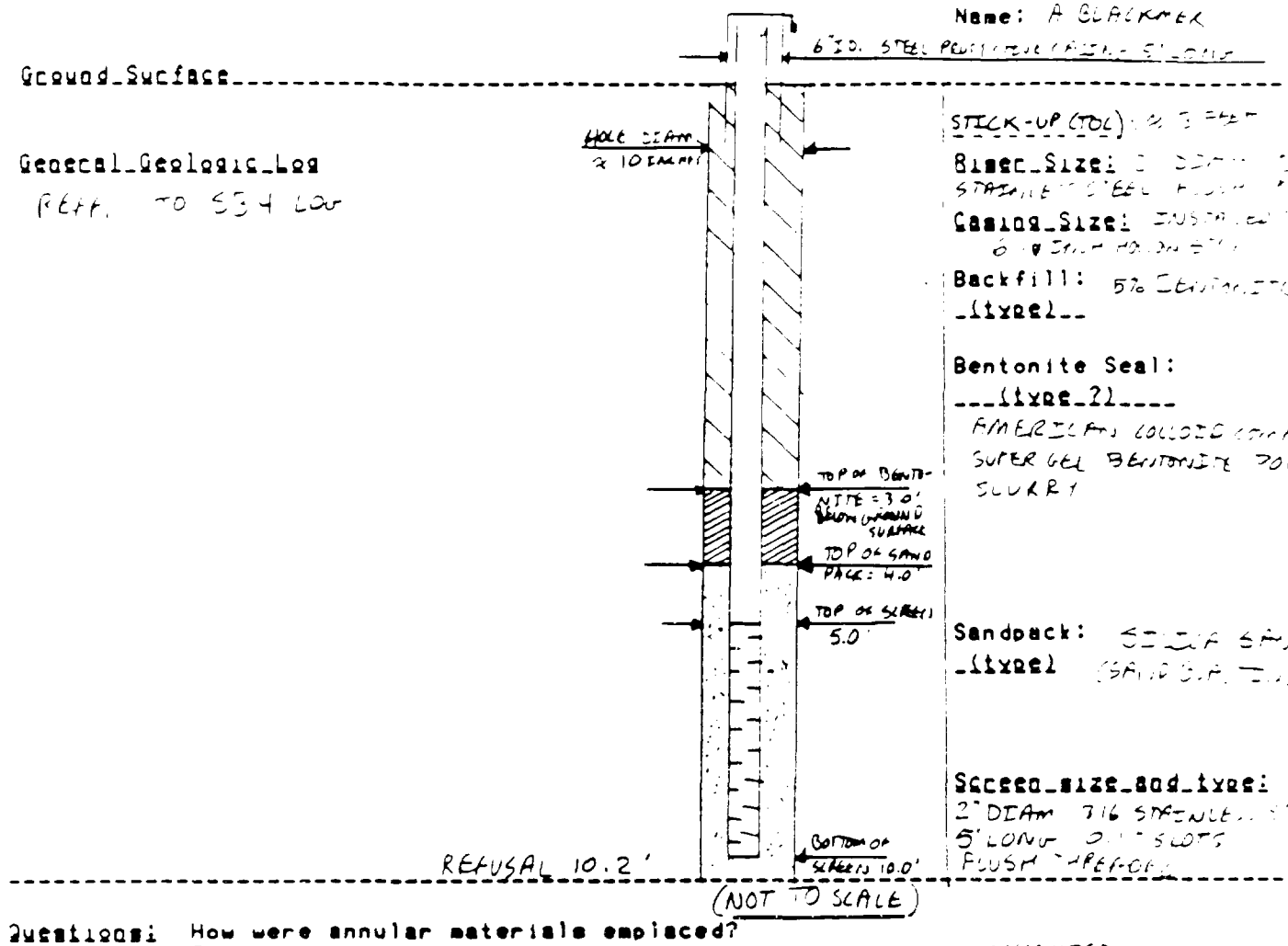
Pipe: Type and quantity 316 Stainless Steel, flush jointed, .01 wire wound screen 1 plug, 1-2' screen, 1-10' riser, 1-5' riser. Removed 1.45' from top for stick up = 3.0' Protective cover (4") and American 5100 lock.

IL 532-1452

WEHRAN ENGINEERING
CONSULTING ENGINEERS

WELL_CONSTRUCTION_DESIGN

Job: 06369
Well Number: L105S
Date: 7/16/86
Time taken to install: [illegible]
Name: A BLACKMER



(NOT TO SCALE)

General_Geologic_Log
REFER TO S34 LOG

Questions: How were annular materials emplaced?
SAND PACK POURED INTO ANNULAR SPACE; BENTONITE SEAL AND GROUTED TREMMIED

How were depths to materials measured?
CHECKED WITH TAPE AND WEIGHT

How developed?
AIR LIFT

How long?
4 HOURS

What parameters were measured?
- PARAMETERS MEASURED DURING PURGE FOR SAMPLING
- RELATIVE TURBIDITY DURING DEVELOPMENT

Drilling_and_Installation_Chronology:
REFER TO CHRONOLOGY OF L105S AND L105D

Comments_and_Problems:
NO PROBLEMS ENCOUNTERED

WEHRAN ENGINEERING
CONSULTING ENGINEERS

WELL CONSTRUCTION DESIGN

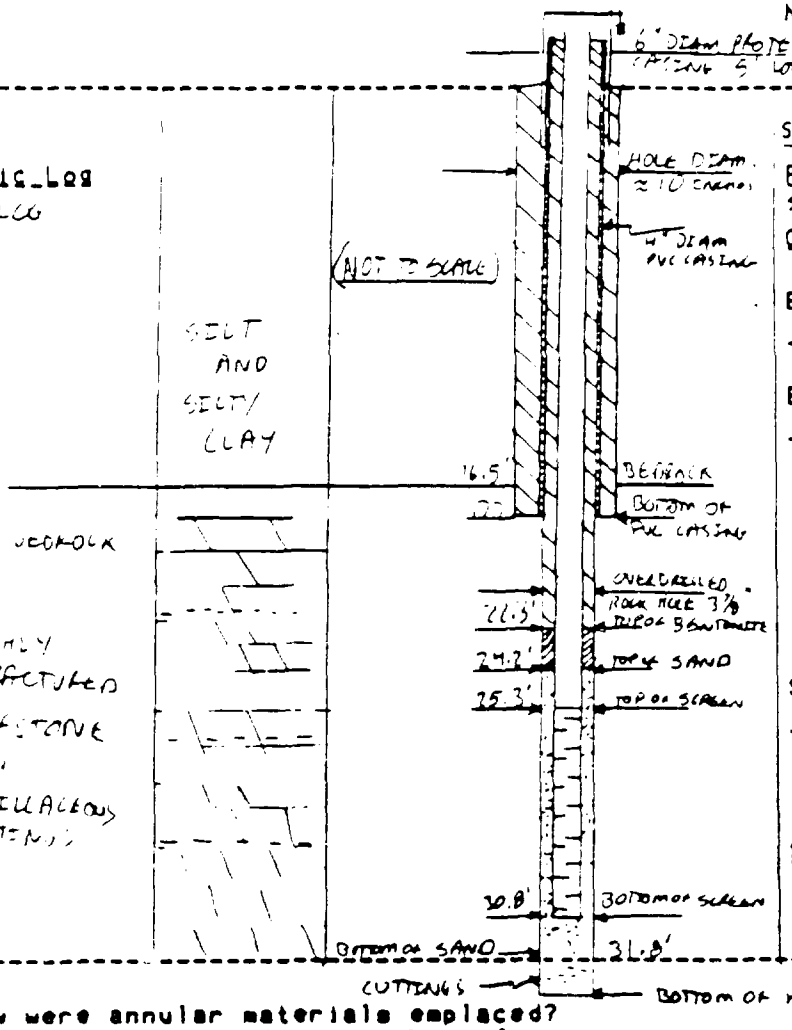
Job: [illegible]
Well Number: L105D

Date: [illegible]
Time taken to install: [illegible]
Name: [illegible]

Ground Surface

STICK-UP (TOC): [illegible] FEET

General Geologic Log
REFER TO SB4 LOG



Bisec Size: [illegible]

Casing Size: [illegible] SCHEDULE 40 CASING

Backfill:
(type) [illegible]

Bentonite Seal:
(type ?)
BENTONITE POWDER IN A [illegible] TREMIE IN.

Sandpack:
(type) [illegible]

Screen size and type:
0.1 INCH SLOT, 2" DIAM [illegible] STAINLESS STEEL [illegible] (DEFAULT)

Questions: **How were annular materials emplaced?**
SAND PACK POURED THROUGH FUNNEL DRY, BENTONITE SEAL AND GROUT TREMIED

How were depths to materials measured?
CHECKED WITH TAPE AND WEIGHT

How developed?
AIR LIFT

How long?
4 HOURS

What parameters were measured?
- PARAMETERS MONITORED DURING PURGE FOR SAMPLING
- RELATIVE TURBIDITY DURING DEVELOPMENT

Drilling and Installation Chronology:
REFER TO CHRONOLOGY OF L105S, L105D AND SB4

Comments and Problems:
HAD PROBLEMS FLUSHING CUTTINGS BECAUSE OF LOSS OF CIRCULATION WHEN [illegible] FRACTURED. SOLUTION: OVERDRILLED HOLE LET CUTTINGS FALL INTO SUMP, INSTALLED SAND PACK ON TOP OF CUTTINGS.

WEHRAN ENGINEERING
CONSULTING ENGINEERS

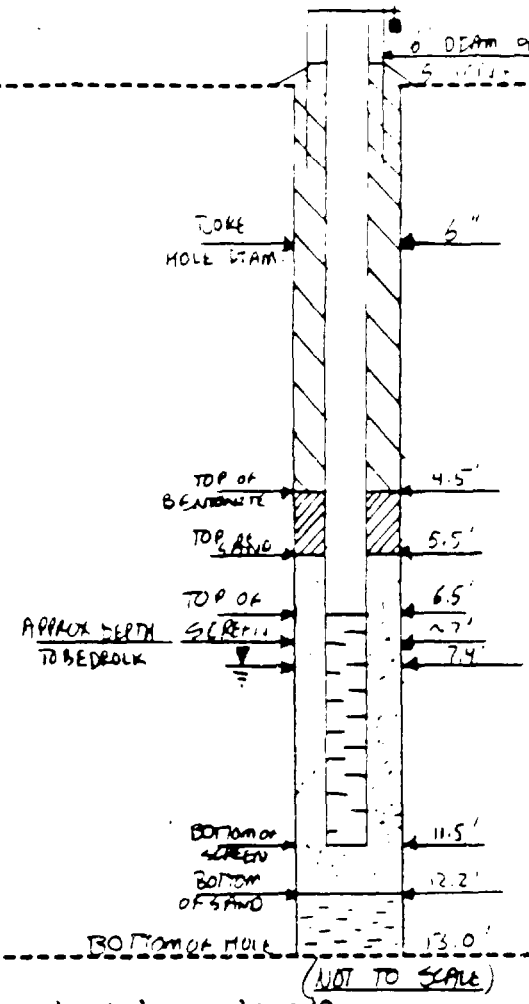
WELL CONSTRUCTION DESIGN

Job: 06359
Well Number: [illegible]
Date: 7/23/[illegible]
Time taken to install:
Name: [illegible]

Ground Surface

General Geologic Log

REFER TO LOG SB3



STICK-UP (TOC)

Riser Size: 2 INCH DIAM [illegible] STAINLESS STEEL, FLUSH THREADED

Casing Size: BORE HOLE DIAM WITH 5 7/8 INCH TREMOUR [illegible]

Backfill:
(type) 5% BENTONITE [illegible]

Bentonite Seal:
(type ?)
1/2 INCH DIAMETER [illegible] PELLETS

Sandpack: SILICA SAND
(type) [illegible]

Screen size and type:
0.1 SLOT 2 INCH DIAM [illegible] LESS STEEL [illegible] LONG, FLUSH [illegible]

Questions: How were annular materials emplaced?
SAND PACK AND BENTONITE PELLETS DRY POURED, GROUT TREMMIED
How were depths to materials measured?
TAPE AND WEIGHT
How developed?
AIR LIFT
How long?
5 HOURS
What parameters were measured?
- PARAMETERS MEASURED DURING PURGE FOR SAMPLING
- RELATIVE TURBIDITY DURING DEVELOPMENT

Drilling and Installation Chronology:
REFER TO CHRONOLOGY OF L106 AND SB3

Comments and Problems:
NO PROBLEMS ENCOUNTERED

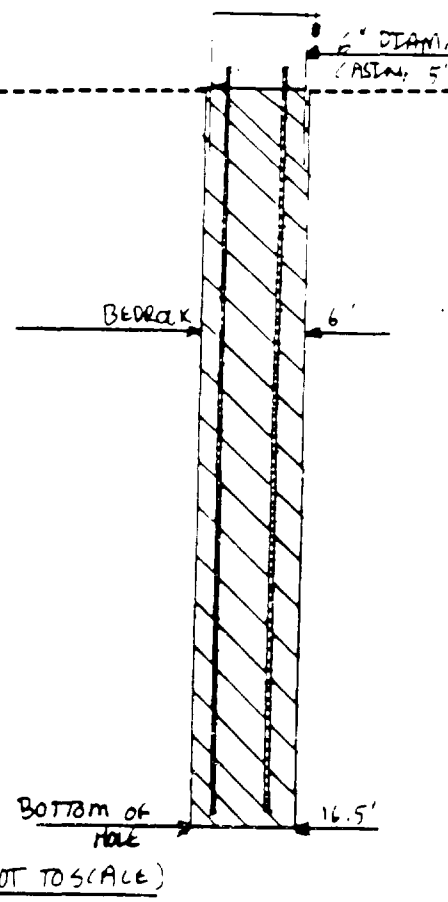
WEHRAN ENGINEERING
CONSULTING ENGINEERS

WELL_CONSTRUCTION_DESIGN

NOT COMPLETED

Job: 06369
Well Number: L106D

Date: 7/21/86
Time taken to install:
Name: A. BLACKMER



Ground_Surface

General_Geologic_Log
REFER TO LOG FOR SB3/L106

STICK-UP (TOC):

Riser_Size:

Casing_Size: 4" PVC [illegible]

Backfill:
(type) ~5% BENTONITE GROUT

Bentonite Seal:
___(type_?)____

Sandpack:
_(type)

Screen_size_and_type:

Questions: How were annular materials emplaced?

How were depths to materials measured?

How developed? How long?

What parameters were measured?

Drilling_and_Installation_Chronology:

Comments_and_Problems:
WELL NEVER COMPLETED

APPENDIX C

TECHNICAL MEMORANDUM NO. 2

TECHNICAL MEMORANDUM NO. 2
SOIL GAS INVESTIGATION
REMEDIAL INVESTIGATION
PHASE I, TASK 1

LENZ OIL SERVICE, INC.
LEMONT, ILLINOIS

REVISION: 1

SUBMITTED BY:

LENZ OIL SETTLING RESPONDENTS

MAY 2, 1991

PREPARED BY:

ENVIRONMENTAL RESOURCES MANAGEMENT-NORTH CENTRAL, INC.
102 WILMOT ROAD, SUITE 300
DEERFIELD, ILLINOIS 60015

PROJECT NO. 0252

TABLE OF CONTENTS

		Page
LIST OF TABLES		
LIST OF FIGURES		
1.0	INTRODUCTION	1-1
2.0	SOIL GAS INVESTIGATION METHODOLOGY	2-1
2.1	Sampling Locations	2-1
2.2	Sampling Procedures	2-2
3.0	ANALYTICAL RESULTS	3-1
4.0	CONCLUSIONS	4-1
5.0	MODIFICATIONS TO MONITORING WELL LOCATIONS	5-1
REFERENCES		
APPENDICES		
A	Soil Gas Data Validation	
B	Soil Gas - Laboratory Analytical Results and Supporting QC Documentation	

LIST OF TABLES

Number	Description	Following Page
2-1	Soil Gas Sampling Locations	2-2
2-2	Target Compounds and Associated Detection Limits	2-2
3-1	Soil Gas Investigation Sampling Results	3-1

LIST OF FIGURES

Number	Description	Following Page
2-1	Soil Gas Sampling Locations	2-2
3-1	Soil Gas Investigation Sampling Results	3-1
3-2	Generalized Geologic Conditions Controlling Soil Gas Sampling	3-2
5-1	Proposed Ground Water Sample Locations	5-1

1.0 INTRODUCTION

This Technical Memorandum presents the results of the Soil Gas Investigation conducted as part of the Phase I, Task 1 activities of the Remedial Investigation/Feasibility Study (RI/FS) for the Lenz Oil site. The site is located at the northeast quadrant of the intersection between Route 83 and Jeans Road in Lemont, Illinois. The Soil Gas Investigation was conducted over an area east and southeast of the Lenz Oil site property.

As noted in the Work Plan, the specific objective of the Soil Gas Investigation was to identify a ground water contaminant plume, if any, downgradient of the Lenz Oil site. The results of the Soil Gas Investigation, as well as the results of the fracture analyses presented in Technical Memorandum No. 1, will be used to finalize the placement of downgradient monitoring wells.

Section 3.0 of this memorandum, presents a discussion of the sample analytical results. Modifications to the preliminary locations of monitoring wells are proposed in Section 5.0. All soil gas sampling activities were conducted in accordance with the Lenz Oil Work Plan and the Sampling and Analysis Plan (SAP), unless otherwise indicated.

2.0 SOIL GAS INVESTIGATION METHODOLOGY

The following subsections summarize the methodology employed during the Phase I, Task 1 Soil Gas Investigation at the Lenz Oil site. Reference is made to the Lenz Oil Work Plan and SAP where appropriate.

2.1 Sampling Locations

The Soil Gas Investigation was conducted in the open area east and southeast of the Lenz Oil site as shown in Figure 2-1. Sampling points were located at 50-foot intervals, along the east-west grid lines, which were spaced 100 feet apart, as described in the SAP. This grid system was surveyed and established by licensed surveyors from Patrick Engineering, Inc.

During the early stages of the investigation, bedrock was encountered at depths as shallow as 6 to 8 inches below the ground surface. As a result, it was impossible to drive the sampling probes down to the intended depth of 36 inches at all locations, as indicated in the SAP. Consequently, the probes were driven to the maximum depth possible, which was generally down to the weathered bedrock. Coarse dolomite gravel and cobbles or the actual bedrock itself prevented advancing the soil gas probe beyond this depth. In addition, the sampling locations were slightly modified as a result of the physical inaccessibility to the exact grid intersects because of vegetation interference or rough terrain. These modifications were implemented after approval was secured from the Illinois Environmental Protection Agency (IEPA) representative at the site, who provided project oversight during the field activities. These were the only modifications made to the SAP.

All of the sample locations are listed in Table 2-1 and Figure 2-1. Table 2-1 presents the actual depths to which the probes were driven. A total of 32 investigative soil gas samples were collected from depths ranging from 16 to 36 inches from the ground surface. This number does not include QC samples or blanks.

2.2 Sampling Procedures

Soil gas samples were collected according to the methodology outlined in the SAP. As noted previously, 32 investigative samples were collected. In addition, four field duplicate samples, two MS/MSD sample pairs, five field blanks, and five trip blanks were collected, resulting in a total of 50.

All samples were properly preserved, packaged, and shipped to PACE Laboratories in Minneapolis, Minnesota for analysis according to the protocols described in the SAP. The soil gas samples were analyzed for the contaminants and associated detection limits presented in Table 2-2. These parameters were chosen because of their confirmed presence in the soils and ground water at the site.

The project-required detection limits for soil gas were calculated by modifying those for ground water, using Henry's Law Constant and a conversion factor for expressing concentrations in parts per million by volume (ppmV). The derivation of the detection limits is presented in Appendix A of the Lenz Oil Quality Assurance Project Plan (QAPP). As shown in Table 2-2, the method detection limits achieved by PACE Laboratories are consistently lower than the project-required detection limits.

TABLE 2-1
LENZ OIL

SOIL GAS INVESTIGATION SAMPLING LOCATIONS

(Page 1 of 2)

SAMPLE I.D.	LOCATION COORDINATES	PROBE DEPTH (inches)
LO-1A1-SG	4+00N, 7+00E	36
LO-1A2-SG	4+00N, 6+50E	18
LO-1A3-SG	4+00N, 6+00E	18
LO-1A4-SG	4+00N, 5+50E	18
LO-1A4-SGFS	4+00N, 5+50E	20
LO-1A5-S5	4+00N, 5+00E	34
LO-1A6-SG	4+00N, 4+50E	18
LO-1A7-SG	4+00N, 4+00E	35
LO-1A8-SG	4+00N, 3+50E	28
LO-1A8-SGMS	4+00N, 3+50E	30
LO-1A8-SGMSD	4+00N, 3+50E	30
LO-1A9-SG	4+00N, 3+00E	36
LO-1B1-SG	3+00N, 7+00E	18
LO-1B2-SG	3+00N, 6+50E	18
LO-1B3-SG	2+90N, 6+00E	16
LO-1B4-SG	3+00N, 5+50E	18
LO-1B5-SG	3+00N, 5+10E	18
LO-1B6-SG	3+15N, 4+55E	18
LO-1B7-SG	3+00N, 4+00E	18
LO-1B8-SG	3+00N, 3+50E	18
LO-1B8-SGMS	3+00N, 3+50E	18

NOTES: Sample locations are relative to the grid system shown in Figure 2-1. QC samples are designated as MS/MSD - matrix spike/matrix spike duplicate; FS and FD are interchangeable suffixes denoting field duplicate samples. Trip and field blanks are not shown.

TABLE 2-1
LENZ OIL

SOIL GAS INVESTIGATION SAMPLING LOCATIONS

(Page 2 of 2)

SAMPLE I.D.	LOCATION COORDINATES	PROBE DEPTH (inches)
LO-1B8-SGMSD	3+00N, 3+50E	18
LO-1B9-SG	3+00N, 3+00E	19
LO-1C1-SG	2+00N, 6+95E	18
LO-1C2-SG	2+00N, 6+50E	18
LO-1C3-SG	2+00N, 6+00E	18
LO-1C4-SG	2+00N, 5+50E	18
LO-1C4-SGFS	2+00N, 5+50E	18
LO-1C5-SG	2+00N, 5+00E	18
LO-1C6-SG	2+00N, 4+50E	18
LO-1C6-SGFS	2+00N, 4+50E	18
LO-1C7-SG	2+00N, 4+00E	18
LO-1C8-SG	2+00N, 3+50E	18
LO-1C9-SG	2+00N, 3+00E	18
LO-1C10-SG	2+00N, 2+50E	18
LO-1C10-SGFD	2+00N, 2+50E	18
LO-1C11-SG	1+80N, 2+20E	18
LO-1C12-SG	2+00N, 1+50E	18
LO-1C13-SG	2+00N, 1+00E	18
LO-1CD14-S	1+50N, 0+75E	18

NOTES: Sample locations are relative to the grid system shown in Figure 2-1. QC samples are designated as MS/MSD - matrix spike/matrix spike duplicate; FS and FD are interchangeable suffixes denoting field duplicate samples. Trip and field blanks are not shown.

TABLE 2-2

TARGET COMPOUNDS AND ASSOCIATED DETECTION LIMITS

COMPOUND	PRDL (1) (ppmV)	MDL (2) (ppmV)	MDL (3) (ppmV)
1,2-dichloroethane	0.05	0.05	0.04
1,2-dichloroethene (cis)	0.40	0.05	0.04
1,2-dichloroethene (trans)	0.33	0.10	0.08
Trichloroethene	0.34	0.04	0.03
1,1,1-Trichloroethane	0.18	0.04	0.03
Toluene	0.34	0.06	0.05
Xylenes (total)	0.32	0.05	0.04

Notes:

(1) Project-required detection limits for soil gas in ppmV, calculated from the project-required detection limits for ground water (see Appendix A of the QAPP).

(2) Method detection limits (MDL) achieved by laboratory for all samples except L0-1C1-SG. Values are based on a sample volume of 25L.

(3) MDL for sample LO-1C1-SG; these values have been adjusted for a sample volume of 29.4L.

PROJECT	REPORT	DRAWN	CHECKED	DATE	APPROVED	CLIENT PROJ.
5252	TM2	GW		4/20/91		LENZ OIL

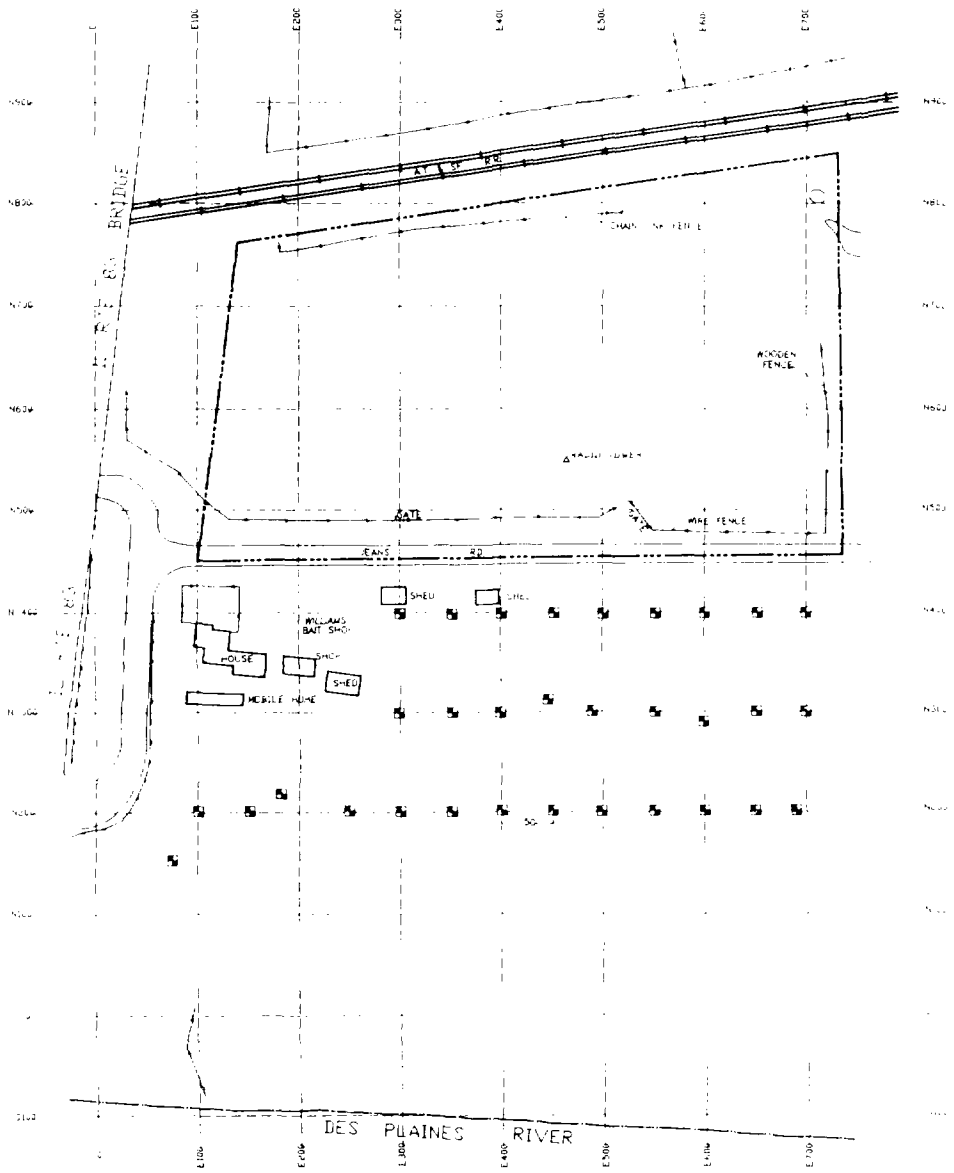


FIGURE 2-1

SOIL GAS SAMPLING LOCATIONS
LENZ OIL SITE

ERM

In addition to the laboratory analyses, field HNu readings of the soil gas were taken at each sampling location through the sample train set ups, as described in the Lenz Oil SAP. All HNu readings were zero.

3.0 ANALYTICAL RESULTS

Table 3-1 presents the laboratory analytical results for the soil gas samples. These data have been validated according to Appendix I of the Lenz Oil QAPP, Standard Operating Procedures for Soil Gas Data Validation. No qualification of the data was necessary. The validation shows that the data are acceptable for the intended uses, except for one field blank analysis (LO-1C1-SGFB) that was qualified as unusable (R). The data validation results are discussed in Appendix A of this Memorandum, and the raw data are presented in Appendix B.

As indicated in Table 3-1, only 2 of the 32 soil gas samples show positive results for any of the target analytical parameters designated for the site. Analytical results for all of the other samples are below the method detection limits. The laboratory result for sample LO-1B9-SG shows concentrations of 0.23 ppmV and 0.10 ppmV for 1,2-dichloroethane and trichloroethene, respectively. A concentration of 0.05 ppmV 1,1,1-trichloroethane was reported for sample LO-1B7-SG. These results are also illustrated on Figure 3-1. The limited number of positive detections does not permit these data to be presented on an isopleth map.

The following technical issues should be considered in reviewing the soil gas analytical data:

1. The shallow nature of the bedrock precluded driving the soil gas probes to the intended depth of 3 feet below ground surface (bgs), and collecting samples closer to the ground water surface. The probability of observing detectable contaminant concentrations at lower depths may have been higher.

TABLE 3-1

LENZ OIL
SOIL GAS INVESTIGATION SAMPLING RESULTS
(Page 1 of 7)

	SAMPLE I.D.	LO-1A1SG	LO-1A1SGFB	LO-1A2SG	LO-1A3SG	LO-1A4SG	LO-1A4SGFS	LO-1A5SGFS	LO-1A6SG
	QC QUALIFIER		Field Blank				Field Duplicate	Field Duplicate	
	PROBE DEPTH	36	NA	18	18	18	20	34	18
ANALYTE	MDL								
1,1,1-Trichloroethane	0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
1,2-Dichloroethane	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Toluene	0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Trichloroethene	0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Xylenes (Total)	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
cis-1,2-Dichloroethene	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
trans-1,2-Dichloroethene	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Field HNu Reading	-----	0	0	0	0	0	0	0	0

Notes:

(1) All results are in ppmV.
(2) Positive detections are enclosed in square brackets.
(3) MDL = Method detection limits achieved by laboratory. All MDLs are based on a sample volume of 25 L, except for the MDLs for sample LO-1C1SG which were adjusted for a sample volume of 29.4L.
(4) NA = Not applicable.
(5) R = Unusable.

TABLE 3-1

LENZ OIL
SOIL GAS INVESTIGATION SAMPLING RESULTS
(Page 2 of 7)

	SAMPLE I.D.	LO-1A7SG	LO-1A8SG	LO-1A8SGMS	LO-1A8GMSD	LO-1A9SG	LO-1B1SG	LO-1B2SG	LO-1B3SG
	QC QUALIFIER			Matrix Spike	Matrix Spike Duplicate				
	PROBE DEPTH	35	28	30	30	36	18	18	16
ANALYTE	MDL								
1,1,1-Trichloroethane	0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
1,2-Dichloroethane	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Toluene	0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Trichloroethene	0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Xylenes (Total)	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
cis-1,2-Dichloroethene	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
trans-1,2-Dichloroethene	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Field HNu Reading	-----	0	0	0	0	0	0	0	0

Notes:

(1) All results are in ppmV.
(2) Positive detections are enclosed in square brackets.
(3) MDL = Method detection limits achieved by laboratory. All MDLs are based on a sample volume of 25 L, except for the MDLs for sample LO-1C1SG which were adjusted for a sample volume of 29.4L.
(4) NA = Not applicable.
(5) R = Unusable.

TABLE 3-1

LENZ OIL
SOIL GAS INVESTIGATION SAMPLING RESULTS
(Page 3 of 7)

	SAMPLE I.D.	LO-1B4SG	LO-1B5SG	LO-1B6SG	LO-1B7SG	LO-1B8SG	LO-1B8SGFB	LO-1B8SGMS	LO-1B8SGMSD
	QC QUALIFIER						Field Blank	Matrix Spike	Matrix Spike Duplicate
	PROBE DEPTH	18	18	18	18	18	18	18	18
ANALYTE	MDL								
1,1,1-Trichloroethane	0.04	<0.04	<0.04	<0.04	[0.05]	<0.04	<0.04	<0.04	<0.04
1,2-Dichloroethane	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Toluene	0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Trichloroethene	0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Xylenes (Total)	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
cis-1,2-Dichloroethene	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
trans-1,2-dichloroethene	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Field HNU Reading	-----	0	0	0	0	0	0	0	0

Notes:

(1) All results are in ppmV.
(2) Positive detections are enclosed in square brackets.
(3) MDL = Method detection limits achieved by laboratory. All MDLs are based on a sample volume of 25 L, except for the MDLs for sample LO-1C1SG which were adjusted for a sample volume of 29.4L.
(4) NA = Not applicable.
(5) R = Unusable.

TABLE 3-1

LENZ OIL
SOIL GAS INVESTIGATION SAMPLING RESULTS
(Page 4 of 7)

	SAMPLE I.D.	LO-1B9SG	LO-1B9SGFB	LO-1C1SG	LO-1C1SGFB	LO-1C2SG	LO-1C3SG	LO-1C4SG	LO-1C4SGFB
	QC QUALIFIER		Field Blank		Field Blank				Field Blank
	PROBE DEPTH	19	18	18	18	18	18	18	18
ANALYTE	MDL								
1,1,1-Trichloroethane	0.04	<0.04	<0.04	<0.03	<0.04R	<0.04	<0.04	<0.04	<0.04
1,2-Dichloroethane	0.05	[0.23]	<0.05	<0.04	<0.05R	<0.05	<0.05	<0.05	<0.05
Toluene	0.06	<0.06	<0.06	<0.05	<0.06R	<0.06	<0.06	<0.06	<0.06
Trichloroethene	0.04	[0.10]	<0.04	<0.03	<0.04R	<0.04	<0.04	<0.04	<0.04
Xylenes (Total)	0.05	<0.05	<0.05	<0.04	<0.05R	<0.05	<0.05	<0.05	<0.05
cis-1,2-Dichloroethene	0.05	<0.05	<0.05	<0.04	<0.05R	<0.05	<0.05	<0.05	<0.05
trans-1,2-Dichloroethene	0.10	<0.10	<0.10	<0.08	<0.10R	<0.10	<0.10	<0.10	<0.10
Field HNu Reading	.....	0	0	0	0	0	0	0	0

Notes:

(1) All results are in ppmV.
(2) Positive detections are enclosed in square brackets.
(3) MDL = Method detection limits achieved by laboratory. All MDLs are based on a sample volume of 25 L, except for the MDLs for sample LO-1C1SG which were adjusted for a sample volume of 29.4L.
(4) NA = Not applicable.
(5) R = Unusable.

TABLE 3-1

LENZ OIL
SOIL GAS INVESTIGATION SAMPLING RESULTS
(Page 5 of 7)

	SAMPLE I.D.	LO-1C5SG	LO-1C6SG	LO-1C6SGFS	LO-1C7SG	LO-1C8SG	LO-1C9SG	LO-1C10SG	LO-1C10SGFD
	QC QUALIFIER			Field Duplicate					Field Duplicate
	PROBE DEPTH	18	18	18	18	18	18	18	18
ANALYTE	MDL								
1,1,1-Trichloroethane	0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
1,2-Dichloroethane	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Toluene	0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Trichloroethene	0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Xylenes (Total)	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
cis-1,2-Dichloroethene	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
trans-1,2-Dichloroethene	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Field HNu Reading	.....	0	0	0	0	0	0	0	0

Notes:

(1) All results are in ppmV.
(2) Positive detections are enclosed in square brackets.
(3) MDL = Method detection limits achieved by laboratory. All MDLs are based on a sample volume of 25 L, except for the MDLs for sample LO-1C1SG which were adjusted for a sample volume of 29.4L.
(4) NA = Not applicable.
(5) R = Unusable.

TABLE 3-1

LENZ OIL
SOIL GAS INVESTIGATION SAMPLING RESULTS
(Page 6 of 7)

	SAMPLE I.D.	LO-1C10SGFB	LO-1C11SG	LO-1C12SG	LO-1C13SG	LO-1CD14SG	LO-1A1SGTB1	LO-1SGTB2	LO-1SGTB3
	QC QUALIFIER	Field Blank					Trip Blank	Trip Blank	Trip Blank
	PROBE DEPTH	18	18	18	18	18	18	18	18
ANALYTE	MDL								
1,1,1-Trichloroethane	0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
1,2-Dichloroethane	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Toluene	0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Trichloroethene	0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Xylenes (Total)	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
cis-1,2-Dichloroethene	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
trans-1,2-Dichloroethene	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Field HNu Reading	-----	0	0	0	0	0	NA	NA	NA

Notes:

(1) All results are in ppmV.
(2) Positive detections are enclosed in square brackets.
(3) MDL = Method detection limits achieved by laboratory. All MDLs are based on a sample volume of 25 L, except for the MDLs for sample LC-1C1SG which were adjusted for a sample volume of 29.4L.
(4) NA = Not applicable.
(5) R = Unusable.

TABLE 3-1

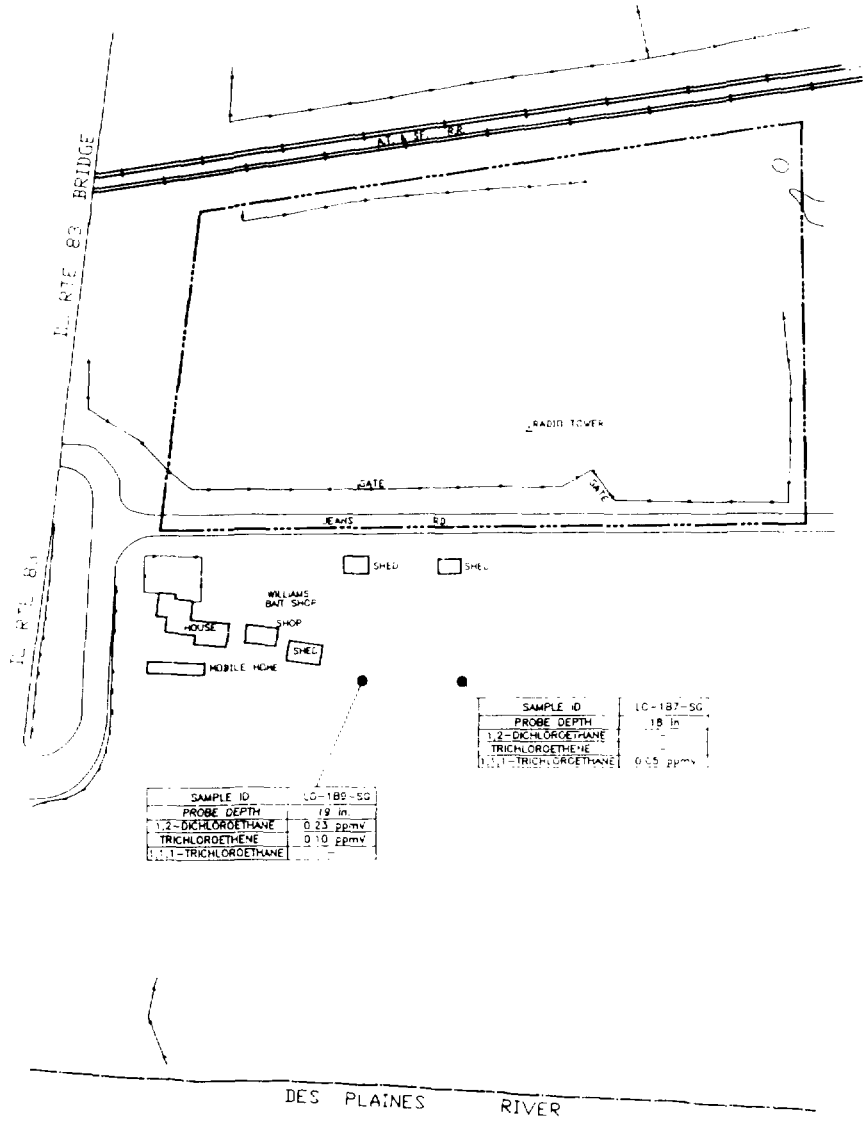
LENZ OIL
SOIL GAS INVESTIGATION SAMPLING RESULTS
(Page 7 of 7)

	SAMPLE I.D.	LO-1SGTB4	LO-1SGTB5						
	QC QUALIFIER	Trip Blank	Trip Blank						
	PROBE DEPTH	18	18						
ANALYTE	MDL								
1,1,1-Trichloroethane	0.04	<0.04	<0.04						
1,2-Dichloroethane	0.05	<0.05	<0.05						
Toluene	0.06	<0.06	<0.06						
Trichloroethene	0.04	<0.04	<0.04						
Xylenes (Total)	0.05	<0.05	<0.05						
cis-1,2-Dichloroethene	0.05	<0.05	<0.05						
trans-1,2-Dichloroethene	0.10	<0.10	<0.10						
Field HNu Reading	-----	NA	NA						

Notes:

(1) All results are in ppmV.
(2) Positive detections are enclosed in square brackets.
(3) MDL = Method detection limits achieved by laboratory. All MDLs are based on a sample volume of 25 L, except for the MDLs for sample LO-1C1SG which were adjusted for a sample volume of 29.4L.
(4) NA = Not applicable.
(5) R = Unusable.

PROJECT	REPORT	DRAWN	CHECKED	DATE	APPROVED	CLIENT PROJ
0252	TM2	GW		4/29/91		LENZ OIL



SAMPLE ID	LO-187-SG
PROBE DEPTH	18 in
1,2-DICHLOROETHANE	-
TRICHLOROETHENE	-
1,1,1-TRICHLOROETHANE	0.05 ppmv

SAMPLE ID	LO-188-SG
PROBE DEPTH	19 in
1,2-DICHLOROETHANE	0.23 ppmv
TRICHLOROETHENE	0.10 ppmv
1,1,1-TRICHLOROETHANE	-

APPROX. SCALE (ft)

SYMBOL LEGEND

PROPERTY LINE

FENCE LINE

RAILROAD

SOIL GAS SAMPLE LOCATION WITH IDENTIFIED CONTAMINATION

FIGURE 3-1

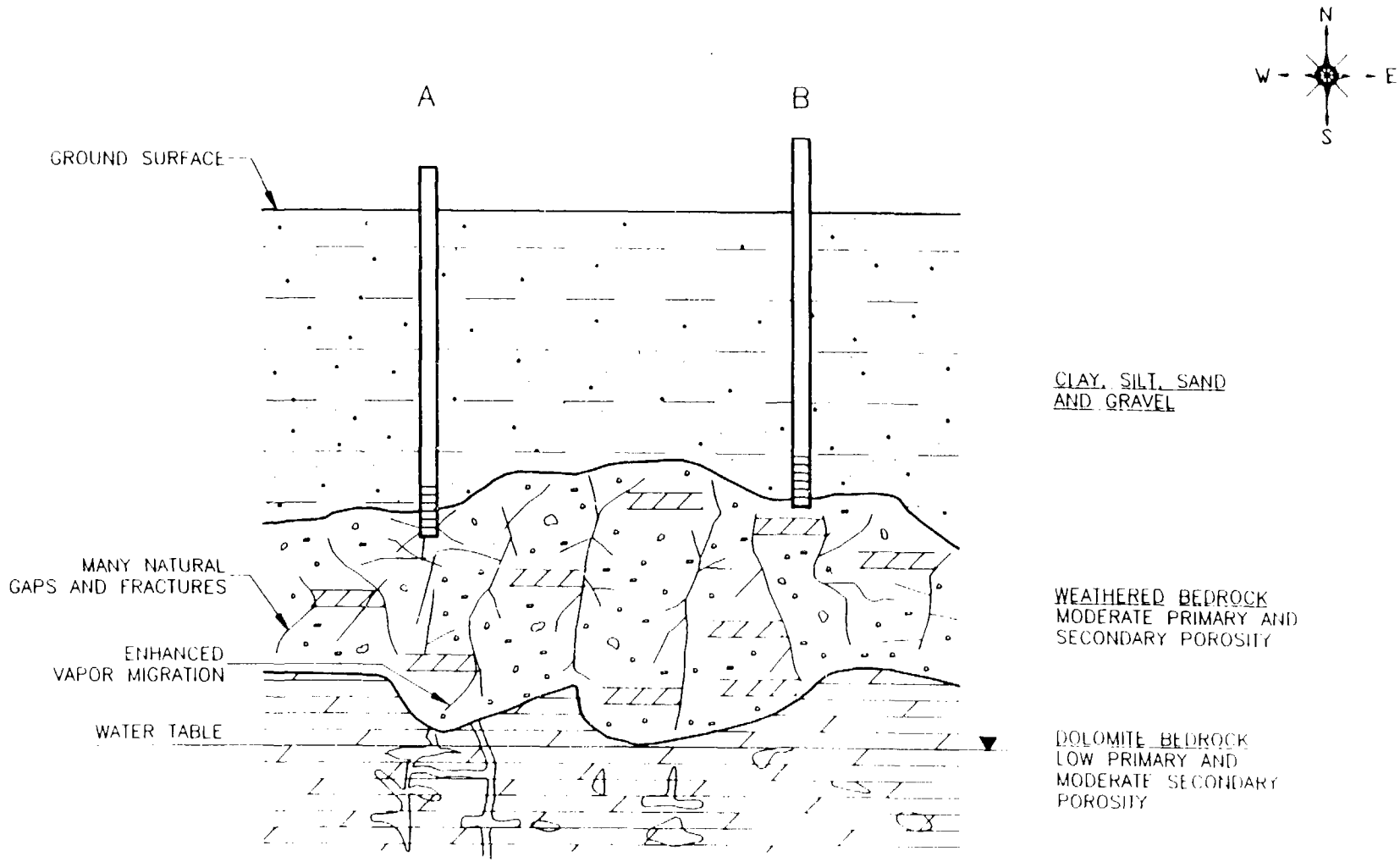
SOIL GAS INVESTIGATION
SAMPLING RESULTS
LENZ OIL SITE

ERM

2. As illustrated in the generalized geologic section (Figure 3-2), the shallow bedrock aquifer at the site is anisotropic, consisting of a fractured dolomite with low primary porosity and relatively high secondary porosity. The secondary porosity has developed preferentially alone vertical joints and horizontal bedding planes in the dolomite. As a result, soil gas contaminants may be unevenly distributed above the plume. Therefore, sampling points located directly above vertical joints, and the resultant solution cavities, are more likely to exhibit positive detects from the ground water plume than those positioned above unfractured dolomite. As shown on Figure 3-2, migration of volatile contaminants from the aquifer is enhanced by the presence of vertical fractures and solution cavities in the dolomite (i.e., below sample point A). Whereas bedrock without extensive fracturing and solution cavities does not readily allow migration of equivalent quantities of volatile contaminants (i.e., below sample point B).

3. There is no way to determine which specific sample points may have intercepted vertical fractures connected to the ground water, but it is assumed that the density of the sampling grid provided adequate data to effectively evaluate plume migration, given the geologic constraints described above.

PROJECT	REPORT	DRAWN	CHECKED	DATE	APPROVED	CLIENT NAME
025	TM2	MO		4/30/91		LENZ OIL



NOT DRAWN TO SCALE

FIGURE 3-2

GENERALIZED GEOLOGIC CONDITIONS CONTROLLING SOIL GAS SAMPLING LENZ OIL SITE

ERM

It is important to note that the two analytical samples with positive detections are located on the same east-west grid line, within 100 feet of each other (see Figure 3-1). If the soil gas collected at these locations can be attributed solely to ground water contamination, then the analytical results suggest that the contaminant plume has migrated at least 200 feet southeast of the Lenz Oil site.

4.0 CONCLUSIONS

Based on the Soil Gas Investigation results, the following general conclusions can be made:

1. Soil gas samples collected south of the Lenz Oil site generally showed no detectable concentrations of the VOCs analyzed. Only two of the 32 investigative samples showed positive detections, both at concentrations less than 0.5 ppmV.

2. If the two positive detections are related solely to ground water contamination, then the plume has migrated at least 200 feet southeast of the site. The three contaminants identified in soil gas samples are:

   - 1,1,1-trichloroethane,
   - 1,2-dichloroethane, and
   - trichloroethene.

   These compounds were found in the primary contaminant sources identified at the Lenz Oil site and in the area soils, as documented in Technical Memorandum No. 1.

3. The distribution of the identified soil gas contamination is consistent with the previously predicted southeastern flow direction of ground water at the site. Soil gas samples were not collected

from the area northeast of the site; therefore, the extent of plume migration was not evaluated in that direction using soil gas.

4. The low concentrations and limited detections of VOCs in the soil gas samples may be indicative of (1) anisotropy in the bedrock aquifer and/or (2) low concentrations of ground water contamination near the distal portions of the ground water plume.

5. The Soil Gas Investigation results can be used, in conjunction with the fracture analysis and previous investigation results, to guide the location of monitoring wells to be installed southeast of the Lenz Oil site.

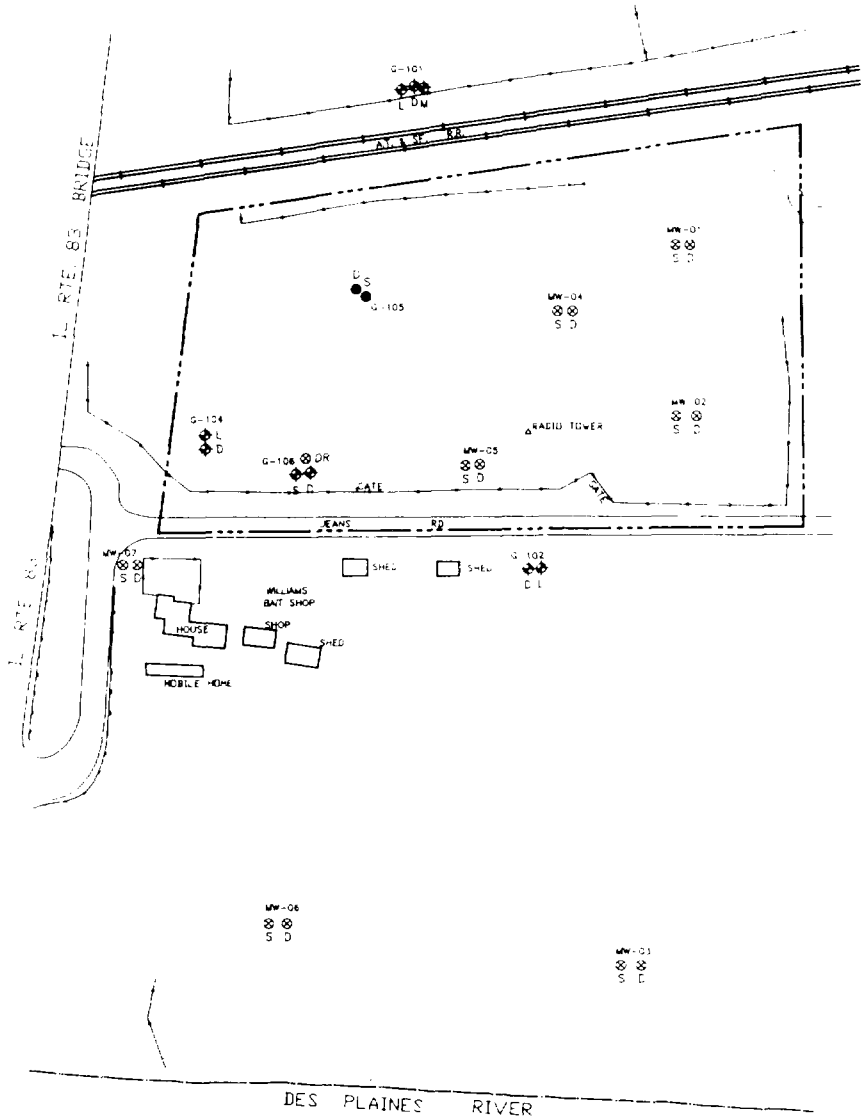
5.0 MODIFICATIONS TO MONITORING WELL LOCATIONS

As described in Technical Memorandum No. 1, the results of the regional bedrock fracture analyses conducted in the vicinity of the site demonstrate that the monitoring well locations and depths proposed in the Lenz Oil RI/FS Work Plan are sufficient to meet the objectives of the ground water investigation. Therefore, none of the preliminary monitoring well locations or depths have been modified as a result of the regional fracture analysis.

However, because contamination was detected in two soil gas samples, located approximately 100 feet southeast of monitoring well cluster G-102, two of the preliminary monitoring well cluster locations should be modified to better delineate the southeastern extent of ground water contamination. Specifically, monitoring well clusters MW-03 and MW-06 should be located further southeast of the site than the preliminary locations. To avoid interfering with potential agricultural activities in the field southeast of the Lenz Oil site, ERM-North Central proposes relocating monitoring well clusters MW-03 and MW-06 on southeast edge of the Williams field at the locations shown on Figure 5-1. These wells will serve to evaluate the southeastern extent of the ground water contaminant plume.

In Revision O of this Technical Memorandum, it was proposed that monitoring well cluster MW-02 be located approximately 200 feet southeast of its preliminary location. The rationale for the proposed change was presented in the Technical Memorandum and expanded in a letter to USEPA, dated March 25, 1991. USEPA and IEPA rejected the proposal in letters dated February 21, 1991, April 1, 1991, and in a telephone conversation dated April 15, 1991. Although the preliminary location of MW-02 presented in the Work Plan may be too close to the probable source area to meet its stated objectives, the participating respondents have agreed to install MW-02 at the location presented in the Work Plan. According to USEPA and IEPA,

PROJECT	REPORT	DRAWN	CHECKED	DATE	APPROVED	CLIENT NAME
0252	TM2	GW		4/29/91		LENZ OIL



APPROX. SCALE (ft.)
0 120

SYMBOL LEGEND

- PROPERTY LINE
- FENCE LINE
- RAILROAD
- WATER SURFACE
- EXISITING MONITORING WELL
- PROPOSED MONITORING WELL
- EXISTING MONITORING WELL TO BE ABANDONED
- IEPA MONITORING WELL CLUSTER
- WELL DEPTH SYMBOLS
- DEEP WELL
- DEEP WELL REPLACEMENT
- INTERMEDIATE DEPTH WELL
- SHALLOW WELL

FIGURE 5-1

PROPOSED GROUND WATER SAMPLE LOCATIONS LENZ OIL SITE

ERM

the purpose of installing the well cluster at that location is to verify the presence of any contaminant plume in that area.

The preliminary locations of well clusters MW-01, MW-04, MW-05 and MW-07 meet the stated objectives of these wells and, therefore, modification of these preliminary locations is not necessary. The southwestern extent of the plume will be evaluated by well cluster MW-07 and the northeastern extent of the plume will be evaluated by well cluster MW-01. Well clusters MW-04 and MW-05 will assist in determining the type and magnitude of ground water contamination near the probable contaminant source.

REFERENCES

ERM-North Central, Inc., Remedial Investigation/Feasibility Study Sampling and Analysis Plan, Lenz Oil Service, Inc., Lemont, Illinois, November 12, 1990.

ERM-North Central, Inc., Remedial Investigation/Feasibility Study Work Plan, Lenz Oil Service, Inc., Lemont, Illinois, November 12, 1990.

ERM-North Central, Inc., Remedial Investigation/Feasibility Study Quality Assurance Project Plan, Lenz Oil Service, Inc., Lemont, Illinois, November 12, 1990.

APPENDIX A

SOIL GAS DATA VALIDATION

TABLE OF CONTENTS

		Page
List of Tables		
1.0	INTRODUCTION	A-1
2.0	DATA VALIDATION SUMMARY	A-1
2.1	Holding Times	A-2
2.2	Blanks	A-2
2.3	Instrument Calibration	A-2
2.3.1	Initial Calibration	A-2
2.3.2	Continuing Calibration	A-3
2.4	Surrogate Spike Recovery	A-3
2.5	Internal Standard Areas	A-3
2.6	Matrix Spike/Matrix Spike Duplicates	A-4
2.7	Field Duplicates	A-5
3.0	MISCELLANEOUS	A-5
3.1	Chromatograms	A-5
3.2	Calculation Checks	A-6
3.3	Data Deliverables	A-6
4.0	CONCLUSIONS	A-6

LIST OF TABLES

Number	Description	Following Page
A-1	Evaluation of Sample Holding Times	A-2

1.0 INTRODUCTION

This appendix presents the data validation results for laboratory analytical data generated during the Soil Gas Investigation conducted as Phase I, Task 1 of the Remedial Investigation/ Feasibility Study (RI/FS) for the Lenz Oil site. The investigation was performed in January 1991, and involved the collection of soil gas samples from 32 locations, downgradient from the Lenz Oil site. Two matrix spike/matrix spike duplicates (MS/MSD), four field duplicates, five field blanks, and five trip blanks were collected for Quality Assurance/Quality Control (QA/QC) purposes. All samples were shipped to PACE Laboratories, Inc. in Minnesota, and were analyzed for 1,1,1-trichloroethane, 1,2-dichloroethane, toluene, trichloroethene, xylenes (total), and cis- and trans-1,2-dichloroethene.

The data validation was conducted in accordance with the procedures contained in Appendix I of the Lenz Oil RI/FS Quality Assurance Project Plan (QAPP), the Standard Operating Procedure for Soil Gas Data Validation. No QC criteria exceeded the control limits were identified, except for sample LO-1C1-SGFB. Because no internal standard was injected, the analytical results for this sample are qualified unusable (R). No qualification was necessary for the other analytical data, which are considered acceptable.

2.0 DATA VALIDATION SUMMARY

The following subsections itemize each aspect of the data validation procedure according to Appendix I of the QAPP.

2.1 Holding Times

All sample tubes were analyzed within 7 days from the date of collection, except for the MS/MSD duplicate pair associated with sample LO-1B8-SG (PACE Nos. 1232.7MS and 1233.5MSD), which were collected on January 12, 1991 and analyzed on January 23, 1991 (see Table A-1). The MS/MSD analysis was performed to obtain recovery information for the method. Therefore, the holding times do not affect the quality of the data.

No qualification of these data is necessary.

2.2 Blanks

None of the target compounds were detected in either the field or the trip blanks. In addition, the laboratory method blanks, which consisted of an aliquot of carbon disulfide spiked with surrogate (decane) and internal standard (bromofluorobenzene) compounds did not contain any analytes on the target list above the method detection limits.

No qualification of these data is necessary.

2.3 Instrument Calibration

2.3.1 Initial Calibration

The percent Relative Standard Deviation (% RSD) for all analytes, and for each set of analyses conducted was less than the QC control limits of 30 percent.

TABLE A-1

EVALUATION OF SAMPLE HOLDING TIMES

	SAMPLE ID.	QA/AC QUALIFIER	DATE		
			COLLECTED	RECEIVED	ANALYZED
1	LO-1-A1SG		1/09/91	1/10/91	1/15/91
2	LO-1-A1SG-FB	Field Blank	1/09/91	1/10/91	1/15/91
3	LO-1-A1SG-TB1	Trip Blank	1/09/91	1/10/91	1/15/91
4	LO-1-A2SG		1/10/91	1/12/91	1/15/91
5	LO-1A3SG		1/10/91	1/12/91	1/15/91
6	LO-1A4SG		1/10/91	1/12/91	1/15/91
7	LO-1A4SG-FS	Field Duplicate	1/10/91	1/12/91	1/15/91
8	LO-1A5SG		1/10/91	1/12/91	1/15/91
9	LO-1A6SG		1/10/91	1/12/91	1/15/91
10	LO-1A7SG		1/10/91	1/12/91	1/15/91
11	LO-1A8SG		1/10/91	1/12/91	1/15/91
12	LO-1A8SG-MS	Matrix Spike	1/10/91	1/12/91	1/15/91
13	LO-1A8SG-MSD	Matrix Spike Duplicate	1/10/91	1/12/91	1/15/91

Notes:

(1) - Samples are presented in the order of collection.

TABLE A-1

EVALUATION OF SAMPLE HOLDING TIMES

	SAMPLE ID.	QA/AC QUALIFIER	DATE		
			COLLECTED	RECEIVED	ANALYZED
14	LO-1A9SG		1/10/91	1/12/91	1/15/91
15	LO-1B9SG		1/10/91	1/12/91	1/15/91
16	LO-1B9SG-FB	Field Blank	1/10/91	1/12/91	1/15/91
17	LO-1SG-TB2	Trip Blank	1/10/91	1/12/91	1/15/91
18	LO-1B1SG		1/11/91	1/12/91	1/16/91
19	LO-1B2SG		1/11/91	1/12/91	1/16/91
20	LO-1B3SG		1/11/91	1/12/91	1/16/91
21	LO-1B4SG		1/11/91	1/12/91	1/16/91
22	LO-1B5SG		1/11/91	1/12/91	1/16/91
23	LO-1B6SG		1/11/91	1/12/91	1/16/91
24	LO-1B7SG		1/11/91	1/12/91	1/16/91
25	LO-1C1SG-FB	Field Blank	1/11/91	1/12/91	1/16/91
26	LO-1C1SG		1/11/91	1/12/91	1/16/91

Notes:

(1) - Samples are presented in the order of collection.

TABLE A-1

EVALUATION OF SAMPLE HOLDING TIMES

	SAMPLE ID.	QA/AC QUALIFIER	DATE		
			COLLECTED	RECEIVED	ANALYZED
27	LO-1C4SG-FS	Field Duplicate	1/1191	1/12/91	1/16/91
28	LO-1C4SG		1/11/91	1/12/91	1/16/91
29	LC-1C5SG		1/11/91	1/12/91	1/16/91
30	LO-1SG-TB3	Trip Blank	1/11/91	1/12/91	1/16/91
31	LO-1C2SG		1/12/91	1/14/91	1/19/91
32	LO-1C3SG		1/12/91	1/14/91	1/19/91
33	LO-1C6SG		1/12/91	1/14/91	1/19/91
34	LO-1C6SG-FS	Field Duplicate	1/12/91	1/14/91	1/19/91
35	LO-1B8SG-FB	Field Blank	1/12/91	1/14/91	1/19/91
36	LO-1B8SG		1/12/91	1/14/91	1/19/91
37	LO-1B8SG-MS	Matrix Spike	1/12/91	1/14/91	1/23/91
38	LO-1B8SG-MSD	Matrix Spike Duplicate	1/12/91	1/14/91	1/23/91
39	LO-1SG-TB4	Trip Blank	1/12/91	1/14/91	1/19/91

Notes:

(1) - Samples are presented in the order of collection.

TABLE A-1

EVALUATION OF SAMPLE HOLDING TIMES

	SAMPLE ID.	QA/AC QUALIFIER	DATE COLLECTED	DATE RECEIVED	DATE ANALYZED
40	LO-1C7SG		1/14/91	1/15/91	1/19/91
41	LO-1C8SG		1/14/91	1/15/91	1/19/91
42	LO-1C9SG		1/14/91	1/15/91	1/19/91
43	LO-1C10SG		1/14/91	1/15/91	1/19/91
44	LO-1C10SG-FB	Field Blank	1/14/91	1/15/91	1/19/91
45	LO-1C10SG-FD	Field Duplicate	1/14/91	1/15/91	1/20/91
46	LO-1C11SG		1/14/91	1/15/91	1/20/91
47	LO-1C12SG		1/14/91	1/15/91	1/20/91
48	LO-1C13SG		1/14/91	1/15/91	1/20/91
49	LO-1CP14SG		1/14/91	1/15/91	1/20/91
50	LO-1SG-TB5	Trip Blank	1/14/91	1/15/91	1/20/91

Notes:

(1) - Samples are presented in the order of collection.

No qualification of these data is necessary.

2.3.2 Continuing Calibration

The percent Difference (% D) for all analytes and for each set of analyses conducted was less than the QC limit of 25 percent.

No qualification of these data is necessary.

2.4 Surrogate Spike Recovery

All surrogate (decane) spike recoveries for each sample analyzed were within the QC limits of 75 to 125 percent.

No qualification of these data is necessary.

2.5 Internal Standard Areas

All internal standard areas were within the QC control limits of 50 to 200 percent as compared to the associated calibration standard, except for sample LO-1C1-SGFB (PACE No. 1070.7 - primary-front), which was not injected with the internal standard. The laboratory-reported results for this sample were taken from a confirmation column by using external calibration. Therefore, the analytical results for this sample are qualified as unusable (R).

Also, sample LO-1C13-SG (PACE No. 1342.2 - primary-front) was injected with double the required concentration of the internal standard (20 μg/L instead of 10 μg/L). This resulted in double the internal standard area. If this area is divided by two, the reported value is within the QC control limits.

No qualification of the data is necessary.

2.6 Matrix Spike/Matrix Spike Duplicates

Two MS/MSD sample pairs corresponding to native samples LO-1A8-SG and LO-1B8-SG were collected as part of the Soil Gas Investigation. As noted previously in Section 2.1 of this appendix, the MS/MSD pair for sample LO-1B8-SG were not analyzed until 11 days after sample collection. The primary tubes had been extracted and analyzed 7 days after collection, but not as an MS/MSD pair. Because of some evaporation of carbon disulfide, the recoveries were high, and were considered to give erroneous information. Therefore, the secondary tubes were analyzed.

Matrix spike recoveries for both MS/MSD pairs (LO-1A8-SGMS/MSD and LO-1B8-SGMS/MSD) were within the QC control limits of 75 to 125 percent. The calculated RPD for each pair of spike recoveries were was within the QC control limits of $\pm$20 percent.

Therefore, no qualification of the native unspiked sample results (LO-1A8-SG and LO-1B8-SG) is necessary.

2.7 Field Duplicates

As noted previously, four field duplicates were collected. The analytical results for these samples and their corresponding native samples are all below detection limits. Therefore, percent differences cannot be calculated, and no qualification of these data is necessary.

3.0 MISCELLANEOUS

All the raw laboratory data were obtained from PACE Laboratory, Inc. These included chromatograms, equipment calibration, and other data. The following subsections present examination results of chromatograms, spot checks of calculations, and other data deliverables.

3.1 Chromatograms

The chromatograms for all sample injections were checked, and the retention times for all compounds were consistent with the laboratory standards. Compound concentrations were determined by using the correct QC standard values and areas.

False readings for trans-1,2-dichloroethene were discovered on chromatogram columns DB-5 and DB-1701. This problem was caused by coelution with carbon disulfide. Another column identified as DB-Wax was used to separate the two compounds; and all samples, blanks, and standards were also analyzed on this column for the sole reason of qualifying the trans-1,2-dichloroethene concentration.

3.2 Calculation Checks

Summaries of the laboratory analytical results were spot checked. These spot checks of contaminant concentrations were performed by using the reported chromatogram areas of selected samples and QC standards.

No errors in the calculations or in data transcriptions were discovered.

3.3 Data Deliverables

PACE Laboratories has submitted all data deliverables according to Appendices B and I of the Lenz Oil QAPP, PACE Standard Operating Procedures, and Standard Operating Procedure for Soil Gas Data Validation, respectively.

4.0 CONCLUSIONS

The results and discussion presented in this appendix show that the laboratory analytical results for the Lenz Oil Soil Gas Investigation samples do not exhibit any anomalies. Therefore, the data are considered acceptable.

APPENDIX B

SOIL GAS - LABORATORY ANALYTICAL RESULTS AND SUPPORTING QC DOCUMENTATION

PACE, Inc.
Soil Gas Analysis QC Sheet

ent Name: ERM - [illegible]
Project Name: Lenz Oil
PACE Project Number: 910110.505

Instrument ID: B
Primary Column ID: 30 meter, 0.32 mm [illegible]
[illegible] 0.8-5

PACE Sample #	Tube (Prime or Second)	Tube Section	Analysis Date	Surrogate Recovery Decane (%)
38.2	Prime	Front	1/15/91	114
		Back		104
39.0		Front		114
		Back		104
740.4		Front		108
		Back		99
Q. [illegible]	—	—	1/15/91	97

PACE Sample #	Tube (Prime or Second)	Tube Section	Analysis Date	Surrogate Recovery Decane (%)

Surrogate QC Limits are 75%-125%.

Comments

PACE, Inc.
Soil Gas Analysis QC Sheet

Client Name: FRM - North central
Project Name: Lenz Oil
PACE Project Number: 91D110.505

Instrument ID: 8
Primary Column ID: 30 meter, 0.32 mm ID
Supelco DB-5

PACE Sample #	Tube (Prime or Second)	Tube Section	Analysis Date	Matrix Spike Recovery (%)					
				1	2	3	4	5	6
Q.C. spike	—	—	1/15/91	80	88	94	93	94	94

Matrix Spike QC Limits are 75%-125%.

1 = cis-1,2-Dichloroethene
2 = 1,1,1-Trichloroethane
3 = Trichloroethene
4 = Toluene
5 = m,p-Xylene
6 = ~~p-Xylene~~ o-xylene

Comments

PACE, Inc.
Soil Gas Analysis QC Sheet
Method Blank Summary

Client Name: ERM - [illegible]
Project Name: Lenz Oil
PACE Project Number: 910110.505

Instrument ID: 3
Primary Column ID: [illegible]

Date Analyzed	Target Compounds
11/5/91	none found

Comments:

PACE, Inc.
Soil Gas Analysis Calibration Summary

Client Name: ERM - North Central
Project Name: Jenz Oil
PACE Project Number: 910110 505

Instrument ID: B
Primary Column ID:
Analysis Date: 30 meter, 0.32 mm I.D. Supelco DB 5

Initial Calibration Summary

Analytes	Standards (ug/ml) 5	10	50	100	500	AVE.	%FSD
cis-1, 2-Dichloroethene	0.401	0.470	0.575	0.578	0.577	0.520	16
trans-1, 2-dichloroethene	6.39×10^{-4}	6.16×10^{-4}	6.33×10^{-4}	5.46×10^{-4}	6.18×10^{-4}	6.20×10^{-4}	3
1, 2-Dichloroethane	0.271	0.388	0.518	0.561	0.589	0.465	29
Trichloroethene	0.347	0.395	0.453	0.463	0.461	0.424	12
1, 1, 1-Trichloroethane	0.446	0.446	0.464	0.458	0.446	0.453	2
Toluene	2.04	2.14	2.37	2.24	2.26	2.22	6
m, p-Xylene (Total) MEB 1/18/91	~~[illegible]~~ 2.22	2.24	2.40	2.33	2.31	2.30	3
o-Xylene	2.22	2.21	2.39	2.32	2.31	2.29	3
Decane (SS)	2.17	2.16	2.29	2.20	2.20	2.20	2

Continuing Calibration Summary

Analytes	Analysis Date	Standard ug	% Diff.	Analysis Date	Standard	% Diff.
cis-1, 2-Dichloroethene	1/15/91	45	10			
trans-1, 2-dichloroethene	↓	41	17			
1, 2-Dichloroethane	1/17/91	47	5			
Trichloroethene	1/15/91	45	11			
1, 1, 1-Trichloroethane	↓	46	8			
Toluene	↓	48	7			
m, p-Xylene (Total)	↓	48	5			
o-Xylene	↓	50	5			
Decane (SS)						

Comments: 1) TRANS-1,2 DICHLOROETHANE WAS RUN ON A SINGLE COLUMN - SUPELCO DB-WAX, 30 meters, 0.25 mm film thickness

2) TRANS-1,2 DICHLOROETHANE WAS CALIBRATED WITH STANDARDS of 10 ug/ml, 25, 50, 100, & 500

pace INCORPORATED

REPORT OF LABORATORY ANALYSIS

ERM - North Central, Inc.
102 Wilmot Road
Suite 300
Deerfield, IL 60015

January 18, 1991
PACE Project
Number: 910112502

Attn: Mr. Dave Edwards

0252JI Lenz Oil

PACE Sample Number:			10 0010502	10 0010510	10 0010529
Date Collected:			01/10/91	01/10/91	01/10/91
Date Received:			01/12/91	01/12/91	01/12/91
			LO-1A2-	LO-1A3-	LO-1A4-
Parameter	Units	MDL	SG	SG	SG
ORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
1,1,1-Trichloroethane	ppm	0.04	ND	ND	ND
1,2-Dichloroethane	ppm	0.05	ND	ND	ND
Toluene	ppm	0.06	ND	ND	ND
Trichloroethylene	ppm	0.04	ND	ND	ND
Xylene	ppm	0.05	ND	ND	ND
cis-1,2-Dichloroethylene	ppm	0.05	ND	ND	ND
trans-1,2-Dichloroethylene	ppm	0.10	ND	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

Offices Serving: Minneapolis, Minnesota; Tampa, Florida; Iowa City, Iowa; San Francisco, California; Kansas City, Missouri; Los Angeles, California; Charlotte, North Carolina; Asheville, North Carolina; New York, New York; Pittsburgh, Pennsylvania

An Equal Opportunity Employer

pace INCORPORATED
THE ASSURANCE OF QUALITY

REPORT OF LABORATORY ANALYSIS

Mr. Dave Edwards
Page 3

January 18, 1991
PACE Project
Number: 910112502

0252JI Lenz Oil

PACE Sample Number:			10 0010561	10 0010570	10 0010588
Date Collected:			01/10/91	01/10/91	01/10/91
Date Received:			01/12/91	01/12/91	01/12/91
Parameter	Units	MDL	LO-1A6-SG	LO-1A8-SG	LO-1A8-SGMS (MS/MSD)
ORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
1,1,1-Trichloroethane	ppm	0.04	ND	ND	ND
1,2-Dichloroethane	ppm	0.05	ND	ND	ND
Toluene	ppm	0.06	ND	ND	ND
Trichloroethylene	ppm	0.04	ND	ND	ND
Xylene	ppm	0.05	ND	ND	ND
cis-1,2-Dichloroethylene	ppm	0.05	ND	ND	ND
trans-1,2-Dichloroethylene	ppm	0.10	ND	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

REPORT OF LABORATORY ANALYSIS

Mr. Dave Edwards
Page 4

January 18, 1991
PACE Project
Number: 910112502

0252JI Lenz Oil

PACE Sample Number:			10 0010596	10 0010600	10 0010618
Date Collected:			01/10/91	01/10/91	01/10/91
Date Received:			01/12/91	01/12/91	01/12/91
Parameter	Units	MDL	LO-1A9-SG	LO-1B9-SG	LO-1B9-SGFB
ORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
1,1,1-Trichloroethane	ppm	0.04	ND	ND	ND
1,2-Dichloroethane	ppm	0.05	ND	0.23	ND
Toluene	ppm	0.06	ND	ND	ND
Trichloroethylene	ppm	0.04	ND	0.10	ND
Xylene	ppm	0.05	ND	ND	ND
cis-1,2-Dichloroethylene	ppm	0.05	ND	ND	ND
trans-1,2-Dichloroethylene	ppm	0.10	ND	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

Offices Serving: Minneapolis, Minnesota; Tampa, Florida; Iowa City, Iowa; San Francisco, California; Kansas City, Missouri; Los Angeles, California; Charlotte, North Carolina; Asheville, North Carolina; New York, New York; Pittsburgh, Pennsylvania

An Equal Opportunity Employer

PACE, Inc.
Soil Gas Analysis QC Sheet

ent Name: ERM - North central
Instrument ID: 3
oject Name: Lenz O
Primary Column ID: 30 meter, 0.32 mm I.D. Supelco DB-5
PACE Project Number: 910112.502

PACE Sample #	Tube (Prime or Second)	Tube Section	Analysis Date	Surrogate Recovery Decane (%)
50.2	Prime	Front	1/15/91	106
		Back		105
51.0		Front		114
		Back		106
1052.9		Front		111
		Back		103
53.7		Front		107
		Back		102
54.5		Front		114
		Back		102
MS-1058.8		Front		109
55.3		Front		112
		Back		104
1056.1		Front		112
		Back		106
57.0		Front		110
		Back		103
58.3		Front		110
		Back		103
1059.6		Front		110
		Back		102

PACE Sample #	Tube (Prime or Second)	Tube Section	Analysis Date	Surrogate Recovery Decane (%)
MSD-1058.8	Prime	Front	1/15/91	106
1060.0		Front		111
		Back		104
1061.8		Front		113
		Back		106
1063.6		Front		112
		Back		108
~~1063~~				
QC spike	—	—		99

S gate QC Limits
at 75%-125%.

Comments sample # 1060.0 has interferences present in the chromatogram

PACE, Inc.
Soil Gas Analysis QC Sheet

Client Name: ERM - North central
Project Name: Lena Oil
PACE Project Number: 910112 502

Instrument ID: 8
Primary Column ID: 30 meter, 0.32 mm I.D. Supelco DB 5

PACE Sample #	Tube (Prime or Second)	Tube Section	Analysis Date	Matrix Spike Recovery (%) 1	2	3	4	5	6
MS 1058 T	Prime	Front	11/15/91	102	105	103	100	100	97
MSD 1038 T	Prime	Front	↓	100	99	100	100	101	99
QC spike	—	—	↓	77	87	92	93	95	95

Matrix Spike QC Limits are 75%-125%.

1 = cis-1,2-Dichloroethene
2 = 1,1,1-Trichloroethane
3 = Trichloroethene
4 = Toluene
5 = m,p-Xylene
6 = ~~p-Xylene~~ o-xylene HRB

Comments

PACE, Inc.
Soil Gas Analysis QC Sheet
Method Blank Summary

Client Name: ERM - North Central
Project Name: Lenz Oil
PACE Project Number: 910112.502

Instrument ID: B
Primary Column ID: 30 meter, 0.32 mm I.D.
supelco DB-5

Date Analyzed	Target Compounds
1/15/91	none found

Comments:

PACE, Inc.
Soil Gas Analysis Calibration Summary

Client Name: ERM - North Central
Project Name: Jerry Oil
PACE Project Number: 410112 502

Instrument ID: B
Primary Column ID:
Analysis Date: 30 meter, 0.32 mm I.D.
Supelco DB 5

Initial Calibration Summary

Analytes	Standards (ug/ml) 5	10	50	100	500	AVE.	%RSD
cis-1, 2-Dichloroethene	0.401	0.470	0.575	0.578	0.577	0.520	16
trans-1, 2-dichloroethene	6.39×10^{-4}	6.16×10^{-4}	6.33×10^{-4}	5.46×10^{-4}	6.18×10^{-4}	6.20×10^{-4}	3
1, 2-Dichloroethane	0.271	0.388	0.518	0.561	0.589	0.465	29
Trichloroethene	0.347	0.395	0.453	0.463	0.461	0.424	12
1, 1, 1-Trichloroethane	0.446	0.446	0.469	0.458	0.446	0.453	2
Toluene	2.04	2.14	2.37	2.29	2.26	2.22	6
m, p-Xylene (Total) MEB 1/18/91	~~1.43~~ 2.22	2.24	2.40	2.33	2.31	2.30	3
o-Xylene	2.22	2.21	2.39	2.32	2.31	2.29	3
Decane (SS)	2.17	2.16	2.29	2.20	2.20	2.20	2

Continuing Calibration Summary

Analytes	Analysis Date	Standard ug	% Diff.	Analysis Date	Standard	% Diff.
cis-1, 2-Dichloroethene	1/15/91	45	10			
trans-1, 2-dichloroethene	↓	41	17			
1, 2-Dichloroethane	1/17/91	47	5			
Trichloroethene	1/15/91	45	11			
1, 1, 1-Trichloroethane		46	8			
Toluene		48	2			
m, p-Xylene (Total)		48	5			
o-Xylene		50	5			
Decane (SS)						

Comments:
1) TRANS-1,2 DICHLOROETHANE WAS RUN ON A SINGLE COLUMN - SUPELCO DB-WAX, 30 meters, 0.25 micron film thickness
2) TRANS 1,2 DICHLOROETHANE WAS CALIBRATED WITH STANDARDS @ 10 ug/ml, 25, 50, 100, & 500

REPORT OF LABORATORY ANALYSIS

ERM - North Central, Inc.
102 Wilmot Road
Suite 300
Deerfield, IL 60015

January 18, 1991
PACE Project
Number: 910112503

Attn: Mr. Dave Edwards

Lenz Oil 0252JI

PACE Sample Number:			10 0010634	10 0010642	10 0010650
Date Collected:			01/11/91	01/11/91	01/11/91
Date Received:			01/12/91	01/12/91	01/12/91
Parameter	Units	MDL	LO-1B1-SG	LO-1B2-SG	LO-1B3-SG
ORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
1,1,1-Trichloroethane	ppm	0.04	ND	ND	ND
1,2-Dichloroethane	ppm	0.05	ND	ND	ND
Toluene	ppm	0.06	ND	ND	ND
Trichloroethylene	ppm	0.04	ND	ND	ND
Xylene	ppm	0.05	ND	ND	ND
cis-1,2-Dichloroethylene	ppm	0.05	ND	ND	ND
trans-1,2-Dichloroethylene	ppm	0.10	ND	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

Offices Serving: Minneapolis, Minnesota; Tampa, Florida; Iowa City, Iowa; San Francisco, California; Kansas City, Missouri; Los Angeles, California; Charlotte, North Carolina; Asheville, North Carolina; New York, New York; Pittsburgh, Pennsylvania

An Equal Opportunity Employer

pace INCORPORATED

REPORT OF LABORATORY ANALYSIS

Mr. Dave Edwards
Page 2

January 18, 1991
PACE Project
Number: 910112503

Lenz 011 0252JI

PACE Sample Number:			10 0010669	10 0010677	10 0010685
Date Collected:			01/11/91	01/11/91	01/11/91
Date Received:			01/12/91	01/12/91	01/12/91
Parameter	Units	MDL	LO-1B4-SG	LO-1B5-SG	LO-1B6-SG
ORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
1,1,1-Trichloroethane	ppm	0.04	ND	ND	ND
1,2-Dichloroethane	ppm	0.05	ND	ND	ND
Toluene	ppm	0.06	ND	ND	ND
Trichloroethylene	ppm	0.04	ND	ND	ND
Xylene	ppm	0.05	ND	ND	ND
cis-1,2-Dichloroethylene	ppm	0.05	ND	ND	ND
trans-1,2-Dichloroethylene	ppm	0.10	ND	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612 525 3377

Offices Serving: Minneapolis, Minnesota; Tampa, Florida; Iowa City, Iowa; San Francisco, California; Kansas City, Missouri; Los Angeles, California; Charlotte, North Carolina; Asheville, North Carolina; New York, New York; Pittsburgh, Pennsylvania

An Equal Opportunity Employer

REPORT OF LABORATORY ANALYSIS

Mr. Dave Edwards
Page 3

January 18, 1991
PACE Project
Number: 910112503

Lenz Oil 0252JI

PACE Sample Number:			10 0010693	10 0010707	10 0010715
Date Collected:			01/11/91	01/11/91	01/11/91
Date Received:			01/12/91	01/12/91	01/12/91
Parameter	Units	MDL	LO-1B7-SG	LO-1C1-SGFB	LO-1C1-SG
ORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
1,1,1-Trichloroethane	ppm	0.03	-	-	ND
1,1,1-Trichloroethane	ppm	0.04	0.05	ND	-
1,2-Dichloroethane	ppm	0.04	-	-	ND
,2-Dichloroethane	ppm	0.05	ND	ND	-
Toluene	ppm	0.05	-	-	ND
Toluene	ppm	0.06	ND	ND	-
Trichloroethylene	ppm	0.03	-	-	ND
Trichloroethylene	ppm	0.04	ND	ND	-
Xylene	ppm	0.04	-	-	ND
Xylene	ppm	0.05	ND	ND	-
cis-1,2-Dichloroethylene	ppm	0.04	-	-	ND
cis-1,2-Dichloroethylene	ppm	0.05	ND	ND	-
trans-1,2-Dichloroethylene	ppm	0.08	-	-	ND
trans-1,2-Dichloroethylene	ppm	0.10	ND	ND	-

MDL Method Detection Limit
ID Not detected at or above the MDL.

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

Offices Serving: Minneapolis, Minnesota; Tampa, Florida; Iowa City, Iowa; San Francisco, California; Kansas City, Missouri; Los Angeles, California; Charlotte, North Carolina; Asheville, North Carolina; New York, New York; Pittsburgh, Pennsylvania

An Equal Opportunity Employer

REPORT OF LABORATORY ANALYSIS

Mr. Dave Edwards
Page 4

January 18, 1991
PACE Project
Number: 910112503

Lenz Oil 0252JI

PACE Sample Number:			10 0010723	10 0010731	10 0010740
Date Collected:			01/11/91	01/11/91	01/11/91
Date Received:			01/12/91	01/12/91	01/12/91
Parameter	Units	MDL	LO-1C4-SG	LO-1C4-SGFS	LO-1C5-SG
ORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
1,1,1-Trichloroethane	ppm	0.04	ND	ND	ND
1,2-Dichloroethane	ppm	0.05	ND	ND	ND
Toluene	ppm	0.06	ND	ND	ND
richloroethylene	ppm	0.04	ND	ND	ND
Xylene	ppm	0.05	ND	ND	ND
cis-1,2-Dichloroethylene	ppm	0.05	ND	ND	ND
trans-1,2-Dichloroethylene	ppm	0.10	ND	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612 525-3377

Offices Serving: Minneapolis, Minnesota; Tampa, Florida; Iowa City, Iowa; San Francisco, California; Kansas City, Missouri; Los Angeles, California; Charlotte, North Carolina; Asheville, North Carolina; New York, New York; Pittsburgh, Pennsylvania

An Equal Opportunity Employer

pace INCORPORATED

REPORT OF LABORATORY ANALYSIS

Mr. Dave Edwards
Page 5

January 18, 1991
PACE Project
Number: 910112503

Lenz Oil 0252JI

PACE Sample Number:			10 0010758
Date Collected:			01/11/91
Date Received:			01/12/91
			LO-1-
Parameter	Units	MDL	SGTB3
ORGANIC ANALYSIS			
INDIVIDUAL PARAMETERS			
1,1,1-Trichloroethane	ppm	0.04	ND
1,2-Dichloroethane	ppm	0.05	ND
Toluene	ppm	0.06	ND
Trichloroethylene	ppm	0.04	ND
Xylene	ppm	0.05	ND
cis-1,2-Dichloroethylene	ppm	0.05	ND
trans-1,2-Dichloroethylene	ppm	0.10	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

The data contained in this report were obtained using EPA or other approved methodologies. All analyses were performed by me or under my supervision.

James J. Matteson
FOR
Liesa A. Shanahan
Organic Chemistry Manager

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

PACE, Inc.
Soil Gas Analysis QC Sheet

ent Name: ERM North central
Project Name: Lenz Oil
PACE Project Number: 910112.503

Instrument ID: 8
Primary Column ID: 30 meter, 0.32 mm I.D. Supelco DB-5

PACE Sample #	Tube (Prime or Second)	Tube Section	Analysis Date	Surrogate Recovery Decane (%)
32 Blk	—	—	1/16/91	98
1063.4	Prime	Front		110
		Back		104
64.2		Front		113
		Back		105
65.0		Front		111
		Back		103
9		Front		112
		Back		105
67.7		Front		109
		Back		107
Q.C. spike	—	—		96
68.5	Prime	Front		98
		Back		101
69.3		Front		110
		Back		103
1070.7		Front		110
		Back		105
71.5		Front		111
		Back		101

PACE Sample #	Tube (Prime or Second)	Tube Section	Analysis Date	Surrogate Recovery Decane (%)
1072.3	Prime	Front	1/16/91	112
		Back		105
Q.C. spike	—	—		97
1073.1	Prime	Front		112
		Back		102
1073.1	Secondary	Front		104
		Back		100
1074.0	Prime	Front		113
		Back		103
1075.8		Front		110
		Back		102
Q.C. spike	—	—		96

Surrogate QC Limits are 6-125%.

Comments: sample 1070.7 Primary - Back → Surrogate recovery taken off of confirmation column (DB-1701)

PACE, Inc.
Soil Gas Analysis QC Sheet

Client Name: ERM - north central
Project Name: Lenz O.1
PACE Project Number: 910112 503

Instrument ID: B
Primary Column ID: [illegible]

PACE Sample #	Tube (Prime or Second)	Tube Section	Analysis Date	Matrix Spike Recovery (%)					
				1	2	3	4	5	6
QC spike	—	—	1/16/91	98	96	97	94	95	95
QC spike	—	—		98	98	100	95	95	95
QC spike				99	98	98	95	95	95

Matrix Spike QC Limits are 75%-125%.

1 = cis-1,2-Dichloroethene
2 = 1,1,1-Trichloroethane
3 = Trichloroethene
4 = Toluene
5 = m,p-Xylene
6 = p-Xylene

Comments

PACE, Inc.
Soil Gas Analysis QC Sheet
Method Blank Summary

Client Name: ERM - North Central
Project Name: Lenz O.1
PACE Project Number: 910112-503

Instrument ID: B
Primary Column ID: 30 meter, 0.32 I.D. megabore DB-5

Date Analyzed	Target Compounds
1/10/91	none found

Comments:

PACE, Inc.
Soil Gas Analysis Calibration Summary

Client Name: ERM - North Central
Project Name: Lenz O.1
PACE Project Number: 910112.503

Instrument ID: B
Primary Column ID: 30 meter, 0.32 ID DB-5
Analysis Date: 1-15-91

Initial Calibration Summary

Analytes	Standards (ug/ml) 5	10	50	100	500	AVE.	%RSD
cis-1, 2-Dichloroethene	0.401	0.470	0.515	0.578	0.577	0.520	16
trans-1, 2-dichloroethene	6.38×10^{-4}	6.16×10^{-4}	6.33×10^{-4}	5.46×10^{-4}	5.12×10^{-4}	6.20×10^{-4}	3
1, 2-Dichloroethane	0.371	0.388	0.518	0.561	0.589	0.465	29
Trichloroethene	0.347	0.375	0.453	0.463	0.461	0.424	12
1, 1, 1-Trichloroethane	0.446	0.442	0.467	0.458	0.446	0.453	2
Toluene	2.04	2.14	2.37	2.29	2.26	2.22	6
m, p-Xylene (Total) MRB 1/18/91	~~1.43~~ 2.22	2.24	2.40	2.33	2.31	2.30	3
o-Xylene	2.22	2.21	2.39	2.32	2.31	2.29	3
Hexane (SS)	2.17	2.16	2.29	2.20	2.20	2.20	2

Continuing Calibration Summary

Analytes	Analysis Date	Standard ug	% Diff.	Analysis Date	Standard	% Diff.
cis-1, 2-Dichloroethene	1/16/91	44	1			
trans-1, 2-dichloroethene	1/17/91	112	~~14~~ 11			
1, 2-Dichloroethane	1/15/91	46	6			
Trichloroethene	1/16/91	98	3			
1, 1, 1-Trichloroethane		98	1			
Toluene		123	0			
m, p-Xylene (Total)		106	2			
o-Xylene		105	0			
Hexane (SS)						

MRB 1/18/91

Comments: 1) TRANS-1,2 DICHLOROETHANE WAS RUN ON A SINGLE COLUMN - SUPELCO DB WAX, 30 METER, 0.25 [illegible]
[illegible]

2) TRANS-1,2 DICHLOROETHANE WAS CALIBRATED WITH STANDARDS @ 10 ug/ml, 25, 50, 100, 500

pace INCORPORATED
THE ASSURANCE OF QUALITY

REPORT OF LABORATORY ANALYSIS

ERM - North Central, Inc.
102 Wilmot Road
Suite 300
Deerfield, IL 60015

January 21, 1991
PACE Project
Number: 910115501

Attn: Mr. Dave Edwards

0252 JI/Lenz Oil

PACE Sample Number:			10 0012262	10 0012270	10 0012289
Date Collected:			01/12/91	01/12/91	01/12/91
Date Received:			01/14/91	01/14/91	01/14/91
Parameter	Units	MDL	LO-IC2-SG	LO-IC3-SG	LO-IC6-SG
ORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
1,1,1-Trichloroethane	ppm	0.04	ND	ND	ND
1,2-Dichloroethane	ppm	0.05	ND	ND	ND
Toluene	ppm	0.06	ND	ND	ND
Trichloroethylene	ppm	0.04	ND	ND	ND
Xylene	ppm	0.05	ND	ND	ND
cis-1,2-Dichloroethylene	ppm	0.05	ND	ND	ND
trans-1,2-Dichloroethylene	ppm	0.10	ND	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

Offices Serving: Minneapolis, Minnesota; Tampa, Florida; Iowa City, Iowa; San Francisco, California; Kansas City, Missouri; Los Angeles, California; Charlotte, North Carolina; Asheville, North Carolina; New York, New York; Pittsburgh, Pennsylvania

An Equal Opportunity Employer

pace INCORPORATED
THE ASSURANCE OF QUALITY

REPORT OF LABORATORY ANALYSIS

Mr. Dave Edwards
Page 2

January 21, 1991
PACE Project
Number: 910115501

0252 JI/Lenz Oil

PACE Sample Number:			10 0012297	10 0012300	10 0012319
Date Collected:			01/12/91	01/12/91	01/12/91
Date Received:			01/14/91	01/14/91	01/14/91
Parameter	Units	MDL	LO-IC6-SGFS	LO-B8-SGFB time 1423	LO-B8-SG time 1613
ORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
1,1,1-Trichloroethane	ppm	0.04	ND	ND	ND
1,2-Dichloroethane	ppm	0.05	ND	ND	ND
Toluene	ppm	0.06	ND	ND	ND
richloroethylene	ppm	0.04	ND	ND	ND
Xylene	ppm	0.05	ND	ND	ND
cis-1,2-Dichloroethylene	ppm	0.05	ND	ND	ND
trans-1,2-Dichloroethylene	ppm	0.10	ND	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

Offices Serving: Minneapolis, Minnesota; Tampa, Florida; Iowa City, Iowa; San Francisco, California; Kansas City, Missouri; Los Angeles, California; Charlotte, North Carolina; Asheville, North Carolina; New York, New York; Pittsburgh, Pennsylvania

An Equal Opportunity Employer

REPORT OF LABORATORY ANALYSIS

Mr. Dave Edwards
Page 3

January 21, 1991
PACE Project
Number: 910115501

0252 JI/Lenz Oil

PACE Sample Number:			10 0012327	10 0012335	10 0012343
Date Collected:			01/12/91	01/12/91	01/12/91
Date Received:			01/14/91	01/14/91	01/14/91
			LO-1B8-SGMS	LO-1B8-SGMS	LO-1-SGTB4
Parameter	Units	MDL	time 1617	time 1620	time 1435
ORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
1,1,1-Trichloroethane	ppm	0.04	ND	ND	ND
1,2-Dichloroethane	ppm	0.05	ND	ND	ND
Toluene	ppm	0.06	ND	ND	ND
Trichloroethylene	ppm	0.04	ND	ND	ND
Xylene	ppm	0.05	ND	ND	ND
cis-1,2-Dichloroethylene	ppm	0.05	ND	ND	ND
trans-1,2-Dichloroethylene	ppm	0.10	ND	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

pace INCORPORATED
THE ASSURANCE OF QUALITY

REPORT OF LABORATORY ANALYSIS

Mr. Dave Edwards
Page 4

January 21, 1991
PACE Project
Number: 910115501

0252 JI/Lenz Oil

PACE Sample Number:			10 0013161	10 0013170	10 0013188
Date Collected:			01/14/91	01/14/91	01/14/91
Date Received:			01/15/91	01/15/91	01/15/91
Parameter	Units	MDL	L01C7SG	L01C8SG	L01C9SG
ORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
1,1,1-Trichloroethane	ppm	0.04	ND	ND	ND
1,2-Dichloroethane	ppm	0.05	ND	ND	ND
Toluene	ppm	0.06	ND	ND	ND
Trichloroethylene	ppm	0.04	ND	ND	ND
Xylene	ppm	0.05	ND	ND	ND
cis-1,2-Dichloroethylene	ppm	0.05	ND	ND	ND
trans-1,2-Dichloroethylene	ppm	0.10	ND	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

Offices Serving: Minneapolis, Minnesota; Tampa, Florida; Iowa City, Iowa; San Francisco, California; Kansas City, Missouri; Los Angeles, California; Charlotte, North Carolina; Asheville, North Carolina; New York, New York; Pittsburgh, Pennsylvania

An Equal Opportunity Employer

pace INCORPORATED
THE ASSURANCE OF QUALITY

REPORT OF LABORATORY ANALYSIS

Mr. Dave Edwards
Page 5

January 21, 1991
PACE Project
Number: 910115501

0252 JI/Lenz Oil

PACE Sample Number:			10 0013196	10 0013200	10 0013218
Date Collected:			01/14/91	01/14/91	01/14/91
Date Received:			01/15/91	01/15/91	01/15/91
Parameter	Units	MDL	L01C10SG	L01C10SGFD	L01C10SGFB
ORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
1,1,1-Trichloroethane	ppm	0.04	ND	ND	ND
1,2-Dichloroethane	ppm	0.05	ND	ND	ND
Toluene	ppm	0.06	ND	ND	ND
Trichloroethylene	ppm	0.04	ND	ND	ND
Xylene	ppm	0.05	ND	ND	ND
cis-1,2-Dichloroethylene	ppm	0.05	ND	ND	ND
trans-1,2-Dichloroethylene	ppm	0.10	ND	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

pace INCORPORATED
THE ASSURANCE OF QUALITY

REPORT OF LABORATORY ANALYSIS

Mr. Dave Edwards
Page 6

January 21, 1991
PACE Project
Number: 910115501

0252 JI/Lenz Oil

PACE Sample Number:			10 0013226	10 0013234	10 0013242
Date Collected:			01/14/91	01/14/91	01/14/91
Date Received:			01/15/91	01/15/91	01/15/91
Parameter	Units	MDL	L01C11SG	L01C12SG	L01C13SG
ORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
1,1,1-Trichloroethane	ppm	0.04	ND	ND	ND
1,2-Dichloroethane	ppm	0.05	ND	ND	ND
Toluene	ppm	0.06	ND	ND	ND
·ichloroethylene	ppm	0.04	ND	ND	ND
..ylene	ppm	0.05	ND	ND	ND
cis-1,2-Dichloroethylene	ppm	0.05	ND	ND	ND
trans-1,2-Dichloroethylene	ppm	0.10	ND	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612-525-3377

pace INCORPORATED
THE ASSURANCE OF QUALITY

REPORT OF LABORATORY ANALYSIS

Mr. Dave Edwards
Page 7

January 21, 1991
PACE Project
Number: 910115501

0252 JI/Lenz Oil

PACE Sample Number:			10 0013250	10 0013269
Date Collected:			01/14/91	01/14/91
Date Received:			01/15/91	01/15/91
Parameter	Units	MDL	L01C14SG	L01SFTB5
ORGANIC ANALYSIS				
INDIVIDUAL PARAMETERS				
1,1,1-Trichloroethane	ppm	0.04	ND	ND
1,2-Dichloroethane	ppm	0.05	ND	ND
Toluene	ppm	0.06	ND	ND
Trichloroethylene	ppm	0.04	ND	ND
Xylene	ppm	0.05	ND	ND
cis-1,2-Dichloroethylene	ppm	0.05	ND	ND
trans-1,2-Dichloroethylene	ppm	0.10	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

The data contained in this report were obtained using EPA or other approved methodologies. All analyses were performed by me or under my supervision.

Liesa Shanahan

Liesa A. Shanahan
Organic Chemistry Manager

1710 Douglas Drive North
Minneapolis, MN 55422
TEL: 612-544-5543
FAX: 612 525-3377

PACE, Inc.
Soil Gas Analysis QC Sheet

ent Name: ERM - North central
roject Name:
PACE Project Number: 9.0.15.501

Instrument ID: B
Primary Column ID: 30 meter, 0.32 mm I.D.
supplier DB-5

PACE Sample #	Tube (Prime or Second)	Tube Section	Analysis Date	Surrogate Recovery Decane (%)
lab std	—	—	1/19/91	97
~~[illegible]~~				
26.2	Prime	Front		114
		Back		104
1227.0		Front		111
		Back		105
28.4		Front		113
		Back		105
[illegible]1.7		Front		111
		Back		104
1230.0		Front		111
		Back		106
[illegible] spike	—	—		96
1231.9	Prime	Front		106
		Back		103
32.7		Front		117
		Back		103
1233.5		Front		110
		Back		103
1234.3		Front		110
		Back		105

MRB 1/22/91

PACE Sample #	Tube (Prime or Second)	Tube Section	Analysis Date	Surrogate Recovery Decane (%)
1316.1	Prime	Front	1/19/91	110
		Back		103
Q.C. spike	—	—		95
Calib std	—	—		95
1317.0	Prime	Front		99
		Back		103
1318.3		Front		110
		Back		103
1319.6		Front		109
		Back		102
1320.0		Front		110
		Back		105
1321.9		Front		108
		Back		104
Q.C. spike	—	—	1/20/91	95
1322.6	Prime	Front		112
		Back		103
1323.4		Front		111
		Back		105
1324.2		Front		111
		Back		104

S rogate QC Limits
75%-125%.

C mments

PACE, Inc.
Soil Gas Analysis QC Sheet

ıent Name: ERM - North Central Inc
Instrument ID: 8
roject Name:
Primary Column ID: 30 meter, 0.32 mm I.D
PACE Project Number: 910115 501
Supelco DB-5

PACE ımple #	Tube (Prime or Second)	Tube Section	Analysis Date	Surrogate Recovery Decane (%)
~~13205~~				
13250	Prime	Front	1/20/19	109
		Back		107
3269		Front		110
		Back		104
[illegible]				92

MRB 1/22/91

PACE Sample #	Tube (Prime or Second)	Tube Section	Analysis Date	Surrogate Recovery Decane (%)

ogate QC Limits
75%-125%.

Comments

PACE, Inc.
Soil Gas Analysis Calibration Summary

Client Name: ERM - North Quincy
Project Name:
PACE Project Number: 910115 501

Instrument ID: B
Primary Column ID: 30 meter, 0.32 mm I.D., Supelco DB-5
Analysis Date: 1/13 & 14/91

Initial Calibration Summary

Analytes	Standards (ug/ml) 5	10	50	100	500	AVE.	%RSD
cis-1, 2-Dichloroethene	0.401	0.472	0.575	0.578	0.577	0.520	16
trans-1, 2-dichloroethene	6.38×10^{-4}	6.16×10^{-4}	6.33×10^{-4}	5.96×10^{-4}	6.18×10^{-4}	6.20×10^{-4}	3
1, 2-Dichloroethane	0.371	0.388	0.518	0.561	0.389	0.465	29
Trichloroethene	0.347	0.395	0.453	0.463	0.461	0.424	12
1, 1, 1-Trichloroethane	0.446	0.446	0.469	0.458	0.446	0.453	2
Toluene	2.04	2.14	2.37	2.29	2.26	2.22	6
m, p-Xylene (Total) MRG 1/18/91	~~1.43~~ 2.22	2.24	2.40	2.33	2.31	2.30	3
o-Xylene	2.22	2.21	2.39	2.32	2.31	2.29	3
Decane (SS)	2.17	2.16	2.29	2.20	2.20	2.20	2

Continuing Calibration Summary

Analytes	Analysis Date	Standard ug	% Diff.	Analysis Date	Standard	% Diff.
cis-1, 2-Dichloroethene	1/14/91	45	9	1/20/91	93	7
trans-1, 2-dichloroethene	1/18/91	58	17	1/18/91	108	9
1, 2-Dichloroethane	1/14/91	53	8	1/20/91	47	4
Trichloroethene	↓	48	6	↓	95	7
1, 1, 1-Trichloroethane		46	7		95	5
Toluene		49	5		100	3
m, p-Xylene (Total)		100	3		102	2
o-Xylene		51	3		104	1
Decane (SS)						

Comments: 1) TRANS-1,2 DICHLOROETHANE WAS RUN ON A SINGLE COLUMN - SUPELCO DB WAX, 30 meters, 0.25 micron film thickness

2) TRANS-1,2 DICHLOROETHANE WAS CALIBRATED WITH STANDARDS OF 10 ug/ml, 25, 50, 100, & 500

PACE, Inc.
Soil Gas Analysis QC Sheet

Client Name: ERM - waste control
Project Name:
PACE Project Number: 910115501

Instrument ID: 8
Primary Column ID: 30 meter, 0.32 mm I.D.
Supelcowax CB-5

PACE Sample #	Tube (Prime or Second)	Tube Section	Analysis Date	Matrix Spike Recovery (%)					
				1	2	3	4	5	6
Q.C. spike			1/19/91	100	98	97	94	95	95
Q.C. spike			1/19/91	101	100	100	96	95	96
Q.C. spike			1/19/91	99	97	99	95	96	96
Q.C. spike			1/20/91	93	95	93	94	94	95

Matrix Spike QC Limits are 75%-125%.

1 = cis-1,2-Dichloroethene
2 = 1,1,1-Trichloroethane
3 = Trichloroethene
4 = Toluene
5 = m,p-Xylene
6 = p-Xylene

Comments

PACE, Inc.
Soil Gas Analysis QC Sheet
Method Blank Summary

Client Name: ERM - North central
Project Name:
PACE Project Number: 910115 501

Instrument ID: B
Primary Column ID: 30 meter, 0.32 mm I.D.
Supelco DB-5

Date Analyzed	Target Compounds
1/19/91	no target compounds found

Comments:

PACE, Inc.
Soil Gas Analysis QC Sheet

Client Name: ERM - [illegible]
Project Name:
PACE Project Number: 910115.501

Instrument ID: B
Primary Column ID: 30 meter, 0.32 mm I.D
supplier DB-5

PACE Sample #	Tube (Prime or Second)	Tube Section	Analysis Date	Surrogate Recovery Decane (%)
1232.7 MS	Second	Front	1/23/91	115
	↓	Back	↓	102
1232.5 MSD		Front		112
		Back		103

PACE Sample #	Tube (Prime or Second)	Tube Section	Analysis Date	Surrogate Recovery Decane (%)

Surrogate QC Limits
are 75%-125%.

Comments

PACE, Inc.
Soil Gas Analysis QC Sheet
Method Blank Summary

Client Name: ERM-NORTH CENTRAL
Project Name:
PACE Project Number: 910115 501

Instrument ID: B
Primary Column ID: 30 meter, 0.32 mm I.D. Supelco DB-5

Date Analyzed	Target Compounds
1/23/91	No Target compounds found

Comments:

PACE, Inc.
Soil Gas Analysis Calibration Summary

Client Name: ERM - [illegible]
Project Name: LEN2 [illegible]
PACE Project Number: 910115501

Instrument ID: B
Primary Column ID: 30 meter, 0.32 mm ID Supelco DB-5
Analysis Date: 1/23/91

Initial Calibration Summary

Analytes	Standards (ug/ml) 5	10	50	100	500	AVE.	%RSD
cis-1, 2-Dichloroethene	0.341	0.492	0.565	0.481	0.493	0.474	17
trans-1, 2-dichloroethene	—	—	—	—	—		
1, 2-Dichloroethane	—	—	—	—	—		
Trichloroethene MAB 1/24/91	~~0.457~~ 0.371	0.361	0.445	0.395	0.403	0.395	8.3
1, 1, 1-Trichloroethane	0.457	0.421	0.449	0.387	0.386	0.419	8.1
Toluene	2.03	2.08	2.27	2.02	1.98	2.08	5.5
m, p-Xylene (Total)	2.24	2.20	2.35	2.12	2.04	2.19	5.4
o-Xylene	2.29	2.23	2.36	2.12	2.04	2.21	5.8
Decane (SS)	2.22	2.16	2.26	2.05	1.97	2.13	5.7

Continuing Calibration Summary

Analytes	Analysis Date	Standard ug	% Diff.	Analysis Date	Standard	% Diff.
cis-1, 2-Dichloroethene	1/23/91	49	103			
trans-1, 2-dichloroethene		—	—			
1, 2-Dichloroethane		—				
Trichloroethene		50	98			
1, 1, 1-Trichloroethane		49	99			
Toluene		51	98			
m, p-Xylene (Total)		100	98			
o-Xylene		51	97			
Decane (SS)		—	—			

Comments:

PACE, Inc.
Soil Gas Analysis QC Sheet

Client Name: ERM - [illegible]
Project Name: LEN2 soil
PACE Project Number: 910115 501

Instrument ID: B
Primary Column ID: 30 meter, 0.32 mm I.D. Supelco DB-5

PACE Sample #	Tube (Prime or Second)	Tube Section	Analysis Date	Matrix Spike Recovery (%)					
				1	2	3	4	5	6
1232.7 MS	SECOND	FRONT	1/23/91	107	108	109	108	107	103
	↓	BACK	↓	99	100	100	98	97	95
1232.5 MSD		Front		103	106	108	105	104	100
		Back		100	102	101	100	99	97

Matrix Spike QC Limits are 75%-125%.

1 = cis-1,2-Dichloroethene
2 = 1,1,1-Trichloroethane
3 = Trichloroethene
4 = Toluene
5 = m,p-Xylene
6 = ~~p-Xylene~~ o-xylene

MRB 1/24/91

Comments

PACE, Inc.

Client Name: ERM - [illegible]
Project Name: LEN2 [illegible]
Project #: 910110.505
Instr. ID: B

Mid-level Standard-

Date/Time: 1/15/91 6.00P [illegible]
File ID:
Column ID: 30 meter, 0.32 [illegible]
Supelco PB-5

Soil Gas Analysis Internal Standard Area Summary

		Bromofluoro-benzene Area	RT			Bromofluoro-benzene Area	RT
	Mid-level Std.	378	9.37		Mid-level Std.		
	Upper Limit	756			Upper Limit		
	Lower Limit	189			Lower Limit		
	PACE Sample No.				PACE Sample No.		
1/23/91 1	~~[illegible]~~			21			
2	738.2 [illegible]-F	343	9.38	22			
3	[illegible]-B	340	9.37	23			
4	739.0 [illegible]-F	317	9.37	24			
5	[illegible]-B	372	9.37	25			
6	740.4 [illegible]-F	327	9.37	26			
7	[illegible]-B	344	9.37	27			
8	Blk spike	352	9.37	28			
9				29			
10				30			
11				31			
12				32			
13				33			
14				34			
15				35			
16				36			
17				37			
18				38			
19				39			
20				40			

QC Limits for Area

UPPER LIMIT = +100% of internal standard area
LOWER LIMIT = -50% of internal standard area.

Retention Time QC Limits

Retention time window is +/- 0.50 minutes.

PACE, Inc.

Client Name: ERM - North Central
Project Name: LENZ Oil
Project #: 910112.502
Instr. ID: 8

Mid-level Standard-

Date/Time:
File ID:
Column ID: 30 meter, 0.32 I
Angelus PB-5

Soil Gas Analysis Internal Standard Area Summary

		Bromofluoro-benzene Area	RT			Bromofluoro-benzene Area	RT
	Mid-level Std.	378	9.37		Mid-level Std.		
	Upper Limit	756			Upper Limit		
	Lower Limit	189			Lower Limit		
	PACE Sample No.				PACE Sample No.		
1	1050.2 Primary-F	345	9.37	21	1059.6 Primary-F	317	9.37
2	Primary-B	326	9.37	22	Primary-B	336	9.37
3	1051.0 Primary-F	315	9.37	23	1058.8 MSD	330	9.37
4	Primary-B	336	9.35	24	1060.0 Primary-F	324	9.37
5	1052.9 Primary-F	321	9.37	25	Primary-B	343	9.37
6	Primary-B	341	9.37	26	1061.8 Primary-F	319	9.37
7	1053.7 Primary-F	354	9.37	27	Primary-B	337	9.37
8	Primary-B	341	9.37	28	1062.6 Primary-F	337	9.37
9	1054.5 Primary-F	309	9.37	29	Primary-B	334	9.37
10	Primary-B	334	9.37	30	Q.C. spike	340	9.37
11	~~[illegible]~~			31			
12	1058.8 MS	340	9.37	32			
13	1055.3 Primary-F	322	9.37	33			
14	Primary-B	327	9.37	34			
15	1056.1 Primary-F	314	9.37	35			
16	Primary-B	330	9.37	36			
17	1057.0 Primary-F	316	9.37	37			
18	Primary-B	332	9.37	38			
19	1058.8 Primary-F	326	9.37	39			
20	Primary-B	339	9.37	40			

MRB 1/23/91

QC Limits for Area

UPPER LIMIT = +100% of internal standard area
LOWER LIMIT = -50% of internal standard area.

Retention Time QC Limits

Retention time window is +/- 0.50 minutes.

PACE, Inc.

Client Name: ERM - North Carolina
Project Name: LENZ site
Project #: 910112.503
Instr. ID: B

Mid-level Standard-

Date/Time: 1/16/91 3:39 PM
File ID:
Column ID: 30 meter, 0.32 mm I.D. Supelco DB-5

Soil Gas Analysis Internal Standard Area Summary

		Bromofluorobenzene Area	RT			Bromofluorobenzene Area	RT
	Mid-level Std.	356	9.37		Mid-level Std.		
	Upper Limit	712			Upper Limit		
	Lower Limit	178			Lower Limit		
	PACE Sample No.				PACE Sample No.		
1	CS2 blk	349	9.37	21	1072.3 Primary-F	325	9.37
2	1063.4 Primary-F	337	9.38	22	Primary-B	348	9.37
3	Primary-B	330	9.38	23	Q.C. spike	363	9.37
4	1064.2 Primary-F	308	9.38	24	1073.1 Primary-F	337	9.37
5	Primary-B	332	9.38	25	Primary-B	355	9.37
6	1065.0 Primary-F	324	9.37	26	1074.0 Primary-F	339	9.37
7	Primary-B	342	9.37	27	Primary-B	336	9.37
8	1066.9 Primary-F	321	9.37	28	1075.8 Primary-F	335	9.37
9	Primary-B	333	9.37	29	Primary-B	~~56~~ 348	9.37
10	1067.7 Primary-F	320	9.37	30	Q.C. spike	363	9.37
11	Primary-B	333	9.37	31			
12	Q.C. spike	343	9.37	32			
13	1068.5 Primary-F	317	9.37	33			
14	Primary-B	310	9.37	34			
15	1069.3 Primary-F	321	9.37	35			
16	Primary-B	335	9.37	36			
17	1070.7 Primary-F	329	9.37	37			
* 18	Primary-B	—	—	38			
19	1071.5 Primary-F	329	9.37	39			
20	Primary-B	341	9.37	40			

QC Limits for Area
UPPER LIMIT = +100% of internal standard area
LOWER LIMIT = -50% of internal standard area.

Retention Time QC Limits
Retention time window is
+/- 0.50 minutes.

* no internal std expected into sample, reported values taken from ~~also~~ confirmation column (DB-1701) using external calibration

PACE, Inc.

Client Name: ERM - [illegible]
Project Name: [illegible]
Project #: 91011.501
Instr. ID: B

Mid-level Standard-

Date/Time: 11/19/91 1:58 PM
File ID:
Column ID:

Soil Gas Analysis Internal Standard Area Summary

		Bromofluorobenzene Area	RT			Bromofluorobenzene Area	RT
	Mid-level Std.	413	9.37		Mid-level Std.		
	Upper Limit	826			Upper Limit		
	Lower Limit	206			Lower Limit		
	PACE Sample No.				PACE Sample No.		
1	CS2 blk	362	9.37	21	1316.1 Primary-F	338	9.37
2	1226.2 Primary-F	340	9.37	22	Primary-B	349	9.37
3	Primary-B	335	9.37	23	Q.C. spike	357	9.37
4	1227.0 Primary-F	381	9.37	24			
5	Primary-B	356	9.37	25			
6	1228.9 Primary-F	343	9.37	26			
7	Primary-B	352	9.37	27			
8	1229.7 Primary-F	345	9.37	28			
9	Primary-B	353	9.37	29			
10	1230.0 Primary-F	337	9.37	30			
11	Primary-B	393	9.37	31			
12	Q.C. spike	387	9.37	32			
13	1231.4 Primary-F	323	9.37	33			
14	Primary-B	355	9.37	34			
15	1232.7 Primary-F	318	9.37	35			
16	Primary-B	353	9.37	36			
17	1233.5 Primary-F	336	9.37	37			
18	Primary-B	359	9.37	38			
19	1234.3 Primary-F	362	9.37	39			
20	Primary-B	357	9.37	40			

QC Limits for Area

UPPER LIMIT = +100% of internal standard area
LOWER LIMIT = -50% of internal standard area.

Retention Time QC Limits

Retention time window is
+/- 0.50 minutes.

PACE, Inc.

Client Name: ERM - [illegible]
Project Name: LEN2 [illegible]
Project #: 910115 501
Instr. ID: B

Mid-level Standard-

Date/Time: 11/20/91 2:50 A.M.
File ID:
Column ID: 30 meter, 0.32 mm I.D. Supelco DB-5

Soil Gas Analysis Internal Standard Area Summary

		Bromofluorobenzene Area	RT			Bromofluorobenzene Area	RT
	Mid-level Std.	388	9.37		Mid-level Std.		
	Upper Limit	776			Upper Limit		
	Lower Limit	194			Lower Limit		
	PACE Sample No.				PACE Sample No.		
1	1317.0 Primary-F	330	9.37	21	1326 Primary-B	365	9.37
2	Primary-B	357	9.37	22			
3	1318.8 Primary-F	345	9.37	23			
4	Primary-B	353	9.37	24			
5	1319.6 Primary-F	329	9.37	25			
6	Primary-B	348	9.37	26			
7	1320.2 Primary-F	345	9.37	27			
8	Primary-B	349	9.37	28			
9	1321.8 Primary-F	342	9.38	29			
10	Primary-B	348	9.38	30			
11	Q.C. Spike	376	9.38	31			
12	1322.6 Primary-F	378	9.37	32			
13	Primary-B	355	9.37	33			
14	1323.4 Primary-F	351	9.37	34			
15	Primary-B	355	9.37	35			
* 16	1324.2 Primary-F	688	9.37	36			
17	Primary-B	358	9.37	37			
18	1325.0 Primary-F	347	9.37	38			
19	Primary-B	360	9.37	39			
20	1326.9 Primary-F	351	9.37	40			

QC Limits for Area

UPPER LIMIT = +100% of internal standard area
LOWER LIMIT = -50% of internal standard area.

Retention Time QC Limits

Retention time window is +/- 0.50 minutes.

* 1324.2 Primary F was — sample was accidentally injected with 20 ul of the internal std — area count is double normal

PACE, Inc.

nt Name: ERM - North Central
oject Name: LEN2 oil
Project #: 910115 S 01
Instr. ID: B

Mid-level Standard-

Date/Time: 1/23/91 4:00 PM
File ID:
Column ID: 30 meter, 0.32 I.D
Supelco DB-5

Soil Gas Analysis Internal Standard Area Summary

		Bromofluoro-benzene Area	RT			Bromofluoro-benzene Area	RT
	Mid-level Std.	355	9.38		Mid-level Std.		
	Upper Limit	710			Upper Limit		
	Lower Limit	178			Lower Limit		
	PACE Sample No.				PACE Sample No.		
	CS_2 Blk	367	9.38	21			
2	1232.7 (MS) Front	356	9.38	22			
3	Back	345	9.38	23			
	1233.5 (MSD) Front	332	9.38	24			
5	Back	347	9.38	25			
				26			
				27			
8				28			
				29			
10				30			
11				31			
12				32			
13				33			
14				34			
15				35			
16				36			
17				37			
18				38			
19				39			
20				40			

QC Limits for Area
UPPER LIMIT = +100% of internal standard area
LOWER LIMIT = -50% of internal standard area.

Retention Time QC Limits
Retention time window is
+/- 0.50 minutes.

ERM Mobil Central, Inc.

L-1991A

Sample Chain of Custody

W.O No.: 0252JI
Project Name: LENZ OIL
Sampler: BBM, HVJ, CVB

ERM Sample Number	Date	Time	COMP	GRAB	Station Location	Number of Containers	1,2 DCA, 1,2 DCE	TCE, 1,1,1 TCA	Toluene, Xylene				Remarks
													FEDX # 8194625810
1	1/9/91	1650		✓	LO-1A1-SG	1	✓	✓	✓				TWO TUBES PER SAMPLE
2	1/9/91	1730		✓	LO-1A1-SGFB	1	✓	✓	✓				CONTAINER.
3	1/9/91	1700		✓	LO-1-SGTB1	1	✓	✓	✓				
													ALL SAMPLES COOLED
													AT 4°C.
				*	7 DAY TURNAROUND								LO-1A1-SG (PRIMARY - LOT # CT-1625)
				*	FOLLOW LENZ OIL SOP								" " (SECONDARY-LOT # CT-1629)
					FOR SOIL GAS ANALYSIS								LO-1A1-SGFB (PRIMARY LOT # CT-1630)
													" " (SECONDARY LOT # CT 1528)
													LO-1-SGTB1 - LOT # CT-1561 & # CT-1565

Sample Relinquished by:	Date	Time	Sample Received by:	Date	Time	Reason for Transfer
[illegible] CT3200	1/9/91	1845	Fed-X	1-9-91	1845	Shipping
			Madeline Mullen	1/10	9:45	

YES. White & Yellow copies accompany sample shipment to laboratory. Yellow copy retained by laboratory. White copy to be returned to ERM for files. Pink copy retained by sampler. Gold copy extra copy as needed.

ERM-North Central, Inc.

COC# - LO1101/D

Sample Chain of Custody

W.O.No.: 0252JI

Project Name: LENZ OIL

Sampler: BBM, HVJ, CJB, DPE

FEDX# 8194625795

ERM Sample Number	Date	Time	COMP	GRAB	Station Location	Number of Containers	1,2 DCA, 1,2 DCE	TCE, 1,1,1 TCA	TOLUENE, XYLENE				Remarks
1	1/10/91	11:00		✓	LO-1A2-SG 1050.2	1	✓	✓	✓				PRIMARY Lot# CT 1592, Sec.# - CT 1595
2		1106		✓	LO-1A3-SG 1051.0	1	✓	✓	✓				PRIMARY Lot# CT 1556, Sec.# - CT 1594
3		1111		✓	LO-1A4-SG 1052.9	1	✓	✓	✓				PRIMARY Lot# CT 1589, Sec.# - CT 1593
4		1116		✓	LO-1A4-SGFS 1053.7	1	✓	✓	✓				PRIMARY Lot# CT 1591, Sec.# - CT 1586
5		1247			LO-1A5-SG 1054.5	1	✓	✓	✓				PRIMARY Lot# CT 1562, Sec.# - CT 1587
6		1240			LO-1A7-SG 1055.3	1	✓	✓	✓				PRIMARY Lot# CT 1590, Sec.# - CT 1588
													- ALL SAMPLES COOLED AT 4°C
				*	7 DAY TURNAROUND								- TWO TUBES PER SAMPLE
				*	FOLLOW LENZ OIL SOP								CONTAINER
					FOR SOIL GAS ANALYSIS								

Sample Relinquished by:	Date	Time	Sample Received by:	Date	Time	Reason for Transfer
[signature]	1/10/91	1900	FEDX	1/10/91	1900	SHIPPING
			[signature]	1/12/91	1100	

COPIES White & Yellow copies accompany sample shipment to laboratory. Yellow copy retained by laboratory. White copy to be returned to ERM for files. Pink copy retained by sampler. Gold copy extra copy as needed.

ERM-North Central, Inc.

[illegible]

Sample Chain of Custody

W.O.No.: 0252JI

Project Name: LENZ OIL

Sampler: BBM, DPE, HVJ, CJB

FED X# 8194625795

ERM Sample Number	Date	Time	COMP	GRAB	Station Location	Number of Containers	1,2 DCA, 1,2 DCE	TCE, 1,1,1 TCA	TOLUENE, XYLENE				Remarks
7	1/10/91	1615		X	LO-1A6-SG 1056.1	1	✓	✓	✓				PRIMARY Lot# CT 1574 Sec.# CT 1566
8		1620		✓	LO-1A8-SG 1057.0	1	✓	✓	✓				PRIMARY Lot# CT 1564 Sec# CT 1560
9		1619		✓	LO-1A8-SGMS 1058.8	2	✓	✓	✓	(MS/MSD)			PRIMARY Lot# CT 1567 1571 Sec# CT 1569 1575
10		1631		✓	LO-1A9-SG BBM 1059.6	1	✓	✓	✓				PRIMARY Lot# CT 1573 Sec# CT 1570
11		1715		✓	LO-1B9-SG 1060.0	1	✓	✓	✓				PRIMARY Lot# CT 1645 Sec# CT 1572
12		1640		✓	LO-1B9-SGFB 1061.8	1	✓	✓	✓				PRIMARY Lot# CT 1568 Sec# CT 1649
13		1610		✓	LO-1-SGTB2 1062.6	1	✓	✓	✓	BBM			~~PRIMARY Lot# CT~~ BBM ~~Sec# CT~~
				*	7 DAY TURNAROUND								– ALL SAMPLES COOLED AT 4°C
				*	FOLLOW LENZ OIL SOP								– TWO TUBES PER SAMPLE
					FOR SOIL GAS ANALYSIS								CONTAINER

Sample Relinquished by:	Date	Time	Sample Received by:	Date	Time	Reason for Transfer
[signature]	1/10/91	1900	FED-X	1/10/91	1900	SHIPPING
			MSL-Pace	1/12/91	1100	

COPIES: White & Yellow copies accompany sample shipment to laboratory. Yellow copy retained by laboratory. White copy to be returned to ERM for files. Pink copy retained by sampler. Gold copy extra copy as needed.

ERM-North Central, inc.

COC# L011191C

Sample Chain of Custody

W.O. No.: 0252JI | Project Name: LENZ OIL

Sampler: BBM, HVJ CJB, DPE 013904

FEDX# 8194625806

ERM Sample Number	Date	Time	COMP	GRAB	Station Location	Number of Containers	1,2DCA, 1,2DCE	TCE, 1,1,1 TCA	TOLUENE, XYLENE				Remarks
1	1/11/91	1043		✓	LO-1B1-SG 1063.4	1	✓	✓	✓				PRIMARY LOT#CT 1598 SEC#CT 1612
2		1047		✓	LO-1B2-SG 1064.2	1	✓	✓	✓				PRIMARY LOT#CT ~~1644~~ 1644 BBM SEC#CT 1651
3		1050		✓	LO-1B3-SG 1065.0	1	✓	✓	✓				PRIMARY LOT#CT 1646 SEC#CT 1651
4		1054		✓	LO-1B4-SG 1066.9	1	✓	✓	✓				PRIMARY LOT#CT 1706 SEC#CT 1610
5		1057		✓	LO-1B5-SG 1067.7	1	✓	✓	✓				PRIMARY LOT#CT 1609 SEC#CT 1613
6		1200		✓	LO-1B6-SG 1068.5	1	✓	✓	✓				PRIMARY LOT#CT 1640 SEC#CT 1636
7		1101		✓	LO-1B7-SG 1069.3	1	✓	✓	✓				PRIMARY LOT#CT 1614 SEC#CT 1611
				*	7 DAY TURNAROUND								- ALL SAMPLES COOLED AT 4°C
				*	FOLLOW LENZ OIL SOP FOR SOIL GAS ANALYSIS								- TWO TUBES PER SAMPLE CONTAINER

Sample Relinquished by:	Date	Time	Sample Received by:	Date	Time	Reason for Transfer
B. Bl[illegible]	1/11/91	1900	FEDX	1/11/91	1900	SHIPPING

COPIES: White & Yellow copies accompany sample shipment to Laboratory. Yellow copy returned by Laboratory. White copy to be returned to ERM for files. Pink copy retained by sampler. Gold copy extra copy as needed.

ERM North Central, Inc.

COC # LC 119193

Sample Chain of Custody

W.O.No.: 0252JI

Project Name: LENZ OIL

Sampler: BBM, HWJ, CJB, DPE

FEDX# 8194625806

ERM Sample Number	Date	Time	COMP	GRAB	Station Location	Number of Containers	1,2 DCA, 1,2 DCE	TCE, 1,1,1 TCA	TOLUENE, XYLENE			Remarks
8	1/11/91	1400		✓	LO-1C1-SGFB 1070.7	1	✓	✓	✓			PRIMARY Lot#CT 1615 Sec#CT *
9		1738		✓	LO-1C1-SG 1071.5	1	✓	✓	✓			PRIMARY Lot#CT 1635 Sec#CT 1637
~~10~~				✓	~~LO-1C2-SG~~	~~1~~	✓	✓	✓			~~PRIMARY Lot#CT Sec#CT~~ BBM
~~11~~		~~1500~~		✓	~~LO-1C3-SG~~	~~1~~	✓	✓	✓			~~PRIMARY Lot#CT Sec#CT~~ BBM
12		1457		✓	LO-1C4-SG 1072.3	1	✓	✓	✓			PRIMARY Lot#CT 1576 Sec#CT 1592
13		1453		✓	LO-1C4-SGFS 1073.1	1	✓	✓	✓			PRIMARY Lot#CT 1583 Sec#CT 1588
14		1500		✓	LO-1C5-SG 1074.0	1	✓	✓	✓			PRIMARY Lot#CT 1634 Sec#CT 1538
15		1630		✓	LO-1-SGTB3 1075.8	1	✓	✓	✓			- ALL Samples cooled at 4°C
				*	7 DAY TURNAROUND							- Two tubes per sample container
				*	FOLLOW LENZ OIL SOP FOR SOIL GAS ANALYSIS							

Sample Relinquished by:	Date	Time	Sample Received by:	Date	Time	Reason for Transfer
[signature]	1/11/91	1900	FED X	1/11/91	1900	SHIPPING

* SECONDARY SAMPLE FOR LO-1C1-SGFB BROKE

COPIES: White & Yellow copies accompany sample shipment to laboratory. Yellow copy retained by laboratory. White copy to be returned to ERM for files. Pink copy retained by sampler. Gold copy extra copy as needed.

ERM North Central, Inc.

(CT#'s 91-1597)

Sample Chain of Custody

W.O.No.: 0252 JI | Project Name: LENZ OIL

Sampler: BBM, HVJ, CTB, DPE

FEDX # 8194625736

ERM Sample Number	Date	Time	COMP	GRAB	Station Location	Number of Containers	1,2 DCA, 1,2 DCE	TCE, 1,1,1 TCA	TOLUENE, XYLENE				Remarks
1	1/12/91	1045		✓	LO-1C2-SG	1	✓	✓	✓		26.2		Primary Lot #CT 1597, Sec #CT 1605
2		1129		✓	LO-1C3-SG	1	✓	✓	✓		27.0		Primary Lot #CT 1599, Sec #CT 1580
3		1310		✓	LO-1C6-SG	1	✓	✓	✓		28.9		Primary Lot #CT 1596, Sec #CT 1604
4		1316		✓	LO-1C6-SGFS	1	✓	✓	✓		29.7		Primary Lot #CT 1578, Sec #CT 1584
5		1423		✓	LO-1B8-SGFB	1	✓	✓	✓		30.0		~~Primary Lot #CT~~, ~~Sec #CT~~ } NO CT #'s
6		1613		✓	LO-1B8-SG	1	✓	✓	✓		31.9		~~Primary Lot #CT~~, ~~Sec #CT~~
7		1620		✓	LO-1B8-SGMS	2	✓	✓	✓		32.7		~~Primary Lot #CT~~, ~~Sec #CT~~
8		1435		✓	LO-1-SGTB4	1	✓	✓	✓		33.5 / 34.3		~~Lot #'s~~
		* 7 DAY TURNAROUND										—	ALL SAMPLES COOLED AT 4°C
		*FOLLOW LENZ OIL SOP FOR SOIL GAS ANALYSIS										—	TWO TUBES PER SAMPLE CONTAINER

Sample Relinquished by:	Date	Time	Sample Received by:	Date	Time	Reason for Transfer
[signature]	1/12/91		FEDX Madeline Muller	1/12/91 '/14		SHIPPING

*SAMPLE LO-1C1-SG WAS TAKEN AT 1800 HOURS INSTEAD OF 1738 AS LABEL SHOWS AND COC FROM 1/11/91. THE SAMPLE VOLUME SHOULD BE ADJUSTED TO 294 LITERS INSTEAD OF THE 25 LITERS THE SOP REQUIRES. PLEASE ANALYZE ACCORDINGLY.

COPIES White & Yellow copies accompany sample shipment to laboratory. Yellow copy retained by laboratory. White copy to be returned to ERM for files. Pink copy retained by sampler. Gold copy extra copy as needed.

ERM-WEST, INC.

COC # [illegible]

Sample Chain of Custody

W.O. No.: 0252 JL

Project Name: LENZ OIL

Sampler: HVJ, CJB, DPE

FED X #
8194625725

ERM Sample Number	Date	Time	COMP	GRAB	Station Location	Number of Containers	1,2-DCA, 1,2-DCE	1,1,2-TCE, 1,1,1-TCA	m,p-Xylene, m-Xylene	1,2,4-TMB, 1,3,5-TMB	1,2-DCB, 1,4-DCB		Remarks
1	1/14/91	1140		✓	L01C7SG 1316.1	1	✓	✓	✓				NO CT #'S FOR THIS
2		1107		✓	L01C8SG 1317.0	1	✓	✓	✓				BATCH OF SAMPLES
3		1105		✓	L01C9SG 1318.8	1	✓	✓	✓				
4		1057		✓	L01C10SG 1319.6	1	✓	✓	✓				ALL SAMPLES COOLED TO 4°C
5		1101 1045		✓	L01C10SGFD 1320.0	1	✓	✓	✓				
6		1045		✓	L01C10SGFB 1321.8	1	✓	✓	✓				
7		16:16		✓	L01C11SG 1322.6	1	✓	✓	✓				
8		15:32		✓	L01C12SG 1323.4	1	✓	✓	✓				
9		15:38		✓	L01C13SG 1324.2	1	✓	✓	✓				
10		15:48		✓	L01C14SG 1325.0	1	✓	✓	✓				
11		16:30		✓	L01SGTB5 1326.9	1	✓	✓	✓				

Sample Relinquished by:	Date	Time	Sample Received by:	Date	Time	Reason for Transfer
[signature]	1/14/91		FED X	1/14/91		SHIP TO LAB

COPIES: White & Yellow copies accompany sample shipment to laboratory. Yellow copy retained by laboratory. White copy to be returned to ERM for file. Pink copy retained by sampler. Gold copy extra copy as needed.

APPENDIX D

DEVIATIONS FROM THE APPROVED SOIL INVESTIGATION

CHANGES IN THE SAMPLE COLLECTION METHODOLOGY AND WORK PLAN
SOIL BORINGS CONDUCTED AT THE LENZ OIL SERVICE SITE
PHASE I REMEDIAL INVESTIGATION/FIELDWORK = 1/91-2/91

	Changes in the Field	Work Plan	Justification
1	Visqueen liner was punctured at 4 boreholes: SB-11 SB-5 SB-7 SB-6 Backfilled with bentonite pellets to seal perforation	The samping will be limited to shallow depths to avoid puncturing the visqueen liner and possibly allowing contaminated groundwater to migrate into the clean backfill	As directed by IEPA Project Manager
2	Used high pressure hot water cleaning equipment	Pressurized steam cleaning equipment	Standard Operating Procedures (SOP) for IEPA Drill Rig when decontaminating equipment and supplies
3	The 3 MS/MSD samples were not designated in the field	Field samples will be collected and designated for matrix spike/matrix spike duplicate (MS/MSD) analysis	Instructed by laboratory that they would select randomly the sample to test
4	SB-01, SB-02, and SB-03 were moved several feet to the Northeast	Need to receive approval from U.S. EPA through ERM-North Central, Inc. to make changes in the work plan/sampling and analysis plan	Moved due to the presence of a major gas pipeline in the areas designated as collection points
5	Started at SB-01 on the west side of the site. U.S. EPA requested that work be initiated on the east side	Not Addressed	Historical information indica ed that construction debris and chemical contamination were more likely located on the east side. Therefore to prevent cross-contamination, work was initiated on the west side.

6	Used a 2-foot split spoon sampler with 4 six-inch brass liners to sample at 7.5 to 9.5 feet of SB-22. Sampling methodology was not the one specified in the QAPjP. There was no U.S. EPA oversight when sample was taken.	Continuous sampler	High OVA readings forced delays in sampling due to health and safety reasons. A field sample was taken for qualitative purposes since the U.S. EPA oversight contractor was not notified that field activities had resumed
7	Samples SB-23, SB-16, SB-15, SB-21, SB-14, and SB-18 were damaged during transit, therefore breaking the Chain-of-Custody		At the Chicago airport, TWA broke the seal to check the coolers for bombs due to the increased security precautions as a result of the Iraq war. Resampling at these borehole locations was done.
8	SB-12 moved several feet to the west	Need to receive approval from U.S. EPA through ERM-North Central, Inc. for changes in the work plan	OVA readings greater than 1,000 with strong odors and white smoke coming out of the hollow-stem augers at the original SB-12 location
9	Used IEPA Field Boring Log	Specifies Geologic Drill Log in Figure 2-5 of the Data Management Plan	Substitution directed by IEPA Project Manager
10	Only 1 field blank for VOCs (2 X 40 ml) was taken	Should have taken a minimum of 5 field blanks (1 field blank/10 samples). All parameters were to be collected: (a) TCL volatile (b) TCL semivolatile organics TCL PCBs TCL Pesticides (c) TAL Metals TAL Cyanide	Oversight by IEPA Project Manager
11	Trip blank taken	Trip blanks are not required for soil samples	

12	The IEPA Chain-of-Custody was used	The Chain-of-Custody from ERM-North Central, Inc. was specified in the QAPjP (Figure 5-5)	IEPA personnel were familiar with the Agency's Chain of Custody
13	Trip blanks were not included on sample tracking form or field data form		Oversight by IEPA Project Manager
14	Several entries on field data forms were corrected by scribbling out error	Errors were to be corrected by crossing out with 1 line	Oversight by IEPA Project Manager
15	There were 17 soil intervals not sampled	Specified by Work Plan	See attached table for explanation
16	Used depth of soil interval as part of the soil coding	Depths wee to be identified by letter codes	Due to the variation in soil intervals collected in the field, it was determined by the IEPA geologist that actual depths should be utilized to avoid confusion
17	Field Blank on sample tracking form should not have depth designation		Oversight by IEPA Project Manager
18	Two intervals: SB-21 9.5'-14.5' SB-22 7.5'-9.5' were not analyzed for all parameters specified in the Work Plan		See attached table for explanation
19	Sample analysis request form (Figure 3-2 in Data Management Plan) was not utilized	Specifies the use of this form	IEPA Chain-of-Custody includes the information
20	Corrective action form (Figure 13-1 in QAPjP) was not used		

CHANGES IN THE SAMPLE COLLECTION METHODOLOGY AND WORK PLAN
SEDIMENT AND OFF-SITE SOIL SAMPLING CONDUCTED AT THE LENZ OIL SERVICE SITE
PHASE I REMEDIAL INVESTIGATION/FIELDWORK = 1/91-2/91

	Changes in the Field	Work Plan	Justification
1	A decontaminated stainless steel spoon and bucket were used to collect the samples. Sampler wore long neoprene gloves.	A stainless stell Eckman dredge or hand auger will be used to obtain bottom sediment grab samples at the center point of each cross-section if surface water is present in the ditch. If no water is present in the ditch, a stainless steel trowel or hand auger will be used to collect a sediment grab sample	Substitution directed by IEPA Project Manager
2	Used high pressure hot water cleaning equipment	Pressurized steam cleaning equipment	Standard Operating Procedures (SOP) for IEPA Drill Rig when decontaminating equipment and supplies
3	MS/MSD samples were not designated in the field for volatile organics and semivolatile organic parameters	Field samples will be collected and designated for matrix spike/matrix spike duplicate (MS/MSD) analysis	Instructed by laboratory that they would select randomly the sample to test
4	A trip blank for sediments and a trip blank for surface soils were collected	Trip blanks were not required for either soil or sediment samples	Oversight by IEPA Project Manager
5	Only 1 field blank for VOCs (2 X 40 ml) was taken	All parameters were to be collected: (a) TCL volatile (b) TCL semivolatile organics TCL PCBs TCL Pesticides (c) TAL Metals TAL Cyanide	Oversight by IEPA Project Manager

6	The IEPA Chain-of-Custody was used	The Chain-of-Custody from ERM-North Central, Inc. was specified in the QAPjP (Figure 5-5)	IEPA personnel were familiar with the Agency's Chain of Custody
7	Sample analysis request form (Figure 3-2 in Data Management Plan) was not utilized	Specifies the use of this form	IEPA Chain-of-Custody includes the information
8	Corrective action form (Figure 13-1 in QAPjP) was not used		Oversight by IEPA Project Manager
9	The trip blanks taken were not included on the sample tracking form or field data form		Oversight by IEPA Project Manager

CHANGES IN THE SAMPLE COLLECTION METHODOLOGY AND WORK PLAN
SURFACE WATER SAMPLING CONDUCTED AT THE LENZ OIL SERVICE SITE
PHASE I REMEDIAL INVESTIGATION/FIELDWORK = 1/91-2/91

	Changes in the Field	Work Plan	Justification
1	Approximately 12 to 14 inches of ice was chopped through to get to the	Not addressed	Due to freezing conditions, an axe was required in order to reach the sampling point
2	Used high pressure hot water cleaning equipment	Pressurized steam cleaning equipment	Standard Operating Procedures (SOP) for IEPA Drill Rig when decontaminating equipment and supplies
3	MS/MSD samples were not designated in the field for volatile organics and semivolatile organic parameters	Field samples will be collected and designated for matrix spike/matrix spike duplicate (MS/MSD) analysis	Instructed by laboratory that they would select randomly the sample to test
4	Extra volume was not collected for MS/MSD analysis of volatile organics and semivolatile organics	Triple the volatile organics sample volume and double the semivolatile organics sample volume	Oversight by IEPA Project Manager
5	Only 1 field blank for VOCs (2 X 40 ml) was taken	All parameters were to be collected: (a) TCL volatile (b) TCL semivolatile organics TCL PCBs TCL Pesticides (c) TAL Metals TAL Cyanide	Oversight by IEPA Project Manager
6	The IEPA Chain-of-Custody was used	The Chain-of-Custody from ERM-North Central, Inc. was specified in the QAPjP (Figure 5-5)	IEPA personnel were familiar with the Agency's Chain of Custody
7	SW03FDTB on the IEPA Chain-of-Custody should read SW03TB		Oversight by IEPA Project Manager

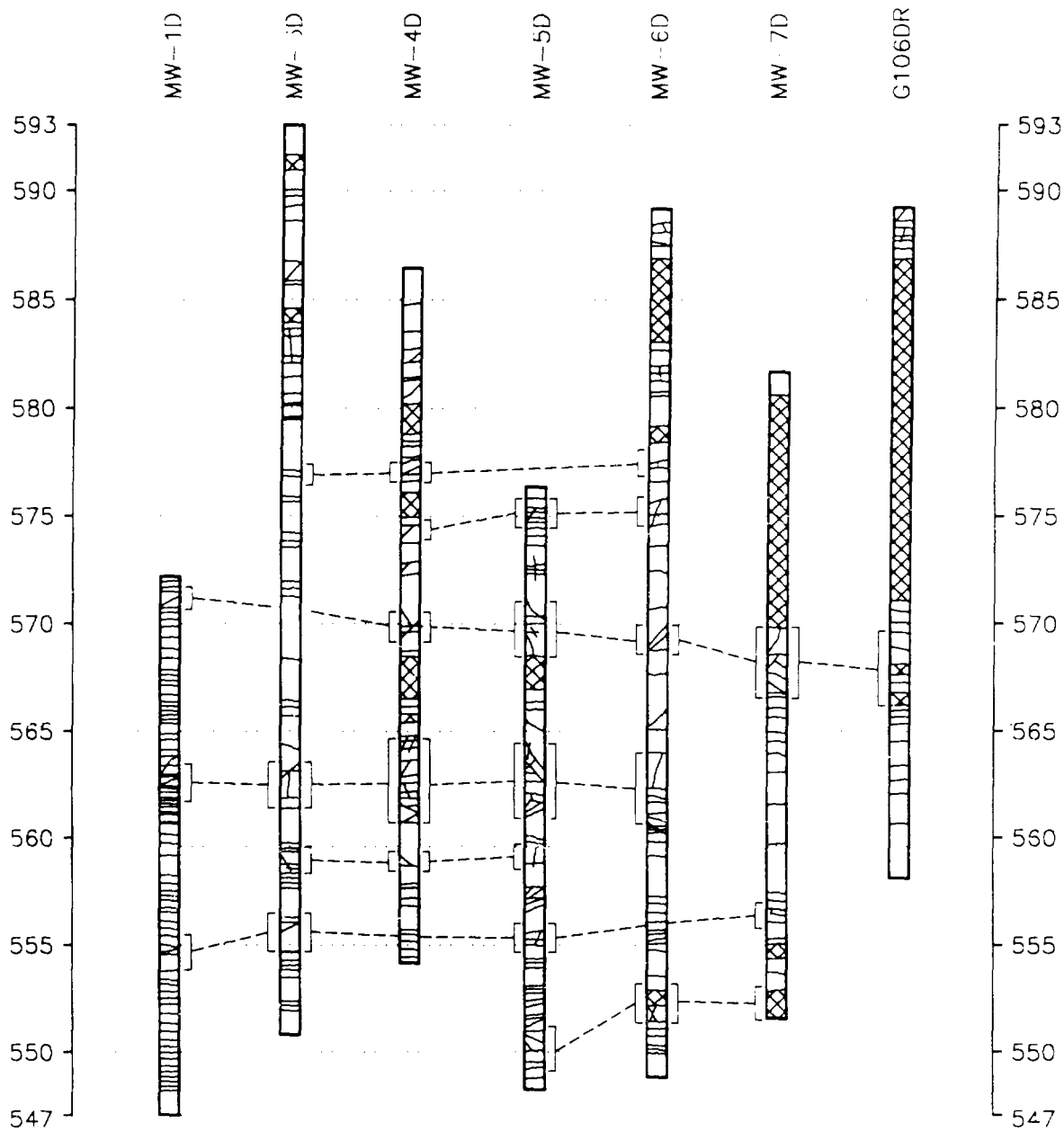
8	Seven trip blanks were taken		Could have prepared shipment so only 1 trip blank would have been required (1 trip blank/cooler)
9	Sample analysis request form (Figure 3-2 in Data Management Plan) was not utilized	Specifies the use of this form	IEPA Chain-of-Custody includes the information
10	Corrective action form (Figure 13-1 in QAPjP) was not used		Oversight by IEPA Project Manager

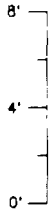
CHANGES IN THE SAMPLE COLLECTION METHODOLOGY AND WORK PLAN
HEALTH AND SAFETY PLAN
PHASE I REMEDIAL INVESTIGATION/FIELDWORK = 1/91-2/91

	Changes in the Field	Work Plan	Justification
1	Personal Safety Certification Form and Site Safety Meeting Log in the Data Management Plan were not completed by personnel on-site	Required in Work Plan	Oversight by IEPA Project Manager
2	Visitor and Employee Log Daily Sign-In/ Sign-Out sheets were not maintained	Required in Work Plan	Oversight by IEPA Project Manager
3	Certification of Completion of Initial, Site-Specific Health & Safety Training forms in the Health & Safety Plan were not completed by personnel working on-site	Required in Work Plan	Oversight by IEPA Project Manager

APPENDIX E

FRACTURE ANALYSIS





VERTICAL SCALE: 1 INCH=8 FEET
UNITS IN FEET ABOVE MEAN SEA LEVEL

SYMBOL LEGEND:

- HORIZONTAL FRACTURES
- HIGH ANGLE FRACTURES
- RUBBLY ZONE
- CORRELATED FRACTURE ZONE

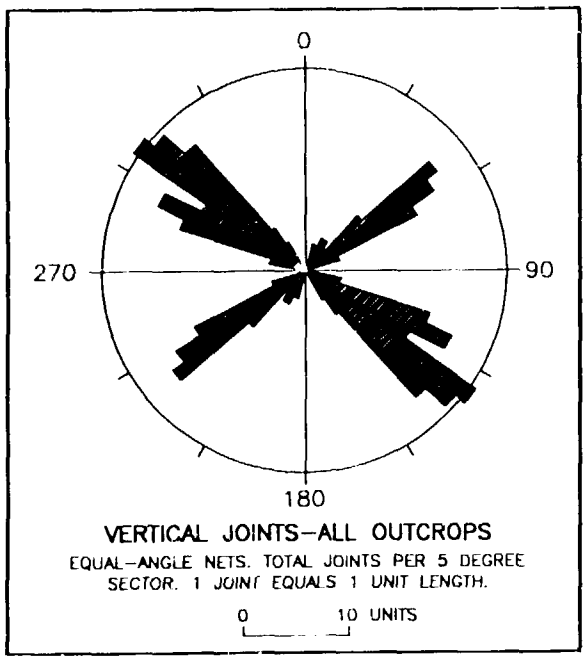
FIGURE E-4

SITE-SPECIFIC FRACTURE DATA
LENZ OIL SITE
LEMONT, ILLINOIS

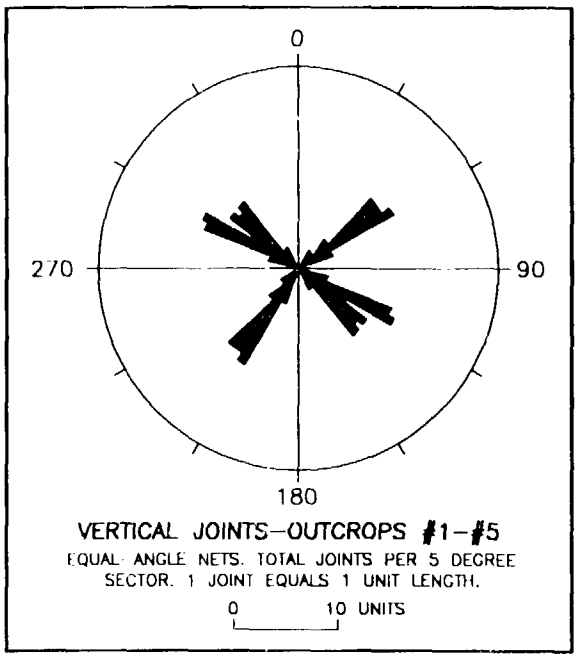
ERM

CLIENT NAME:	LENZ OIL
APPROVED:	
DATE:	10/14/92
CHECKED:	
DRAWN:	MO
REPORT:	RI
PROJECT:	0252-7

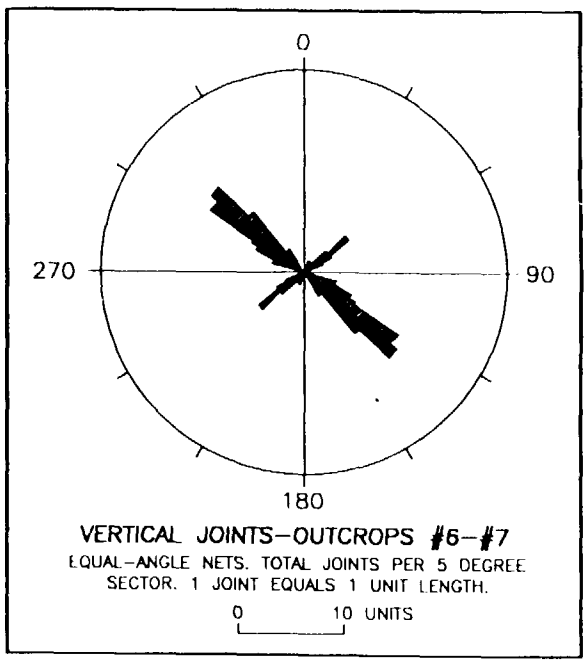
PROJECT:	REPORT:	DRAWN	CHECKED	DATE:	APPROVED
0252	TM1	MO		10/8/92	



A



B



C

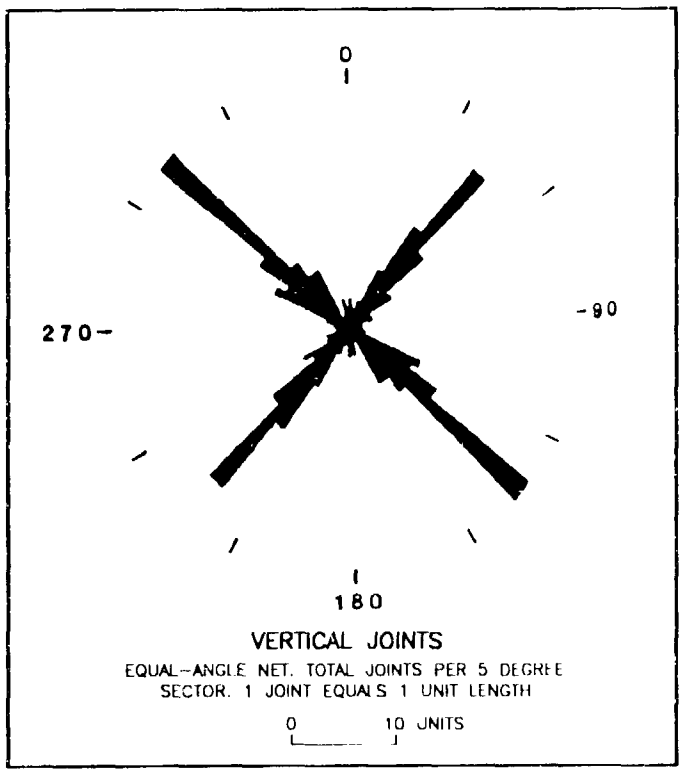
NOTE: ORIENTATIONS ARE IN DEGREES AZIMUTH.
ZERO DEGREES IS TRUE NORTH.

FIGURE E-3

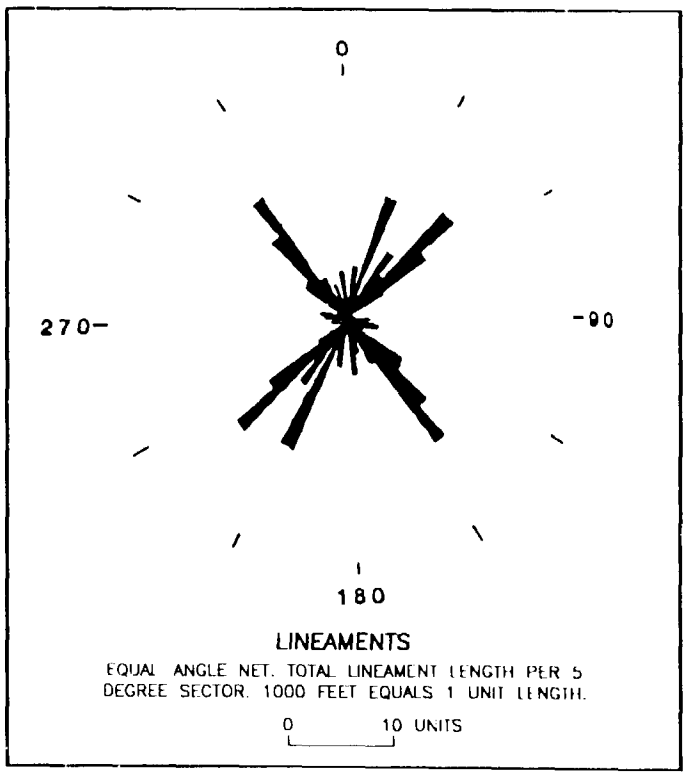
ERM-NORTH CENTRAL, INC., VERTICAL JOINT ORIENTATION DATA LEMONT, ILLINOIS AREA

ERM

PROJECT:	REPORT:	DRAWN	CHECKED	DATE	APPROVED
0252	TM1	MO		10/8/92	



A



B

NOTE: ORIENTATIONS ARE IN DEGREES AZIMUTH; ZERO DEGREES IS TRUE NORTH. MODIFIED FROM NICHOLAS AND HEALY (1988).

FIGURE E-1

UNITED STATES GEOLOGICAL SURVEY
VERTICAL JOINT AND LINEAMENT
ORIENTATION DATA
LEMONT, ILLINOIS AREA

ERM

TABLE E-1

VERTICAL JOINT ORIENTATION DATA
LEMONT, ILLINOIS AREA
(Page 3 of 3)

Joint Azimuth Degree	All Outcrops	Outcrops #1-#5 [1]	Outcrops #6 and #7 [2]
145-150	24	12	12
150-155	7	3	4
155-160	5	3	2
160-165	1	1	0
165-170	1	0	1
170-175	0	0	0
175-180	3	2	2
Total	278	167	111

Notes:

(1) Outcrops #1 through #5 are located near the Calumet Sag Channel and may have been disturbed by construction activities.

(2) Outcrops #6 and #7 are located away from the Calumet Sag Channel and are probably undisturbed.

TABLE E-1

VERTICAL JOINT ORIENTATION DATA
LEMONT, ILLINOIS AREA
(Page 2 of 3)

Joint Azimuth Degree	All Outcrops	Outcrops #1-#5 (1)	Outcrops #6 and #7 (2)
70-75	1	0	1
75-80	0	0	0
80-85	1	1	0
85-90	0	0	0
90-100	2	2	0
100-105	1	1	0
105-110	2	2	0
110-115	5	4	1
115-120	5	4	1
120-125	19	14	5
125-130	23	15	8
130-135	17	8	9
135-140	29	12	17
140-145	29	11	18

TABLE E-1

VERTICAL JOINT ORIENTATION DATA
LEMONT, ILLINOIS AREA
(Page 1 of 3)

Joint Azimuth Degree	All Outcrops	Outcrops #1-#5 (1)	Outcrops #6 and #7 (2)
0-5	1	1	0
5-10	1	1	0
10-15	3	2	1
15-20	3	1	2
20-25	5	3	2
25-30	2	2	0
30-35	3	2	1
35-40	4	3	1
40-45	11	6	5
45-50	24	15	9
50-55	20	15	5
55-60	19	16	3
60-65	6	5	1
65-70	1	1	0

A major fracture zone with a thickness between 1.0 and 2.8 feet was also encountered at an elevation between 568 and 571 feet in all of the cores, except MW-3D. However, three horizontal fractures are present in the MW-3D core at this elevation. This fracture zone probably represents one of the major regional fracture zones identified by Nicholas and Healy (1988), who reported the presence of a major horizontal fracture zone at an elevation of 565 feet.

The deepest set of major horizontal and vertical fractures that was observed during the RI is located at an elevation of 562 to 563 feet. This fracture zone, which was identified in cores from MW-1D, MW-3D, MW-4D, and MW-5D, is composed primarily of high-angle fractures with thicknesses that range from 1.1 to 1.7 feet.

As shown on Figure E-4, minor fracture zones occur at elevations of 551, 555, and 559 feet. These minor fracture zones are generally thin and not as laterally persistent as the major fracture zones.

12 inches. The spacing for the secondary joints ranges from 8 to 24 inches and averages approximately 14 inches. The length and depth of the joints could not be accurately discerned because of limited bedrock exposure. Where present, the tertiary joints are prominent and laterally extensive, but they were infrequently observed.

The site-specific fracture data from the borings (Figure E-4) revealed the presence of several discrete fracture zones that can be correlated between cores. The shallowest fracture zone occurs in borings MW-3D, MW-6D, and G106DR at an average elevation of 587 feet. This fracture zone ranges from 0.5 to 1.4 feet in thickness and is composed primarily of horizontal fractures. Because the top of the bedrock is below 587 feet at the other boring locations, this fracture zone does not appear in the other cores.

The next major fracture series occurs in the cores from MW-3D, MW-4D, MW-6D, and possibly MW-7D and G106DR. This fracture zone varies in thickness from 0.3 to 0.8 of a foot and is composed of a combination of horizontal and high-angle fractures. Because the rock quality in MW-7D and G106DR is very poor at the elevation of this fracture series, positive identification of the fracture series in these cores was not possible.

At an elevation of 574 feet, a minor fracture zone was identified in three of the six cores that intersected this elevation. The fracture zone was apparent in borings MW-4D, MW-5D, and MW-6D at a thickness of 0.6 to 1.2 feet. Although the fracture zone is not obvious in boring MW-3D, four horizontal bedding planes were logged at the same elevation in boring MW-3D. Because weathered rubble was present in boring MW-7D and G106DR at an elevation of 574 feet, the fracture zone could not be identified.

Because the bimodal distribution may be a result of construction activities along the Calumet Sag Channel, ERM-North Central separated these data into two groups: (1) measurements collected near the channel (i.e., Outcrops #1 through #5) and measurements collected away from the channel (i.e., Outcrops #6 and #7). The measurement data from each group were tabulated (Table E-1) and plotted on rose diagrams (Figures E-3b and E-3c). The primary joint set measurements taken from outcrops near the channel (Figure E-3b) show the same bimodal distribution as the entire data set (Figure E-3a). However, the primary joint set data collected from the outcrops away from the channel form a single node at 130-degree to 150-degree (Figure E-3c). This suggests that joints exhibiting an orientation of 115-degree to 125-degrees are only found along the Calumet Sag Channel and, thus, may be artifacts of blasting and construction along the channel and not representative of natural conditions. The joint orientation data from outcrops away from the channel (Figure E-3c) are the least likely to have been affected by man-made causes and, thus, are considered the most representative of the regional vertical joint orientation patterns. These data suggest the presence of: (1) a primary joint set with an average azimuth of 135 degree, (2) a secondary joint set oriented at right angles to the primary joint set with an average azimuth of 45 degree, and (3) a minor tertiary joint set with an average azimuth of 20 degree. These results are very similar to the vertical joint orientation results reported by Nicholas and Healy (1988).

Because no information regarding the spacing and width of the vertical joints was found in the published literature, ERM-North Central collected these measurements from the previously described seven outcrops. The width (or aperture) of the primary and secondary joints varies from tightly closed to approximately 4 inches, and the exposed joints are generally wider than the unexposed joints, as a result of weathering. The spacing for the primary joints ranges from 0.5 to 36 inches and averages approximately

Nicholas and Healy (1988) have classified all of the horizontal joints in the area of study into two groups: subregional and regional. Joints that are areally extensive are considered regional joints; whereas joints that are located in bedrock highs and truncated at the bedrock surface are classified as subregional joints. The subregional joints are more commonly filled with glacial sediment than the regional joints. Based on their interpretation of borehole geophysical logs, Nicholas and Healy (1988) have identified major regional joints at elevations of approximately 415, 440, 525, 550, and 565 feet above sea level.

ERM-NORTH CENTRAL INVESTIGATION

As proposed in Section 5.1.9 of the Lenz Oil Remedial Investigation/Feasibility Study (RI/FS) Work Plan, Environmental Resources Management-North Central, Inc. (ERM-North Central) conducted: (1) a regional fracture analysis to independently verify the findings of previous investigations, and (2) a site-specific fracture analysis to evaluate the nature of fractures below and downgradient of the site (ERM-North Central, 1990a). These field investigations were conducted between March 16 and April 7, 1991.

ERM-North Central performed a reconnaissance of the area within approximately 1.5 miles of the site to locate outcrops of the Silurian dolomite to be used for the collection of the regional fracture data. The Des Plaines River Channel, the Chicago Sanitary and Ship Canal, the Illinois and Michigan Canal, and the Calumet Sag Channel were all investigated for bedrock exposures. Silurian dolomite outcrops were observed in many areas along these canals and channels, but many of the outcrops appeared to have been disturbed by construction activities. The best undisturbed bedrock exposures were found at or near the Sag Quarries Recreation Area in the Palos Forest Preserve (T37N,

degrees. The rose diagram of the lineaments reveals three major sets: two of which correspond to the vertical joint sets and one that is oriented at 20 degrees azimuth and has no apparent analogy among the vertical joint sets.

Zeizel and others (1962) and Foote (1982) have shown that the frequency and aperture of vertical joints in the vicinity of the Lenz Oil site decrease with depth below the bedrock surface. This interpretation is based on the assumption that private wells are generally set opposite the most productive portion of an aquifer, which would be the most highly fractured portion of the aquifer in the case of the Silurian dolomite. By plotting well frequency versus depth of penetration into the Silurian dolomite, Zeizel and others (1962) concluded that the upper 60 feet of the dolomite is the most productive portion of the aquifer. Although unconfirmed by direct field measurements, significant fractures probably extend at least 60 feet into the dolomite; however, this conclusion is preliminary and may not accurately describe the bedrock below the Lenz Oil site.

According to Nicholas and Healy (1988), horizontal joints along bedding planes are evident in outcrops and in borings drilled at the low-level radioactive waste disposal site. Outcrops along the northern side of the Des Plaines River Valley display prominent horizontal joints that are hundreds of feet long. Many of the joints are weathered, and some are several inches wide. Because the correlation of horizonal joints between borings at the low-level radioactive waste disposal site is excellent, the joints are likely to be continuous for at least 1,600 feet in the subsurface (Nicholas and Healy, 1988). The apertures of the subsurface horizonal joints were measured to be as wide as 2 feet. There is also evidence that many horizontal joints have been infilled with sediment ranging in size from clay to sand.

on the crest of the Kankakee Arch. Joints in the brittle Silurian dolomite occur in three mutually orthogonal sets, two of which are vertical and one of which is horizontal (Nicholas and Healy, 1988). The vertical sets of joints were caused by structural deformation (i.e., the tensile stress from the subsidence of the Michigan and Illinois Basins and the uplift of the Wisconsinan and Kankakee Arches). However, the horizontal set was formed as a result of carbonate dissolution along bedding planes. According to Zeizel and others (1962), the orientation of bedrock valleys in DuPage County is controlled by these major joint sets.

PREVIOUS INVESTIGATIONS

The U.S. Geological Survey conducted research into the orientation and spacing of joint sets in the Silurian dolomite as part of their study to determine the geologic and hydrologic factors that control the migration of tritium from a closed, low-level radioactive waste disposal site, located approximately 1.5 miles southeast of the Lenz Oil site (Nicholas and Healy, 1988). The joint analyses performed by Nicholas and Healy (1988) included lineament mapping, bedrock surface mapping, and studies of joint orientations exposed in outcrops of the Silurian dolomite. The orientations of 156 vertical joints measured in two quarries were plotted on a rose diagram by using a 1-unit length per joint and grouping the joints into 5-degree sectors (Figure E-1). A total of 106 linear structural features were mapped on aerial photographs of the 25-square-mile area surrounding the low-level radioactive waste disposal site. These linear features were plotted on a rose diagram by using a 1-unit length per 1,000 feet of lineament length and grouping the lineaments into 5-degree sectors (Figure E-1). The rose diagram of the vertical joint orientations shows two orthogonal sets of joints: one set of joints with an azimuth of 40 degrees, and the other set with an azimuth of 130

APPENDIX E

FRACTURE ANALYSIS

INTRODUCTION

An investigation was performed to gather information regarding the orientation, spacing, width, lateral extent, and interconnectedness of bedrock fractures in the vicinity of the Lenz Oil site. Because much of the surficial aquifer is composed of fractured limestone, fractures are undoubtedly a dominant factor that controls the ground water flow direction and velocity. The regional network of fractures is defined by data from previous investigations near the site, field investigations of outcrops around the site, and site-specific investigations of cores. This Appendix presents the methodology and results of those investigations.

GEOLOGICAL SETTING

The Lenz Oil site is located on the crest of the Kankakee Arch, near the northeastern edge of the Illinois Basin. The southeastern extent of the Sandwich Fault Zone is located approximately 23 miles southwest of the Lenz Oil site at its closest approach. Although all of these structural features are presently inactive, the local character of the bedrock has been strongly influenced by historical geological activities. For example, in the vicinity of the Lenz Oil site, the Silurian strata are nearly horizontal because the site is

APPENDIX F

SOIL BORING LOGS

IEPA PHASE I SOIL BORING LOGS

Illinois Environmental Protection Agency

Field Boring Log

Page 1 of

Site File No 0438020003 County DuPage Boring No SB-01 Monitor Well No NA

Site File Name Lemont / Lenz Oil Service Inc Surface Elev _____ Completion Depth 12.5

Fed ID No _____ Auger Depth 12.5 Rotary Depth N

Quadrangle SAG Bridge Sec. 11 T 37N R 11E Date Start 1-16-91 Finish 1-16-91

Boring Location see site map

Drilling Equipment CME 75 3 3/4" HSA
5 ft. Continuous Sampler (CS)

Personnel
G - Sherry Otto
D - Paul Mason
H - Bob Mathis Jr.
H - Bill Walkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Valves (Blows)	OVA or HNU readings	REMARKS
	0-2.5 Sand, Gravel Fill material Sample Time 11:50 VOA (2) 2oz bottles PCBs, Pest (1) 32oz " Metals/CN (1) 32oz	0	SB-01 0-5 ft	CS	2				OVA 3.2 HNu 0
	2.5-5.0 Sand, Gravel Fill Material	3 4		CS	1.35				OVA >1,000 HNu 0
	5.0-7.5 Black and Gray ~~clay~~ Silt with some clay and gravel Sample Time 12:26 P.M. VOA (2) 2oz. bottles PCBs/Pest. (1) 32oz. Metals/CN (1) 32oz	5 6 7	SB-01-5-7.5 ft	CS	3.1				OVA > 1,000 HNu 0
	7.5-9.5 Black and Gray Silt with water Mostly water. Sheen on water	8 9	NA	CS	.4				OVA 100
	9.5-12.5 Gray Weathered Dolomite Sandy layer just above bedrock Sample Time 12:54 VOA (2) 2oz bottle PCB/Pest (1) 32oz Metals/CN (1) 32oz.	10 11 12	SB-01-9.5-12.5	CS	2.8				OVA 400
	Boring Completed at 12.5	13 14							

Illinois Environmental Protection Agency — Field Boring Log — Page ___ of ___

Site File No 0438020003 County DuPage Boring No SB-02 Monitor Well No [illegible]

Site File Name Lemont / Lenz Oil Service Inc. Surface Elev ___ Completion Depth 7.[illegible]

Fed ID No ___ Auger Depth 7.[illegible] Rotary Depth NA

Quadrangle SAG Bridge Sec 11 T 37N R 11E Date Start 1-16-91 Finish 1-16-91

Boring Location See site map

Drilling Equipment CME 75 3 3/4 inch HSA

Personnel: G - S Otto; D - P Mason; H - Ro Mathis Jr; H - B. Wolfenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Valves (Blows)	OVA or HNU readings	REMARKS
	0-2.5 Concrete in sample shoe Gravel and Cement Fill Material Sample Time 3:24 1524 CST VOA (2) 2oz BNA/Pest (1) 32oz. Metals/CN (1) 32oz	1 2	SB-02 0-2.5	CS	2.2				HNu 0 OVA not operable
	2.5-4.5 Brown-Lt Brown Silt and Gravel Fill Material	3 4		CS	1.2				HNu 0 OVA not operable
	4.5-5.6 Gray Sandy Silt 5.6-6.3 Black Oily clayey Silt 6.3-7.5 Black Oily Silt Sample Time 1540 CST VOA (2) 2oz. BNA/Pest (1) 32oz. Metals/CN (1) 32oz.	5 6 7	SB 02 4.5-7.5	CS	2.3				At bore hole OVA 40 At sample OVA >1000
	7.5-8.7 Top 0.2 ft sand Black clayey Silt Bottom 1.0 ft. Black Peat Bedrock at 8.7 ft.	8	SB-02 7.5-8.7	CS	2.4				OVA at sample shoe 700 OVA at head of Sample >1000
	Boring Completed at 8.7 Sample SB-02 - 7.5-8.7 Sample Time 1555 CST VOA (2) 2oz. BNA/Pest (1) 32oz Metal/CN (1) 32oz.	9 10 11 12 13							

Illinois Environmental Protection Agency

Field Boring Log

Site File No 0438020003 County Du Page Boring No SB-03 Monitor Well No NA

Site File Name Lemont / Lenz Oil Surface Elev _____ Completion Depth 2.5

Fed ID No _____ Auger Depth 2.5 Rotary Depth N

Quadrangle SAG Bridge Sec. 11 T 37N R 11E Date Start 1-16-91 Finish 1-16-91

Boring Location See site map

Drilling Equipment CME 75 3 3/4 inch HSA

Personnel
G - S. Orto
D - P. Mason
H - B. Mathis
H - B. Walkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Valves (Blows)	OVA or HNU readings	REMARKS
	0-2.5 Black Sandy Gravel Fill Material Sample Time 1640 CST VOA (2) 2oz BNA/Pest. (1) 32oz Metal/CN (1) 32oz Bedrock at 2.5	1 2	SB-03 0-2.5	0.5	1.7				OVA at Sample Shoe >1000
	Boring Completed at 2.5	3 4 5 6 7 8 9 10							

Site File No 0433020003 County DuPage Boring No SB-04 Monitor Well No N/A

Site File Name Lement Lenz Oil Services Inc Surface Elev _____ Completion Depth 5.0

Fed ID No _____ Auger Depth 5.0 Rotary Depth N/A

Quadrangle SAG Bridge Sec. 11 T 37N R 11E. Date: Start 2/4/91 Finish 2/4/91

Boring Location See site map

Drilling Equipment CME 75 3 3/4" HSA 5' Continuous Sampler (CS)

Personnel: G - S. Otto; D - P. Mason; H - B. Martin Jr; H - B. Walkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-2.5 Black sand, gravel, Ash. Top 0.5 frozen. Sample Time 1804 CST. Metals/CN (1) 32oz bottle. TCLP (1) 32oz	1, 2	SB-04 0-2.5	CS	1.35				OVA at augers 4. HNu ND. OVA at shoe 5. HNu ND. OVA at head 3.5
	2.5-5.0 Black sand, gravel, Ash. Sample Time 1816 CST. Metals/CN (1) 32oz bottle. TCLP (1) 32oz.	3, 4, 5	SB-04 2.5-5.0	CS	2.05				OVA at augers 3. HNu ND. OVA at shoe 150. HNu 1. OVA at head 9. HNu ND
		6, 7, 8, 9, 10, 11, 12, 13							HNu 11.7 bump

Illinois Environmental Protection Agency

Field Boring Log

Page 1 of ___

Site File No 0433020003 County DuPage Boring No SB-05 Monitor Well No NA

Site File Name Lemont Lenz Oil Services Inc. Surface Elev ___ Completion Depth ___

Fed ID No ___ Auger Depth ___ Rotary Depth ___

Quadrangle SAG Bridge Sec. 11 T 37N R 11E Date Start 2/4/91 Finish 2/4/91

Boring Location See site map

Drilling Equipment CME 75 3 3/4 " HSA
5 ft continuous sampler (CS)

Personnel
G - S. Otto
D - P Mason
H - B. Mathis Jr
H - B Walkenback

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Valves (Blows)	OVA or HNU readings	REMARKS
	0-4.7 Black sand, gravel Ash with a piece of black plastic Sample Time 1706 CST Metals/CN (1) 32 oz TCLP (1) 32 oz	1 2 3 4	SB-05 2.5-4.7	CS	2.25				OVA at augers Not work OVA at sample shoe HNu ND OVA at sample head HNu ND
	5.0-8.5 At 1.3 ft. from top of sample, black plastic. Above 1.3 ft black, sand, gravel, Ash. Gray dolomite in shoe of sampler Sample Time 1724 CST VOA (2) 2 oz. BNA/Pest. (1) 32 oz Metals/CN (1) 32 oz. TCLP (1) 32 oz. Bed rock at 8.5 feet	5 6 7 8 9 10 11	SB-05 5.0-8.5	CS	1.3				OVA at shoe HNu 10 OVA at head 3.9 HNu 2 HNu 11.7 Lamp

* 1/2 bucket of bentonite pellets was placed in the bottom of the boring before backfilling hole with cuttings.

Site File No 0438020003 County DuPage Boring No SB-06 Monitor Well No NA

Site File Name Lemont Lenz Oil Services Inc Surface Elev _____ Completion Depth 2.7

Fed ID No _____ Auger Depth 8.7 Rotary Depth NA

Quadrangle SAG Bridge Sec. 11 T 37N R 11E Date Start 2-5-91 Finish 2-5-91

Boring Location see site map

Drilling Equipment CME 75 3 3/4" HSA
5' continuous sampler (CS)

Personnel
G - S Otto
D - P. Mason
H - B Mathis Jr
H - B. Walkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-5 Black sand gravel Ash Sample SB-06 2.5-5.0 Time 937 Metals / CN (1) 32 oz bottle TCLP (1) 32 oz. Also took 1 set of duplicate samples	1 2 3 4 5	SB-06 2.5-5.0	CS	1.15				OVA at augers 6.N OVA at sample shoe [illegible] HNu 3 OVA at head NO HNu NO
	5-8.7 Dark brown Ash above 8 ft. At 8 ft. black plastic from 8-8.7 strong petro odor. Sheen on sample Mostly clayey silt with pieces of wire, Fill Mat. Sample SB-06 5-8.7 Time 948 VOA (2) 2 oz bottles BNA/Pest. (1) 32 g. Metals /CN (1) 32 g. TCLP (1) 32 g. Bedrock at 8.7	6 7 8 9 10 11	SB-06 5.0-8.7	CS	1.6				OVA at augers >1000 HNu NO OVA at sample shoe >1000 OVA at head 37 HNu used 11.7 lamp

Note. Placed 1/2 bucket of bentonite pellets into bottom of boring before backfilling hole with cuttings

Illinois Environmental Protection Agency — Field Boring Log — Page 1 of 1

Site File No 0433220003 County DuPage Boring No SB-02 Monitor We No NA

Site File Name Lemont Lenz Oil Services Inc. Surface Elev ____ Completion Depth 5

Fed ID No ____ Auger Depth 9.0 Rotary Depth NA

Quadrangle Sag Bridge Sec. 11 T. 37N R 11E Date Start 2-4-91 Finish 2-4-91

Boring Location see site map

Drilling Equipment CME 75 3 3/4 inch HSA

Personnel: G - S Otto; D - P Mason; H - B Marks Jr; H - B. Walkenbac

Elev.	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-5 Black sand and gravel, Ash Rig chatter	1, 2							OVA at augers 3 HNu NO OVA at shoe 7 HNu 10 OVA at head NO HNu NO
	2.5-5.0 Sample Time 1617 CST Metals /CN (1) 32g. TCLP (1) 32g.	3, 4	SB-07 2.5-5.0	CS	1.6				
	5.0-9 Black sand, gravel Ash Black plastic in shoe of sampler. While drilling, load rig chatter at 8 feet. Sample Time 1630 CST VOA (2) 2g. BNA/Pest. (1) 32g. Metals /CN (1) 32g. TCLP (1) 32g.	5, 6, 7, 8	SB-07 5.0-9.0	CS	2.17				OVA at augers 2 OVA at shoe 8 HNu 90 led augers cu hole had >100 on OVA at boreh HNu 60.
		9, 10, 11							HNu 11.7 lamp

Site File No 0433020002 County DuPage Boring No SB-08 Monitor Well No NA

Site File Name Lemont Lenz Oil Services Inc. Surface Elev _____ Completion Depth 5.0

Fed ID No _____ Auger Depth 5.0 Rotary Depth NA

Quadrangle SAG Bridge Sec. 11 T 37N R 11E Date Start 2-5-91 Finish 2-5-91

Boring Location see site map

Drilling Equipment CME 75 3 3/4" HSA
CME 5' Continuous Sampler (CS)

Personnel
G - S. Otto
D - P Mason
H - B. Mathis Jr
H - B Walkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Valves (Blows)	OVA or HNU readings	REMARKS
	0-2.5 Dark brown sand gravel, silt Ash with pieces of black plastic Sample Time 9:03 CST Metals /CN (1) 32g bottle TCLP (1) 32g bottle	1 2	SB-08 0-2.5	CS	1.8				OVA at augers 10 OVA at sample shoe 70 HNu 18 HNu at head ND
	2.5-5.0 Dark brown sand, gravel, silt, Ash, Fill Mat. Sample Time 9:05 CST Metals /CN (1) 32g bottle TCLP (1) 32g.	3 4 5	SB-08 2.5-5.0	CS	1.7				OVA at augers 62 HNu .5 OVA at sample head 10 HNu ND OVA at shoe 720 HNu 3
		6 7 8							HNu used 11.7 lamp

Illinois Environmental Protection Agency — Field Boring Log — Page 1 of 1

Site File No: CH3802000 3 — County: Du Page — Boring No: SB-09 — Monitor Well No: NL

Site File Name: Lemont Lenz Oil Services Inc. — Surface Elev: — Completion Depth: 7.0

Fed ID No: — Auger Depth: 7.0 — Rotary Depth: [illegible]

Quadrangle: SAG Bridge — Sec. 11 — T 37N — R 11E — Date Start: 2-5-91 — Finish: 2-5-91

Boring Location: see site map

Drilling Equipment: CME 75 3¾" HSA, 5' Continuous Sampler (CS)

Personnel: G-S. Otto; D-P. Mason; H-B. Mathis Jr.; H-B. Walkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-5 Dark brown sand gravel Ash Sample SB-09 2.5-5.0 Time 1050 Metals/CN (1) 32oz bottle TCLP (1) 32oz.	1, 2, 3, 4	SB-09 2.5-5.0	CS	1.5				OVA at augers 78 HNu ND OVA at shoe 650 HNu ND OVA at head .5 HNu ND
	5-7 Dark gray Silt with trace gravel. Sample SB-09 5-7 Time 1056 VOA (2) 2oz bottles BNA/Pest. (1) 32oz. Metals/CN (1) 32oz TCLP (1) 32oz.	5, 6, 7, 8, 9, 10, 11	SB-09 5-7	CS	1.8				OVA at augers HNu 1.5 OVA at shoe >1000 HNu 1.0 OVA at head 48 HNu 11.7 hamp

Illinois Environmental Protection Agency

Field Boring Log

Page [illegible] of [illegible]

Site File No 1438020003 County DuPage Boring No SB-10 Monitor Well No [illegible]

Site File Name Lemont Lenz Oil Services Inc. Surface Elev _____ Completion Depth [illegible]

Fed. D. No _____ Auger Depth 5.0 Rotary Depth [illegible]

Quadrangle SAG Bridge Sec. 11 T 37N R 11E Date Start 2-4-91 Finish 2-4-91

Boring Location See site map

Drilling Equipment CME 75 3 3/4 inch HSA

Personnel: G - S. Otto; D - P. Mason; H - B. Mathis Jr; H - B. Wakeman

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-2.5 Dark brown silty sludge bottom .4 gravel Top .5 frozen Sample Time 1551 Metals/CN (1) 32oz TCLP (1) 32oz	1, 2	SB-10 0-2.5	CS	2.1				OVA at augers [illegible] HNu [illegible] lamp [illegible] OVA at shoe [illegible] OVA at head [illegible]
	2.5-5.0 Black sand, gravel, Ash Sample Time 1600 CST Metals/CN (1) 32oz TCLP (1) 32oz.	3, 4	SB-10 2.5-5.0	CS	1.8				OVA at augers > [illegible] HNu 15 OVA at shoe [illegible] HNu 2 OVA at head ND HNu ND
		5, 6, 7, 8, 9, 10							HNu 11.7 lamp

Illinois Environmental Protection Agency

Field Boring Log

Page 1 of 1

Site File No C43302 0003 County Du Page Boring No SB-11 Monitor Well No NA

Site File Name Lemont Lenz Oil Services Inc. Surface Elev _____ Completion Depth 5.0

Fed ID No _____ Auger Depth 5.0 Rotary Depth NA

Quadrangle SAG Bridge Sec. 11 T 37N R 11E Date Start 2-5-91 Finish 2-5-91

Boring Location see site map

Drilling Equipment CME 75 3 3/4" HSA
5' Continuous Sampler (CS)

Personnel
G - S. Otto
D - P Mason
H - B Mathis Jr
H - B Walkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Valves (Blows)	OVA or HNU readings	REMARKS
	0-2.5 Dark brown sand, gravel, silt Sample Time 828 Metals/CN (1) 32oz bottle TCLP (1) 32oz.	1 2	SB-11 0-2.5	CS	1.35				OVA at augers 20 OVA at sample shoe >100 HNu at shoe 10 OVA at head 1 HNu ND
	2.5-5.0 Dark brown sand, gravel, silt with pieces of black plastic Sample Time 835 Metals/CN (1) 32oz. TCLP (1) 32oz.	3 4 5	SB-11 2.5-5.0	CS	1.0				OVA at augers 900 HNu 10.5 OVA at sample shoe >100 HNu 50 OVA at head 100 HNu ND.
		6 7 8 9 10							HNu 11.7 Lamp

Site File No 0438020003 County DuPage Boring No SB-12 Monitor Well No NA

Site File Name Lemont Lenz Oil Services Inc. Surface Elev _____ Completion Depth 8.0

Fed ID No _____ Auger Depth 8.0 Rotary Depth NA

Quadrangle SAG Bridge Sec. 11 T 37N R 11E Date Start 2-5-91 Finish 2-5-9

Boring Location see site map

Drilling Equipment CME 75 3 3/4" HSA
5' Continuous Sampler (CS)

Personnel
G - S Otto
D - P. Mason
H - B Mathis Jr.
H - B Walkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-5 Dark Brown gravel, silt Fill Mat. Sample 2.5-5.0 Time 1120 Metals / CN (1) 32 oz Bottle TCLP (1) 32 oz.	1, 2, 3, 4, 5	SB-12 2.5-5.0	CS					OVA at augers 100 HNu .5 OVA at shoe 100 HNu .5 OVA at head 6 HNu 40
	5-8.0 Dark brown gravel, silt Fill Mat. Very strong odors, white smoke from inside H.S Augers. Bedrock at 7.0	5, 6, 7, 8		CS	0.9				OVA at augers >10 HNu 40 OVA at shoe 900 HNu 154 OVA at head >100
	Jim Janssen moved SB-12 because this was not inside the excavated area.	9, 10							HNu 11.7 lamp
	New SB-12 location 73 1/2 ft from SB-11 to New SB-12 74 ft from SB-18 to New SB-12								

Illinois Environmental Protection Agency — Field Boring Log — Page 1 of 1

Site File No 0438020003 County DuPage Boring No New SB-12 Monitor Well No N/A

Site File Name Lemont Lenz Oil Services Inc. Surface Elev ____ Completion Depth 2.8

Fed ID No ____ Auger Depth 2.8 Rotary Depth N

Quadrangle SAG Bridge Sec. 11 T 37N R 11E Date Start 2-5-91 Finish 2-5-91

Boring Location see site map 73 1/2 ft. from SB-11
74 ft. from SB-18

Drilling Equipment CME 75 3 3/4" HSA
5' continuous sampler (CS)

Personnel: G - S Otto; D - P Mason; H - B. Mathis Jr.; H - B. Walkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA (or HNU readings)	REMARKS
	0-2.8 Dark brown gravel Auger refusal at 2.8 SB-12 0-2.8 Time 1507 VOA (2) 2 oz bottles BNA/Pest (1) 32 oz Metals/CN (1) 32 oz TCLP (1) 32 oz.	1 2 3 4	SB-12 0-2.8	CS	1.1				0 / Auger refusal >1000 HNu 11.5 HNu 11.7 temp

Site File No 0438020003 County DuPage Boring No SB-13 Monitor Well No N/A

Site File Name Lemont Lenz Oil Service, Inc. Surface Elev _____ Completion Depth 1.7

Fed ID No _____ Auger Depth 1.7 Rotary Depth N/A

Quadrangle SAG Bridge Sec 11 T 37N R 11E Date Start 2-6-91 Finish 2-6-91

Boring Location see site map

Drilling Equipment CME 75 3 3/4 inch HSA
5' Continuous Sampler (CS)

Personnel
G - S Otto
D - P Mason
H - B. Mathis Sr
H - B Walkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-1.7 Augers locked up due to concrete and metal Fill Material. Sample Time 1010 VOA (2) 2oz bottles BNA/Pest. (1) 32oz Metals/CN (1) 32oz.	1	SB-13 0-1.7	CS	1.1				
		2							
		3							
		4							

Illinois Environmental Protection Agency

Field Boring Log

Page 1 of 1

Site File No 0438020003 County DuPage Boring No SB-14 Monitor Well No N/A

Site File Name Lemont Lenz Oil Service Inc. Surface Elev _____ Completion Depth _____

Fed ID No _____ Auger Depth 4.5 Rotary Depth _____

Quadrangle SAG Bridge Sec. 11 T 37N R 11E Date Start 1-29-91 Finish 1-29-91

Boring Location see site map

Drilling Equipment CME 75 3 3/4 inch HSA

Personnel: G - S Otto; O - P Mason; H - B. Mathis Jr.; H - B. Walkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-2.5 Fill Material Gravel, metal wire, black visqueen	1, 2	SB-14 0-4.5	CS	2.08				OVA at augers >10[illegible]; HNu at augers 3; OVA at shoe >1000
	2.5-4.5 Dark brown silt, sand and Gravel At 3.9 Bedrock gray dolomite	3, 4		CS	1.95				OVA at shoe >1000; OVA at head 10
	Sample Time 1020 CST VOA (2) 2g BNA/Pest. (1) 32g. Metals/CN (1) 32g. Boring Completed at 4.5	5							

Site File No 0438020003 County DuPage Boring No SB-14-R Monitor Well No NA

Site File Name Lemont Lenz Oil Services Inc. Surface Elev _____ Completion Depth 4.5

Fed ID No _____ Auger Depth 4.5 Rotary Depth NA

Quadrangle SAG Bridge Sec. 11 T 37N R 11E Date Start 2/4/91 Finish 2/4/91

Boring Location see site map 1.7 ft. S of SB-14

Drilling Equipment CME 75 3 3/4" HSA

Personnel
G - S. Otto
D - P. Mason
H - B. Mathis Jr.
H - B. Walkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-4.5 Dark brown Fill Material								OVA at augers 0
	gravel silt, fibrous material	1							OVA at shoe 100
	black plastic material.		0-4.5	CS	135				OVA at head 40
	Bedrock in shoe	2							
	Sample Time 1425 CST								
	VOA (2) 2oz.	3	SB-14-R						
	BNA/Pest. (1) 32oz								
	Metals/CN (1) 32oz.	4							
		5							
		6							

Illinois Environmental Protection Agency — Field Boring Log — Page 1 of 1

Site File No 0433020003 County DuPage Boring No SB-15 Monitor Well No NA

Site File Name Lemont Lenz Oil Services Inc. Surface Elev _____ Completion Depth 12.5

Fed ID No _____ Auger Depth 12.5 Rotary Depth N.

Quadrangle SAG Bridge Sec. 11 T 37N R 11E Date Start 1-28-91 Finish 1-28-91

Boring Location see site map

Drilling Equipment CME 75 3 3/4 inch HSA

Personnel: G - S. Otto; D - P. Mason; H - B. Mathis Jr; H - B. Walkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-2.5 Sand, gravel, Fill Material	1	0-4.5	CS	1.53				OVA at auger 20; OVA at shoe 10; Drill Rig chatter
	2.5-4.5 Same as above. Bottom 0.6 greenish gray clayey silt. Sample Time 1551; VOA (2) 2oz.; BNA/Pest. (1) 32oz.; Metals/CN (1) 32oz.	2, 3, 4	SB-15	CS	1.45				OVA at augers 100; OVA at shoe >100; OVA at head 6
	4.5-9.5 Cobble in shoe, very poor recovery. Greenish gray silt, very wet. Sheen on inside walls of sampler. Petroleum type odor.	5, 6, 7, 8, 9		CS	0.62				OVA at auger; OVA at shoe 60; OVA at head 20
	9.5-12.5 Gray weathered Bedrock very wet, very strong petroleum type odor. Sample Time 1617 CST; VOA (2) 2oz.; BNA/Pest. (1) 32oz.; Metals/CN (1) 32oz.	10, 11, 12	SB-15 9.5-12.5	CS	2.2				OVA at shoe 10; OVA at head 33
	Boring Completed at 12.5	13							

Site File No 0432120003 County DuPage Boring No SB-15-B Monitor Well No NA

Site File Name Lemont Lenz Oil Services Inc. Surface Elev _____ Completion Depth 9.5

Fed ID No _____ Auger Depth 9.5 Rotary Depth NA

Quadrangle SAG Bridge Sec. 11 T 37N. R 11E. Date Start 2/4/91 Finish 2/4/91

Boring Location see site map 1 ft. S of SB-15

Drilling Equipment CME 75 3 3/4" HSA

Personnel: G-S Otto; D-P Mason; H-B Mathis Jr.; H-B Walkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-2.5 Dark brown sand, gravel, silt Fill Mat.	1, 2		CS	1.7				OVA at augers 4; OVA at head; OVA at shoe 40
	2.5-4.5 Black gravel silt. Bottom .5 greenish yellow clay silt. Sample Time 1324 CST; VOA (2) 2oz.; BNA/Pest (1) 32oz.; Metals/CN (1) 32oz. Took duplicate sample	3, 4	SB-15-A 2.5-4.5	CS	2.5				OVA at shoe 250; OVA at head 44
	4.5-9.5 Yellowish gray silt with trace gravel. Chips of bedrock. Sheen on augers and sample. One foot above bottom of sample black staining with petro. type odor. Sample Time 1343 CST; VOA (2) 2oz.; BNA/Pest (1) 32oz.; Metals/CN (1) 32oz.	5, 6, 7, 8, 9	SB-15-A 4.5-9.5	CS	2.4				OVA at shoe 100; OVA at head 150
	Bedrock at 9.0	10, 11, 12, 13, 14							

Illinois Environmental Protection Agency

Field Boring Log

Site File No 0438020003 County DuPage Boring No SB-16 Monitor Well No N/A

Site File Name Lemont Lenz Oil Service Inc. Surface Elev _____ Completion Depth 4.5

Fed ID No _____ Auger Depth 4.5 Rotary Depth N/A

Quadrangle SAG Bridge Sec. 11 T 37N R 11E Date: Start 1-28-91 Finish 1-28-91

Boring Location see site map

Drilling Equipment CME 75 3 3/4 inch HSA

Personnel: G. Sotto; D. P. Mason; H. B. Mathis Jr; H. B. Walkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-4.5 Dark brown gravel, silt, Fill Material Sample Time 1519 CST VOA (2) 2oz GHA/Pest (1) 32oz Metals/CN (1) 32oz. Bedrock at 4.5 Greenish gray powdered.	1 2 3 4	SB-16 0-4.5	C3	1.35				OVA at shoe 1.5 OVA at auger >1000 HNu. 1.5
	Boring Completed at 4.5	5 6 7 8 9 10							

Site File No 0433020003 County DuPage Boring No SB-16-R Monitor Well No NA

Site File Name Lemont / Lenz Oil Services Inc. Surface Elev _____ Completion Depth 4.5

Fed ID No _____ Auger Depth 4.5 Rotary Depth NA

Quadrangle SAG Bridge Sec. 11 T 37N R 11E Date Start 2/4/91 Finish 2/4/91

Boring Location see site map 1.6 ft. SW of SB-16

Drilling Equipment CME 75 3 3/4" HSA

Personnel
G - S. Otto
D - P. Mason
H - B. Mathis Jr
H - B. Walkenbach

Elev.	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	3-4" of water at surface								OVA at augers 50
	0 - 2.5 Dark brown sand gravel, silt Fill Mat. Rig chatter	1	SB-16-R 0-4.5	CS	1.73				OVA at shoe 100
		2							OVA at head 6
	2.5-4.5 Greenish yellow silt with chips of bedrock throughout	3							OVA at augers 25
	Bedrock at 4.5	4		CS	1.17				OVA at shoe 40
	Sample Time 1254 CST								OVA at head 100
	VOA (2) 2 oz.	5							
	BNA/Pest (1) 32 oz.								
	Metals/CN (1) 32 oz.	6							
		7							
		8							
		9							
		10							

Field Boring Log Page 1 of

Site File No 043302 0003 County DuPage Boring No SB-17 Monitor Well No NA

Site File Name Lemont Lenz Oil Services Inc. Surface Elev _____ Completion Depth 3.8

Fed ID No _____ Auger Depth 3.8 Rotary Depth N

Quadrangle SAG Bridge Sec. 11 T 37N R 11E Date Start 2-6-91 Finish 2-6-91

Boring Location see site map

Drilling Equipment CME 75 3 3/4" HSA Continuous 5' Sampler (CS)

Personnel: G - S Otto; D - P Mason; H - B. Marks Jr; H - B Walkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Valves (Blows)	OVA or HNU readings	REMARKS
	0-3.8 Black Ash Top 0.4 frozen	1	SB-17 0-3.8	CS	1.45				
	Auger refusal at 3.8 from								
	metal and demo fill mat.	2							
	Sample Time 940								
	VOA (2), 2 oz bottles	3							
	BNA / Pest (1), 32 oz								
	Metals / CN (1), 32 oz.	4							
	Took rinsate 2 VOA bottles.								
		5							

Illinois Environmental Protection Agency

Field Boring Log

Page 1 of 1

Site File No 0438020003 County DuPage Boring No SB-18 Monitor Well No NA

Site File Name Lemont Lenz Oil Service Inc. Surface Elev _____ Completion Depth 14.5

Fed ID No. _____ Auger Depth 14.5 Rotary Depth NA

Quadrangle SAG Bridge Sec. 11 T 37N R 11E Date: Start 1-29-91 Finish 1-29-91

Boring Location see site map

Drilling Equipment CME 75 3 3/4 inch HSA

Personnel: G - S Otto; D - P. Mason; H - B. Mat[illegible] Jr; H - B Walkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Valves (Blows)	OVA or HNU readings	REMARKS
	0-2.5 Fill Material 0-.8 silt back-fill .8-2.5 Black ash	1, 2	SB-18 0-4.5	CS	1.4				OVA at augers 40-[illegible] OVA at shoe 420
	2.5-4.5 Silt, sand + Gravel Sample Time 1152 CST VOA (2) 2g. BNA/Pest (1) 32g. Metals/CN (1) 32g.	3, 4		CS	.85				OVA at augers twice had flat-out >1000 HNu 200±
	4.5-7.5 Dark gray Silt	5, 6, 7	SB-18 4.5-9.5	CS	.9				OVA at augers >100 HNu at
	7.5-9.5 Dark gray silt Sample Time 1215 VOA (2) 2g BNA/Pest. (1) 32g. Metals/CN (1) 32g.	8, 9		CS	1.0				OVA at augers >10[illegible] HNU 20
	9.5-12.5 No Recovery	10, 11, 12		CS	0				OVA at augers [illegible] HNU 10
	12.5-14.5 No Recovery	13, 14		CS	0				OVA at augers >[illegible] HNU 10
	Bedrock at 12.5								
	Boring Completed at 14.5	15							

Illinois Environmental Protection Agency — Field Boring Log — Page ___ of ___

Site File No 0433020003 County DuPage — Boring No SB-18-R — Monitor Well No [illegible]

Site File Name Lemont Lenz Oil Services Inc. — Surface Elev ___ — Completion Depth [illegible]

Fed ID No ___ — Auger Depth 12.5 — Rotary Depth [illegible]

Quadrangle SAG Bridge — Sec. 11 T 37N R 11E — Date Start 2-6-91 — Finish 2-6-91

Boring Location see site map 1.5 ft. S of SB-18

Drilling Equipment CME 75 3 3/4" HSA, 5' Continuous Sampler

Personnel: G - S. Otto; D - B. Mason; H - B. Matnis Jr; H - B. Walkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-2.5 Top 0.8 Silt .8-1.75 Black Ash Sample Time 1055 VOA (2) 2oz bottles BNA/Pest. (1) 32oz Metals/CN (1) 32oz	1, 2	SB-18-R 0-2.5	CS	1.75				
	2.5-4.5 No recovery	3, 4		CS	0				
	4.5-9.5 Dark greenish gray Silt, black oil streaks throughout Sample 7.5-9.5 Time 1104 VOA (2) 2oz bottles BNA/Pest. (1) 32oz Metals/CN (1) 32oz	5, 6, 7, 8, 9	SB-18-R 7.5-9.5	CS	4.8				HNu at shoe - HNu at head -0
	9.5-12.5 Brown Silt with black oil streaks Sample Time 1110 VOA (2) 2oz bottles BNA/Pest (1) 32oz Metals/CN (1) 32oz	10, 11, 12	SB-18-R 9.5-12.5	CS	28				HNu at head 2 HNu at shoe N.
		13							HNu 11.7 1

Site File No 0438020003 County Du Page Boring No SB-19 Monitor Well No NA

Site File Name Lemont Lenz Oil Services Inc Surface Elev _____ Completion Depth _____

Fed D No _____ Auger Depth _____ Rotary Depth NA

Quadrangle SAG Bridge Sec. 11 T 37N R 11E. Date Start 2-5-91 Finish 2-5-91

Boring Location see site map

Drilling Equipment CME 75 3 3/4" HSA
5' Continuous Sampler (CS)

Personnel
G - S. Otto
D - P. Mason
H - B. Mathis Jr.
H - B. Walkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-2.6 Dark brown silt, gravel, sand very strong petro odor Bedrock in shoe of sampler Auger refusal at 2.6 Sample 0-2.6 Time 1600 VOA (2) 2oz. bottles BNA/Pest. (1) 32oz. Metals/CN (1) 32oz.	1 2 3 4 5 6	SB-19 0-2.6	CS	1.7				OVA at augers >1000 HNu 3
									HNu 11.7 Lamp

Illinois Environmental Protection Agency — Field Boring Log — Page 1 of 1

Site File No 0438020003 County DuPage — Boring No SB-20 Monitor Well No NA

Site File Name Lemont Lenz Oil Services Inc. — Surface Elev ____ Completion Depth 12.9

Fed ID No ____ — Auger Depth 12.9 Rotary Depth NA

Quadrangle SAG Bridge Sec. 11 T 37N. R 11E — Date Start 2-6-91 Finish 2-6-91

Boring Location see site map

Drilling Equipment CME 75 3 3/4" HSA 5' Continuous Sampler (CS)

Personnel: G - S. Otto; D - P. Mason; H - B. Marbis Jr.; H - B. Walkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA w HNU readings	REMARKS
	0-2.5 Fill Mat. Chips of concrete	1, 2		CS	1.1				OVA not working HNu at augers ND
	2.5-4.5 Greenish gray clayey Silt Till. Top 0.8 concrete fill mat. Sample Time 819. VOA (2) 2oz bottles; BNA/Pest. (1) 32oz; Metals/CN (1) 32oz.	3, 4	SB-20 2.5-4.5	CS	1.5				HNu at augers ND
	4.5-9.5 Greenish gray clayey Silt Till. Sample Time 830. VOA (2) 2oz bottles; BNA/Pest (1) 32oz; Metals/CN (1) 32oz.	5, 6, 7, 8, 9	SB-20 4.5-9.5	CS	4.0				HNu at augers
	9.5-12.9 Top 0.7 Black peat like mat. light greenish gray Silt with lenses of peat. Bottom 0.25 Gray dolomite. Sample Time 903. VOA (2) 2oz bottles; BNA/Pest. (1) 32oz; Metals/CN (1) 32oz.	10, 11, 12, 13	SB-20 9.5-12.9	CS	2.4				

Illinois Environmental Protection Agency

Field Boring Log

Page 1 of

Site File No C438C2CCC3 County DuPage Boring No SB-21 Monitor Well No

Site File Name Lemont Lenz Oil Service Inc Surface Elev Completion Depth 8

Fed ID No Auger Depth 18.3 Rotary Depth

Quadrangle SAG Bridge Sec. 11 T. 37N R 11E Date Start 1-29-91 Finish 1-29-91

Boring Location see site map

Drilling Equipment CME 75 3 3/4 inch HSA

Personnel: G - S Otto; D - P Mason; H - B. Mathis Jr.; H - B. Walkenbac

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Valves (Blows)	OVA or HNU readings	REMARKS
	0-2.5 Dark brown silt and gravel Fill Material Top 0.5 Frozen Sample Time 825 CST VOA (2) 2oz. BNA/Pest. (1) 32oz. Metals/CN (1) 32oz	1 2 3 4	SB-21 0-4.5	CS	1.3				OVA at augers 5 OVA at shoe 6
				CS	0.4				OVA at shoe 2
	4.5-7.5 Fill, Trash, fiberous material in shoe	7.5		CS	0				OVA at augers 7 OVA at shoe >100
	7.5-9.5 Fill, Trash, wire	9.5		CS	0				OVA at augers 3 Rig chatter
	9.5-12.5 Fill, Trash, fiberous	12.5		CS	.5				OVA at breathing zone >100 OVA at shoe >1 HNu at augers
	12.5-14.5 A piece of wire, sheen on inside of sampler	14.5		CS	0				HNu at auger
	14.5-18.3 Trash with rock chips Gray weathered Bedrock very wet, sheen Sample Time 947 CST VOA (2) 2oz. BNA/Pest (1) 32oz. Metals/CN (1) 32oz.	18.3	SB-21 14.5-18.3	CS	.9				OVA at augers HNu at augers OVA at shoe 5 OVA at head >
	Boring Completed 15.3								

Illinois Environmental Protection Agency — Field Boring Log — Page 1 of 1

Site File No 043802 C003 County DuPage Boring No SB-21-R Monitor Well No 1 A

Site File Name Lemont Lenz Oil Services Inc. Surface Elev _____ Completion Depth 14.5

Fed ID No _____ Auger Depth 14.5 Rotary Depth _____

Quadrangle SAG Bridge Sec. 11 T 37N R 11E Date: Start 2-6-91 Finish 2-6-91

Boring Location see site map 1.6 ft. S of SB-21

Drilling Equipment CME 75 3 3/4" HSA 5' Continuous Sampler (CS)

Personnel: G - S. Otto; D - P. Mason; H - B. Mathis Jr; H - B Walkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-2.5 Dark brown gravel, silt, wood, trash Fill Material Sample Time 1144 VOA (2) 2 oz bottles BNA/Pest (1) 32 oz Metals/CN (1) 32 oz.	1, 2	SB-21-R 0-2.5	CS	1.7				HNu at augers 2 HNu at shoe 9
	2.5-4.5 Wire and fibrous material wrapped around augers Drillers upgraded to level C	3, 4		CS	0				HNu at augers 15
	4.5-9.5 0 Recovery Fill Material, Trash	5, 6, 7, 8, 9		CS	0				
	9.5-14.5 Gray Fill Material mostly water with sheen, very strong odor, metal wire and gray chips of dolomite Sample Time 1216 VOA (2) 2 oz bottles BNA/Pest (1) 32 oz. No Metals/CN Not enough sample	10, 11, 12, 13, 14, 15	SB-21-R 9.5-14.5	CS					HNu at augers 6 HNu at shoe 5

Site File No 0438020003 County DuPage Boring No SB-22 Monitor Well No NA

Site File Name Lemont / Lenz Oil Service Inc. Surface Elev _____ Completion Depth 9.5

Fed ID No _____ Auger Depth 7.5 Rotary Depth NA

Quadrangle SAG Bridge Sec. 11 T 37N R 11E Date Start 1-17-91 Finish 1-17-91

Boring Location see site map

Drilling Equipment CME 75 3 3/4 inch HSA

Personnel: G - S. Orto; D - P. Mason; H - B. Mathis; H - B. Walkenback

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-2.5 Black Sand, Gravel and Silt Fill Material Sample Time 8:39 CST VOA (2) 2oz BNA/Pest (1) 32oz Metals/CN (1) 32oz	1 2	SB-22 0-2.5	CS	1.4				OVA at borehole > 20 OVA at sample shoe 20
	2.5-4.5 Black, Sand, Gravel, Silt, Fill Material	3 4		CS	1.6				OVA at Sample Shoe > 1000
	4.5-7.5 Stopped drilling >100 at breathing zone using OVA Description Same as 2.5-4.5 Didn't sample due to unsafe conditions. No SCBAs on site.	5 6 7		CS					OVA at Sample Shoe > 1000
	7.5-9.5 Used 6" brass tubes inside split spoon sampler. Wrapped the bottom (2) tubes in aluminum foil and capped ends with Plastic caps. Sample Time 1700 Gray dolomite in shoe of sampler. Bedrock at 9.5 Boring Completed at 9.5	8 9 10 11	SB-22 7.5-9.5	CS			2/4/4/8		OVA at Sample 40-80

Illinois Environmental Protection Agency

Field Boring Log

Page 1 of 1

Site File No 0438020003 County DuPage

Boring No SB-23 Monitor Well No NA

Site File Name Lemont Lenz Oil Service Inc

Surface Elev _____ Completion Depth 7.5

Fed ID No _____

Auger Depth 7.5 Rotary Depth N

Quadrangle SAG Bridge Sec. 11 T 37N R 11E

Date Start 1-28-91 Finish 1-28-91

Boring Location See site map

Drilling Equipment CME 75 3 3/4 inch HSA

Personnel
G - S. Otto
D - P. Mason
H - B. Mathis Jr
H - B. Walkenbach

Elev.	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-4.5 Dark brown gravel, silt, Fill Material Top 0.1 New white rock strong solvent type odor from 2.5-4.5 Sample Time 1356 CST VOA (2) 2oz. BNA/Pest/(1) 32oz. Metals/CN (1) 32oz.	1, 2	SB-23 0-4.5	CS	1.0				OVA at augers 30 OVA at shoe 100
		3, 4		CS	0.9				OVA at augers >1000 HNU 200 OVA at shoe 100 OVA at head 500
	4.5-7.5 Weathered Bedrock Greenish Gray powdered rock. Bedrock at 5.0 ft. Sample Time 1439 VOA (2) 2oz. BNA/Pest (1) 32oz Not enough sample for Metals/CN	5, 6, 7	SB-23 4.5-7.5	CS	0.5				OVA at augers 16 HNU 135
	Boring complete at 7.5	8, 9, 10							

Site File No 0438020003 County DuPage Boring No SB-23-R Monitor Well No N/A

Site File Name Lemont / Lenz Oil Service Inc. Surface Elev _____ Completion Depth 5.5

Fed ID No _____ Auger Depth 5.5 Rotary Depth N/A

Quadrangle SAG Bridge Sec. 11 T 37N. R 11E. Date Start 2-4-91 Finish 2-4-91

Boring Location see site map 1.5 ft. NE of SB-23

Drilling Equipment CME 75 3 3/4" HSA

Personnel: G - S. Otto; D - P. Mason; H - B. Mathis Jr.; H - B. Walkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-2.8 Fill Mat.	1, 2		CS	2.8				OVA at augers 1.5
	2.8-4.5 Dark Brown gravel, silt Fill Mat. thin metal wire in cuttings Rig chatter Sample Time 1215 CST VOA (2) 2 oz. BNA/Pest (1) 32 oz. Metals/CN (1) 32 oz.	3, 4	SB-23-R 2.8-4.5	CS	1.8				OVA at augers >100 OVA at sample shoe 200 OVA at sample head 65
	4.5-5.5 Dark Brown silty sand Bottom 0.5 greenish yellow chips of dolomite No sample: poor recovery	5		CS	0.43				OVA at augers >100 OVA at sample shoe 30 OVA at sample head 50
		6, 7, 8, 9, 10							

IEPA PHASE II SOIL BORING LOGS

Illinois Environmental Protection Agency — **Field Boring Log** — Page 1 of 1

Site File No 0438020003 County DuPage Boring No SB04 Monitor Well No NA

Site File Name Lemont / Lenz Oil Surface Elev _____ Completion Depth 8

Fed ID No _____ Auger Depth 8 ft Rotary Depth NA

Quadrangle SAG Bridge Sec 11 T 37N. R 11E. Date Start 2-14-92 Finish 2-14-92

Boring Location See site map

Drilling Equipment CME 75 3 3/4" HSA 5 ft. Continuous Sampler (CS)

Personnel: G - S. Otto; D - P. Mason; H - R. Marhis Jr.; H - B. Walkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-5ft Top .55 top soil, black Silt roots abundant. Bottom Black Ash Sample Time 8:50 1 8oz. VOA 1 32oz. BNA/Pest. 1 8oz. Metals + Duplicates 8:52	1 2 3 4 5	105B04A5 + AD	CS	2.6				Background OVA 9 HNU 1 While drilling OVA 9 HNU 1 Sample shoe OVA 9 HNU 1 Sample head OVA 9 HNU 1
	5-8ft Black Ash, wet Sample Time 9:00 1 8oz. VOA 1 32oz. BNA/Pest. 1 8oz. Metals	6 7 8	105B04B5	CS	1.9				While drilling OVA 9 HNU 1 Sample shoe OVA 9 HNU 1 Sample head OVA 9 HNU 1
	Black plastic on lead auger teeth (Plastic retained by T. Fitzgerald) 25lbs. of bentonite and 1 94# bag of cement was placed in borehole.	9 10 11							

Illinois Environmental Protection Agency

Field Boring Log

Page 1 of ___

Site File No 0438020003 County DuPage Boring No SB08 Monitor Well No NA

Site File Name Lemont / Lenz Oil Surface Elev ___ Completion Depth 7.5

Fed ID No ___ Auger Depth 7.5 ft. Rotary Depth NA

Quadrangle SA6 Bridge Sec. 11 T 37N. R 11E. Date Start 2-14-92 Finish 2-14-92

Boring Location see site map

Drilling Equipment CME 75 3 3/4" HSA 5 ft. Continuous Sampler (CS)

Personnel
G - S. Otto
D - P. Mason
H - R. Marhis Jr.
H - B. Walkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Valves (Blows)	OVA or HNU readings	REMARKS
	0-5 ft. Top .7 top soil, black Silt, roots abundant. Bottom 1.0 Black Ash Sample Time 9:15 1 8oz. VOA 1 32oz. BNA/Pest 1 8oz. Metals	1 2 3 4	LOSB08AS	CS	1.7				Background OVA 9 HNU 1 While drilling OVA 9 HNU 1 Sample shoe OVA 9 HNU 1 Sample head OVA 9 HNU 1
	5-7.5 ft Black Ash Sample Time 9:25 1 8oz. VOA 1 32oz. BNA/Pest. 1 8oz. Metals	5 6 7	LOSB08BS	CS	1.7				While drilling OVA 9 HNU 1 Sample shoe OVA 9 HNU 1 Sample head OVA 9 HNU 1
	25 lbs of bentonite was placed in the bottom of the bore hole.	8 9							

Illinois Environmental Protection Agency — **Field Boring Log** — Page 1 of 1

Site File No 0438020003 County, DuPage — Boring No SB10 — Monitor Well No NA

Site File Name Lemont / Lenz Oil — Surface Elev ____ — Completion Depth 7.5

Fed ID No ____ — Auger Depth 7.5ft — Rotary Depth NA

Quadrangle SAG Bridge — Sec. 11 — T. 37N. — R 11E. — Date Start 2-14-92 — Finish 2-14-92

Boring Location See site map

Drilling Equipment CME 75 3 3/4" HSA, 5 ft. Continuous Sampler (CS)

Personnel: G - S. Crto; D - P. Mason; H - R. Marhis Jr.; H - B. Walkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-5ft. Top 0.4 Black Silt top soil, roots abundant. Bottom Black Ash Sample Time 10:15 1 8oz VOA 1 32oz. BNA/Pest. 1 8oz. Metals	1 2 3 4	10SB10A5	CS	1.7				Background OVA 9 HNU 1 While drilling OVA 9 HNU 1 Sample shoe OVA 9 HNU 1 Sample head OVA 9 HNU 1
	5-7.5 Black Ash Sample Time 10:20 1 8oz. VOA No BNA/Pest. No Metals Not enough sample recovery	5 6 7	10SB10B5	CS	0.4				While drilling OVA 9 HNU 1 Sample shoe OVA 9 HNU 1 Sample head OVA 9 HNU 1
	Water in bore hole at 6.5 ft. 25 lbs of bentonite was placed in the bottom of the bore hole.	8							

Illinois Environmental Protection Agency — Field Boring Log

Page 1 of

Site File No 0438020003 County DuPage Boring No SB11 Monitor Well No NA

Site File Name Lemont / Lenz Oil Surface Elev _____ Completion Depth 7.5

Fed ID No _____ Auger Depth 7.5 ft Rotary Depth NA

Quadrangle SAG Bridge Sec. 11 T 37N. R 11E. Date Start 2-14-92 Finish 2-14-92

Boring Location See site map

Drilling Equipment CME 75 3 3/4" HSA 5 ft. Continuous Sampler (CS)

Personnel: G - S. Otto; D - P. Mason; H - R. Marhis Jr.; H - B. Walkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0.5 ft. Top .2 black silt top soil, roots abundant. Bottom black ash Sample Time 9:45 1 8oz. VOA 1 32oz. BNA/Pest. 1 8oz. Metals + Duplicates 9:50	1 2 3 4	LOSB11A5 and AD	CS	1.7				Background OVA 0 HNU 0 While drilling OVA 0 HNU 0 Sample shoe OVA HNU Sample head OVA 0 HNU 0
	5-7.5 ft. Black Ash Sample Time 9:55 1 8oz. VOA 1 32oz. BNA/Pest 1 8oz. Metals	5 6 7	LOSB11B5	CS	1.9				While drilling OVA 0 HNU Sample shoe OVA 0 HNU Sample head OVA 0 HNU 0
	Hole dry 25 lbs of bentonite was placed in the bottom of the borehole	8							

Illinois Environmental Protection Agency — Field Boring Log

Page 1 of 1

Site File No 0438020003 County Du Page Boring No SB-12 Monitor Well No NA

Site File Name Lemont / Lear Oil Surface Elev _____ Completion Depth 8...

Fed ID No _____ Auger Depth 8.1 ft Rotary Depth NA

Quadrangle SAG Bridge Sec. 11 T 37N. R 11E. Date Start 2-13-92 Finish 2-13-92

Boring Location See site map

Drilling Equipment CME 75 3 3/4" HSA 5 ft Continuous sampler (CS)

Personnel: G - S. Otto; D - P. Mason; H - R. Morris Jr.; H - B. Wilkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-5 ft. Dark brown clayey silt with gravel and pebbles Sample Time 12:50 1 8oz. VOA 1 32oz. BNA/Pest 1 8oz. Metals	1 2 3 4 5	LCSB12AS	CS	2.2				Background OVA 10 HNU 3 While drilling OVA – HNU 20 At bore hole OVA 14 HNU 50 Sample head OVA 15 HNU 3 Sample shoe OVA .03 HNU
	5-8.1 ft. Tan to light gray highly fractured, weathered bedrock Sample Time 1:05 1 8oz. VOA 1 32oz. BNA/Pest 1 8oz. Metals Auger Refusal at 8.1 ft. bore hole dry	6 7 8 9 10	LCSB12BS	CS	2.6				While drilling OVA 30 HNU 8 Sample shoe OVA .24 Sample head OVA 50

Illinois Environmental Protection Agency — **Field Boring Log** — Page 1 of 1

Site File No 0438020003 County Du Page Boring No New SB-14 Monitor Well No NA

Site File Name Lemont / Lenz Oil Surface Elev _____ Completion Depth 12.1

Fed ID No _____ Auger Depth 12.1 ft. Rotary Depth NA

Quadrangle SAG Bridge Sec. 11 T. 37N. R 11E. Date Start 2-11-92 Finish 2-11-92

Boring Location See site map

Drilling Equipment CME 75 3 3/4" HSA 5 ft Continuous sampler (CS)

Personnel: G - S. Otto; D - P. Mason; H - R. Mathis Jr; H - B Wilkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Valves (Blows)	OVA or HNU readings	REMARKS
	0-5 ft. No sample taken	1, 2, 3, 4							Background OVA 0 HNU 0 While drilling OVA 20 HNU 3 Sample shoe OVA 2 HNU 1 Sample head OVA 0 HNU 9
	5-10 ft. Dark brown to black sand and gravel. Bottom 1.4 of 5 ft. sampler wet. Sample Time 2:25 1 8oz. VOA 1 32oz. BNA/Pest No Metals not enough recovery	5, 6, 7, 8, 9	LOSB14 5-10 ft	CS	0.8				While drilling OVA 200 HNU 6 Sample shoe OVA 100 HNU 20 Sample head OVA 200 HNU 0
	10-12.1 ft. Black silty clayey Sand with gravel and pebbles throughout. Black streaks throughout with coal tar type odor, very wet Auger Refusal at 12.1 ft. Sample Time 3:35 1 8oz. Metals 1 8oz VOA 1 32oz BNA/Pest Water measured in open bore hole at 4.0 ft bgs	10, 11, 12, 13	LOSB14 10-12.1	CS	1.2				While drilling OVA 20 Sample shoe OVA 2 HNU 14 Sample head OVA 200 HNU 19 Filled bore hole with bentonite and cement

Illinois Environmental Protection Agency — Field Boring Log

Site File No 0438020003 County Du Page — Boring No SB-19 — Monitor Well No NA

Site File Name Lemont / Lear Oil — Surface Elev ____ — Completion Depth 11.5

Fed ID No ____ — Auger Depth 11.5 ft. — Rotary Depth NA

Quadrangle SAG Bridge — Sec. 11 — T. 37N. — R 11E. — Date: Start 2-13-92 — Finish 2-13-92

Boring Location See site map

Drilling Equipment CME 75 3 3/4" HSA, 5 ft Continuous sampler (CS)

Personnel: G - S. Otto; D - P. Mason; H - R. Morris Jr.; H - B. Wilkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-5 ft. Dark brown clayey Silt with some gravel.	1, 2, 3, 4, 5		CS	2.25				Background OVA 15 HNU 3 Sample head OVA 0 HNU 3 Sample shoe OVA 6 HNU 10
	5-10 ft. Top .7 black oily wood, cinders very wet, heavy oil odor .7-2.3 Dark greenish gray to black silty Clay with some gravel, trace roots 2.3-3.7 Light brown rock, dolomite Sample Time 11:25 1 8oz. VOA 1 32oz. BNA/Pest. 1 8oz. Metals	6, 7, 8, 9, 10	10581985 + AD	CS	3.7				While drilling OVA 20 HNU 2 Sample head OVA 20 HNU 0 Sample shoe OVA 0.37 HNU 9
	10-11.5 ft. Gray very coarse sand with dolomite rock, large chips. very wet Auger Refusal 11.5 ft. Sample Time 11:35 1 8oz. VOA 1 32oz BNA/Pest 1 8oz. Metals	11, 12, 13, 14, 15	#10581986	CS	1.5				While drilling OVA 12 Sample head OVA 30 HNU 8 Sample shoe OVA 70 HNU 6

Backfilled borehole with bentonite and cement

Illinois Environmental Protection Agency — Field Boring Log

Page 1 of 1

Site File No 0438020003 County DuPage Boring No SB22 Monitor Well No NA

Site File Name Lemont / Lenz Oil Surface Elev _____ Completion Depth 15+

Fed ID No _____ Auger Depth 15 ft Rotary Depth NA

Quadrangle SAG Bridge Sec. 11 T. 37N. R 11E. Date Start 2-13-92 Finish 2-13-92

Boring Location See site map

Drilling Equipment CME 75 3 3/4" HSA 5 ft. Continuous Sampler (CS)

Personnel: G - S. Otto; D - P. Mason; H - R. Markis Jr.; H - B. Walkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-5 ft. Dark brown clayey Silt with some gravel and pebbles Sample Time 3:00 1 8oz. VOA 1 32oz BNA/Pest. 1 8oz Metals	1, 2, 3, 4	10SB22AS	CS	1.8				Background OVA 9 HNU 3 While drilling OVA [illegible] HNU [illegible]
	5-10 ft Dark brown clayey Silt with gravel and pebbles throughout Sample Time 3:10 1 8oz. VOA 1 32oz BNA/Pest 1 8oz. Metals + Duplicates 3:12	5, 6, 7, 8, 9	10SB22BS and BD	CS	2.7				While drilling OVA [illegible] HNU [illegible] At borehole OVA [illegible] Sample shoe OVA [illegible] HNU [illegible] Sample head OVA [illegible] HNU 4
	10-15 ft. Top 2.8 Dark brown coarse to very coarse Sand with gravel, very wet Bottom gray highly weathered dolomite bedrock Sample Time 3:35 1 8oz. VOA 1 32oz. BNA/Pest. 1 8oz. Metals	10, 11, 12, 13, 14	10SB22CS	CS	4.4				While drilling OVA [illegible] Sample shoe OVA [illegible] Sample head OVA 5[illegible] HNU 3
	Back filled hole with bentonite and cement	15							

Illinois Environmental Protection Agency

Field Boring Log

Site File No 0438020003 County Du Page Boring No SB-201 Monitor Well No NA

Site File Name Lemont / Lear Oil Surface Elev _____ Completion Depth 5

Fed ID No _____ Auger Depth 5 ft. Rotary Depth NA

Quadrangle SAG Bridge Sec 11 T 37N. R 11E. Date Start 2-10-92 Finish 2-10-92

Boring Location See site map

Drilling Equipment CME 75 3 3/4" HSA
5 ft Continuous sampler (CS)

Personnel
G - S. Otto
D - P. Mason
H - P. Morris Jr
H - B. Wilkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-3 ft Dark brown Silt with gravel Sample Time 2:45 1 8oz. VOA 1 32oz BNA/Pest 1 8oz. Metals	1 2 3	20SB201AS	CS	1.15				Background OVA 0 HNU While drilling OVA 0 Sample shoe OVA 0 HNU 1 Sample head OVA 0 HNU 2
	3-5 ft. Black Silt with gravel, petro. odor, yellow clay at bottom Sample Time 2:50 1 8oz. VOA 1 32oz BNA/Pest 1 8oz Metals	4 5	20SB201BS	CS	1.1				While drilling OVA 0 Sample shoe OVA 0 HNU
	Boring Completed at 5 feet								

Illinois Environmental Protection Agency — Field Boring Log

Site File No 0438020003 County Du Page Boring No SB-202 Monitor Well No NA

Site File Name Lemont / Lenz Oil Surface Elev _____ Completion Depth 5 ft

Fed ID No _____ Auger Depth 5 ft. Rotary Depth NA

Quadrangle SAG Bridge Sec. 11 T 37N. R 11E. Date: Start 2-10-92 Finish 2-10-9

Boring Location See site map

Drilling Equipment CME 75 3 3/4" HSA
5 ft Continuous sampler (CS)

Personnel
G - S. Otto
D - P Mason
H - P Morris Jr
H - B Wilkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-3 ft. Dark bluish gray clayey Silt, black streaks throughout Top 1 ft. sand and gravel Sample Time 2:00 1 8oz. VOA 1 32oz. BNA/Pest. 1 8oz. Metals	1 2	10SB202AS	CS	2.2				Background OVA 0 HNU 4 While drilling OVA . Sample shoe OVA 10 HNU 3 Sample head OVA 0 HNU 10
	3-5 ft. Dark brown to black silty Sand with a greenish silty clay seam ≈ .3 thick at bottom of sample Sample Time 2:15 1 8oz VOA 1 8oz. Metals 1 32oz BNA/Pest.	3 4	10SB202BS	CS	1.9				While drilling OVA 5 Sample shoe OVA >10 HNU 7 Sample head OVA 0 HNU 7
	Boring Completed at 5 ft.	5							

Illinois Environmental Protection Agency — Field Boring Log

Page 1 of 1

Site File No 0438020003 County Du Page Boring No SB203 Monitor Well No NA

Site File Name Lemont / Lenz Oil Surface Elev _____ Completion Depth 5 ft

Fed ID No _____ Auger Depth 5 ft. Rotary Depth NA

Quadrangle SAG Bridge Sec. 11 T 37N. R 11E. Date Start 2-11-92 Finish 2-11-92

Boring Location see site map

Drilling Equipment CME 75 3 3/4" HSA
5 ft Continuous sampler (CS)

Personnel: G - S. Otto; D - P. Mason; H - R. Morris Jr.; H - B. Wilkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-3 ft. Brown Sand and Gravel Sample Time 10:40 1 8oz VOA 1 32oz BNA/Pest. 1 8oz Metals	1 2	L0SB203AS	CS	0.9				Background OVA 0 HNU 0 While drilling OVA 0 HNU 0 Sample shoe OVA 0 HNU 0 Sample head OVA 0 HNU 1
	3-5 ft. Dark brown demo debris; brick, wood, with sand + gravel Sample Time 10:50 1 8oz VOA No BNA/Pest No Metals Not enough to sample	3 4 5	L0SB203BS	CS	0.6				While drilling OVA 10 Sample shoe OVA 30 HNU Sample head OVA 3 HNU 1
	Boring Completed 5 ft.								

Illinois Environmental Protection Agency — **Field Boring Log** — Page 1 of 1

Site File No 0438020003 County Du Page — Boring No SB-204 — Monitor Well No NA

Site File Name Lemont / Lenz Oil — Surface Elev ____ — Completion Depth 5 ft

Fed ID No ____ — Auger Depth 5 ft — Rotary Depth NA

Quadrangle SAG Bridge — Sec. 11 — T 37N. — R 11E. — Date Start 2-11-92 — Finish 2-11-92

Boring Location See site map

Drilling Equipment CME 75 3 3/4" HSA 5 ft Continuous sampler (CS)

Personnel: G - S. Otto; D - P. Masch; H - R. Morris Jr.; H - B. Wilkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-3 ft. Dark brown silty Clay, top 0.4 Sand and gravel. Sample Time 10:15 1 8 oz. VOA 1 32 oz BNA/Pest. 1 8 oz Metals	1, 2	10SB204AS	CS	1.6				Background OVA 0 HNU 0; While drilling OVA 0 HNU 0; Sample head OVA 0 HNU 0; Sample shoe OVA 0 HNU 0
	3-5 ft. Dark gray to black clayey Silt top 0.6 Black oily muck with phenol type odor. Bottom 1' Clayey Silt Sample Time 10:25 1 8 oz VOA 1 32 oz BNA/Pest. 1 8 oz. Metals	3, 4	10SB204BS	CS	1.7				While drilling OVA 0 HNU 1; Driller note sewage odor; Sample shoe OVA 100 HNU 3; Head OVA 67 HNU
	Boring Completed 5 ft.	5							

Illinois Environmental Protection Agency — Field Boring Log

Site File No 0438020003 County Du Page Boring No SB205 Monitor Well No NA

Site File Name Lemont / Lear Oil Surface Elev _____ Completion Depth 5

Fed ID No _____ Auger Depth 5 ft. Rotary Depth NA

Quadrangle SAG Bridge Sec 11 T 37N. R 11E. Date Start 2-10-92 Finish 2-10-92

Boring Location see site map

Drilling Equipment CME 75 3 3/4" HSA
5 ft Continuous sampler (CS)

Personnel: G - S. Otto; D - P. Mason; H - R. Morris Jr.; H - B. Wilkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-3ft. 0-.7 Sand and gravel .7-1.5 Dark brown silt with trace gravel. Sample Time 1 35 1 8oz. VOA 1 32oz. BNA/Pest 1 8oz Metals	1 2	LOSB205AS	CS	1.5				Background OVA 0 HNU 4 While drilling OVA 0 Sample shoe OVA 0 HNU 5 Sample head OVA 0 HNU 5.5
	3-5ft. 0-.7 Brown silt and Gravel Sample Time 1:45 1 8oz. VOA 1 32oz. BNA/Pest 1 8oz. Metals	3 4 5	LOSB205BS	CS	0.7				Sample shoe OVA 35 HNU 6 Sample head OVA -
	Boring Completed at 5 ft.								

Illinois Environmental Protection Agency — Field Boring Log

Site File No 0438020003 County Du Page Boring No SB-206 Monitor Well No NA

Site File Name Lemont / Lenz Oil Surface Elev _____ Completion Depth 5 ft

Fed. ID No _____ Auger Depth 5 ft Rotary Depth NA

Quadrangle SAG Bridge Sec. 11 T 37N. R 11E. Date. Start 2-10-92 Finish 2-10-92

Boring Location See site map

Drilling Equipment CME 75 3 3/4" HSA 5 ft Continuous sampler (CS)

Personnel: G - S. Otto; D - P. Mason; H - R. Morris Jr; H - B. Wilkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-3 ft. 0-.6 Sand and Gravel .6-1.0 Brown Silt Bottom .3 Black oil on silt, petroleum. Sample Time 12:50 1 8oz. VOA 1 32oz. BNA/Pest. 1 8oz Metals	1 2	206AS	CS	1.3				Background OVA 0 HNU 4 While drilling OVA 7 HNU 4 Sample shoe OVA 15 HNU 5 Sample head OVA 0 HNU 4
	3-5 ft. 0 Recovery, Rock in cutting head Moved rig 2 ft. north, sampled 3-5 ft interval again, still 0 recovery.	3 4 5			0				
	Boring Completed at 5 ft.								

Illinois Environmental Protection Agency — **Field Boring Log** — Page 1 of 1

Site File No 0438020003 County Du Page Boring No SB207 Monitor Well No NA

Site File Name Lemont / Lenz Oil Surface Elev _____ Completion Depth 5

Fed ID No _____ Auger Depth 5 ft Rotary Depth NA

Quadrangle SAG Bridge Sec. 11 T 37N. R 11E. Date Start 2-11-92 Finish 2-11-92

Boring Location See site map

Drilling Equipment CME 75 3 3/4" HSA
5 ft Continuous sampler (CS)

Personnel
G - S. Otto
D - P Mason
H - R. Mathis Jr
H - B Wilkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-3 ft. Brown Sand and Gravel Sample Time 9 35 1 8oz. VOA 1 32oz BNA/Pest. 1 8oz Metals	1 2 3	LOSB207AS	CS	1.3				Background OVA 0 HNU 0 While drilling OVA 0 Sample shoe OVA 7 HNU 1 Sample head OVA 0 HNU 1
	3-5 ft. Lt. brown and Lt. gray mottled clayey Silt with some gravel and pebbles, iron staining throughout Sample Time 9:40 1 8oz VOA 1 8oz Metals 1 32oz BNA/Pest	4 5	LOSB207BS	CS	2.05				While drilling OVA 0 Sample shoe OVA 10 HNU Sample head OVA 2 HNU 1.5
	Boring Completed at 5 ft.								

Illinois Environmental Protection Agency — Field Boring Log

Site File No 0438020003 County Du Page Boring No SB 209 Monitor Well No NA

Site File Name Lemont / Lear Oil Surface Elev _____ Completion Depth 5 ft

Fed ID No _____ Auger Depth 5 ft Rotary Depth NA

Quadrangle SAG Bridge Sec. 11 T. 37N. R 11E. Date Start 2-11-92 Finish 2-11-92

Boring Location See site map

Drilling Equipment CME 75 3 3/4" HSA
5 ft Continuous sampler (CS)

Personnel:
G - S. Otto
D - P. Mason
H - P. Mathis Jr
H - B. Wilkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-3 ft. Top 1.2 Silty Gravel Lt. Brown 1.2-2.15 Lt. Brown clayey Silt with some gravel and large pebbles Sample Time 9:00 1 8oz. VOA 1 32oz. BNA/Pest 1 8oz Metals	1 2	L0582208AS L0582208AD	CS	2.15				Background OVA 1 HNU 0 While drilling OVA 1 HNU 0 Sample shoe OVA 1 HNU 0 Sample head OVA 1 HNU 2
	3-5 ft. Light brown clayey Silt with some gravel and large pebbles Sample Time 9:20 1 8oz. VOA 1 32oz BNA/Pest. 1 8oz. Metals	3 4 5	L0582208BS	CS	1.1				While drilling OVA 1 Sample shoe HNU 2 Sample head OVA 2.
	Boring Completed at 5 ft.								

Illinois Environmental Protection Agency — **Field Boring Log** — Page 1 of 1

Site File No 0438020003 County Du Page Boring No SB-209 Monitor Well No NA

Site File Name Lemont / Lear Oil Surface Elev _____ Completion Depth 5

Fed ID No _____ Auger Depth 5 ft Rotary Depth NA

Quadrangle SAG Bridge Sec. 11 T 37N. R 11E. Date Start 2-10-92 Finish 2-10-92

Boring Location See site map

Drilling Equipment CME 75 3 3/4" HSA
5 ft Continuous sampler (CS)

Personnel: G - S. Otto; D - P. Mason; H - P. Morris Jr.; H - B. Wilkenbach

Elev.	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-3 ft. 0-.7 Sand and gravel .7-2.0 Reddish brown silt Sample Time 12:15 1 8oz VOA 1 32oz BNA/Pest 1 8oz Metal	1 2	10SB209AS	CS	2.0				Background OVA 0 HNU 0 OVA while drilling 0 Sample shoe OVA 0 HNU 0 Sample head OVA 0 HNU 1
	3-5 ft. Brown with gray mottling Sandy silt iron staining throughout Sample Time 12:35 1 8oz. VOA 1 32oz. BNA/Pest 1 8oz. Metal	3 4 5	10SB209BS	CS	1.5				Sample shoe OVA 0 HNU 2 Sample head OVA HNU 0
	Boring Completed at 5.0 ft.								

Illinois Environmental Protection Agency

Field Boring Log

Site File No CH3802000 3 County DuPage Boring No SB-210 Monitor Well No NA

Site File Name Lemont / Lenz C.1 Surface Elev _____ Completion Depth NA

Fed ID No _____ Auger Depth NA Rotary Depth NA

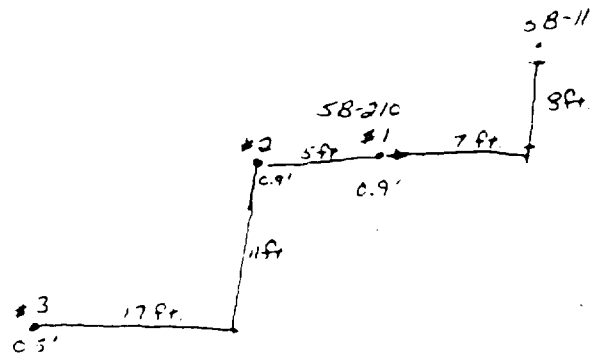
Quadrangle SAG Bridge Sec. 11 T 37N. R 11E. Date: Start 2-11-92 Finish 2-11-92

Boring Location see site map

Drilling Equipment CME 75 3 3/4" HSA 5 ft. continuous sampler

SAMPLES						Personnel
Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	G - S. Orto D - P. Mason H - R. Marhis Jr. H - B. Walkenbach

Elev	DESCRIPTION	Depth in feet	REMARKS
	Encountered concrete pad at 0.9 ft below surface, auger refusal. Moved rig 5 ft. again hit concrete pad at 0.9 ft. Moved rig a 3rd time, hit concrete pad at 0.5 ft		



Illinois Environmental Protection Agency

Field Boring Log

Page 1 of

Site File No 0438020003 County Du Page Boring No SB211 Monitor Well No NA

Site File Name Lemont / Lenz Oil Surface Elev _____ Completion Depth _____

Fed ID No _____ Auger Depth _____ Rotary Depth _____

Quadrangle SAG Bridge Sec 11 T 37N. R 11E. Date Start 2-11-92 Finish 2-11-92

Boring Location See site map

Drilling Equipment CME 75 3 3/4" HSA
5 ft Continuous sampler (CS)

Personnel
G - S. Otto
D - P Mason
H - R Mathis Jr
H - B Wolkenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-3 ft. Top 1.1 Dark brown sandy gravelly Silt. Bottom .5 Dark brown clayey Silt with petro. type odor Sample Time 1:15 1 8oz VOA 1 32oz BNA/Pest 1 8oz Metals	1, 2	LOSB211AS	CS	1.65				Background OVA 0 HNU 0; While drilling OVA [illegible] HNU [illegible]; Sample shoe OVA 10 HNU 2[illegible]; Sample head OVA 0
	3-5 ft Top .9 Light Brown clayey Sand Bottom .7 light brown sand fine to med grain, piece of dolomite bedrock .25 in size. Sample Time 1:25 1 8oz VOA 1 32oz BNA/Pest 1 8oz. Metals	3, 4	LOSB211BS	CS	1.65				While drilling OVA 1 HNU 3; Sample shoe OV HNU; Sample head OVA 2 HNU 1[illegible]
	Boring Completed at 5 ft.	5, 6, 7							

Illinois Environmental Protection Agency — **Field Boring Log** — Page 1 of 1

Site File No: 0N3802CCC3 County: Du Page Boring No: SB212 Monitor Well No: NA

Site File Name: Lemont / Lenz Oil Surface Elev: _____ Completion Depth: 2.9

Fed ID No: _____ Auger Depth: 2.9 ft Rotary Depth: NA

Quadrangle: SAG Bridge Sec: 11 T: 37N. R: 11E. Date Start: 2-11-92 Finish: 2-11-92

Boring Location: See site map

Drilling Equipment: CME 75 3 3/4" HSA
5 ft Continuous sampler (CS)

Personnel:
G - S. Otto
D - P. Mason
H - R. Morris Jr.
H - B. Wallenbach

Elev	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-3 ft. Light brown to brown silty sand and gravel, dolomite rock chips throughout sample Sample Time 1.50 1 8oz. VOA 1 32oz BNA/Pest. 1 8oz. Metals	1	LOSB212RS	CS	1.65				Background OVA 0 HNU 0
		2							While drilling OVA 0 HNU 3
									Sample shoe OVA 2 HNU 20
									Sample head OVA 2 HNU 20
	Auger Refusal at 2.9 ft.	3							
		4							
		5							

ERM-NORTH CENTRAL, INC. SOIL BORING LOGS

ERM - North Central, Inc.
Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NO.
Lenz Oil RI/FS	0252	1 OF 3	MW-01D

SITE	COORDINATES	ANGLE FROM HORIZ	BEARING
LENZ OIL RI/FS	N 723; E 616	Vertical	------

BEGUN	COMPLETED	DRILLER	DRILLING EQUIPMENT	BORING DIA.	TOTAL DEPTH
3-6-91		FOX DRILLING	CME-75	11.5"	47.0

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
28.9/41	4	0		602.1	▽ / ▼ /	22.4/

SAMPLE DEVICE	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
2"x2' Split Spoon/NX Core Barrel		Dirk Kaiser

Samples/R. Core: Sample No. Time	Rec. (ft)	Length(ft)	Blow Count RQD(%)	Contaminant Screening: Amb. Air* VOC(ppm)	Sample ** VOC(ppm)	Visual Observ.	LAYER ELEV. DEPTH	DEPTH	GRAPHICS	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
							602.1					
SS-1 08:30	1.4	2.0	17 17 9 8	0.0	0.5		600.1 2.0				0-2':GRAVEL: Dusky yellow green (10GY 3/2), .3' gravel, with very fine grained silt, very moist 1.1' same as above, very oily	Drilling: Smooth
SS-2 08:41	1.4	2.0	8 10 10 24	0.0	0.5		598.1 4.0				2-4':SAND AND GRAVEL: Medium light gray (5N5), medium grained, SAND, with a trace of gravel, oil, moist 0.4' olive black (5Y 2/1) SILTY CLAY, with trace of wood pieces, gravely, with some sand, purple sand lens 2mm thick	
SS-3 08:48	0.3	2.0	2 3 8 15	0.0	0.0			5			0.5' light gray (7N7) well sorted, medium grained, SAND, trace small gravel, grading to very coarse oily sand with trace gravel, moist	Driller indicates possible water table
SS-4 08:53	1.6	2.0	3 1 5 6	0.0	0.0						4-12':SILT: Olive black (5Y 2/1), very fine grained silt trace of organic roots, moist 0.6' Same as above, very moist 1.0' mottled, light gray (6N6), moderate olive brown (5Y 4/4), CLAYEY SILT, with well rounded, sub-angular, pebbles, moist	
SS-5 09:00	0.1	2.0	8 2 8 9	0.0	0.0						Same as above, very soft, moist	
SS-6 09:15	0.6	2.0	6 9 1 15	0.0	0.0		590.1 12.0	10			Same as above, very soft, very moist	
SS-7 09:25	0.4	2.0	13 22 29 27	0.0	0.0						12-18':SAND AND GRAVEL: Medium light gray (6N6), very angular, dolomite fragments, saturated	
SS-8 09:42	0.7	2.0	6 12 22 18	0.0	0.0			15			Same as above, with some medium light gray (6N6) silt	Drilling: Tough
SS-9 10:02	1.1	2.0	52 24 36 26	0.0	0.0		584.1 18.0				Same as above, without the silt, saturated	
SS-10 10:13	1.5	2.0	40 30 76 32	0.0	0.0						18-22.4':SILT: Medium gray (5N5), very fine grained, gravelly, saturated 0.7' angular, dolomite chips, saturated	

CONTAMINANT SCREENING NOTES
*HNu w/10.2 eV ** Split Spoon Screenin

SITE: LENZ OIL RI/FS

HOLE NO.: MW-01D

ERM - North Central, Inc.
Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NO.
Lenz Oil RI/FS	0252	2 OF 3	MW-01D

Samples/R. Core Sample # Time	Rec. (ft)	Length (ft)	Blow Cnt RQD(%)	Contaminant Screening Amb Air* VOC(ppm)	Sample** VOC(ppm)	Visual Observ.	LAYER ELEV. DEPTH	DEPTH	GRAPHICS	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
SS-11 11:12	1.2	2.0	24 32 220	0.0	0.0						Same as above, with 0.1" silty lens, saturated	
											Same as above	
SS-12 11:34	0.7	2.0	125	0.0	0.0		579.7 22.4					Bedrock
RUN 1 15:20	2.4	2.4						25			22.4-47.0': **RACINE FORMATION** Yellowish gray (5Y 8/1), finely crystalline, **DOLOMITE**, with some interclasts, peloids, occasional zones of wavy laminae of clay, heavy minerals, calcite, some quartz infillings, moderately vuggy	
							575.7 26.4				Auger and Ream to 27'	
							575.1 27.0					
RUN 2 16:20	5.0	5.0						30			Same as above	
							570.1 32.0					
RUN 3 16:55	9.9	10.0						35			Same as above, with some fossils	
								40			40.55'-40.60': Sand lens (?)	
							560.1 42.0					
RUN 4 17:15	5.0	5.0									Same as above, with peloids of a very white clay textured material (?)	

ERM - North Central, Inc.
Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NO.
Lenz Oil RI/FS	0252	3 OF 3	MW-01D

Samples/R. Core: Sample # Time	Rec. (ft)	Length (ft)	Blow Cnt RQD(%)	Contaminant Screening: Amb Air* VOC(ppm)	Sample** VOC(ppm)	Visual Observ.	LAYER ELEV. DEPTH	DEPTH	GRAPHICS	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
							555.1 / 47.0				End of boring, 47'	
								50				
								55				
								60				
								65				

ERM - North Central, Inc.
Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NO.
Lenz Oil RI/FS	0252	1 OF 2	MW-02D

SITE	COORDINATES	ANGLE FROM HORIZ	BEARING
LENZ OIL RI/FS	N 0; E 0	Vertical	------

BEGUN	COMPLETED	DRILLER	DRILLING EQUIPMENT	BORING DIA.	TOTAL DEPTH
4-24-91	4-25-91	FOX DRILLING	CME-75	11.5"	43.0

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
0.0/0	0	0		0.0	6.0/-6.0 /	15.5/

SAMPLE DEVICE	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
2"x2' Split Spoon/NX Core Barrel		Dirk Kaiser

Samples/R. Core: Sample No. Time	Rec. (ft)	Length (ft)	Blow Count RQD(%)	Contaminant Screening: Amb. Air* VOC(ppm)	Sample ** VOC(ppm)	Visual Observ.	LAYER ELEV. DEPTH	DEPTH	GRAPHICS	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
	1.0	2.0	20 12 7 12	0.0	0.0		0.0				0-5.8': **SILTY SAND & GRAVEL**: light olive brown (5Y5/6), poor sorting, dry	
	0.7	2.0	4 12 13 13	0.0	0.0							
	1.2	2.0	5 9 16 14	0.0	0.0			5				
	1.4	2.0	6 6 6 9	0.0	0.0		-5.9 5.9				5.8-6.0': Color change to med. grey (5N5), very moist in tip of spoon	
							-7.3 7.3				6-7.3': **SAND**: light brown, well sorted, fine grained, saturated	
	1.0	2.0	16 17 27 25	0.0	0.0						7.3-8': **SILT** medium grey (5N5), very soft, saturated. As Above - some gravel, stiff, moist	
	0.8	2.0	- - - -	0.0	0.0		-9.9 9.9	10			10.0-15.5': **GRAVEL** with silt, sandy, poorly sorted, angular, saturated.	
	1.0	2.0	85 175	0.0	0.0							
	0.8	1.5	111 116 116	0.0	0.0			15				
							-15.5 15.5				22.4-47.0': **RACINE FORMATION** Yellowish gray (5Y 8/1), finely crystalline, **DOLOMITE**, with some interclasts, peloids, occasional zones of wavy laminae of clay, heavy minerals, calcite, some quartz infillings, moderately vuggy	
		3.5										Lost all water return
		4.5										

CONTAMINANT SCREENING NOTES
*HNu w/10.2 eV ** Split Spoon Screenin

SITE: LENZ OIL RI/FS

HOLE NO.: MW-02D

ERM - North Central, Inc.
Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NO.
Lenz Oil RI/FS	0252	2 OF 2	MW-02D

Samples/R. Core: Sample # Time	Rec. (ft)	Length (ft)	Blow Cnt RQD(%)	Contaminant Screening: Amb Air* VOC(ppm)	Sample** VOC(ppm)	Visual Observ.	LAYER ELEV. DEPTH	DEPTH	GRAPHICS	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
		3.8						25				
		6.3						30				
		10.0						35				
								40				
							-43.0					
							43.0				End of boring, 43'	

ERM - North Central, Inc.
Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NO.
Lenz Oil RI/FS	0252	1 OF 2	MW-03D

SITE	COORDINATES	ANGLE FROM HORIZ	BEARING
LENZ OIL RI/FS	N 10: E 586	Vertical	------

BEGUN	COMPLETED	DRILLER	DRILLING EQUIPMENT	BORING DIA.	TOTAL DEPTH
3-21-91	3-22-91	FOX DRILLING	CME-75	11.5"	44.0

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
40.0/90	5	0	597.87	595.3	6.0/589.3 /	2.3/

SAMPLE DEVICE	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
2"x2' Split Spoon/NX Core Barrel		Dirk Kaiser

Samples/R. Core: Sample No. Time	Rec. (ft)	Length(ft)	Blow Count RQD(%)	Contaminant Screening: Amb. Air* VOC(ppm)	Sample ** VOC(ppm)	Visual Observ.	LAYER ELEV. DEPTH	DEPTH	GRAPHICS	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
							595.3					
SS01	0.5	2.0		0.0	0.0						0-2.3': TOPSOIL - Black and Dark Brown mottled, some clay, some fine sand, grass, roots, soft, moist.	
							593.0 / 2.3					Bedrock at 2.3'
											2.3-44.0': RACINE FORMATION: Yellowish gray (5Y 8/1), Finely crystalline, dolomite, with some intraclasts and peloids, occasional zones of wavy laminae, fractured with clay, heavy mineral and calcite infillings, some open fractures, slightly fossiliferous	
							591.3 / 4.0					
Run#1	10.0	10.0		0.0				5			4.0-14.0': Run#1 4.0-4.5': Highly Fractured	Water table at -6'
								10			10.8-11.5': Highly Fractured	
							581.3 / 14.0					
Run#2	10.0	10.0		0.0				15			14.0-24.0': Run#2	

CONTAMINANT SCREENING NOTES
*HNu w/10.2 eV **Split Spoon Screening

SITE: LENZ OIL RI/FS

HOLE NO.: MW-03D

ERM - North Central, Inc.
Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NO.
Lenz Oil RI/FS	0252	2 OF 2	MW-03D

Samples/R. Core: Sample # Time	Rec. (ft)	Length (ft)	Blow Cnt RQD(%)	Contaminant Screening: Amb Air* VOC(ppm)	Sample** VOC(ppm)	Visual Observ.	LAYER ELEV. DEPTH	DEPTH	GRAPHICS	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
							571.3					
Run#3	10.0	10.0		0.0			24.0				24.0-34.0': Run#3	
								25				
								30			29.9': 1" very fine grained sandstone lense, CaCO3 cemented	
							561.3					
Run#4	10.0	10.0		0.0			34.0				34.0-44.0': Run#4	
								35				
											37.5': 2-3" vug	
								40				
							551.3					
							44.0				End of boring, 44.0'.	

ERM - North Central, Inc.
Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NO.
Lenz Oil RI/FS	0252	1 OF 3	MW-04D

SITE	COORDINATES	ANGLE FROM HORIZ	BEARING
LENZ OIL RI/FS	N 658; E 507	Vertical	------

BEGUN	COMPLETED	DRILLER	DRILLING EQUIPMENT	BORING DIA.	TOTAL DEPTH
3-13-91	3-14-91	W. Holloman	CME-75	9.0"	46.0

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
28.0/95	4	15	602.80	600.5	5.0/595.5 5.0 /	17.5/

SAMPLE DEVICE	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
2"x2' Split Spoon/NX Core Barrel		Dirk Kaiser

Samples/R. Core: Sample No. Time	Rec. (ft)	Length (ft)	Blow Count RQD(%)	Contaminant Screening: Amb. Air* VOC(ppm)	Sample ** VOC(ppm)	Visual Observ.	LAYER ELEV. DEPTH 600.5	DEPTH	GRAPHICS	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
SS-A 09:30	2.0	2.0	11 18 35 36	0.0	1.0						0.0-1.5': GRAVELLY SANDY CLAY Black, oil stained, limestone fragments	
SS-B 09:45	1.8	2.0	20 13 36 92	0.0	0.0						1.5-2.0': SAND & GRAVEL Orange-brown, coarse grained sand, limestone up to 1" 2.0-2.7': CLAY Black, organic, with limestone fragments 2.7-3.5': GRAVEL Orange-yellow to light grey, weathered	
SS-C 09:50	1.0	2.0	49 62 20 13	0.0	0.0			5			3.5-4.0': GRAVEL & CLAY Light grey stained black, weathering 4.0-4.5': CLAY Black, organic Water Table @ 5.0' 4.5-6.0': As Above - with limestone fragments up to 3" in diameter.	
SS-D 10:05	0.0	2.0	2 1 2 3	0.0	0.8						6.0-8.0': No recovery	
SS-E 10:15	1.2	2.0	2 5 7 9	0.0	0.8						3.0-8.5': SILTY CLAY Black, organic, with light grey limestone fragments 8.5-9.5': CLAY Olive-brown, dense	
SS-F 10:30	0.5	2.0	11 17 19 13	0.0	0.6			10			9.5-10.0': As Above - stained black (oily?), wet, no odor 10.0-11.0': As Above - with limestone fragments	
SS-G 11:15	1.0	2.0	39 67 30 42	0.0	0.0						11.0-12.0': GRAVEL Light grey, limestone, covered with a dark oily liquid 12.0-14.0': As Above	
SS-H 11:50	2.0	2.0	32 51 67 170	0.0	0.0			15			14.0-16.0': As Above - fractured, ground up	
SS-I	1.0	1.5	96 65 100	0.0	0.0						16.0-17.5': As Above	
RUN 1 08:50 09:15	3.8	4.3		0.0			583.0 17.5				17.5-46.0': RACINE FORMATION: Yellowish gray (5Y 8/1), Finely crystalline, dolomite, with some intraclasts and peloids, occasional zones of wavy laminae, fractured with clay, heavy mineral and calcite infillings, some open	

CONTAMINANT SCREENING NOTES
*HNu w/10.2 eV **Split Spoon Screening

SITE: LENZ OIL RI/FS

HOLE NO.: MW-04D

ERM - North Central, Inc.
Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NO.
Lenz Oil RI/FS	0252	2 OF 3	MW-04D

Samples/R. Core: Sample # / Time	Rec. (ft)	Length (ft)	Blow Cnt RQD(%)	Contaminant Screening: Amb Air* VOC(ppm)	Sample** VOC(ppm)	Visual Observ.	LAYER ELEV. DEPTH	DEPTH	GRAPHICS	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
											fractures, horizontal and high angle fractures. 20.6-21.8': Highly fractured	
							578.7					
RUN 2 09:25 09:50	4.7	4.7		0.0			21.8					
								25			24.5-25.5': highly fractured	
							574.0					
RUN 3 10:00 10:25	3.5	6.5		0.0			26.5					
								30				
											32.5': Sand Seam - 0.7mm, calcite cemented, very fine grained	
							567.5					
RUN 4 11:00 11:30	5.5	5.5		0.0			33.0				32.6-34.4': highly fractured	
								35			34.6-35.0': highly fractured	
							562.0					
RUN 5 11:40 12:00	2.8	2.8		0.0			38.5					
								40				
							559.2					
RUN 6 12:05 12:15	4.7	4.7		0.0			41.3					

ERM - North Central, Inc.
Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NO.
Lenz Oil RI/FS	0252	3 OF 3	MW-04D

Samples/R. Core: Sample # / Time	Rec. (ft)	Length (ft)	Blow Cnt / RQD(%)	Contaminant Screening: Amb Air* VOC(ppm)	Sample** VOC(ppm)	Visual Observ.	LAYER ELEV. / DEPTH	DEPTH	GRAPHICS	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
							554.5 / 46.0					
											End of Boring - 46.0' Total loss of water during drilling to formation: MW-04D: 2610 gallons MW-04S: 0 gallons	
								50				
								55				
								60				
								65				

ERM - North Central, Inc.
Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NO.
Lenz Oil RI/FS	0252	2 OF 3	MW-05D

Samples/R. Core Sample # Time	Rec. (ft)	Length (ft)	Blow Cnt RQD(%)	Contaminant Screening Amb Air* VOC(ppm)	Sample** VOC(ppm)	Visual Observ.	LAYER ELEV. DEPTH	DEPTH	GRAPHICS	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
SS-11 10:21	0.9	2.0	4 4 19 11	0.0	0.5						-Same as above, 1"-2" dolomite cobbles	
SS-12 10:33	1.0	2.0	13 17 11 12	0.0	0.0						-Same as above, but light gray (7N7)	
SS-13 10:42	0.9	2.0	10 12 100	0.0	0.0			25			-Same as above	
	0.0	0.5		0.0	0.0		577.4					
RUN 1 15:20	9.0	9.0		0.0			26.5				**RACINE FORMATION**: Yellowish gray (5Y 8/1), Finely crystalline, dolomite, with some intraclasts and peloids, occasional zones of wavy laminae, fractured with clay, heavy mineral and calcite infillings, some open fractures, slightly fossiliferous -Clay infillings in fracture @ 36.0'-36.8' 0.01" wide.	
								30				
								35				
							568.4					
RUN 2 16:20	8.0	8.0		0.0			35.5				-Same as above	
								40				
							560.4					
RUN 3 16:55	5.5	5.5		0.0			43.5					

ERM - North Central, Inc.
Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NO.
Lenz Oil RI/FS	0252	3 OF 3	MW-05D

Samples/R. Core: Sample # / Time	Rec. (ft)	Length (ft)	Blow Cnt / RQD(%)	Contaminant Screening: Amb Air* VOC(ppm)	Sample** VOC(ppm)	Visual Observ.	LAYER ELEV. / DEPTH	DEPTH	GRAPHICS	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
							554.9					
RUN 4 17:15	5.5	5.5		0.0			49.0	50				
							549.4					
							54.5	55			End of boring, 54.5'	
								60				
								65				

ERM - North Central, Inc.
Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NO.
Lenz Oil RI/FS	0252	1 OF 2	MW-06D

SITE	COORDINATES	ANGLE FROM HORIZ	BEARING
LENZ OIL RI/FS	N 67; E 203	Vertical	------

BEGUN	COMPLETED	DRILLER	DRILLING EQUIPMENT	BORING DIA.	TOTAL DEPTH
3-18-91	3-19-91	FOX DRILLING	CME-75	11.5"	44.0

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
44.0/80	5	0	595.95	593.4	2.0/591.4	/

SAMPLE DEVICE	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
2"x2' Split Spoon/NX Core Barrel		Dirk Kaiser

Samples/R. Core: Sample No. Time	Rec. (ft)	Length(ft)	Blow Count RQD(%)	Contaminant Screening: Amb. Air* VOC(ppm)	Sample ** VOC(ppm)	Visual Observ.	LAYER ELEV. DEPTH	DEPTH	GRAPHICS SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
							593.4				
SS01 10:40	1.2	2.0	2 2 3 12	0.0	0.0					0-0.7': TOPSOIL - Black organic clay, sandy, grass, roots, soft, moist. 0.7-2.0': As Above - Orange to yellow orange with weathered limestone fragments	Water Table
							591.2 2.2				
										2.6-44.0': RACINE FORMATION: Yellowish gray (5Y 8/1), Finely crystalline, dolomite, with some intraclasts and peloids, occasional zones of wavy laminae, fractured with clay, heavy mineral and calcite infillings, some open fractures, slightly fossiliferous	Bedrock at 2.6' Casing driven to 3.3' Hole reamed to 4.0' prior to coring
							589.4 4.0				
Run#1	9.0	9.3		0.0				5		4.0-13.3': Run#1 4.0-4.5': Highly Fractured 6.5-10.2': Highly fractured	
								10		11.5-12.3': Mg nodules in fractures	
							580.1 13.3				
Run#2	6.0	6.7		0.0				15		13.3-20.0': Run#2 14.5-15.0': Heavily fractured	
							573.4				

CONTAMINANT SCREENING NOTES
*HNu w/10.2 eV ** Split Spoon Screenin

SITE	HOLE NO.
LENZ OIL RI/FS	MW-06D

ERM - North Central, Inc.
Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NO.
Lenz Oil RI/FS	0252	2 OF 2	MW-06D

Samples/R. Core: Sample # / Time	Rec. (ft)	Length (ft)	Blow Cnt / RQD(%)	Contaminant Screening: Amb Air* VOC(ppm)	Sample** VOC(ppm)	Visual Observ.	LAYER ELEV. / DEPTH	DEPTH	GRAPHICS / SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
Run#3	9.0	9.0		0.0			20.0			20.0-29.0': Run#3	
								25			
							564.4				
Run#4	10.0	10.0		0.0			29.0			29.0-39.0': Run#4	
								30			
										32.5-32.7': Highly fractured	
								35			
							554.4				
Run#5	5.0	5.0					39.0			39.0-44.0': Run#5	
								40			
										41.0-42.5': Highly fractured	
							549.4			43.5-43.6': Highly fractured	
							44.0			End of boring at 44.0'	

ERM - North Central, Inc.
Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NO.
Lenz Oil RI/FS	0252	1 OF 3	MW-07D

SITE	COORDINATES	ANGLE FROM HORIZ	BEARING
LENZ OIL RI/FS	N 375; E 18	Vertical	------

BEGUN	COMPLETED	DRILLER	DRILLING EQUIPMENT	BORING DIA.	TOTAL DEPTH
3-28-91	4-1-91	FOX DRILLING	CME-75	7.5"	53.8

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
28.8/	3			608.0	23.0/585.0 /	24.0/

SAMPLE DEVICE	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
2"x2' Split Spoon/NX Core Barrel		Dirk Kaiser

Samples/R. Core: Sample No. Time	Rec. (ft)	Length(ft)	Blow Count RQD(%)	Contaminant Screening: Amb. Air* VOC(ppm)	Sample ** VOC(ppm)	Visual Observ.	LAYER ELEV. DEPTH	DEPTH	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
							608.0			
SS-1 08:35	1.1	2.0	4 32 29 15	0.0	0.0		607.1 0.9		0-1.0': TOPSOIL - Moderate brown (5 YR 3/4), trace sand, moist	
							606.1 1.9		1.0-2.0': GRAVEL - Dark yellowish orange (10 YR 6/6)	
SS-2 08:40	0.6	2.0	11 9 9 13	0.0	0.0				2.0-4.0': GRAVELLY CLAY - Moderate yellowish brown, some iron stains, some sand, dry	
SS-3 08:55	1.1	2.0	11 4 4 6	0.0	0.0			5	4.0-6.8': As Above - soft, moist	
SS-4 09:05	1.4	2.0	2 3 8 6	0.0	0.0		600.6 7.4		6.8-7.4': As Above - Grading to dusky yellow green	
SS-5 09:10	1.2	2.0	8 15 28 24	0.0	0.0		599.4 8.6		7.4-8.6': SAND/FILL? - Black, very fine grained, hard, trace cinders (?)	
SS-6 09:25	1.2	2.0	31 90 67 50	0.0	0.0			10	8.6-10.0': SILTY SAND - Grayish yellow (5 Y 8/4), some gravel, moderately sorted, trace silt, moist 10.0-12.0': As Above - with cobbles of dolomite	
SS-7 10:20	1.8	2.0	39 67 136 106	0.0	0.0				12.0-14.0': As Above - mottled gray in spots	
SS-8 10:40	2.0	2.0	31 55 64 65	0.0	0.0			15	14.0-24.0': As Above - Color change at 15.0' to medium light grey (N6), moist	
SS-9 11:25	1.5	2.0	37 65 81 131	0.0	0.0					
SS-10 11:50	1.5	2.0	38 54 59 67	0.0	0.0					

CONTAMINANT SCREENING NOTES
*HNu w/10.2 eV **Split Spoon Screening

SITE: LENZ OIL RI/FS

HOLE NO. MW-07D

ERM - North Central, Inc.
Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NO.
Lenz Oil RI/FS	0252	2 OF 3	MW-07D

Samples/R. Core: Sample # Time	Rec. (ft)	Length (ft)	Blow Cnt RQD(%)	Contaminant Screening: Amb Air* VOC(ppm)	Sample** VOC(ppm)	Visual Observ.	LAYER ELEV. DEPTH	DEPTH	GRAPHICS	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
SS-11 12:10	1.5	2.0	14 50 34 24	0.0	0.0							
SS-12 13:15	1.8	2.0	13 24 36 100	0.0	0.0						23.0 Saturated at 23.0', water rising to 14.0'	
							584.0 24.0				24-53.8': **RACINE FORMATION**: Yellowish gray (5Y 8/1), Finely crystalline, dolomite, with some intraclasts and peloids, occasional zones of wavy laminae, fractured with clay, heavy mineral and calcite infillings, some open fractures, slightly fossiliferous 25.0-35.2': Highly fractured	
Run#1	3.0	3.0		0.0	0.0			25				
							580.0 28.0					
Run#2	3.8	3.8		0.0	0.0			30				
							576.2 31.8					
Run#3	3.2	3.2		0.0	0.0							
							573.0 35.0	35				
Run#4	4.0	4.0		0.0	0.0						37.7-37.9': Highly fractured	
							569.0 39.0					
Run#5	9.0	9.0		0.0	0.0			40				

ERM - North Central, Inc.
Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NO.
Lenz Oil RI/FS	0252	3 OF 3	MW-07D

Samples/R. Core: Sample # Time	Rec. (ft)	Length (ft)	Blow Cnt RQD(%)	Contaminant Screening: Amb Air* VOC(ppm)	Sample** VOC(ppm)	Visual Observ.	LAYER ELEV. DEPTH	DEPTH	GRAPHICS	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
							560.0					
Run#6	5.8	5.8		0.0	0.0		48.0					
								50			50.1-50.7': Highly fractured	
											52.8-53.8': Highly fractured	
							554.3 53.7					
											End of Boring at 53.8'	
								55				
								60				
								65				

ERM - North Central, Inc.
Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NO.
Lenz Oil RI/FS	0252	1 OF 2	MW08S

SITE	COORDINATES	ANGLE FROM HORIZ	BEARING
LENZ OIL RI/FS	N 550; E 142	Vertical	------

BEGUN	COMPLETED	DRILLER	DRILLING EQUIPMENT	BORING DIA.	TOTAL DEPTH
2-13-92	2-14-92	W. Holloman	Fox Drilling, Mobil D-65	7.25"	22.5

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
12.5/	2	0	602.48	599.7	/ /	5.7/

SAMPLE DEVICE	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
2"x2' Split Spoon/NX Core Barrel	Monitoring Well 8S	Dirk Kaiser

Samples/R. Core: Sample No. Time	Rec. (ft)	Length (ft)	Blow Count RQD(%)	Contaminant Screening: Amb. Air* VOC(ppm)	Sample** VOC(ppm)	Visual Observ.	LAYER ELEV. DEPTH (599.7)	DEPTH	GRAPHICS / SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
SS-1 10:00	1.5	2.0	2 8 36	0.0	0.0	None	599.4 0.3 599.1 0.6			0-0.25': **FILL**: Brick, glass, roots, organic material, sand and gravel.	
										0.25-0.6': **CLAY**: Light yellow brown, saturated.	
SS-2 10:11	0.8	1.0	35 50/6"	0.0	0.0	None					
SS-3 10:18	1.9	2.0	65 65 75 78	0.0	0.0	None				0.6-1.1': **SILTY CLAY**: Dark brown, pebbly, moist. 1.1-2.0': **SILTY SAND**: Yellow, fine grained, some pebbles, well rounded, some iron staining.	
							594.8 4.9	5		2-3.0': **SILTY SAND**: With, some broken gravel, trace clay, moist. 3-5.0': **SILTY SAND**: As above, stiffer.	
RUN 1 14:00 14:15	2.5	6.0		0.0	0.0	None				5.0-11.0': **DOLOMITE**: Rubbly, not consolidated bedrock, probably boulders.	
								10			
RUN 2 15:01 15:15	3.0	3.0		0.0	0.0	None				11-14.0': **DOLOMITE**: Core is mostly rubble, 6" piece of banded quartzite from between 12 to 13.5', banding is at 60 degree angle from center of core, several heavy metals can be seen along band.	
RUN 3 15:45 15:50	2.0	2.0		0.0	0.0	None		15		14-16.0: **DOLOMITE**: Rubbly dolomite.	
RUN 4 16:06 16:14	5.0	5.0		0.0	0.0	None				16-21.0' **DOLOMITE**: As above.	

CONTAMINANT SCREENING NOTES
*HNu w/10.2 eV **SS Screening

SITE	HOLE NO.
LENZ OIL RI/FS	MW08S

ERM - North Central, Inc.
Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NO.
Lenz Oil RI/FS	0252	2 OF 2	MW08S

Samples/R. Core: Sample # Time	Rec. (ft)	Length (ft)	Blow Cnt RQD(%)	Contaminant Screening: Amb Air* VOC(ppm)	Sample** VOC(ppm)	Visual Observ.	LAYER ELEV. DEPTH	DEPTH	GRAPHICS SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
							578.7 / 21.0			End of Boring at 21.0' Set Monitoring Well MW08S in Borehole.	
								25			
								30			
								35			
								40			

ERM - North Central, Inc.
Environmental Resources Management

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NO.
Lenz Oil RI/FS	0252	1 OF 2	MW08S

SITE	COORDINATES	ANGLE FROM HORIZ	BEARING
LENZ OIL RI/FS	N 550; E 142	Vertical	------

BEGUN	COMPLETED	DRILLER	DRILLING EQUIPMENT	BORING DIA.	TOTAL DEPTH
2-13-92	2-14-92	W. Holloman	Fox Drilling, Mobil D-65	7.25"	22.5

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
12.5/	2	0	602.48	599.7	▽ / ▼ /	5.7/

SAMPLE DEVICE	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
2"x2' Split Spoon/NX Core Barrel	Monitoring Well 8S	Dirk Kaiser

Samples/R. Core: Sample No. Time	Rec. (ft)	Length(ft)	Blow Count RQD(%)	Contaminant Screening: Amb. Air* VOC(ppm)	Sample ** VOC(ppm)	Visual Observ.	LAYER ELEV. DEPTH (599.7)	DEPTH	GRAPHICS	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
SS-1 10:00	1.5	2.0	2 8 36	0.0	0.0	None	599.4 0.3 599.1 0.6				0-0.25':**FILL**: Brick, glass, roots, organic material, sand and gravel. 0.25-0.6':**CLAY**: Light yellow brown, saturated.	
SS-2 10:11	0.8	1.0	35 50/6"	0.0	0.0	None						
SS-3 10:18	1.9	2.0	65 65 75 78	0.0	0.0	None	594.8 4.9				0.6-1.1':**SILTY CLAY**: Dark brown, pebbly, moist. 1.1-2.0':**SILTY SAND**: Yellow, fine grained, some pebbles, well rounded, some iron staining.	
RUN 1 14:00 14:15	2.5	6.0		0.0	0.0	None		5			2-3.0':**SILTY SAND**: With some broken gravel, trace clay, moist. 3-5.0':**SILTY SAND**: As above, stiffer. 5.0-11.0':**DOLOMITE**: Rubbly, not consolidated bedrock, probably boulders.	
								10				
RUN 2 15:01 15:15	3.0	3.0		0.0	0.0	None					11-14.0':**DOLOMITE**: Core is mostly rubble, 6" piece of banded quartzite from between 12 to 13.5', banding is at 60 degree angle from center of core, several heavy metals can be seen along band.	
RUN 3 15:45 15:50	2.0	2.0		0.0	0.0	None		15			14-16.0:**DOLOMITE**: Rubbly dolomite.	
RUN 4 16:06 16:14	5.0	5.0		0.0	0.0	None					16-21.0'**DOLOMITE**: As above.	

CONTAMINANT SCREENING NOTES
*HNu w/10.2 eV **SS Screening

SITE: LENZ OIL RI/FS

HOLE NO.: MW08S

ERM - North Central, Inc.
Environmental Resources Management

GEOLOGIC DRILL LOG

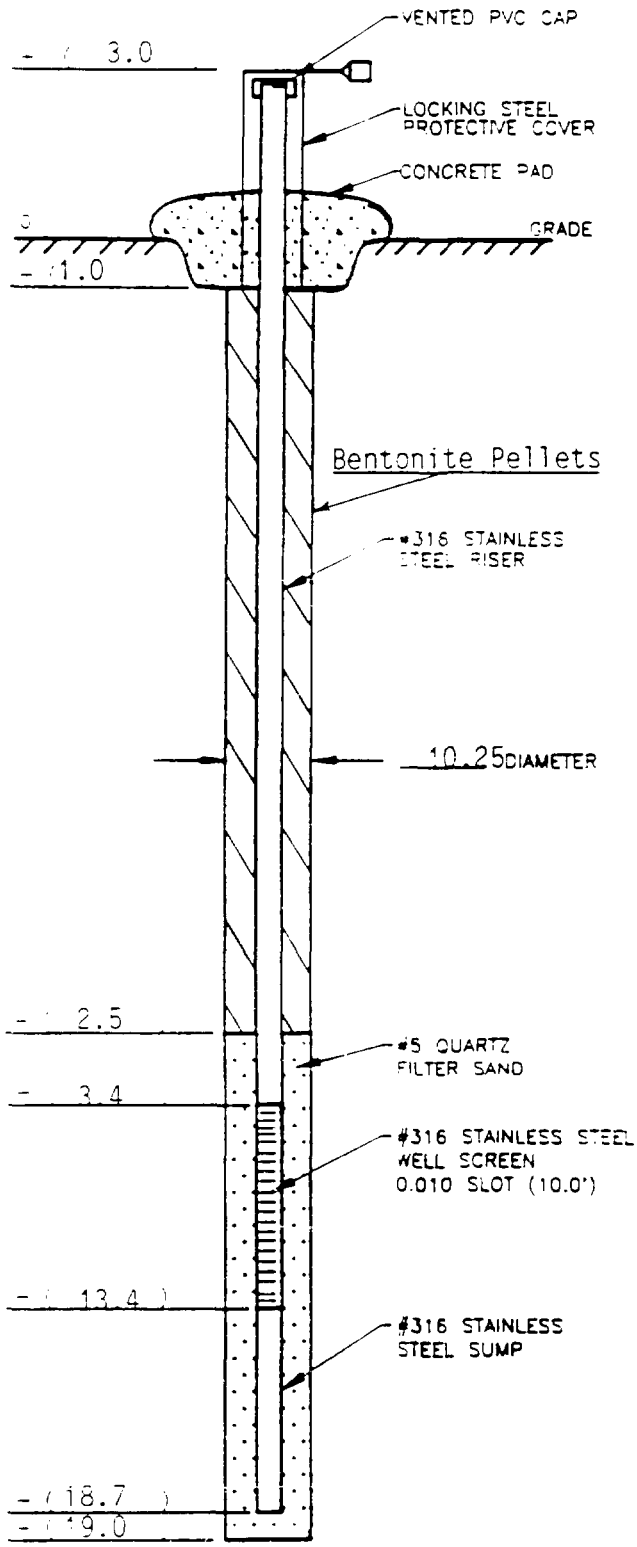
PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NO.
Lenz Oil RI/FS	0252	2 OF 2	MW08S

Samples/R. Core: Sample # / Time	Rec. (ft)	Length (ft)	Blow Cnt / RQD(%)	Contaminant Screening: Amb Air* VOC(ppm)	Sample** VOC(ppm)	Visual Observ.	LAYER ELEV. / DEPTH	DEPTH	GRAPHICS / SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
							578.7 / 21.0			End of Boring at 21.0' Set Monitoring Well MW08S in Borehole.	
								25			
								30			
								35			
								40			

APPENDIX G

WELL CONSTRUCTION DIAGRAMS

WELL CONSTRUCTION LOG



NOT DRAWN TO SCALE

ERM JOB # 0252

PROJECT Lenz Oil WELL MW01S
TOWN/CITY Lemont
COUNTY DuPage STATE IL
ELEVATION
GRADE 602.88 MSL
TOP OF CASING 600.04 MSL (M.P.)
SURVEY BY Patrick Engineering, Inc.
INSTALLATION DATE(S) 3/11/91
DRILLING METHOD HSA
DRILLING CONTRACTOR Fox Drilling, Inc.
DRILLING FLUID DuPage County Municipal Water Supply
DEVELOPMENT TECHNIQUE(S) AND DATE(S)
Centrifugal Pump/Bailing

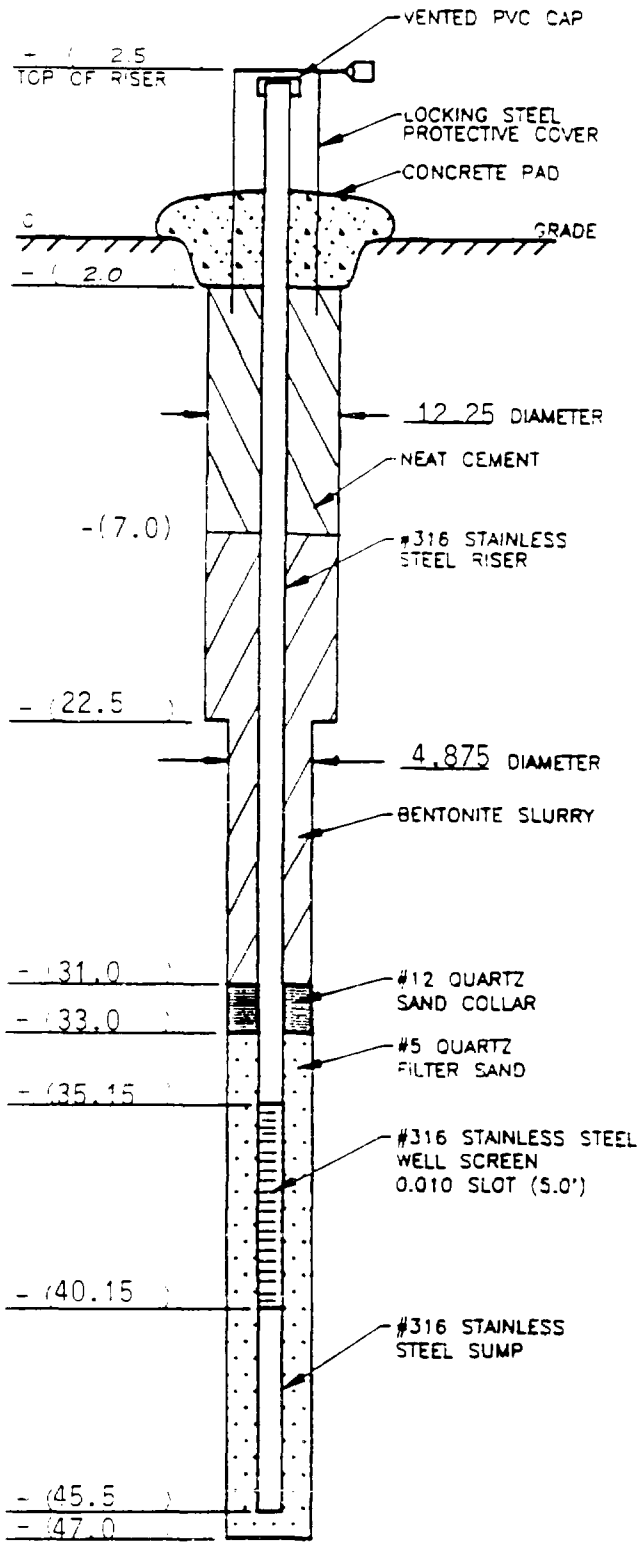
FLUID LOSS DURING DRILLING 0 GAL
WATER REMOVED DURING DEVELOPMENT 360 GAL
STATIC DEPTH TO WATER
FEET BELOW M.P. 7.17 DATE 5 / 9 / 91
PUMPING DURATION HOURS
YIELD gpm DATE / /
REMARKS

PREPARED BY Dirk Kaiser, ERM

PROJECT	0252
REPORT	TM3
DRAWN	CHM
DATED	
DATE	8/20/91
APPROVED	
CLIENT NAME	KMZ - LENZ OIL

ERM

WELL CONSTRUCTION LOG



NOT DRAWN TO SCALE

ERM JOB # 0252

PROJECT Lenz Oil WELL MW01D
TOWN/CITY Lemont
COUNTY DuPage STATE IL
ELEVATION
GRADE 599.91 MSL
TOP OF CASING 602.11 MSL (M.P.)
SURVEY BY Patrick Engineering, Inc.
INSTALLATION DATE(S) 3/7/91
DRILLING METHOD HSA/Rotory
DRILLING CONTRACTOR Fox Drilling, Inc.
DRILLING FLUID DuPage County Municipal Water Supply
DEVEOLPMENT TECHNIQUE(S) AND DATE(S)
Centrifugal Pump
Bailing

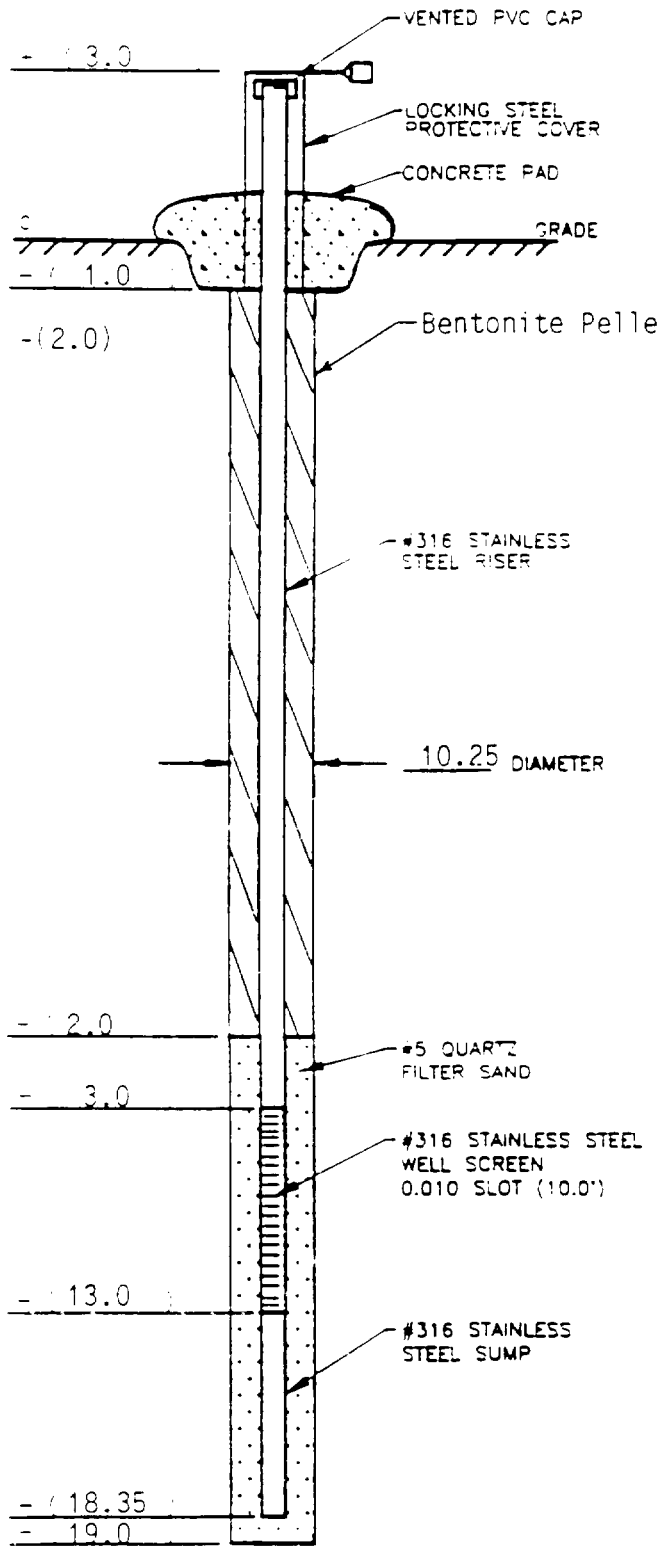
FLUID LOSS DURING DRILLING 1525 GAL
WATER REMOVED DURING DEVELOPMENT 1850 GAL
STATIC DEPTH TO WATER
FEET BELOW M.P. 8.84 DATE 5 / 9 / 91
PUMPING DURATION _____ HOURS
YIELD _____ gpm DATE ___/___/___
REMARKS

PREPARED BY Dirk Kaiser, ERM

ERM

PROJECT	REPORT	DRAWN	CHECKED	DATE	APPROVED	CLIENT NAME
0252	TM3	CMM		6/20/91		KMZ - LENZ OIL

WELL CONSTRUCTION LOG



NOT DRAWN TO SCALE

ERM JOB # 0252

PROJECT Lenz Oil WEL MW02S
TOWN/CITY Lemont
COUNTY DuPage STATE IL
ELEVATION
GRADE 600.28 MSL
TOP OF CASING 603.23 MSL (M.P.)
SURVEY BY Patrick Engineering, Inc.
INSTALLATION DATE(S) 4/25/91
DRILLING METHOD HSA
DRILLING CONTRACTOR Fox Drilling, Inc.
DRILLING FLUID DuPage County
Municipal Water Supply
DEVELOPMENT TECHNIQUE(S) AND DATE(S)
Centrifugal Pump/Bailing

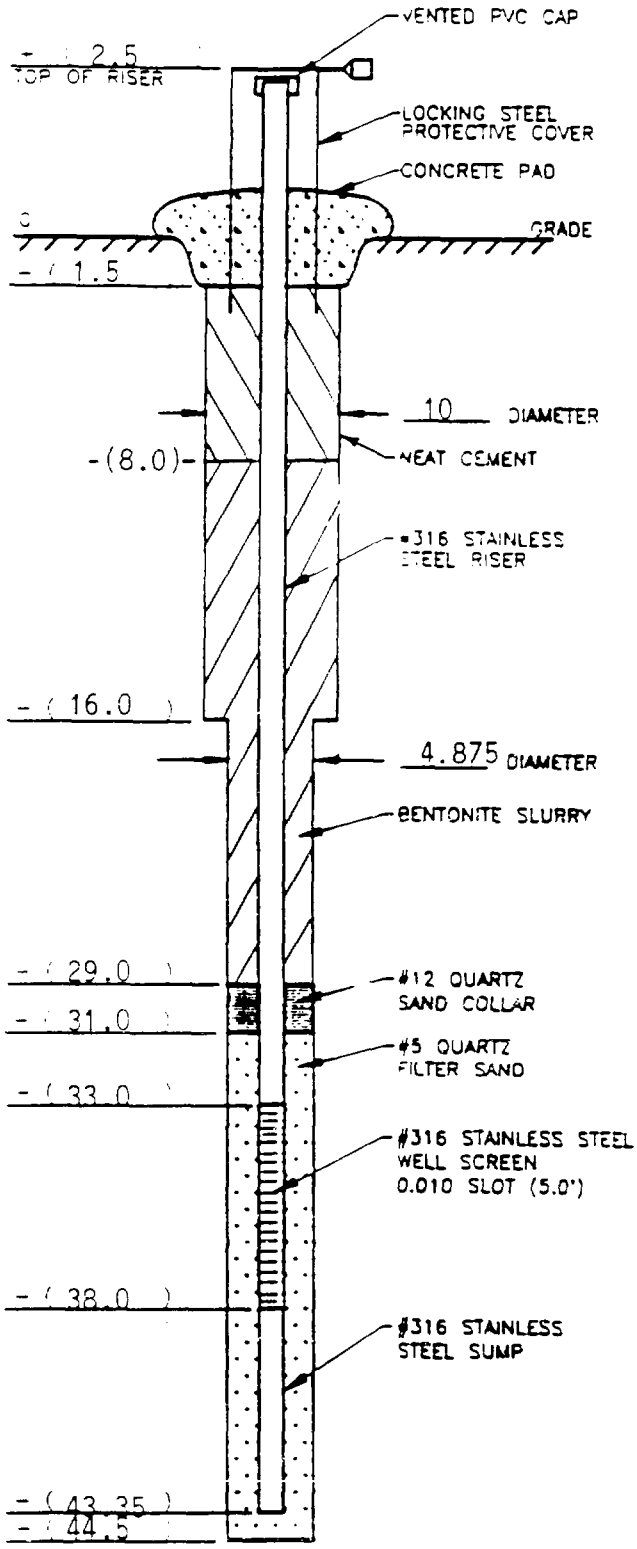
FLUID LOSS DURING DRILLING 10 GAL
WATER REMOVED DURING DEVELOPMENT
205 GAL
STATIC DEPTH TO WATER
FEET BELOW M.P. 7.95 DATE 5 / 9 /91
PUMPING DURATION _____ HOURS
YIELD _____ gpm DATE ___/___/___
REMARKS

PREPARED BY Dirk Kaiser ERM

PROJECT	0252
REVISION	TM3
DRAWN	CMM
CHECKED	
DATE	6/20/91
APPROVED	
CLIENT NAME	KMZ - LENZ OIL

ERM

WELL CONSTRUCTION LOG



NOT DRAWN TO SCALE

ERM JOB # 0252

PROJECT Lenz Oil WELL MW02D
TOWN/CITY Lemont
COUNTY DuPage STATE Il
ELEVATION
GRADE 600.30 MSL
TOP OF CASING 602.63 MSL (M.P.)
SURVEY BY Patrick Engineering, Inc.
INSTALLATION DATE(S) 4/24/91
DRILLING METHOD HSA/Rotory
DRILLING CONTRACTOR Fox Drilling, Inc.
DRILLING FLUID DuPage County Municipal Water Supply
DEVEOLPMENT TECHNIQUE(S) AND DATE(S)
Centrifugal Pump
Bailing

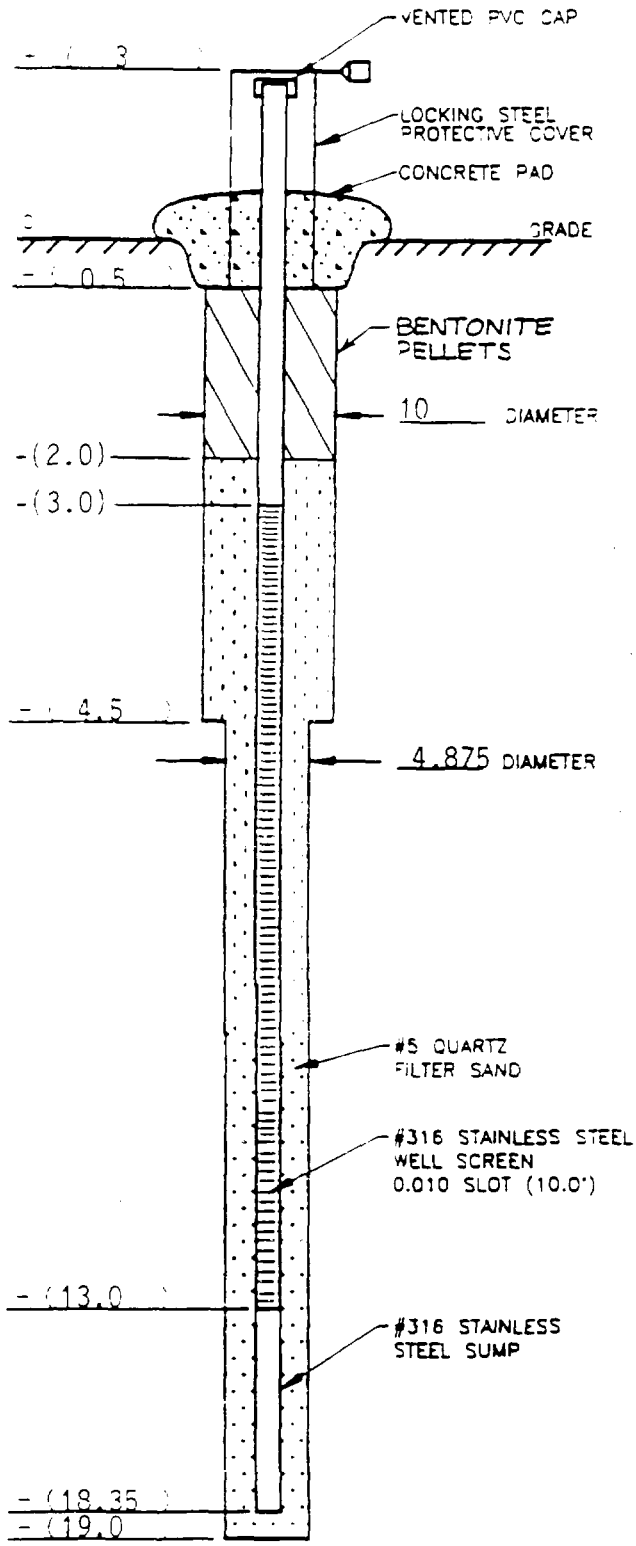
FLUID LOSS DURING DRILLING 1630 GAL
WATER REMOVED DURING DEVELOPMENT 1650 GAL
STATIC DEPTH TO WATER
FEET BELOW M.P. 9.73 DATE 5 / 9 / 91
PUMPING DURATION _____ HOURS
YIELD _____ gpm DATE ___/___/___
REMARKS

PREPARED BY Dirk Kaiser, ERM

ERM

PROJECT 0252 | REVISION TM3 | DRAWN CMM | DATE 6/20/91 | APPROVED | CLIENT NAME KMZ - LENZ OIL

WELL CONSTRUCTION LOG



ERM JOB # 0252

PROJECT Lenz Oil WELL MW03S
TOWN/CITY Lemont
COUNTY DuPage STATE IL
ELEVATION
GRADE 594.91 MSL
TOP OF CASING 597.91 MSL (M.P.)
SURVEY BY Patrick Engineering, Inc.
INSTALLATION DATE(S) 4/4/91
DRILLING METHOD HSA/Rotory
DRILLING CONTRACTOR Fox Drilling, Inc.
DRILLING FLUID DuPage County Municipal Water Supply
DEVELOPMENT TECHNIQUE(S) AND DATE(S)
Centrifugal Pump
Bailing

FLUID LOSS DURING DRILLING 358 GAL
WATER REMOVED DURING DEVELOPMENT 360 GAL
STATIC DEPTH TO WATER
FEET BELOW M.P. 6.54 DATE 5/9/91
PUMPING DURATION _____ HOURS
YIELD _____ gpm DATE ___/___/___
REMARKS

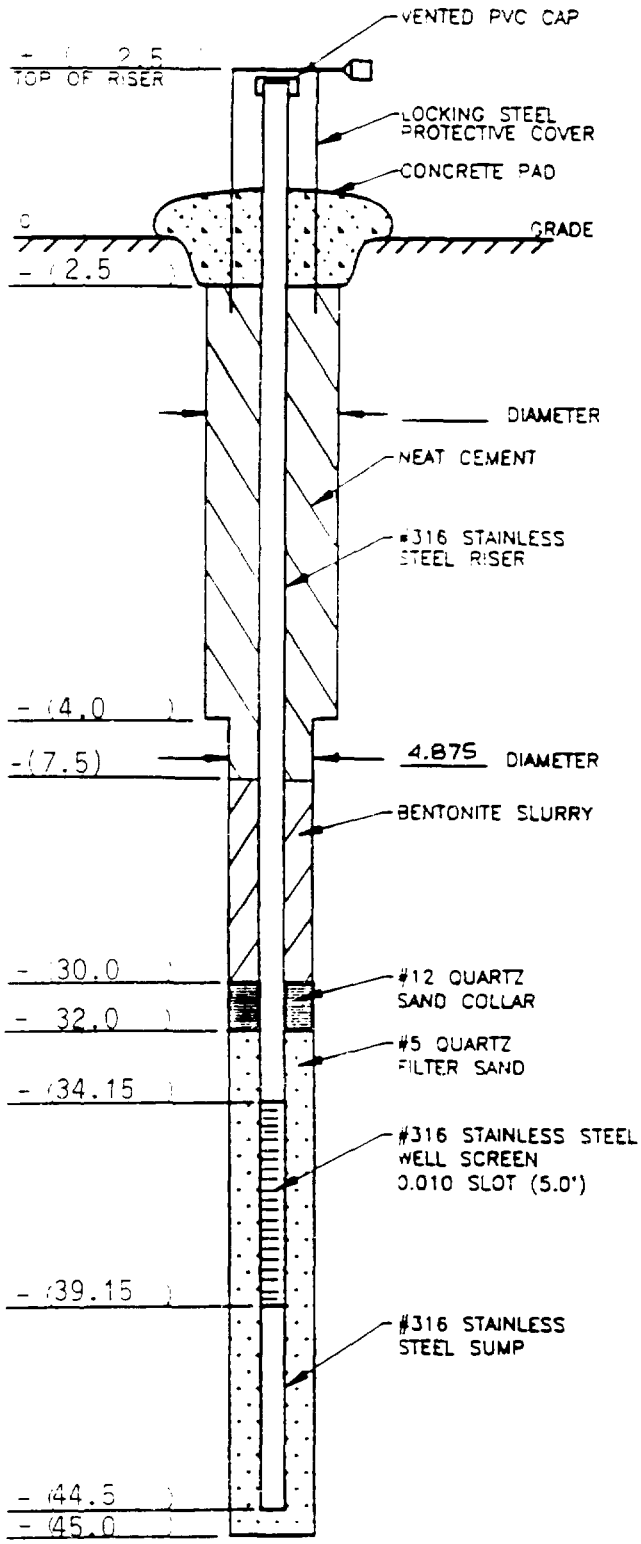
PREPARED BY Dirk Kaiser, ERM

NOT DRAWN TO SCALE

ERM

PROJECT 0252 | REPORT TM3 | DRAWN CMM | CHECKED | DATE 6/20/91 | APPROVED | CLIENT NAME KMZ - LENZ OIL

WELL CONSTRUCTION LOG



NOT DRAWN TO SCALE

ERM JOB # 0252

PROJECT Lenz Oil WELL MW03D
TOWN/CITY Lemont
COUNTY DuPage STATE IL
ELEVATION
GRADE 595.31 MSL
TOP OF CASING 597.87 MSL (M.P.)
SURVEY BY Patrick Engineering, Inc.
INSTALLATION DATE(S) 3/21-3/22, 1991
DRILLING METHOD HSA/Rotory
DRILLING CONTRACTOR Fox Drilling, Inc.
DRILLING FLUID DuPage County Municipal Water Supply
DEVEOLPMENT TECHNIQUE(S) AND DATE(S)
Centrifugal Pump
Bailing

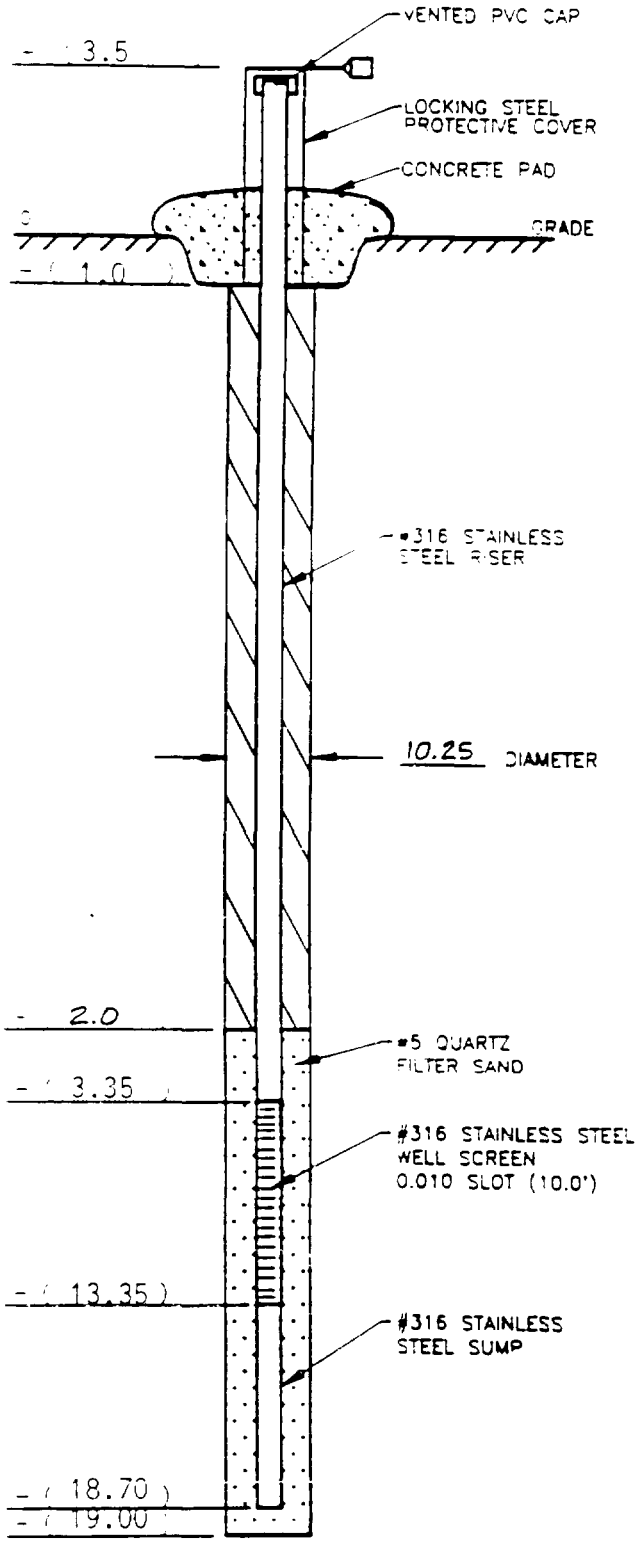
FLUID LOSS DURING DRILLING 3500 GAL
WATER REMOVED DURING DEVELOPMENT 3530 GAL
STATIC DEPTH TO WATER
FEET BELOW M.P. 5.83 DATE 5 / 9 /91
PUMPING DURATION _____ HOURS
YIELD _____ gpm DATE ___/___/___
REMARKS

PREPARED BY Dirk Kaiser, ERM

ERM

PROJECT	0252
REPORT	TM3
DRAWN	CMM
CHECKED	
DATE	6/20/91
APPROVED	
CLIENT NAME	KMZ - LENZ OIL

WELL CONSTRUCTION LOG



NOT DRAWN TO SCALE

ERM JOB # 0252

PROJECT Lenz Oil WELL MW04S
TOWN/CITY Lemont
COUNTY DuPage STATE IL
ELEVATION
GRADE 600.55 MSL
TOP OF CASING 603.35 MSL (M.P.)
SURVEY BY Patrick Engineering, Inc.
INSTALLATION DATE(S) 4/15/91
DRILLING METHOD HSA
DRILLING CONTRACTOR Fox Drilling, Inc.
DRILLING FLUID DuPage County
Municipal Water Supply
DEVEOLPMENT TECHNIQUE(S) AND DATE(S)
Centrifugal Pump/Bailing

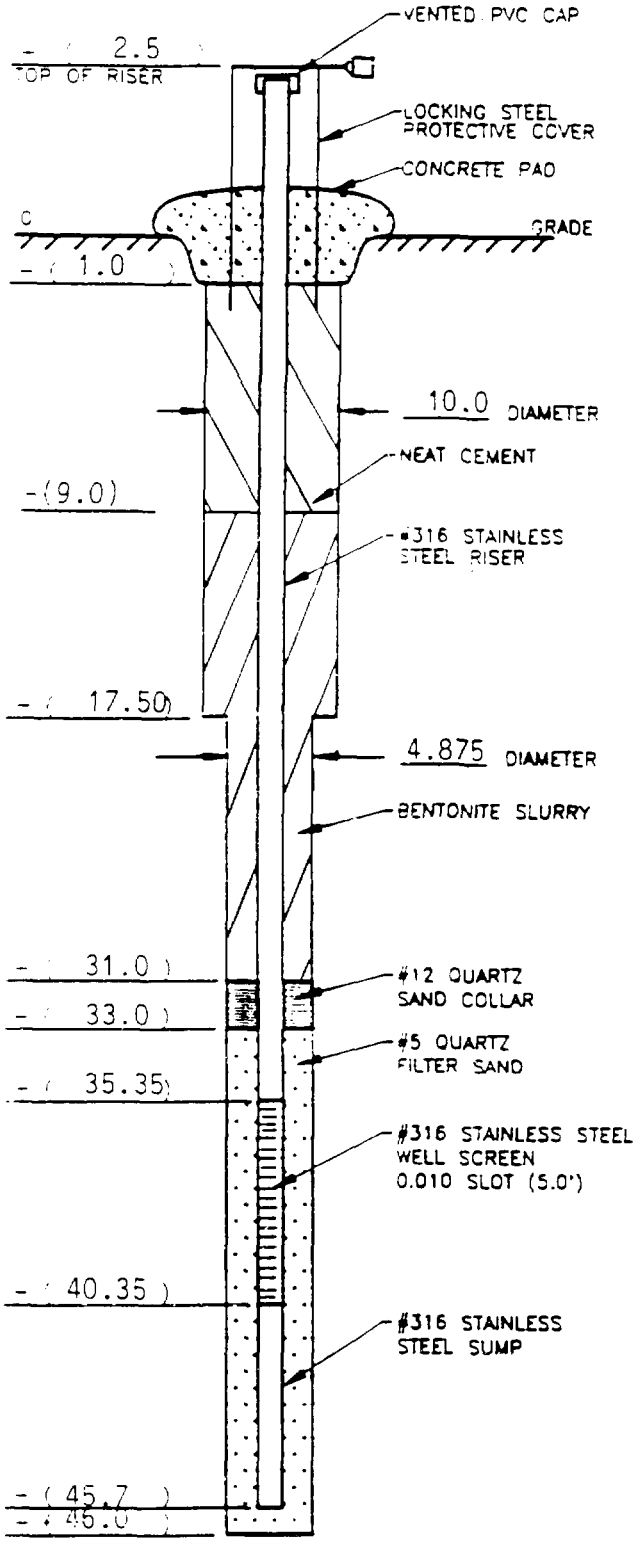
FLUID LOSS DURING DRILLING 400 GAL
WATER REMOVED DURING DEVELOPMENT
415 GAL
STATIC DEPTH TO WATER
FEET BELOW M.P. 7.97 DATE 5 / 9 / 91
PUMPING DURATION _____ HOURS
YIELD _____ gpm DATE ___/___/___
REMARKS

PREPARED BY Dirk Kaiser, ERM

ERM

PROJECT 0252 | REPORT TM3 | DRAWN CMM | CHECKED | DATE 6/20/91 | APPROVED | CLIENT NAME KMZ - LENZ OIL

WELL CONSTRUCTION LOG



NOT DRAWN TO SCALE

ERM JOB # 0252

PROJECT Lenz Oil WELL MW04D
TOWN/CITY Lemont
COUNTY DuPage STATE IL
ELEVATION
GRADE 600.51 MSL
TOP OF CASING 602.80 MSL (M.P.)
SURVEY BY Patrick Engineering, Inc.
INSTALLATION DATE(S) 3/14/91
DRILLING METHOD HSA/Rotory
DRILLING CONTRACTOR Fox Drilling, Inc.
DRILLING FLUID DuPage County Municipal Water Supply
DEVELOPMENT TECHNIQUE(S) AND DATE(S)
Centrifugal Pump
Bailing

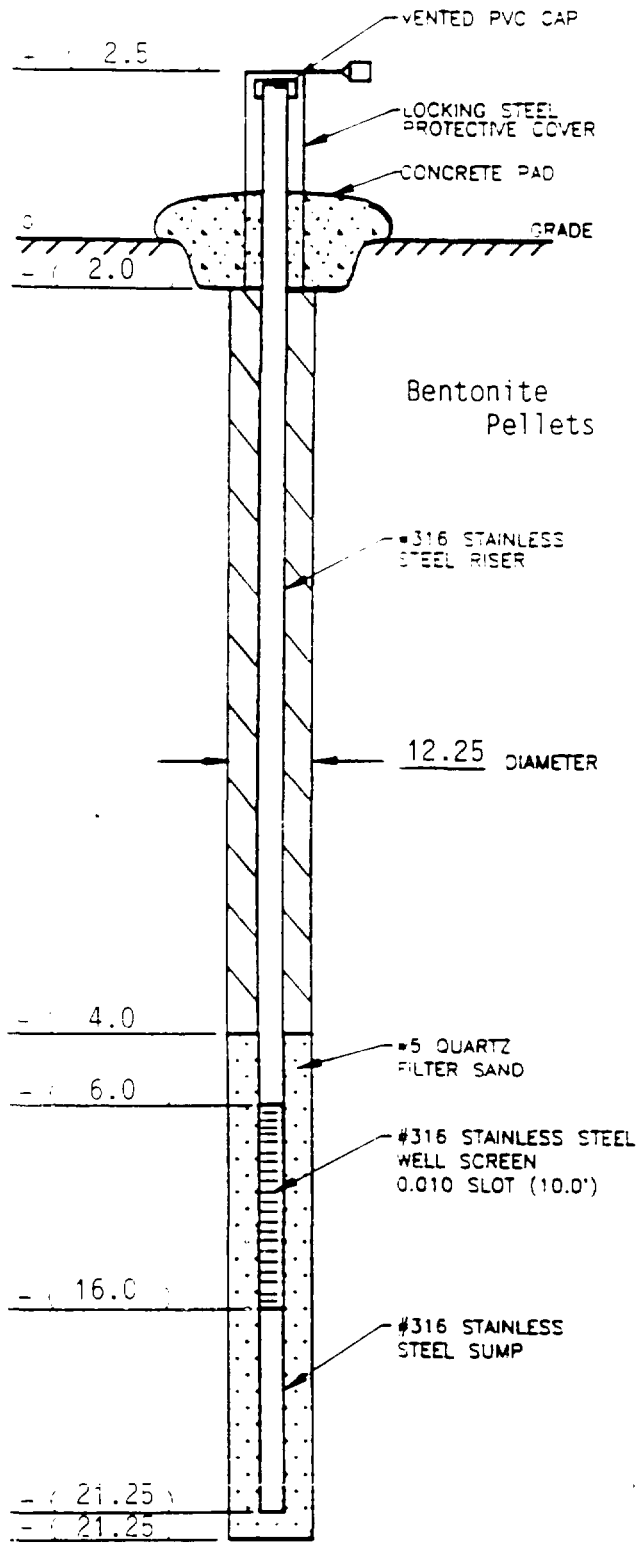
FLUID LOSS DURING DRILLING 3000 GAL
WATER REMOVED DURING DEVELOPMENT 3075 GAL
STATIC DEPTH TO WATER
FEET BELOW M.P. 10.16 DATE 5 / 9 / 91
PUMPING DURATION _____ HOURS
YIELD _____ gpm DATE ___/___/___
REMARKS

PREPARED BY Dirk Kaiser, ERM

PROJECT	0252
REPORT	TMJ
DRAWN	CMW
DESIGN	
DATE	6/20/91
APPROVED	
CLIENT NAME	KMZ - LENZ OIL

ERM

WELL CONSTRUCTION LOG



NOT DRAWN TO SCALE

ERM JOB # 0252

PROJECT Lenz Oil WELL MW05S
TOWN/CITY Lemont
COUNTY DuPage STATE IL
ELEVATION
GRADE 600.07 MSL
TOP OF CASING 603.92 MSL (M.P.)
SURVEY BY Patrick Engineering, Inc.
INSTALLATION DATE(S) 3/5/91
DRILLING METHOD HSA
DRILLING CONTRACTOR Fox Drilling, Inc.
DRILLING FLUID DuPage County Municipal Water Supply
DEVELOPMENT TECHNIQUE(S) AND DATE(S) Centrifugal Pump/Bailing

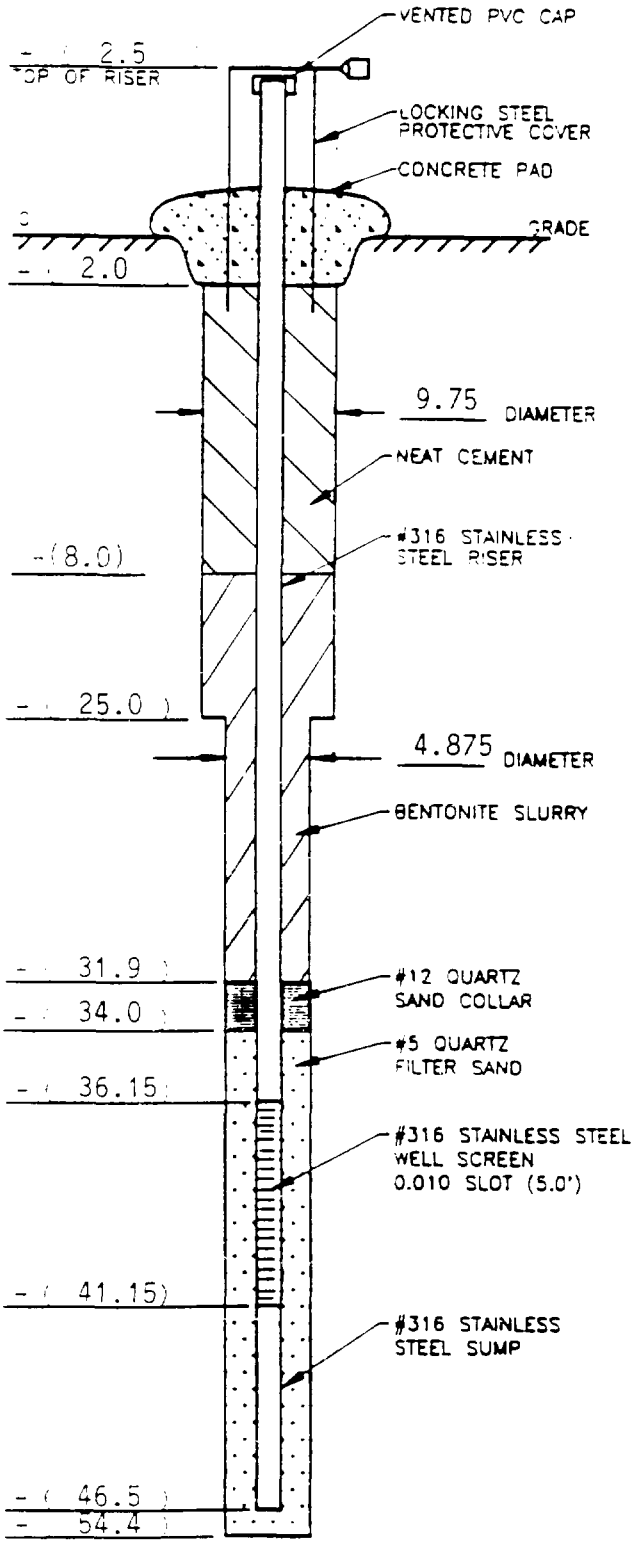
FLUID LOSS DURING DRILLING 0 GAL
WATER REMOVED DURING DEVELOPMENT 90 GAL
STATIC DEPTH TO WATER
FEET BELOW M.P. 8.85 DATE 5 / 9 / 91
PUMPING DURATION HOURS
YIELD gpm DATE / /
REMARKS

PREPARED BY Dirk Kaiser, ERM

PROJECT: 0252 | REPORT: TM3 | DRAWN: CMM | CHECKED: | DATE: 8/20/91 | APPROVED: | CLIENT NAME: KMZ - LENZ OIL

ERM

WELL CONSTRUCTION LOG



NOT DRAWN TO SCALE

ERM JOB # 0252

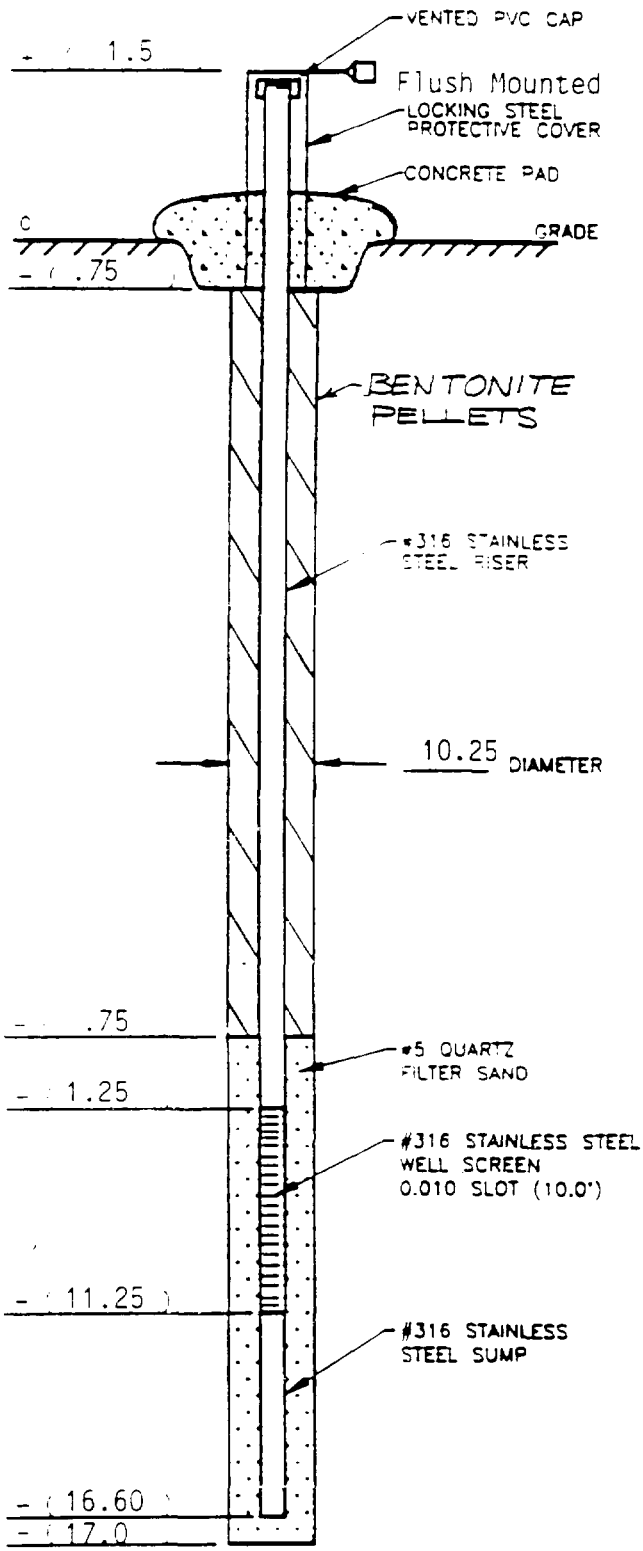
PROJECT Lenz Oil WELL MW05D
TOWN/CITY Lemont
COUNTY DuPage STATE IL
ELEVATION
GRADE 601.26 MSL
TOP OF CASING 603.91 MSL (M.P.)
SURVEY BY Patrick Engineering, Inc.
INSTALLATION DATE(S) 3/4/91
DRILLING METHOD HSA/Rotory
DRILLING CONTRACTOR Fox Drilling, Inc.
DRILLING FLUID DuPage County Municipal Water Supply
DEVELOPMENT TECHNIQUE(S) AND DATE(S)
Centrifugal Pump
Bailing

FLUID LOSS DURING DRILLING 1865 GAL
WATER REMOVED DURING DEVELOPMENT 1920 GAL
STATIC DEPTH TO WATER
FEET BELOW M.P. 11.37 DATE 5 / 9 / 91
PUMPING DURATION HOURS
YIELD gpm DATE / /
REMARKS

PREPARED BY Dirk Kaiser, ERM

PROJECT	0252
REPORT	TM3
DRAWN	CMM
CHECKED	
DATE	8/20/91
APPROVED	
CLIENT INFO	KMZ - LENZ OIL

WELL CONSTRUCTION LOG



NOT DRAWN TO SCALE

ERM JOB # 0252

PROJECT Lenz Oil WELL MW06S
TOWN/CITY Lemont
COUNTY DuPage STATE IL
ELEVATION
GRADE 593.60 MSL
TOP OF CASING 594.04 MSL (M.P.)
SURVEY BY Patrick Engineering, Inc.
INSTALLATION DATE(S) 3/20/91
DRILLING METHOD HSA
DRILLING CONTRACTOR Fox Drilling, Inc.
DRILLING FLUID DuPage County
Municipal Water Supply
DEVELOPMENT TECHNIQUE(S) AND DATE(S)
Centrifugal Pump/Bailing

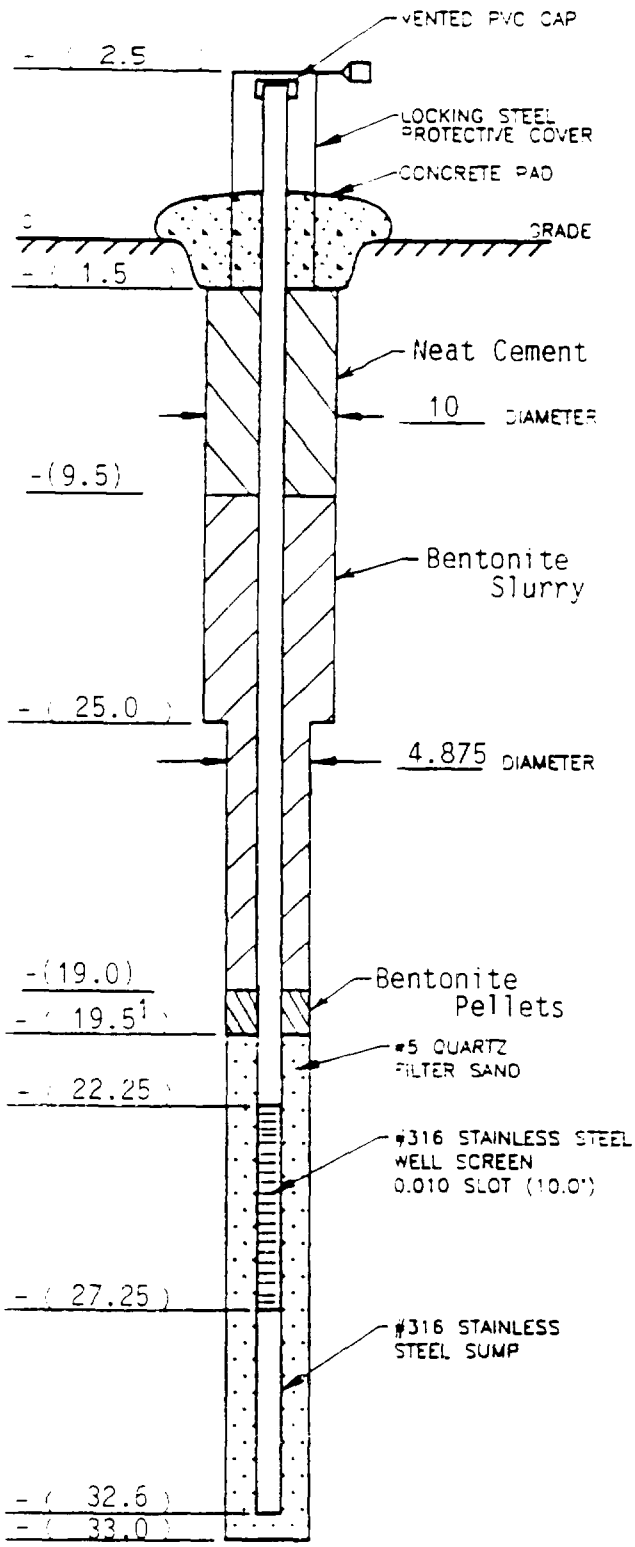
FLUID LOSS DURING DRILLING 150 GAL
WATER REMOVED DURING DEVELOPMENT
180 GAL
STATIC DEPTH TO WATER
FEET BELOW M.P. 1.63 DATE 5 / 9 / 91
PUMPING DURATION _____ HOURS
YIELD _____ gpm DATE ___ / ___ / ___
REMARKS

PREPARED BY Dirk Kaiser, ERM

ERM

PROJECT 0252 | REPORT TM3 | CHECKED CMM | DATE 6/20/91 | APPROVED | CLIENT NAME KMZ - LENZ OIL

WELL CONSTRUCTION LOG



NOT DRAWN TO SCALE

ERM JOB # 0252

PROJECT Lenz Oil WELL MW07S
TOWN/CITY Lemont
COUNTY DuPage STATE IL
ELEVATION
GRADE 605.59 MSL
TOP OF CASING 608.26 MSL (M.P.)
SURVEY BY Patrick Engineering, Inc.
INSTALLATION DATE(S) 4/3/91
DRILLING METHOD HSA/Rotory
DRILLING CONTRACTOR Fox Drilling, Inc.
DRILLING FLUID DuPage County Municipal Water Supply
DEVELOPMENT TECHNIQUE(S) AND DATE(S)
Centrifugal Pump
Bailing

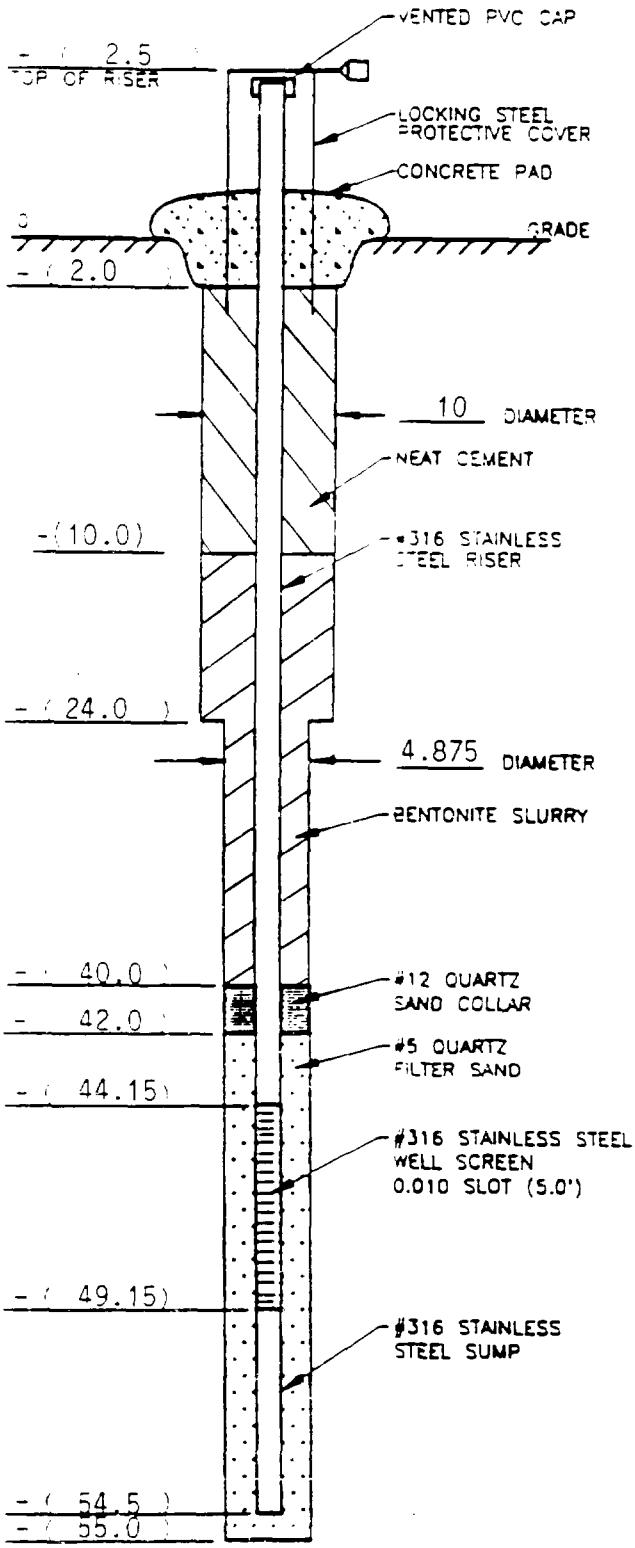
FLUID LOSS DURING DRILLING 50 GAL
WATER REMOVED DURING DEVELOPMENT
Hand Bailed GAL
STATIC DEPTH TO WATER
FEET BELOW M.P. 16.31 DATE 5 / 9 / 91
PUMPING DURATION _____ HOURS
YIELD _____ gpm DATE ___ / ___ / ___
REMARKS

PREPARED BY Dirk Kaiser, ERM

ERM

PROJECT	0252
REPORT	TM3
DRAWN	CMM
CHECKED	
DATE	6/20/91
APPROVED	
CLIENT NAME	KMZ - LENZ OIL

WELL CONSTRUCTION LOG



NOT DRAWN TO SCALE

ERM JOB # 0252

PROJECT Lenz Oil WELL MW07D
TOWN/CITY Lemont
COUNTY DuPage STATE IL
ELEVATION
GRADE 605.41 MSL
TOP OF CASING 607.98 MSL (M.P.)
SURVEY BY Patrick Engineering, Inc.
INSTALLATION DATE(S) 4/1/91
DRILLING METHOD HSA/Rotory
DRILLING CONTRACTOR Fox Drilling, Inc.
DRILLING FLUID DuPage County Municipal Water Supply
DEVEOLPMENT TECHNIQUE(S) AND DATE(S)
Centrifugal Pump
Bailing

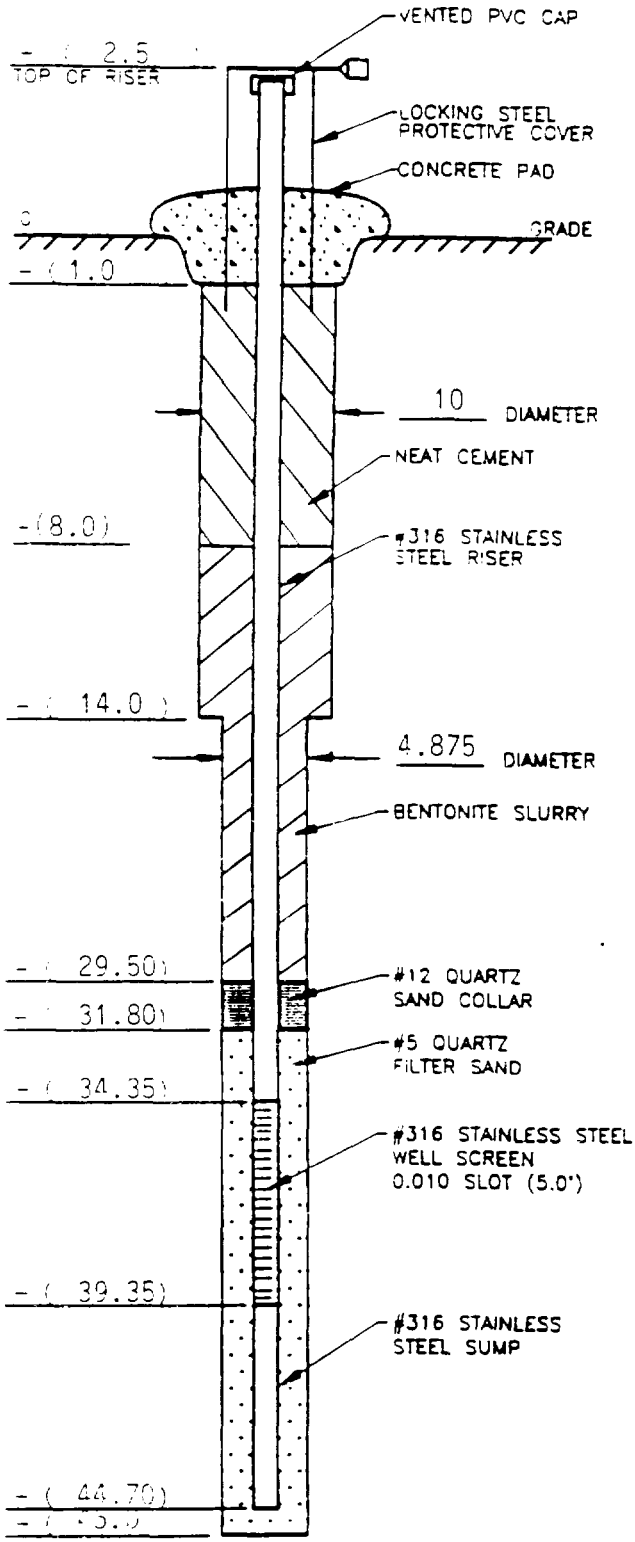
FLUID LOSS DURING DRILLING 549 GAL
WATER REMOVED DURING DEVELOPMENT 650 GAL
STATIC DEPTH TO WATER
FEET BELOW M.P. 15.80 DATE 5 / 9 / 91
PUMPING DURATION _____ HOURS
YIELD _____ gpm DATE ___/___/___
REMARKS

PREPARED BY Dirk Kaiser, ERM

ERM

PROJECT 0252 | REPORT TM3 | DRAWN CWM | DESIGNED | DATE 6/20/91 | APPROVED | CLIENT NAME KMZ - LENZ OIL

WELL CONSTRUCTION LOG



NOT DRAWN TO SCALE

ERM JOB # 0252

PROJECT Lenz Oil WELL G106DR
TOWN/CITY Lemont
COUNTY DuPage STATE IL
ELEVATION
GRADE 601.11 MSL
TOP OF CASING 603.28 MSL (M.P.)
SURVEY BY Patrick Engineering, Inc.
INSTALLATION DATE(S) 3/25-3/26 1991
DRILLING METHOD HSA/Rotory
DRILLING CONTRACTOR Fox Drilling, Inc.
DRILLING FLUID DuPage County Municipal Water Supply
DEVEOLPMENT TECHNIQUE(S) AND DATE(S)
Centrifugal Pump
Bailing

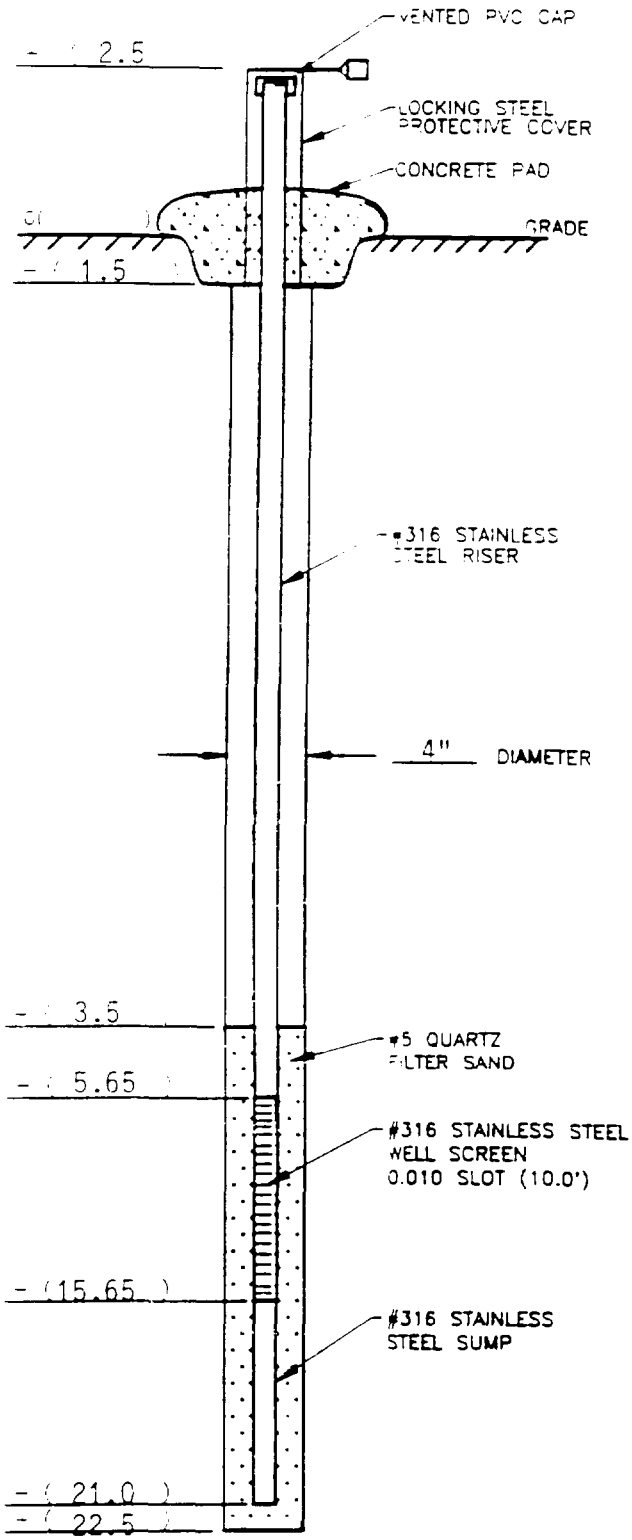
FLUID LOSS DURING DRILLING 1022 GAL
WATER REMOVED DURING DEVELOPMENT 1030 GAL
STATIC DEPTH TO WATER
FEET BELOW M.P. 10.86 DATE 5 / 9 / 91
PUMPING DURATION _____ HOURS
YIELD _____ gpm DATE ___/___/___
REMARKS

PREPARED BY Dirk Kaiser, ERM

ERM

0252 | TM3 | CMN | 6/20/91 | KMZ - LENZ

WELL CONSTRUCTION LOG



NOT DRAWN TO SCALE

ERM JOB # 0252

PROJECT Lenz Oil WELL MW08S
TOWN/CITY Lemont
COUNTY DuPage STATE IL
ELEVATION
GRADE _____ MSL
TOP OF CASING _____ MSL (M.P.)
SURVEY BY _____
INSTALLATION DATE(S) 2/14/92
DRILLING METHOD HSA/Rotary
DRILLING CONTRACTOR Fox Drilling, Inc.
DRILLING FLUID DuPage County Municipal Water Supply
DEVELOPMENT TECHNIQUE(S) AND DATE(S)
Centrifugal Pump
Bailer

FLUID LOSS DURING DRILLING 1,150 GAL
WATER REMOVED DURING DEVELOPMENT 1,200 GAL
STATIC DEPTH TO WATER
FEET BELOW M.P. _____ DATE ___/___/___
PUMPING DURATION _____ HOURS
YIELD _____ gpm DATE ___/___/___
REMARKS
2-inch I.D. #316 Stainless Steel Matl.
All units in feet

PREPARED BY Dirk Kaiser, ERM

CLIENT NAME: KMZ - LENZ OIL
APPROVED
DATE: 6/20/91
DESIGNED
DRAWN: CMM
REPORT: TM3
PROJECT: 0252

ERM

APPENDIX H

MONITORING WELL DEVELOPMENT WATER ANALYTICAL RESULTS

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

LO-TANK/001RE

Lab Name: ARDL, INC. Contract: LENZ OIL

Lab Code: ------ Case No.: 111898 SAS No.: ------ SDG No.: -------

Matrix: (soil/water) TCLP Lab Sample ID: 111898-1RE

Sample wt/vol: 0.5 (g/ml) mL Lab File ID: >V9020

Level: (low/med) LOW Date Received: 5/07/91

% Moisture: not dec. ----- Date Analyzed: 05/14/91

Column: (pack/cap) PACK Dilution Factor: 10.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
75-01-4	Vinyl Chloride	100	U
75-35-4	1,1-Dichloroethene	50	U
67-66-3	Chloroform	50	U
107-06-2	1,2-Dichloroethane	50	U
78-93-3	2-Butanone	100	U
56-23-5	Carbon Tetrachloride	50	U
79-01-6	Trichloroethene	50	U
71-43-2	Benzene	50	U
127-18-4	Tetrachloroethene	50	U
108-90-7	Chlorobenzene	50	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

LO-TANK/001

Lab Name: ABDL, INC. Contract: LENZ OIL

Lab Code: ------ Case No.: 111898 SAS No.: ------ SDG No.: -------

Matrix: (soil/water) TCLP Lab Sample ID: 111898-1

Sample wt/vol: 1000.0 (g/ml) mL Lab File ID: >D5449

Level: (low/med) LOW Date Received: 05/07/90

% Moisture: not dec. ----- dec. ----- Date Extracted: 05/10/90

Extraction: (Sepf/Cont/Sonc) SEPF Date Analyzed: 05/31/91

GPC Cleanup: (Y/N) N pH: --- Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
110-86-1	Pyridine	10	U
106-46-7	1,4-Dichlorobenzene	10	U
95-48-7	2-Methylphenol (o-Cresol)	10	U
108-39-4	3-Methylphenol (m-Cresol)	10	U
106-44-5	4-Methylphenol (p-Cresol)	10	U
67-72-1	Hexachloroethane	10	U
98-95-3	Nitrobenzene	10	U
87-68-3	Hexachlorobutadiene	10	U
88-06-2	2,4,6-Trichlorophenol	10	U
95-95-4	2,4,5-Trichlorophenol	50	U
121-14-2	2,4-Dinitrotoluene	10	U
118-74-1	Hexachlorobenzene	10	U
87-86-5	Pentachlorophenol	50	U

1D
PESTICIDE ORGANIC ANALYSIS

Customer Sample No.

LO-TANK/001

Lab Name: ARDL, Inc. Contract: LENZ OIL
Lab Code: --- Case No.: 111898 SAS No.: --- SDG No.: ---

Matrix (SOIL/WATER) : TCLP Lab Sample ID : 111898-1
Sample wt/vol : 1000 (g/mL) mL Lab File ID : ---
Level (LOW/MED) : LOW Date Received : 05/07/91
% Moisture (not dec): --- dec. - Date Extracted : 05/10/91
Extraction (SEPF/CONT/SONC): SEPF Date Analyzed : 05/17/91
GPC Cleanup (Y/N): N pH: 7.0 Dilution Factor: 1.0

CAS No.	Compound	Concentration Units: ug/L (ug/L or ug/Kg)	Q
319-84-6	alpha-BHC	0.05	U
319-85-7	beta-BHC	0.05	U
319-86-8	delta-BHC	0.05	U
58-89-9	gamma-BHC(Lindane)	0.05	U
76-44-8	Heptachlor	0.05	U
309-00-2	Aldrin	0.05	U
1024-57-3	Heptachlor epoxide	0.05	U
959-98-8	Endosulfan I	0.05	U
60-57-1	Dieldrin	0.10	U
72-55-9	4,4'-DDE	0.10	U
72-20-8	Endrin	0.10	U
33213-65-9	Endosulfan II	0.10	U
72-54-8	4,4'-DDD	0.10	U
1031-07-8	Endosulfan sulfate	0.10	U
50-29-3	4,4'-DDT	0.10	U
72-43-5	Methoxychlor	0.50	U
53494-70-5	Endrin ketone	0.10	U
5103-71-9	alpha-Chlordane	0.50	U
5103-74-2	gamma-Chlordane	0.50	U
8001-35-2	Toxaphene	1.0	U
12674-11-2	Aroclor 1016	0.50	U
11104-28-2	Aroclor 1221	0.50	U
11141-16-5	Aroclor 1232	0.50	U
53469-21-9	Aroclor 1242	0.50	U
12672-29-6	Aroclor 1248	0.50	U
11097-69-1	Aroclor 1254	1.0	U
11096-82-5	Aroclor 1260	1.0	U

HERBICIDE ORGANIC ANALYSIS

Customer Sample No.

LO-TANK/001

Lab Name: ARDL, Inc. Contract: LENZ OIL
Lab Code: _____ Case No.: 111898 SAS No.: ____ SDG No.: ____

Matrix (SOIL/WATER) : TCLP
Sample wt/vol : 1000 (g/mL) mL
Level (LOW/MED) : LOW
% Moisture(not dec) : --- dec. -
Extraction(SEPF/CONT/SONC): SEPF
GPC Cleanup (Y/N) : N pH: 7.0

Lab Sample ID : 111898-1
Lab File ID :
Date Received : 05/07/91
Date Extracted : 05/09/91
Date Analyzed : 05/11/91
Dilution Factor: 1.0

CAS No.	Compound	Concentration Units: ug/L (ug/L or ug/Kg)	Q
94-75-7	2,4 D	12	U
93-72-1	2,4,5 TP (Silvex)	1.7	U

FORM IA

INORGANIC ANALYSIS DATA SHEET
METALS

Lab Name ARDL, Inc. IEPA Sample No. LO-TANK/001

Matrix (soil/water) WATER-TCLP Lab Sample ID: 111898-1

Level (low/med): Date Received: 5-7-91

% Solids: 0.0

Concentration units (ug/L or mg/kg dry weight) UG/L

CAS No.	Analyte	Concentration	C	M	Q
7429-90-5	Aluminum			P	
7440-36-0	Antimony				
7440-38-2	Arsenic	4.1	U	BH	
7440-39-3	Barium	[86]		P	
7440-41-7	Beryllium			P	
7440-43-9	Cadmium	6.6	U	P	
7440-70-2	Calcium			P	
7440-47-3	Chromium	11	U	P	
7440-48-4	Cobalt			P	
7440-50-8	Copper			P	
7439-89-6	Iron			P	
7439-92-1	Lead	[2.3]		F	
7439-95-4	Magnesium			P	
7439-96-5	Manganese			P	
7439-97-6	Mercury	0.18	U	CV	
7440-02-0	Nickel			P	
7440-09-7	Potassium			P	
7782-49-2	Selenium	4.5	U	BH	
7440-22-4	Silver	15	U	P	
7440-23-5	Sodium			P	
7440-28-0	Thallium			F	
7440-62-2	Vanadium			P	
7440-66-6	Zinc			P	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

LO-TANK/002

Lab Name: ARDL, INC. Contract: LENZ OIL

Lab Code: ------ Case No.: 111898 SAS No.: ------ SDG No.: ------

Matrix: (soil/water) WATER Lab Sample ID: 111898-2

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: >V9042

Level: (low/med) LOW Date Received: 5/07/91

Moisture: not dec. --- Date Analyzed: 5/14/91

Column: (pack/cap) PACK Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
74-87-3	Chloromethane	10.	U
74-83-9	Bromomethane	10.	U
75-01-4	Vinyl Chloride	10.	U
75-00-3	Chloroethane	10.	U
75-09-2	Methylene Chloride	3.	JB
67-64-1	Acetone	10.	U
75-15-0	Carbon Disulfide	5.	U
75-35-4	1,1-Dichloroethene	5.	U
75-34-3	1,1-Dichloroethane	5.	U
540-59-0	1,2-Dichloroethene (total)	5.	U
67-66-3	Chloroform	5.	U
107-06-2	1,2-Dichloroethane	5.	U
78-93-3	2-Butanone	10.	U
71-55-6	1,1,1-Trichloroethane	5.	U
56-23-5	Carbon Tetrachloride	5.	U
108-05-4	Vinyl Acetate	10.	U
75-27-4	Bromodichloromethane	5.	U
78-87-5	1,2-Dichloropropane	5.	U
10061-01-5	cis-1,3-Dichloropropene	5.	U
79-01-6	Trichloroethene	5.	U
124-48-1	Dibromochloromethane	5.	U
79-00-5	1,1,2-Trichloroethane	5.	U
71-43-2	Benzene	5.	U
10061-02-6	trans-1,3-Dichloropropene	5.	U
75-25-2	Bromoform	5.	U
108-10-1	4-Methyl-2-Pentanone	10.	U
591-78-6	2-Hexanone	10.	U
127-18-4	Tetrachloroethene	5.	U
79-34-5	1,1,2,2-Tetrachloroethane	5.	U
108-88-3	Toluene	5.	U
108-90-7	Chlorobenzene	5.	U
100-41-4	Ethylbenzene	5.	U
100-42-5	Styrene	5.	U
108-38-3	m-Xylene	5.	U
106-42-3	o & p-Xylene	5.	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

LO-TANK/002RE

Lab Name: ARDL, INC. Contract: LENZ OIL

Lab Code: ------ Case No.: 111898 SAS No.: ------ SDG No.: -------

Matrix: (soil/water) WATER Lab Sample ID: 111898-2RE

Sample wt/vol: 5.0 (g/mL) mL Lab File ID: >V9042

Level: (low/med) LOW Date Received: 5/07/91

Moisture: not dec. ----- Date Analyzed: 5/14/91

Column: PACK Dilution Factor: 1.00000

Number TICs found: 1

CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Unknown	13.40	38.	
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

LO-TANK/002

Lab Name: ARDL, INC. Contract: LENZ OIL

Lab Code: ------ Case No.: 111898 SAS No.: ----- SDG No.: -----

Matrix: (soil/water) WATER Lab Sample ID: 111898-2

Sample wt/vol: 1000.0 (g/mL) mL Lab File ID: >D5404

Level: (low/med) LOW Date Received: 5/07/91

Moisture: not dec. --- dec. --- Date Extracted: 5/10/91

Extraction: (Sepf/Cont/Sonc) SEPF Date Analyzed: 5/26/91

GPC Cleanup: (Y/N) N pH: 7.2 Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
108-95-2	Phenol	10.	U
111-44-4	bis(-2-Chloroethyl)Ether	10.	U
95-57-8	2-Chlorophenol	10.	U
541-73-1	1,3-Dichlorobenzene	10.	U
106-46-7	1,4-Dichlorobenzene	10.	U
100-51-6	Benzyl alcohol	10.	U
95-50-1	1,2-Dichlorobenzene	10.	U
95-48-7	2-Methylphenol	10.	U
39638-32-9	bis(2-chloroisopropyl)ether	10.	U
106-44-5	4-Methylphenol	10.	U
621-64-7	N-Nitroso-Di-n-propylamine	10.	U
67-72-1	Hexachloroethane	10.	U
98-95-3	Nitrobenzene	10.	U
78-59-1	Isophorone	10.	U
88-75-5	2-Nitrophenol	10.	U
105-67-9	2,4-Dimethylphenol	10.	U
65-85-0	Benzoic acid	50.	U
111-91-1	bis(-2-Chloroethoxy)Methane	10.	U
120-83-2	2,4-Dichlorophenol	10.	U
120-82-1	1,2,4-Trichlorobenzene	10.	U
91-20-3	Naphthalene	10.	U
106-47-8	4-Chloroaniline	10.	U
87-68-3	Hexachlorobutadiene	10.	U
59-50-7	4-Chloro-3-methylphenol	10.	U
91-57-6	2-Methylnaphthalene	7.	J
77-47-4	Hexachlorocyclopentadiene	10.	U
88-06-2	2,4,6-Trichlorophenol	10.	U
95-95-4	2,4,5-Trichlorophenol	50.	U
91-58-7	2-Chloronaphthalene	10.	U
88-74-4	2-Nitroaniline	50.	U
131-11-3	Dimethyl Phthalate	10.	U
208-96-8	Acenaphthylene	10.	U
606-20-2	2,6-Dinitrotoluene	10.	U

1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

LO-TANK/002

Lab Name: ABDL, INC. Contract: LENZ OIL

Lab Code: ------ Case No.: 111898 SAS No.: ----- SDG No.: -----

Matrix: (soil/water) WATER Lab Sample ID: 111898-2

Sample wt/vol: 1000.0 (g/mL) mL Lab File ID: >D5404

Level: (low/med) LOW Date Received: 5/07/91

% Moisture: not dec. --- dec. --- Date Extracted: 5/10/91

Extraction: (Sepf/Cont/Sonc) SEPF Date Analyzed: 5/26/91

GPC Cleanup: (Y/N) N pH: 7.2 Dilution Factor: 1.00000

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L	Q
99-09-2	3-Nitroaniline	50.	U
83-32-9	Acenaphthene	10.	U
51-28-5	2,4-Dinitrophenol	50.	U
100-02-7	4-Nitrophenol	50.	U
132-64-9	Dibenzofuran	10.	U
121-14-2	2,4-Dinitrotoluene	10.	U
84-66-2	Diethylphthalate	10.	U
7005-72-3	4-Chlorophenyl-phenylether	10.	U
86-73-7	Fluorene	10.	U
100-01-6	4-Nitroaniline	50.	U
534-52-1	4,6-Dinitro-2-methylphenol	50.	U
86-30-6	N-Nitrosodiphenylamine (1)	10.	U
101-55-3	4-Bromophenyl-phenylether	10	U
118-74-1	Hexachlorobenzene	10.	U
87-86-5	Pentachlorophenol	50.	U
85-01-8	Phenanthrene	10.	U
120-12-7	Anthracene	10.	U
84-74-2	Di-n-butylphthalate	10.	U
206-44-0	Fluoranthene	10.	U
129-00-0	Pyrene	10.	U
85-68-7	Butylbenzylphthalate	10.	U
91-94-1	3,3'-Dichlorobenzidine	20.	U
56-55-3	Benzo(a)anthracene	10.	U
218-01-9	Chrysene	10.	U
117-81-7	bis(2-Ethylhexyl)phthalate	5.	JB
117-84-0	Di-n-Octyl_Phthalate	10.	U
205-99-2	Benzo(b)fluoranthene	10.	U
207-08-9	Benzo(k)fluoranthene	10.	U
50-32-8	Benzo(a)pyrene	10.	U
193-39-5	Indeno(1,2,3-cd)pyrene	10.	U
53-70-3	Dibenzo(a,h)Anthracene	10.	U
191-24-2	Benzo(g,h,i)perylene	10.	U

(1) - Cannot be separated from Diphenylamine

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

LO-TANK/002

ab Name: ARDL, INC. Contract: LENZ OIL

b Code: ------- Case No.: 111898 SAS No.: ------- SDG No.: -------

atrix: (soil/water) WATER Lab Sample ID: 111898-2

mple wt/vol: 1000.0 (g/mL) mL Lab File ID: >D5404

vel: (low/med) LOW Date Received: 5/07/91

Moisture: not dec. --- dec. --- Date Extracted: 5/10/91

traction: (Sepf/Cont/Sonc) SEPF Date Analyzed: 5/26/91

Cleanup: (Y/N) N pH: 7.2 Dilution Factor: 1.00000

umber TICs found: 20

CONCENTRATION UNITS:
(ug/L or ug/Kg) ug/L

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	Unknown	4.04	13.	
2.	Unknown	7.45	7.	
3.	Unknown	7.98	73.	
4.	Unknown	8.64	26.	
5. 526738	Benzene, 1,2,3-trimethyl-	11.44	7.	
6.	Unknown	11.62	28.	
7.	Unknown	11.75	5.	
. 112276	Triethylene glycol	14.96	39.	
9.	Unknown	16.10	5.	
10.	Naphthalene, dimethyl-	17.76	14.	
11.	Naphthalene, dimethyl-	17.99	18.	
12.	Naphthalene, dimethyl-	18.03	9.	
13.	Naphthalene, dimethyl-	18.27	5.	
14.	Unknown	19.01	6.	
15.	Naphthalene, trimethyl-	19.49	5.	
16.	Naphthalene, trimethyl-	19.93	5.	
17.	Unknown	20.38	4.	
18.	Unknown	21.47	6.	
19.	Unknown	22.42	5.	
20.	Unknown adipate	28.45	840.	
21.				
22.				
23.				
24.				
25.				
26.				
27.				
28.				
29.				
30.				

1D
PESTICIDE ORGANIC ANALYSIS

Customer Sample No.

LO-TANK/002

Lab Name: ARDL, Inc. Contract: LENZ OIL
Lab Code: --- Case No.: 111898 SAS No.: --- SDG No.: ---

Matrix (SOIL/WATER) : WATER Lab Sample ID : 111898-2
Sample wt/vol : 1000 (g/mL) mL Lab File ID : ---
Level (LOW/MED) : LOW Date Received : 05/07/91
% Moisture (not dec): --- dec. - Date Extracted : 05/10/91
Extraction (SEPF/CONT/SONC): SEPF Date Analyzed : 05/17/91
GPC Cleanup (Y/N): N pH: 7.2 Dilution Factor: 1.0

CAS No.	Compound	Concentration Units: ug/L (ug/L or ug/Kg)	Q
319-84-6	alpha-BHC	0.05	U
319-85-7	beta-BHC	0.05	U
319-86-8	delta-BHC	0.05	U
58-89-9	gamma-BHC(Lindane)	0.05	U
76-44-8	Heptachlor	0.05	U
309-00-2	Aldrin	0.05	U
1024-57-3	Heptachlor epoxide	0.05	U
959-98-8	Endosulfan I	0.05	U
60-57-1	Dieldrin	0.10	U
72-55-9	4,4'-DDE	0.10	U
72-20-8	Endrin	0.10	U
33213-65-9	Endosulfan II	0.10	U
72-54-8	4,4'-DDD	0.10	U
1031-07-8	Endosulfan sulfate	0.10	U
50-29-3	4,4'-DDT	0.10	U
72-43-5	Methoxychlor	0.50	U
53494-70-5	Endrin ketone	0.10	U
5103-71-9	alpha-Chlordane	0.50	U
5103-74-2	gamma-Chlordane	0.50	U
8001-35-2	Toxaphene	1.0	U
12674-11-2	Aroclor 1016	0.50	U
11104-28-2	Aroclor 1221	0.50	U
11141-16-5	Aroclor 1232	0.50	U
53469-21-9	Aroclor 1242	0.50	U
12672-29-6	Aroclor 1248	0.50	U
11097-69-1	Aroclor 1254	1.0	U
11096-82-5	Aroclor 1260	1.0	U

FORM IA

INORGANIC ANALYSIS DATA SHEET
METALS

Lab Name ARDL, Inc. IEPA Sample No. LD-TANK/002

Matrix (soil/water) WATER Lab Sample ID: 111898-2

Level (low/med): Date Received: 5-7-91

% Solids: 0.0

Concentration units (ug/L or mg/kg dry weight) UG/L

CAS No.	Analyte	Concentration	C	M	Q
7429-90-5	Aluminum	200	U	P	
7440-36-0	Antimony	60	U		
7440-38-2	Arsenic	4.5	U	SH	
7440-39-3	Barium	[100]		P	
7440-41-7	Beryllium	5.0	U	P	
7440-43-9	Cadmium	5.0	U	P	
7440-70-2	Calcium	150000		P	
7440-47-3	Chromium	10	U	P	
7440-48-4	Cobalt	50	U	P	
7440-50-8	Copper	25	U	P	
7439-89-6	Iron	910		P	N
7439-92-1	Lead	[2.9]		F	W N
7439-95-4	Magnesium	77000		P	
7439-96-5	Manganese	15	U	P	
7439-97-6	Mercury	0.20	U	CV	
7440-02-0	Nickel	40	U	P	
7440-09-7	Potassium	8300		P	
7782-49-2	Selenium	4.5	U	SH	
7440-22-4	Silver	10	U	P	
7440-23-5	Sodium	190000		P	
7440-28-0	Thallium	5.0	U	F	W
7440-62-2	Vanadium	50	U	P	
7440-66-6	Zinc	33		P	
	Cyanide	10	U	C	

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

APPENDIX I

HYDRAULIC CONDUCTIVITY TESTING RESULTS

APPENDIX I

HYDRAULIC CONDUCTIVITY TESTING RESULTS

Hydraulic conductivity values were determined for the aquifer materials beneath the Lenz Oil site by conducting rising and falling head hydraulic conductivity tests, as described in Section 2.12.3 of this report. A conventional rising head slug test was performed in all of the wells screened at and within 4 feet of the water table (i.e., MW-1S, MW-2S, MW-3S, MW-4S, MW-5S, MW-6S, MW-7S, G101M, G101D, G101L, and G102L). In addition, pressure testing was conducted in each monitoring well with a well screen submerged at least 4 feet below the water level (i.e., MW-1D, MW-2D, MW-3D, MW-4D, MW-5D, MW-6D, MW-7S, MW-7D, G102D, G104D, and G106DR). G104L was not tested because it could not be pressurized, and the presence of free product in G106L prevented testing of that well. Monitoring wells MW-3S, MW-5D, and MW-6D were retested to examine the precision of calculated permeability values.

The horizontal hydraulic conductivity values calculated from this testing are summarized in Table I-1. In addition, the following supporting documentation is included in this appendix: (1) spreadsheets showing the raw test data, the test parameters, and the analytical procedure, and (2) graphs indicating the recovery rate of each well. The method of calculation and assumptions used to determine the hydraulic conductivity values are summarized in the following paragraphs.

The Bouwer and Rice (1976) method was used to analyze the hydraulic conductivity test data because of its applicability to both fully and partially penetrating wells. The main assumptions of this method are: (1) a steady radial flow based on the Thiem equation (i.e., storage effects are negligible); (2) a homogeneous and isotropic zone of influence; and (3) a clean well screen (i.e., not obstructed with silt, clay, or grout).

The wells screened in the unconsolidated deposits satisfy these assumptions reasonably well. However, some heterogeneity is present in the screened interval of the wells that intersect interbedded sand, silt, and clay. The computed hydraulic conductivity values for these heterogeneous screened intervals are, therefore, a weighted average of each of the contributing water bearing units. In other words, the hydraulic conductivity values are an average for the aquifer materials in the screened interval and not the values of any single sand, silt, or clay bed.

The calculated hydraulic conductivity values for the wells screened in the dolomite bedrock only partially satisfy the assumptions of the Bouwer and Rice (1976) method. Some of these wells are screened in highly fractured zones, that can be considered an equivalent porous medium. Others are screened in zones with few or single fractures that contradict the assumption of flow through a porous medium. Because the extent to which a fractured zone can be considered an equivalent porous medium is difficult to infer, the calculated hydraulic conductivity values for the Silurian dolomite are relatively inaccurate and should not be compared with the more accurate values for the unconsolidated deposits. However, these tests are still useful in assessing the relative differences in hydraulic conductivity for each of the screened intervals in the dolomite.

The procedure for analyzing the slug test and pressure test data is summarized in the hydraulic conductivity test spreadsheets. The raw data consist of rising head test data vs. time. The net decrease in induced head vs. time is obtained by subtracting the final head value at the end of each test from each rising head test value. Data points for determining the line of best fit are subjectively chosen. Therefore, to standardize this subjective choice of data points, Environmental Resources Management-North Central, Inc. considered the first data point in each series of test data that showed a steady decrease in induced head as the beginning of the test (Pandit and Miner, 1986). The last data point for the least squares linear fit was generally selected at the point when 80 percent of the initial induced head had dissipated. This standardization minimizes the subjectivity of the analysis procedure. The close agreement of test values and retest values indicates good precision in the testing procedure and consistency in the analysis.

Because most of the monitoring wells were similarly constructed, the radius of the developed zone was assumed to be 0.25 of a foot, which was based on the monitoring well construction diagrams. Slightly different values for the radius of the developed zone were used for monitoring wells G101M, MW-1S, MW-1D, and MW-3S because of differences in well construction. Since the water table intersects the screened intervals of monitoring wells MW-1S, MW-2S, MW-4S, MW-5S, and MW-6S, the radius of the developed zone for these wells was calculated to be 0.15 of a foot, assuming a gravel pack porosity of 30 percent. The effective length of inflow was calculated as the sum of the thicknesses of all of the contributing water bearing units in the screened zone. The saturated thickness and the effective length of inflow of each well were determined from the soil boring logs (Appendix F).

As shown in Table I-1, the horizontal hydraulic conductivity values for the unconsolidated deposits range from 178 to 4,102.5 gal/day/ft^2, with a geometric mean of 774 gal/day/ft^2. For the monitoring wells screened in the fractured dolomite, the horizontal hydraulic conductivity values range from 12.4 to 819.3 gal/day/ft^2, with a geometric mean of 92.9 gal/day/ft^2. The geometric mean of all of the horizontal hydraulic conductivity values is 152.12 gal/day/ft^2. The formula used to calculate the geometric mean is:

$$\bar{x} = e^{P}$$

Where:

$\bar{x}$ = Geometric mean

$P = \dfrac{\log X_1 + \log X_2 + \log X_n}{n}$

X = Hydraulic conductivity value

n = Number of values

The lower horizontal hydraulic conductivity values of the dolomite may be a result of the inability of slug and pressure testing to influence a wide enough zone of interconnected fractures. Single-hole packer testing at Argonne National Laboratory in 10-foot vertical intervals by Nicholas and Shapiro (1986) yielded horizontal hydraulic conductivity values for the joint sets in the range 1,292 to 6,462 gal/day/ft^2. Based on

the interpretation of pump test data generated by Nicholas and Healy (1988) at Argonne National Laboratory, horizontal hydraulic conductivity values range from 250 to 400 gal/day/ft^2 in the Silurian dolomite, assuming a saturated thickness of 175 feet. These tests suggest that the horizontal hydraulic conductivity values determined for the fractured dolomite by slug and air pressure testing are possibly lower than the actual horizontal hydraulic conductivities of the fractured bedrock. The calculated horizontal hydraulic conductivity value for monitoring well G102D is unreliable because of the slow decay of head, which violates the assumption of an instantaneous change in head, at the beginning of a test.

The close agreement of the horizontal hydraulic conductivity test and retest values indicates good precision in the hydraulic conductivity calculations. This close agreement also demonstrates that the testing procedure is reliable and reproducible and that the subjective choice of data points in the linear fit had a limited effect on the calculated values. Although the calculated radius of influence used in the Bouwer and Rice (1976) method depends only on the well geometry, in reality, its value also depends on drawdown. Therefore, the calculated radius of influence values shown on the attached spreadsheets are only approximate.

A comparison of the horizontal hydraulic conductivity values calculated from the slug and pressure testing at monitoring well MW-7S shows that the tests yielded similar values. This good precision indicates that the values from the slug and pressure tests are comparable. The accuracy of the hydraulic conductivity values provided by the slug and pressure testing probably varies by one order of magnitude as a result of measurement errors, heterogeneities, and other deviations from the mathematical model.

TABLE I-1

HYDRAULIC CONDUCTIVITY TEST SUMMARY
LENZ OIL SITE
LEMONT, ILLINOIS
(Page 1 of 2)

Well	Aquifer Material	Test Method	Hydraulic Conductivity	
			gallons/day/ft^2	cm/sec
G101L	Unconsolidated deposits	Slug	370.1	1.75×10^{-2}
MW-1S	Unconsolidated deposits	Slug	4,102.5	1.94×10^{-1}
MW-2S	Unconsolidated deposits	Slug	1,645.9	7.76×10^{-2}
MW-4S	Unconsolidated deposits	Slug	1,664.3	7.85×10^{-2}
MW-5S	Unconsolidated deposits	Slug	178	8.40×10^{-3}
MW-7S	Unconsolidated deposits	Slug	314.8	1.48×10^{-2}
MW-7S	Unconsolidated deposits	Pressure	298.8	1.41×10^{-2}
MW-7S	Unconsolidated deposits	Pressure (retest)	261.2	1.23×10^{-2}
G101M	Fractured dolomite	Slug	213.6	1.01×10^{-2}
G102L	Fractured dolomite	Slug	16.9	7.97×10^{-4}
MW-3S	Fractured dolomite	Slug	135.8	6.41×10^{-3}
MW-3S	Fractured dolomite	Slug (retest)	126.8	5.98×10^{-3}
MW-6S	Fractured dolomite	Slug	819.3	3.86×10^{-2}
G101D	Fractured dolomite	Slug	169.3	7.99×10^{-3}
G102D(1)	Fractured dolomite	Pressure	12.4	5.85×10^{-4}
G104D	Fractured dolomite	Pressure	13.2	6.23×10^{-4}
G106DR	Fractured dolomite	Pressure	31.9	1.50×10^{-3}
MW-1D	Fractured dolomite	Pressure	51.4	2.42×10^{-3}
MW-2D	Fractured dolomite	Pressure	111.7	5.27×10^{-3}
MW-3D	Fractured dolomite	Pressure	117	5.52×10^{-3}
MW-4D	Fractured dolomite	Pressure	115.6	5.45×10^{-3}

TABLE I-1

HYDRAULIC CONDUCTIVITY TEST SUMMARY
LENZ OIL SITE
LEMONT, ILLINOIS
(Page 2 of 2)

Well	Aquifer Material	Test Method	Hydraulic Conductivity	
			gallons/day/ft^2	cm/sec
MW-5D	Fractured dolomite	Pressure	151.4	7.14×10^{-3}
MW-5D	Fractured dolomite	Pressure (retest)	154.4	7.28×10^{-3}
MW-6D	Fractured dolomite	Pressure	164.2	7.75×10^{-3}
MW-6D	Fractured dolomite	Pressure (retest)	161.2	7.60×10^{-3}
MW-7D	Fractured dolomite	Pressure	66.7	3.15×10^{-3}

Note:

(1) These test data may not be reliable and were not included in the geometric mean calculations because the well experienced a sudden change in water level during the test.

Key:

Slug = Conventional rising head slug test.
Pressure = Rising head pressure test.