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Site Investigation Report

Former Langlade Oil Company, Inc. Property
604 Fourth Avenue
Antigo, Wisconsin

STS Project No. 4-26788XA

Wisconsin Department of Natural Resources
Antigo Service Center
223 Steinfest Road
Antigo, Wisconsin 54409-2777

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Wisconsin Department of Natural Resources
STS Project No. 4-26788XA
August 19, 2002

1.0 BACKGROUND

1.1 Objectives and Scope of Work

The scope of work in this investigation report was performed in accordance with Wisconsin Department of Natural Resources (WDNR) project specifications for the investigation of the former Langlade Oil Company, Inc. (Langlade Oil), site located at 604 Fourth Avenue, Antigo, Wisconsin, dated August 19, 1999 (Appendix A), and a Work Plan prepared by STS and dated September 21, 2001.

The objective of the site investigation was to determine the extent of soil and groundwater contamination and evaluate remedial options for cleanup.

1.2 Site Location

The former Langlade Oil site is located at 604 Fourth Avenue (Figure 1) in the city of Antigo, Wisconsin, east and adjacent to Spring Brook. The site is located in the SW 1/4 of the SW 1/4 of Section 29, Range 11E, Township 31N, Langlade County, Wisconsin. The site is bordered to the north by Antigo Lake, to the east by a commercial building, to the west by Spring Brook, and to the south by a feed mill beyond Fourth Avenue.

1.3 Site Ownership and Contacts

Langlade Oil owned and operated a petroleum bulk plant/distribution facility at 604 Fourth Avenue in Antigo, Wisconsin, from at least 1945 until the company went out of business in 1986.

The site contacts for this project are provided below:

Site Contact:	Mr. John Sager, WDNR 223 East Steinfest Road Antigo, Wisconsin 54409
Consultant:	STS Consultants, Ltd. 1035 Kepler Drive Green Bay, Wisconsin 54311 Attention: Mr. Steve McDowell

1.4 Site History

The former Langlade Oil property was a former bulk petroleum storage facility, which consisted of nine aboveground storage tanks (ASTs). According to WDNR files, Langlade Oil went out of business in 1986. The ASTs were removed from the site in approximately 1987. Petroleum

impacts were detected in three soil samples collected by City of Antigo Fire Department personnel in 1990. The WDNR has documentation of several instances since 1987 where free product was observed in Spring Brook, which borders the property to the west. A site map is provided as Figure 2.

1.5 Regional and Local Geology

According to *Glacial and Related Deposits of Langlade County, Wisconsin* (Michelson 1986), the site is underlain by alluvial sediments deposited by Spring Brook. The regional geology consists of approximately 50 to 100 feet of glacial outwash deposits that overlie granitic bedrock. The topography in the vicinity of the site is relatively flat with local relief of less than 10 feet.

Hydraulic features in the vicinity of the site include Lake Antigo on the northern border of the property and Spring Brook on the western border of the property. Lake Antigo is an impoundment on Spring Brook, with the dam creating the impoundment located on the northwestern corner of the site. Given the close proximity of these hydraulic features, groundwater flow was assumed to generally be to the west toward Spring Brook for the purposes of locating the soil borings and monitoring wells.

Groundwater was encountered on site at depths approximately 5 to 9 feet below ground surface. It is our understanding that historically there may have been significant fluctuations in water elevations on the site related to the Lake Antigo impoundment located north and east of the property.

2.0 SITE INVESTIGATION PROCEDURES

The site investigation was conducted in three phases, as outlined in the September 2001 Work Plan:

- Advancement of 14 hydraulic-push soil borings and groundwater sampling to estimate the vertical and horizontal extent of impacts.
- Installation of Chapter NR 141 monitoring wells to monitor groundwater quality and to measure horizontal and vertical hydraulic gradients on site. This stage also involved the addition of a soil boring and monitoring well to address the potential for off-site impacts identified in a Phase I Environmental Site Assessment.
- Two quarterly rounds of groundwater monitoring to establish a baseline of groundwater quality on site.

2.1 Soil Borings

STS subcontracted US Filter/Enviroscan (US Filter) of Rothschild, Wisconsin to advance 14 direct push (Geoprobe) soil borings at the site on September 26, 2001. Boring B-15 was advanced in conjunction with monitoring well installation in November 2001. The soil borings were advanced to the apparent water table. An STS Senior Environmental Technician was provided as a representative during field activities to log soil borings, screen soil samples collected in the field, prepare soil or groundwater samples for chemical analyses, and gather other field data, as appropriate.

Soil samples were collected continuously from each boring location using a 2-inch-diameter split-spoon. After the soil samples were recovered from the sample device, they were placed in clean, quart-size glass jars and covered with a sheet of aluminum foil and sealed with a metal screw-on lid. The quart-jar sample was used for field-screening. The soil sample was then returned to the STS laboratory in Green Bay, Wisconsin, for further classification according to the Unified Soil Classification System. Upon completion of soil and groundwater sampling, the borings were backfilled with bentonite in accordance with Chapter NR 141, Wisconsin Administrative Code. The soil boring locations are depicted on Figure 3.

Field-screening of collected soil samples was conducted using a flame ionization detector (FID). The FID is a trace analyzer capable of qualitatively measuring a variety of organic compounds present in the headspace. After calibration, the probe of the FID was inserted through the

aluminum foil covering on the quart jar and the peak FID reading was recorded. The FID results are summarized on the WDNR Soil Boring Log Information forms (Appendix A).

Two soil samples from each boring collected from above the apparent water table were submitted to US Filter for gasoline range organics (GRO), diesel range organics (DRO), and petroleum volatile organic compounds (PVOCs) analyses. In addition, Soil Boring Samples B-3 (1), B-9 (1), and B-12 (1) were analyzed for volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs), and lead. As requested by the WDNR, STS also submitted Samples B-3 (1), B-8 (1), and B-12 (2) for total organic carbon (TOC) analyses to US Analytical Services Inc., of Kimberly, Wisconsin.

STS collected water samples from Borings B-2, B-5 through B-10, B-11, B-13, and B-14. Groundwater samples were submitted to US Filter for GRO, DRO, and VOC analyses.

2.2 Monitoring Well Installation

On November 1 and November 2, 2001, STS installed eight groundwater monitoring wells (MW-1 through MW-8) and one piezometer (PZ-1) to estimate the horizontal and vertical extent of groundwater impacts. An additional boring, Boring B-15, was advanced east of the property. The monitoring wells and piezometers were installed in general accordance with Chapter NR 141, Wisconsin Administrative Code (NR 141). All of the monitoring well borings, except MW-8, were advanced in the general location of a hydraulic push-probe boring. Accordingly, these monitoring well borings were blind drilled (no sampling) to the depth of the corresponding hydraulic push-probe boring, and samples for soil classification were collected in continuous 2-foot intervals thereafter. Soil samples were collected in continuous 2-foot intervals from Monitoring Well MW-8 and Soil Boring B-15 and field-screened as described in Section 2.1. The WDNR Soil Boring Log Information forms and Monitoring Well Installation forms for the monitoring wells and for Boring B-15 are included in Appendix A.

One soil sample each from Borings MW-8 and B-15 was submitted to US Filter for GRO, DRO, and PVOC analyses.

Two quarterly rounds of groundwater sampling were conducted on the eight monitoring wells and one piezometer. During each round, STS personnel measured water table elevations and

groundwater field parameters including pH, conductivity, dissolved oxygen (DO), and oxidation/reduction potential (ORP) (Appendix B). Groundwater samples from the first round on November 8, 2001, were submitted to US Filter for VOC, DRO, GRO, dissolved lead, dissolved iron, soluble sulfate, and nitrate+nitrite analyses. The second set of groundwater samples, collected on January 28, 2002, were submitted to US Filter for the same analyses as the first round, except PVOC analysis was substituted for the VOC analysis.

Field hydraulic conductivity tests were conducted on Monitoring Wells MW-1 and MW-3. The field hydraulic conductivity tests were conducted by inserting and removing a solid PVC cylinder to induce a lowered head in the well and observe the rise in water level as it returned to static conditions after removing the PVC cylinder. Drawdown data was analyzed using the Bouwer and Rice Method (Bouwer, H, 1988)[1], for a partially penetrating monitoring well in an unconfined aquifer.

[1] Bouwer, H., 1988, The Bouwer and Rice Slug Test – An Update: Ground Water, Volume 27, No. 3, pages 304-309.

3.0 RESULTS

3.1 Soil Conditions

Soils encountered during boring activities consisted primarily of silty sand fill overlying fine to medium silty sands. The interpretation regarding fill material was based on the occurrence of wood and cinders, with the silty sand in approximately the upper 10 feet of soil encountered at the site. Results of field screening activities indicated elevated readings on the FID meter in excess of 1,000 units in soil samples collected from Borings B-3, B-4, B-8, B-9, B-10, and B-12 (Table 1). Elevated concentrations of petroleum constituents generally correspond to these borings.

Results of chemical analyses for PVOC compounds were compared to Risk Screening Criteria provided in Chapter NR 746, Wisconsin Administrative Code, on Tables 1 and 2. Table 1 values provide an indication of residual petroleum product in soil pores based on the physical characteristics of these compounds. Table 2 values represent direct contact standards for soils within the upper 4 feet of the ground surface. These risk-screening criteria can be used as on-site soil cleanup standards as defined under Chapter NR 720, Wisconsin Administrative Code. If Table 1 or Table 2 values from Chapter NR 746, Wisconsin Administrative Code, are exceeded, as they are at this site, the soils must be remediated or soil cleanup standards specific to the site or facility can be proposed in accordance with Chapter NR 720.19.

As depicted on Table 1, Chapter NR 746 Table 1 or 2 risk screening criteria were exceeded in Borings B-3, B-8, B-9, and B-12. Site-specific residual contaminant levels (SSRCLs) were calculated based on the average TOC concentration in soil samples collected from the site. The SSRCLs were calculated for the groundwater pathway for benzene, ethylbenzene, trimethylbenzene, and xylenes. The SSRCLs were calculated using an equation combining a soil-water partitioning expression with a dilution default attenuation factor for the groundwater mixing zone. The lowest measured TOC concentration of 0.0095 grams per gram was used in the calculations. Default values from WDNR guidance documents were used in the calculations where site-specific values were not available. Calculations for the SSRCLs for the groundwater pathway are provided in Appendix C. Results of the SSRCL calculations for the groundwater pathway indicate that the exceedances for PVOC compounds for the groundwater pathway are for the compounds benzene and trimethylbenzene. When the SSRCLs were recalculated (Appendix C) using measured TOC values, all but one of the trimethylbenzene results (B-9 2) were below the re-calculated SSRCLs. Analytical test reports for soil are provided in Appendix D.

In addition to the PVOC analyses, three soil samples were analyzed for polynuclear aromatic hydrocarbons (PAHs) and total lead from Borings B-3, B-9, and B-12. Results of these analyses are summarized on Table 2. PAH results were compared to the WDNR Interim Soil Standards for PAH Concentrations for non-industrial direct contact and groundwater pathways. As indicated on this table, the non-industrial direct contact standard for lead (from Table 2 in Chapter NR 726, Wisconsin Administrative Code) was exceeded in Borings B-3 and B-12. Also, the direct contact RCL for naphthalene was exceeded in Boring B-3. Site-specific RCLs for groundwater pathway PAHs were calculated for naphthalene, 1- and 2-methylnaphthalene, and phenanthrene, using the same equation that was used for the PVOC compounds. Results of the SSRCL analysis indicated that there were groundwater pathway exceedances for naphthalene and phenanthene in samples from Borings B-3 and B-12. The concentrations of phenanthrene and naphthalene in Boring B-12 were below the calculated SSRCLs using the average site-specific TOC value (Appendix C). There were no direct contact or groundwater pathway exceedances in the soil sample from B-9.

Based on the results of the analysis of soil samples collected on site, a map depicting the approximate extent of petroleum-impacted soil was prepared and is presented as Figure 4. As depicted on this figure, the extent of soil impact appears to be limited to an area covering approximately 5,000 square feet.

3.2 Groundwater Conditions

Results of groundwater hydraulic conductivity tests conducted on Monitoring Well MW-1 indicated a hydraulic conductivity of approximately $2x10^{-3}$ centimeters per second (cm/s). This hydraulic conductivity is consistent with the sand soils present on site. The rate of recovery in MW-3 was very rapid (recharge to the static water level in less than 30 seconds). Accordingly, manual measurements with the electronic water level indicator did not provide sufficient data for calculation of a specific hydraulic conductivity for this well. However, based on the rate of recovery, the hydraulic conductivity in MW-3 is likely greater than $1x10^{-2}$ cm/s.

Groundwater contour maps were prepared based on water elevations measured in November 2001 and January 2002 and are presented as Figures 5 and 6, respectively. As depicted on the groundwater contour maps, the groundwater flow direction is generally southwest at a hydraulic

gradient of approximately 0.005 across the site. Results of groundwater elevation measurements made on PZ-1 and MW-3 indicated no measurable vertical gradient was present at the site.

Results of groundwater analyses conducted on samples collected from Geoprobe borings and monitoring wells are provided on Tables 3 and 4, respectively. Analytical test reports for groundwater are provided in Appendix D. As depicted on these tables, enforcement standards (ES) stipulated in Chapter NR 140, Wisconsin Administrative Code, for benzene, trimethylbenzenes, and naphthalene were present in four of the ten Geoprobes from which water samples were collected, Borings B-6, B-8, B-9, and B-10. There were no Chapter NR 140, Wisconsin Administrative Code, ES exceedances in any of the monitoring wells installed on site. However, there were no monitoring wells installed in the vicinity of Borings B-8, B-9, and B-10. Results of groundwater analyses conducted in January 2002 are depicted on Figure 7. Depictions of subsurface conditions are also represented on Cross-Sections A-A' and B-B' on Figures 8 and 9. These cross-sections depict soil stratigraphy, the depth to groundwater, and the approximate extent of subsurface soil and groundwater impacts.

Results of groundwater assessment activities indicated that the area of greatest petroleum impacts to groundwater appears to be in the vicinity of Borings B-8, B-9, and B-10, near the former AST locations. Groundwater monitoring results from Monitoring Wells MW-2, MW-3, MW-4, MW-6, and MW-8 provided further evidence that the extent of petroleum hydrocarbon impact is generally limited to the area near the former AST locations.

4.0 REMEDIAL ALTERNATIVES

4.1 Soil

Based on results of soil assessment activities, there appears to be an area of approximately 5,000 square feet of petroleum-impacted soil which needs to be addressed. Based on the results of this site investigation, STS proposes the following options for remediation of subsurface conditions to achieve site closure.

Option 1 – Remediation by Excavation and Disposal

Excavation of impacted soils within the approximate 5,000-square-foot area identified on Figure 4 could be conducted to address the impacted soil. Assuming an average excavation depth of 6 feet over an area of 5,000 square feet, approximately 1,100 cubic yards of soil would need to be excavated and disposed. Assuming a conversion factor of 1.5 tons per cubic yard and a cost for disposal of $30 per ton, the estimated cost for excavation and disposal of soil would be approximately $50,000.

Advantages of this remedial option are the potential positive effect on groundwater conditions and the avoidance of applying a performance standard to the property under Chapter NR 720.19, Wisconsin Administrative Code. The approximate cost, including project coordination, waste characterization, and documentation is $60,000 to $70,000. This estimate includes $4,000 to $8,000 (estimated) to import fill for regrading the site, including topsoil and reseeding.

Option 2 – Limited Source Removal with Application of a Performance Standard on the Remainder of Soil Impact

Results of soil and groundwater analyses indicated that there is residual soil exceeding the RCL for the groundwater pathway. Additional soil sampling would be necessary to provide further definition of the area which exceeds groundwater pathway SSRCLs. It is possible that the amount of soil excavated can be reduced significantly by removing only soil with groundwater pathway SSRCL exceedances. Assuming the area of excavation can be reduced by half, approximately 550 cubic yards of soil would need to be excavated and disposed of at a cost of $30 per ton. The estimated cost for excavation and disposal, including project coordination, waste characterization, and documentation is $25,000 to $30,000.

The remainder of the area of impacted soil could be capped to limit the exposure potential for direct contact. The performance standard to limit exposure for direct contact could consist of an

impermeable cover, such as asphalt or concrete, or a less permeable cover consisting of a geomembrane to define the top of the impacted area covered by compacted clay or crushed stone or a layer of rooting zone material and topsoil.

The cost for the capping of this area will depend on the final grades decided for the property and the type of cap desired. Assuming potential restoration of this property would include general filling in the center of the site, the estimated cost for applying the performance standard would range from $10,000 to $20,000..

Option 3 – Active Remediation Using Forced Air Technology (Soil Vapor Extraction/Air Sparging)

The silty sand soil present at this site would be conducive to forced air remediation technologies for remediation of residual hydrocarbons in the soil and groundwater. Horizontal vapor extraction lines could be installed generally oriented north-south in the area of impact to a depth of approximately 2 to 4 feet. The horizontal vapor extraction pipe would be perforated and connected to a common header and blower contained in a small equipment building with dimensions of approximately 10 feet by 10 feet. It is possible that significant residual hydrocarbon mass could be removed using forced air remediation technology on the relatively permeable sandy soils at this site. The majority of hydrocarbons would likely be removed within the first one to three years of operation of the forced air remediation system. The soil vapor extraction component of the remediation system could be enhanced with the application of air injection below the water table at various locations.

If this option is considered viable, STS would recommend that a pilot test be conducted to confirm the feasibility of forced air remediation before proceeding with design plans and specifications. The cost for pilot testing, design plans, and construction of a forced air remediation system for this site would range between $50,000 and $80,000 with annual operation and maintenance costs ranging from $20,000 to $30,000, including groundwater monitoring and reporting.

Advantages of this remedial option include minimal site disruption during remediation activities and potentially significant removal of hydrocarbon mass from the site.

4.2 Groundwater

It is our opinion that groundwater assessment activities indicate active remediation of groundwater is not necessary to achieve closure at this time. The limited extent of the area of groundwater impact observed in comparison with the amount of time since the ASTs were removed from the site (over 12 years) provided evidence that groundwater impacts on this property are generally stable. Based on the elevated concentrations of petroleum hydrocarbon constituents in the vicinity of Borings B-8, B-9, and B-10, additional groundwater assessment in this area may be warranted. Accordingly, installation of a monitoring well between Borings B-8 and B-9 and B-10 would be recommended with all three of the soil remediation options previously discussed. The timing for the well installation would vary depending on which option is chosen. If soil excavation is chosen, it is recommended that a monitoring well be installed following soil remediation activities.

Future groundwater monitoring is required to confirm that groundwater concentrations of petroleum constituents are generally stable or decreasing over time. Subsequent groundwater monitoring is also required to confirm groundwater flow direction and gradient across the site. STS recommends that one round of monitoring be conducted for PAH compounds to confirm groundwater concentrations do not exceed the ES for these compounds.

Based on the above information, STS anticipates that one to two years of groundwater monitoring would be required prior to achieving closure of this site. The cost for quarterly groundwater monitoring and reporting would be approximately $10,000 to $15,000 per year. The cost for preparation of a closure report and abandonment of monitoring wells would likely be an additional $10,000 to 15,000. If active remediation is a chosen option for soil, an additional $5,000 to $10,000 would be required for decommissioning of the remediation system upon achieving closure.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Results of field observations and chemical analyses conducted from soil borings and groundwater monitoring wells for this site investigation indicated the approximate extent of soil and groundwater impacts to the subsurface has been defined. It appears that the impact of petroleum hydrocarbons to the subsurface is limited to the former Langlade Oil property. Based on the concentrations of petroleum hydrocarbons observed in groundwater samples, it does not appear that there is the potential for significant discharge of petroleum hydrocarbons to Spring Brook at this time. An explanation for previous reports of product in Spring Brook adjacent to the property is not readily apparent; however, historical fluctuations in water levels on the site related to the neighboring Lake Antigo impoundment may provide one explanation. At this time, sources other than the former Langlade Oil property cannot be ruled out. Results of soil borings conducted adjacent to Spring Brook do not indicate concentrations of petroleum constituents which would be expected with the presence of free product.

STS recommends that the WDNR review the remedial options presented in this report with consideration for future land use of the property. It is our understanding that there is some consideration regarding the future use of this property as a park. STS recommends that the WDNR consider the proposed Brownfields Green Space and Public Facility Grant Program, which are currently expected to be available for application by local government units (LGU) in fall 2002. It is our understanding that there is $1-million available during the 2001-2003 bienneum under this grant program. As the WDNR is aware, there are a significant number of other Brownfield Grant Programs available for use by LGUs in remediating Brownfield property and putting it back to productive use.

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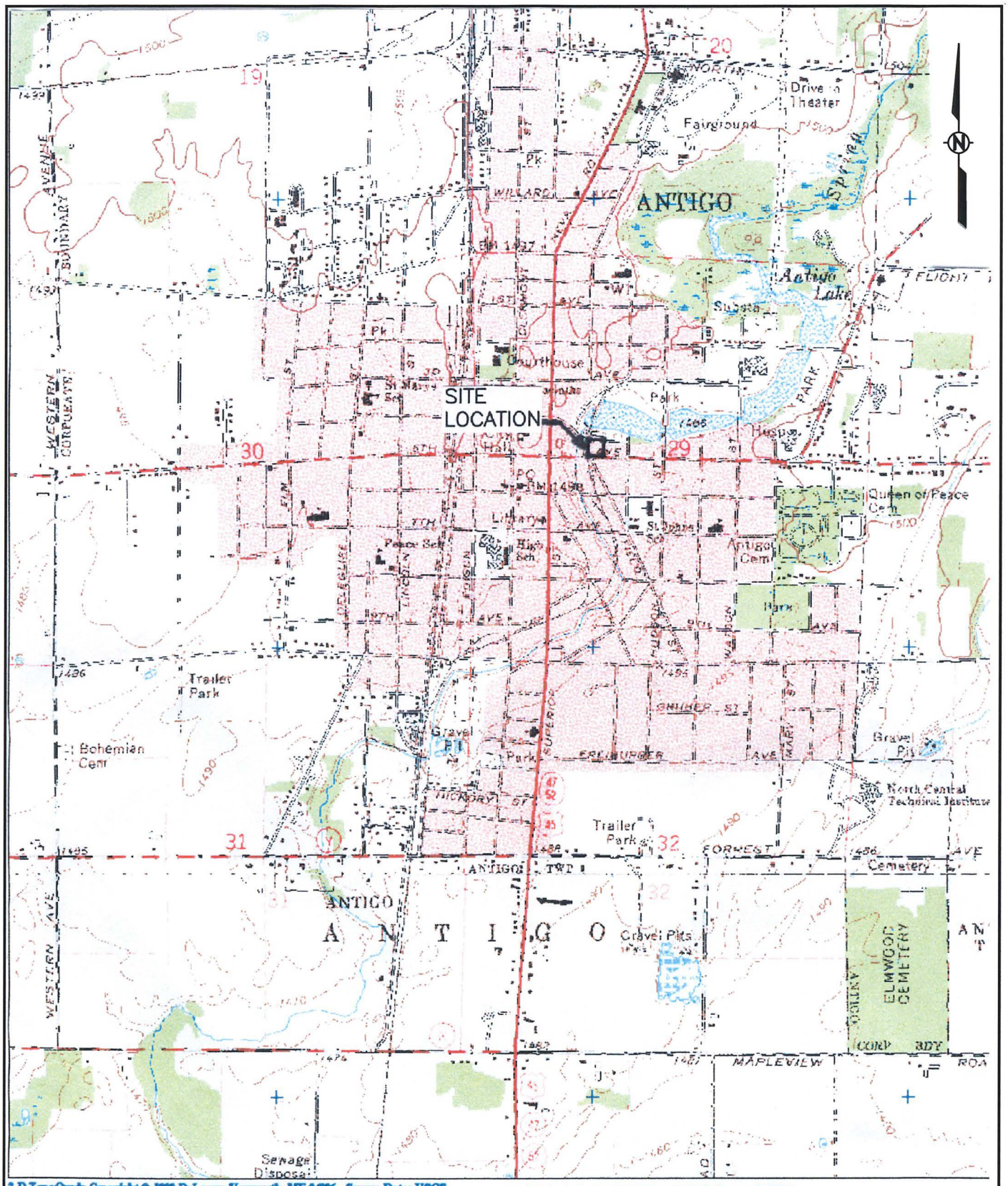
Figures



3-D TopoQuads Copyright © 1999 DeLorme Yarmouth, ME 04096 Source Data: USGS

700 ft Scale: 1 : 24,000 Detail: 13-1 Datum: WGS84

MAP SOURCE: MODIFIED FROM DeLORME 3-D TOPOQUADS ANTIGO, WISCONSIN.

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SITE LOCATION MAP

DESIGNED BY	MJC	04/01/02
DRAWN BY	ACS	04/01/02
APPROVED BY		
CADFILE	SCALE 1":2000'	
STS PROJECT NO. 26788XA	FIGURE NO. 1	

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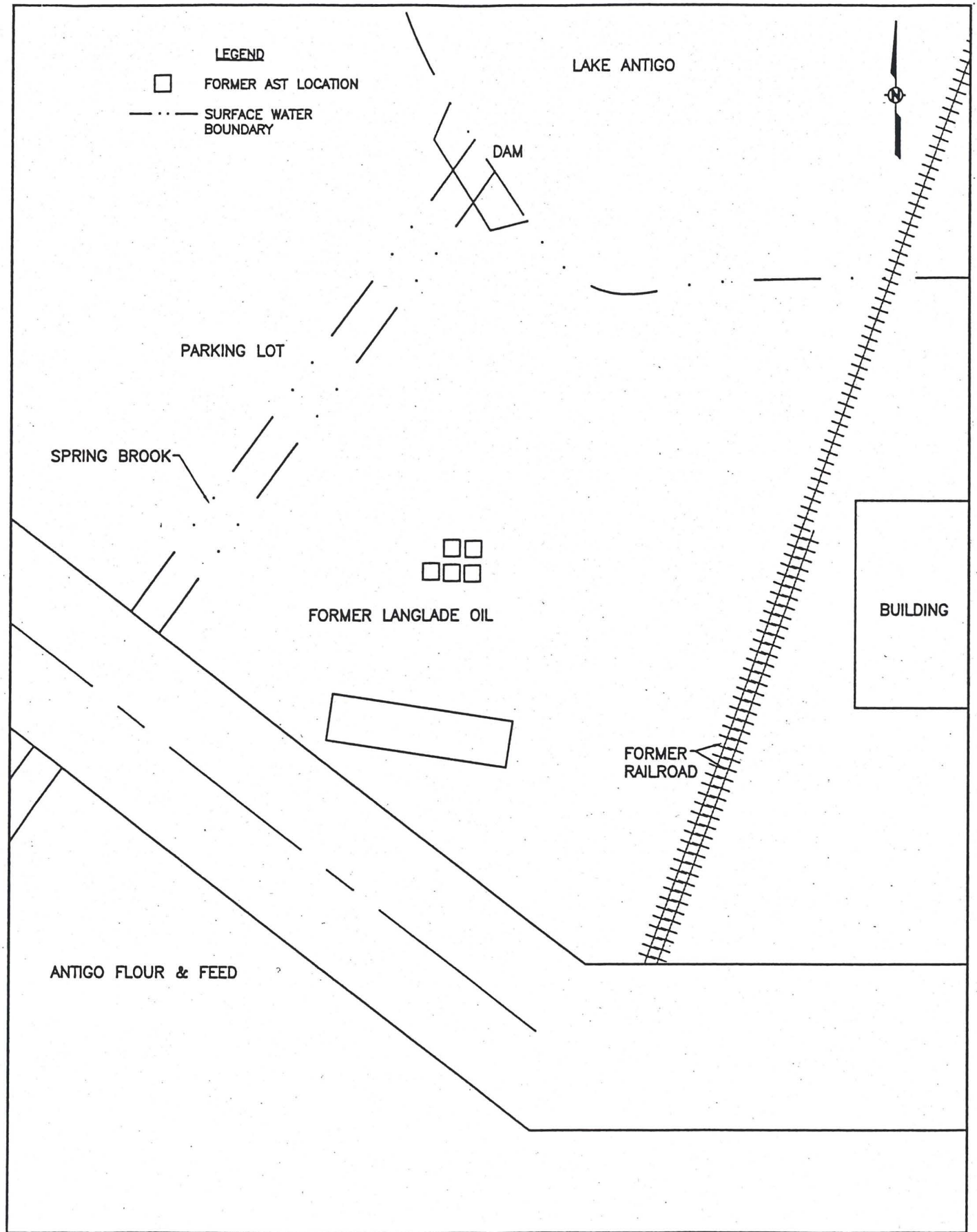

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SITE MAP

DESIGNED BY	MJC	04/01/02
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APPROVED BY		
CADFILE	SCALE 1"=30'	
STS PROJECT NO. 26788XA	FIGURE NO. 2	

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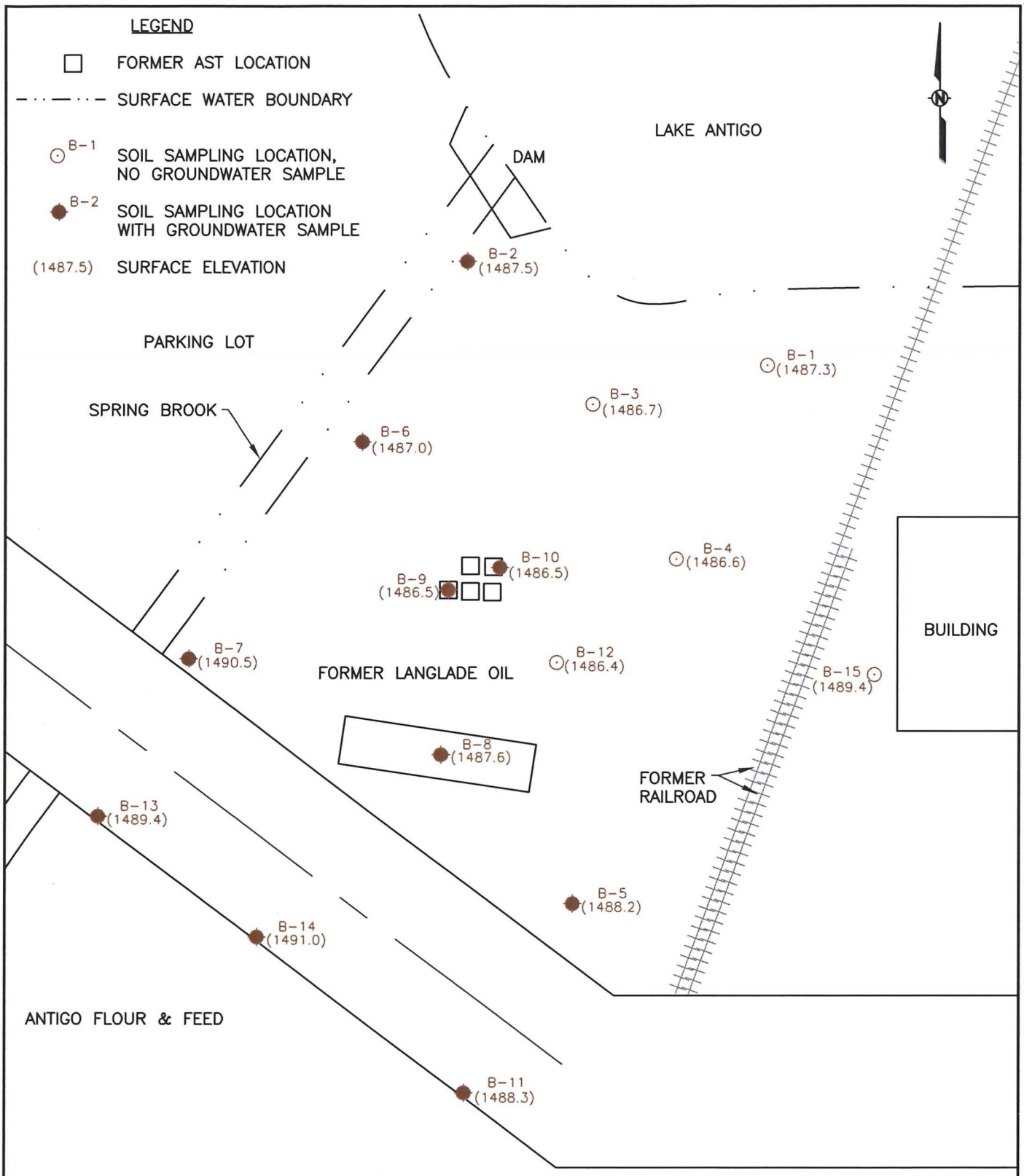

NOTE: BENCHMARK ON NORTHEAST FOOTING OF DAM=1490.12

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SOIL BORING LOCATION DIAGRAM

DESIGNED BY	MJC	04/01/02
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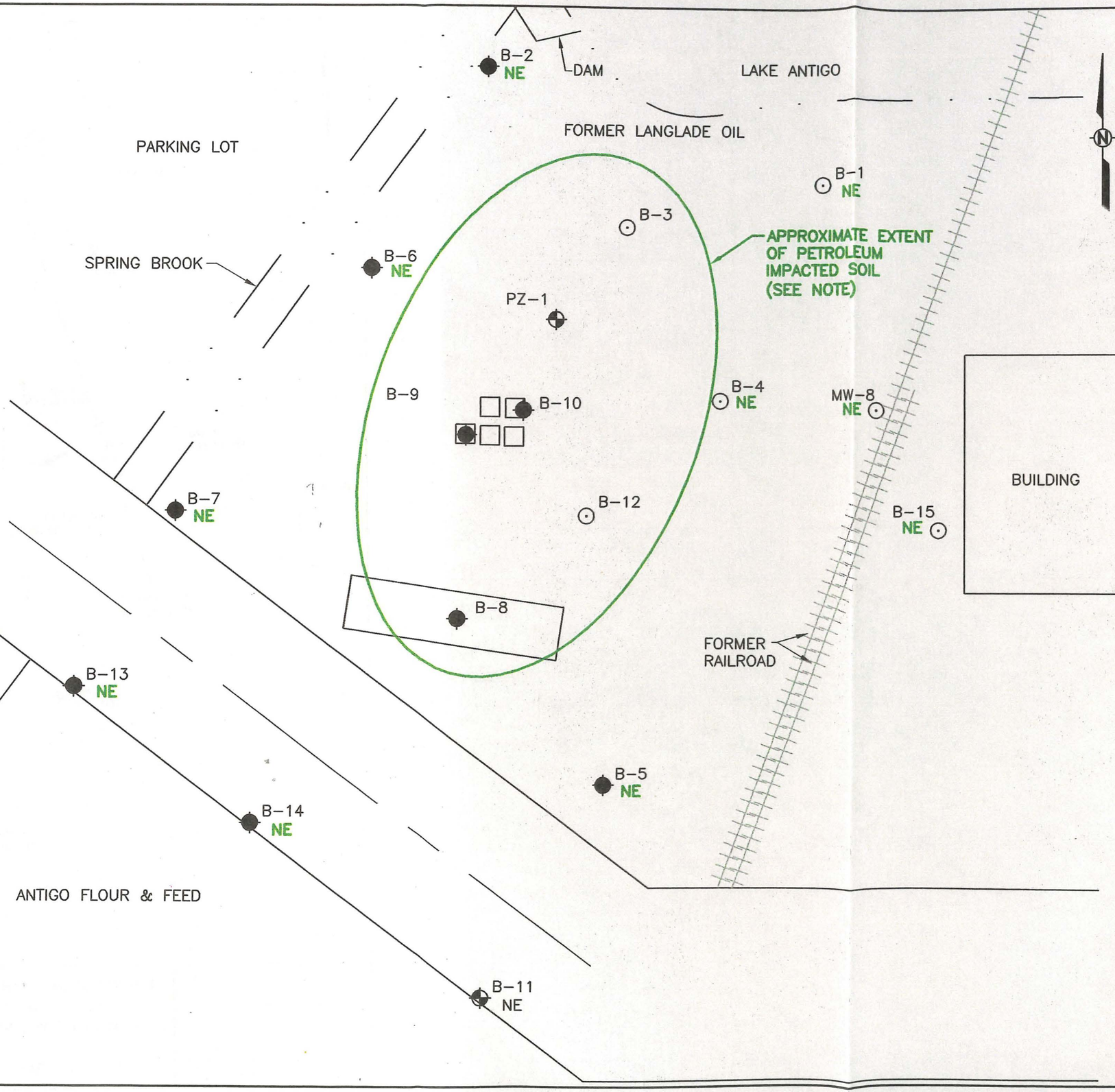
CADFILE	SCALE 1"=30'	
STS PROJECT NO. 26788XA	FIGURE NO. 3	

LEGEND

- FORMER AST LOCATION
- B-1 — SOIL SAMPLING LOCATION, NO GROUNDWATER SAMPLE
- B-2 — SOIL SAMPLING LOCATION WITH GROUNDWATER SAMPLE
- SURFACE WATER BOUNDARY
- NE — NO EXCEEDANCE FOR NR 746 TABLE 1 OR TABLE 2 RISK SCREENING LEVELS OR GROUNDWATER PATHWAY SSRCLS



NOTE: APPROXIMATE EXTENT OF PETROLEUM IMPACT IS BASED ON EXCEEDANCES FOR DIRECT CONTACT RCLS, RISK SCREENING LEVELS (NR 746), AND/OR GROUNDWATER PATHWAY SSRCLS (SEE TABLES 1 AND 2)

DESIGNED BY MJC — DATE 07/01/02
DRAWN BY ACS — DATE 07/01/02
APPROVED BY — DATE
CADFILE
XREF

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APPROXIMATE EXTENT OF PETROLEUM IMPACTED SOIL

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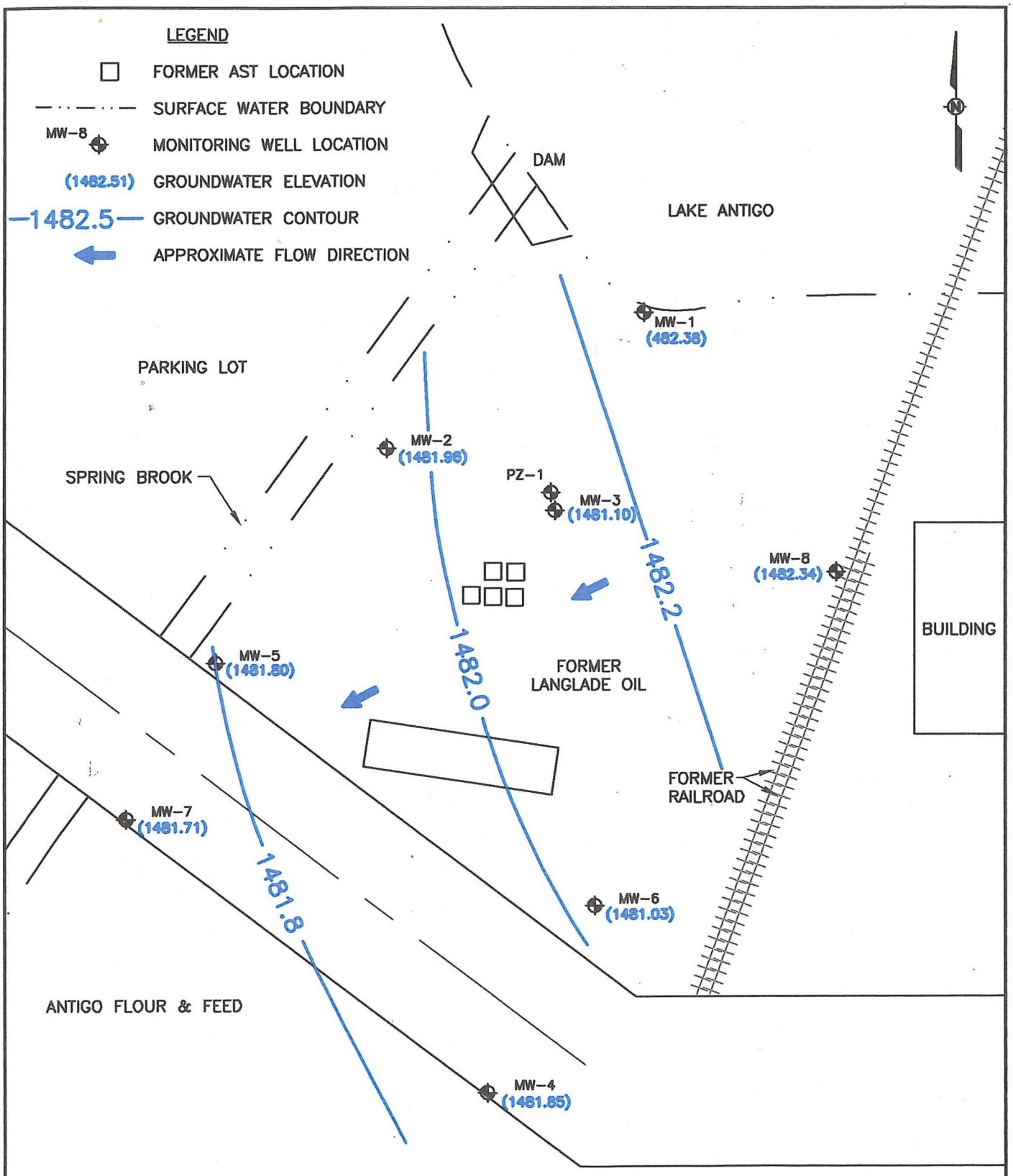
STS PROJECT NO. 26788XA
STS PROJECT FILE
SCALE 1"=20'
FIGURE NO. 4



NOTE: BENCHMARK ON NORTHEAST FOOTING OF DAM=1490.12

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GROUNDWATER CONTOUR MAP 11-8-01

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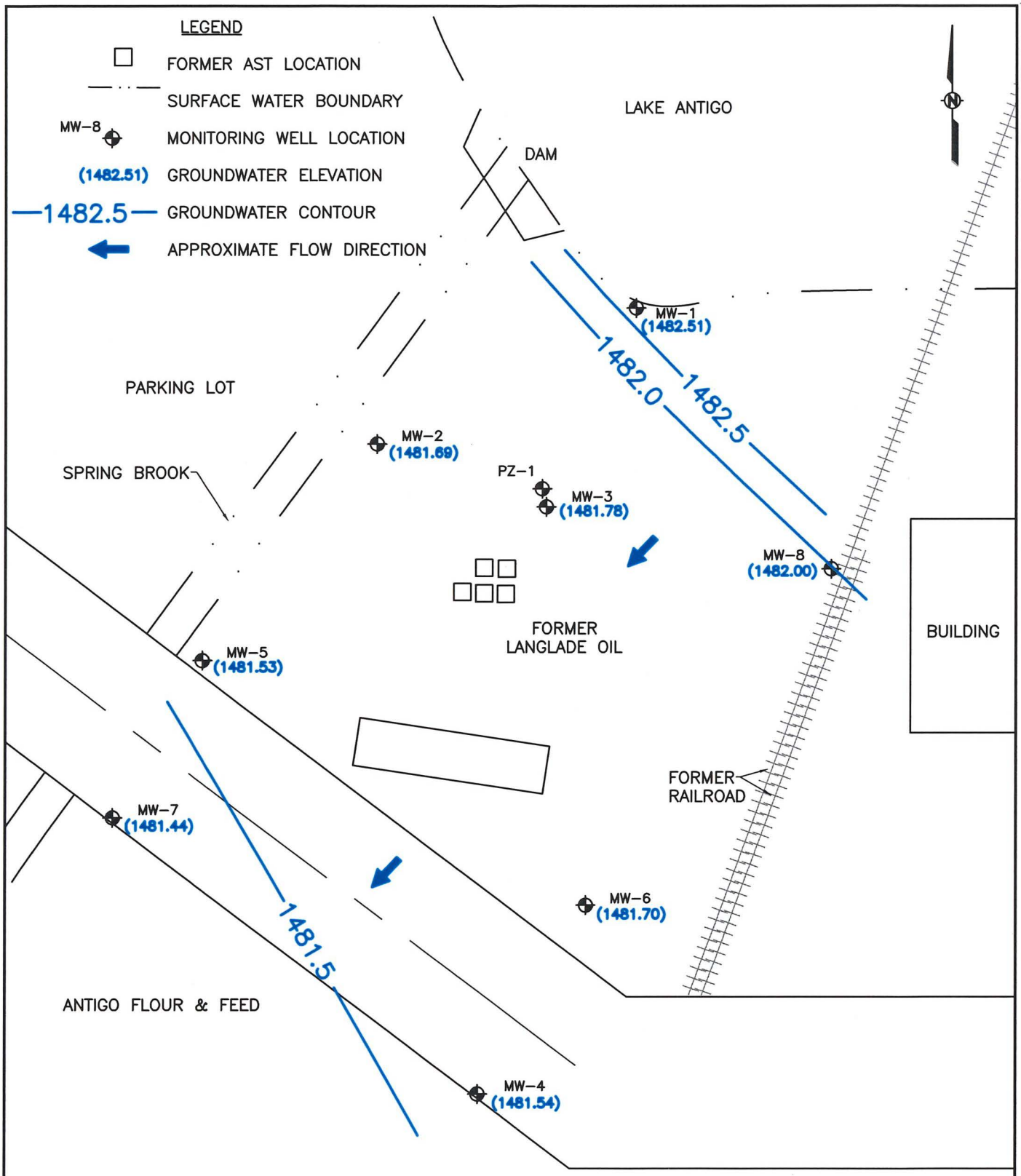
CADFILE	SCALE 1"=30'	
STS PROJECT NO. 26788XA	FIGURE NO. 5	



NOTE: BENCHMARK ON NORTHEAST FOOTING OF DAM=1490.12

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GROUNDWATER CONTOUR MAP 1-28-02

DESIGNED BY	MJC	04/01/02
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APPROVED BY		
CADFILE	SCALE 1"=30'	
STS PROJECT NO. 26788XA	FIGURE NO. 6	

LEGEND

- FORMER AST LOCATION
- B-1 SOIL SAMPLING LOCATION, NO GROUNDWATER SAMPLE
- B-2 SOIL SAMPLING LOCATION WITH GROUNDWATER SAMPLE
- SURFACE WATER BOUNDARY
- MW-1 MONITORING WELL LOCATION
- B BENZENE
- T TOLUENE
- E ETHYLBENZENE
- X XYLENE
- TMB TRIMETHYLBENZENE
- B <0.16 BENZENE CONCENTRATION IN MONITORING WELL

LAKE ANTIGO

DAM

PARKING LOT

SPRING BROOK

MW-1
B <0.16
T <0.4
E <0.5
X <0.57
TMB <0.57

MW-2 (B-6)
B <0.16
T <0.4
E <0.5
X <0.57
TMB 0.546

PZ-1
B <0.16
T <0.4
E <0.5
X <0.57
TMB <0.57

MW-3
B 1.27
T <0.4
E <0.5
X 11.2
TMB 16.38

MW-8
B <0.16
T <0.4
E <0.5
X <0.57
TMB <0.57

MW-5 (B-7)
B <0.16
T <0.4
E <0.5
X <0.57
TMB <0.57

MW-7 (B-13)
B <0.16
T <0.4
E <0.5
X <0.57
TMB <0.57

MW-6 (B-5)
B <0.16
T <0.4
E <0.5
X 0.423
TMB 1.89

MW-4 (B-11)
B <0.16
T <0.4
E <0.5
X <0.57
TMB <0.57

B-1, B-2, B-3, B-4, B-8, B-9, B-10, B-12, B-14, B-15

FORMER LANGLADE OIL

FORMER RAILROAD

BUILDING

ANTIGO FLOUR & FEED

N

DESIGNED BY MJC	DRAWN BY ACS	APPROVED BY
DATE 07/17/02	DATE 07/17/02	DATE
CADFILE XREF		

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FORMER LANGLADE OIL COMPANY, INC.
604 4TH AVENUE ANTIGO, WISCONSIN

GROUNDWATER ANALYTICAL RESULTS FROM MONITORING WELLS 1-28-02

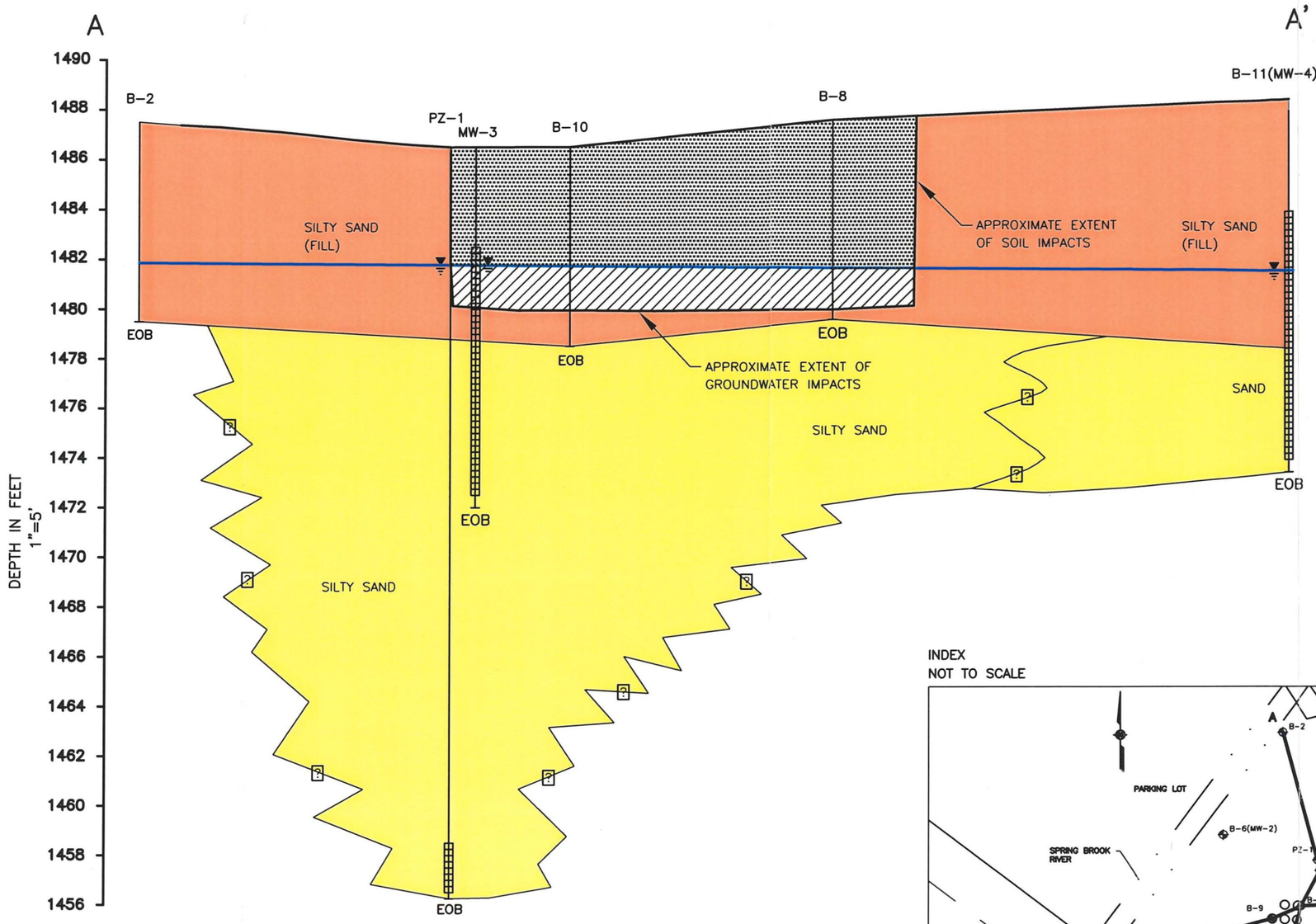
STS Consultants Ltd.
Consulting Engineers
1035 Kepler Dr.
Green Bay, WI 54311
920.468.1978

STS PROJECT NO. 26788XA

STS PROJECT FILE

SCALE 1"=20'

FIGURE NO. 7



LEGEND

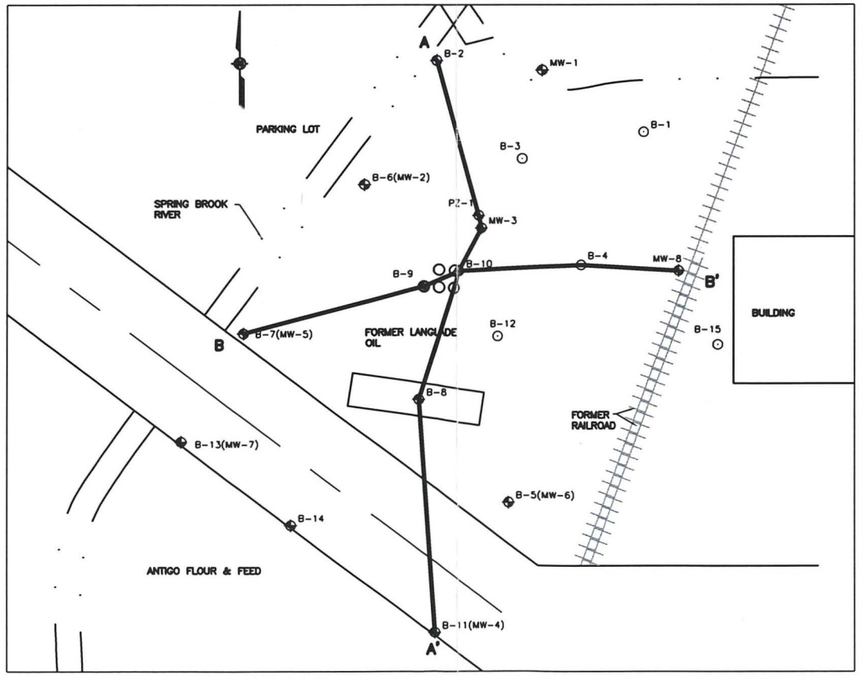
B-7(MW-5)	SOIL BORING/MONITORING WELL
SM	SOIL CLASSIFICATION (USCS)
	STRATIGRAPHIC CONTACT
	APPROXIMATE GROUNDWATER LEVEL
	WELL SCREEN
EOB	END OF BORING

NOTE:
WATER LEVELS BASED ON MEASUREMENTS MADE 1/28/02 FROM MW-3 AND MW-4

GEOLOGIC CROSS SECTION A--A'

SCALE: HORIZ. 1"= 20'
VERT. 1"= 5'

INDEX
NOT TO SCALE



WISCONSIN DEPARTMENT OF NATURAL RESOURCES
FORMER LANGLADE OIL COMPANY, INC.
604 4TH AVENUE ANTIGO, WISCONSIN

CROSS-SECTION A-A'

DESIGNED BY	S.P.M.	DATE 6/27/02
DRAWN BY	J.L.C.	DATE 6/27/02
APPROVED BY	S.P.M.	DATE 6/27/02
CADFILE	X:\PROJECTS\DWG2002\26788\XA\gb88a01.DWG	
XREF		

STS Consultants Ltd.
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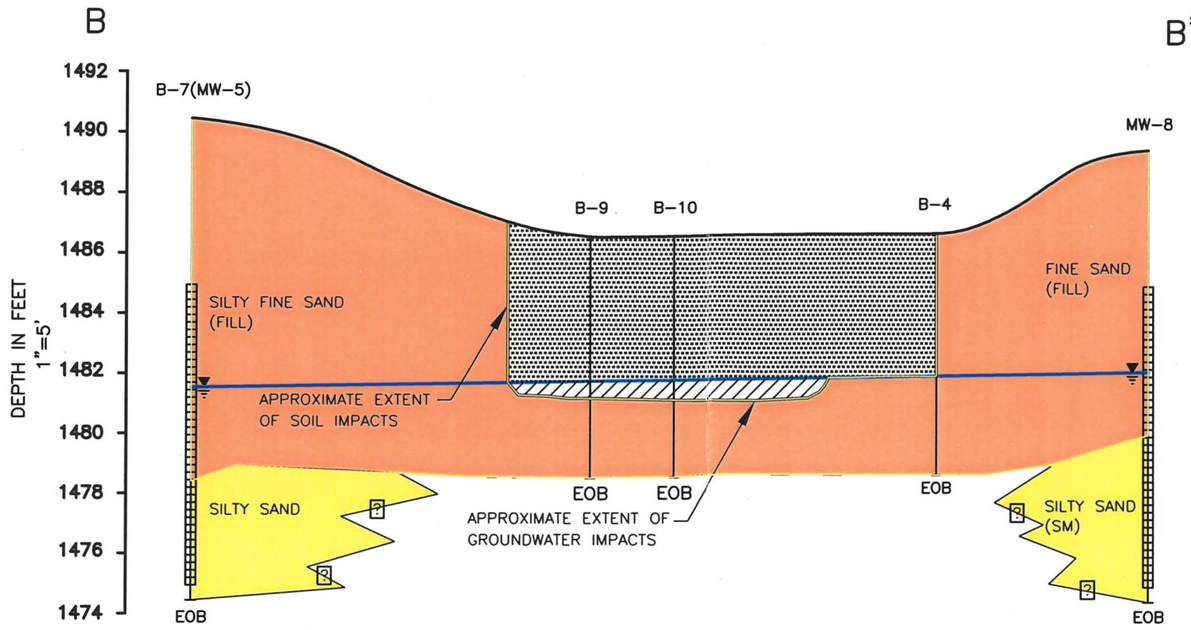
STS PROJECT NO. 26788XA
STS PROJECT FILE gb88a01
SCALE AS SHOWN
FIGURE NO. 8



GEOLOGIC CROSS SECTION B–B'

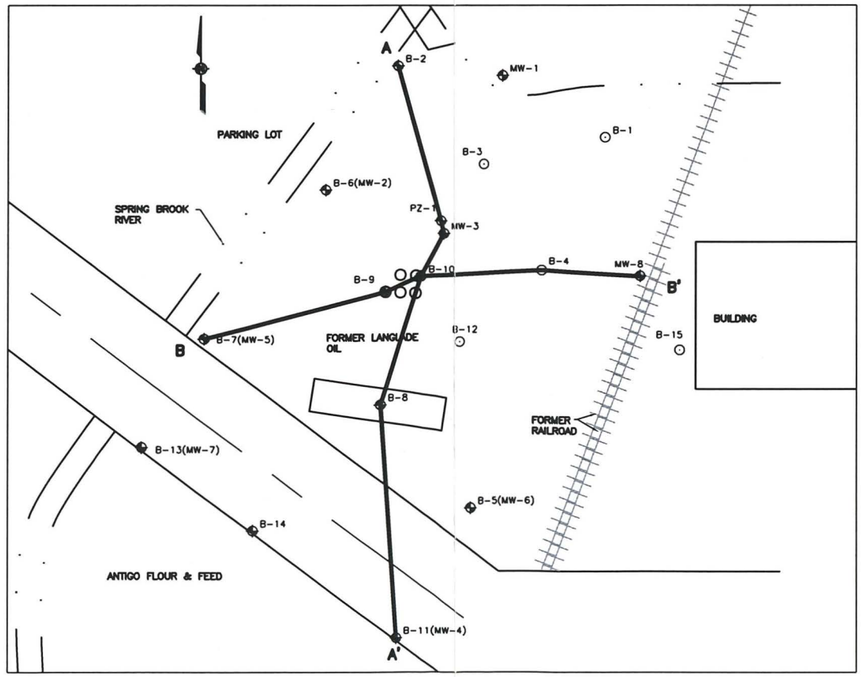
SCALE: HORIZ. 1"= 20'
VERT. 1"= 5'

LEGEND

B–7(MW–5)	SOIL BORING/MONITORING WELL
SM	SOIL CLASSIFICATION (USCS)
	STRATIGRAPHIC CONTACT
	APPROXIMATE GROUNDWATER LEVEL
	WELL SCREEN
EOB	END OF BORING

NOTE:
WATER LEVELS BASED ON MEASUREMENTS MADE 1/28/02 FROM MW–5 AND MW–8

INDEX
NOT TO SCALE



WISCONSIN DEPARTMENT OF NATURAL RESOURCES
FORMER LANGLADE OIL COMPANY, INC.
604 4TH AVENUE ANTIGO, WISCONSIN

CROSS–SECTION B–B'

DESIGNED BY	S.P.M.	DATE 6/27/02
DRAWN BY	J.L.C.	DATE 6/27/02
APPROVED BY	S.P.M.	DATE 6/27/02
CADFILE	X:\PROJECTS\DWG2002\26788\XA\gb88a01.DWG	
XREF		

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STS PROJECT NO.	26788XA
STS PROJECT FILE	gb88a01
SCALE	AS SHOWN
FIGURE NO.	9

Wisconsin Department of Natural Resources
STS Project No. 4-26788XA

Tables

Table 1
Soil Analytical Results - PVOC, DRO, and GRO
Former Langlade Oil Company, Inc.
Antigo, Wisconsin

Sample ID	Depth bgs	Benzene mg/kg	Toluene mg/kg	Ethylbenzene mg/kg	Xylene (Total) mg/kg	1,2,4-TMB mg/kg	1,3,5-TMB mg/kg	Total TMB mg/kg	MTBE mg/kg	DRO mg/kg	GRO mg/kg	FID
B-1 1	0-4	<0.025	<0.025	<0.025	<0.050	<0.025	<0.025	<0.050	<0.025	33	<5.34	<1
B-1 2	4-8	<0.025	<0.025	<0.025	<0.050	<0.025	<0.025	<0.050	<0.025	247	<6.67	250
B-2 1	0-4	<0.025	<0.025	<0.025	<0.050	<0.025	<0.025	<0.050	<0.025	17.6	<5.61	<1
B-2 2	4-7	<0.025	<0.025	<0.025	<0.050	<0.025	<0.025	<0.050	<0.025	10.2	<5.85	150
B-3 1	0-4	<2.08	<2.08	6.27	9.82	69.3	26.4	**95.7**	<2.08	28,200	2260	>1000
B-3 2	4-7	<0.208	<0.208	4.82	14.4	60.1	20.4	**80.5**	<0.208	86,800	658	>1000
B-4 1	0-4	<0.025	<0.025	<0.025	<0.050	<0.025	<0.025	<0.050	<0.025	220	<6.22	<1
B-4 2	4-6.75	<0.025	0.143	<0.025	1.00	11.0	5.59	16.59	<0.025	13,000	336	>1000
B-5 1	0-4	<0.025	<0.025	<0.025	<0.050	<0.025	<0.025	<0.050	<0.025	322	<6.20	300
B-5 2	4-8	<0.025	<0.025	<0.025	<0.050	<0.025	<0.025	<0.050	<0.025	730	<11.9	500
B-6 1	0-4	<0.025	<0.025	<0.025	<0.050	<0.025	<0.025	<0.050	<0.025	75.5	<5.37	<1
B-6 2	4-8	<0.025	<0.025	<0.025	1.13	6.67	2.69	9.36	<0.025	1,340	173	500
B-7 1	0-4	<0.025	<0.025	<0.025	<0.050	<0.025	<0.025	<0.050	<0.025	7.07	<5.28	3
B-7 2	4-8	<0.025	<0.025	<0.025	<0.050	<0.025	<0.025	<0.050	<0.025	<5.14	<5.14	2
B-8 1A	1-4	**0.0963**	0.0383	0.0286	0.096	0.0758	0.0449	0.1207	<0.025	1,700	6.99	475
B-8 2	4-7	**1.43**	<0.4	1.53	68.4	81.1	26.9	**108**	<0.4	11,700	900	>1000
B-9 1	0-4	<0.4	<0.4	0.648	2.71	10.3	4.49	14.79	<0.4	686	375	550
B-9 2	4-7	<1.00	<1.00	18.3	103	181	72.3	**253.3**	<1.00	39,300	2150	>1000
B-10 1	0-4	<0.025	<0.025	<0.025	<0.050	0.053	0.15	0.203	<0.025	74.9	11.4	200
B-10 2	4-8	**0.6**	<0.4	3.43	17.0	23.6	8.18	31.78	<0.4	7,200	270	>1000
B-11 1	0-4	<0.025	<0.025	<0.025	0.061	0.0493	<0.025	0.0493	<0.025	83.4	<5.50	12
B-11 2	4-8	<0.025	<0.025	<0.025	<0.050	<0.025	<0.025	<0.050	<0.025	96.7	<8.18	120
B-12 1	0-4	<2.00	<2.00	2.55	53.3	83.6	39.3	**122.9**	<2.00	28,700	1530	>1000
B-12 2	4-7	<2.00	<2.00	<2.00	91	99.8	49.2	**149**	<2.00	32,800	1140	>1000
B-13 1	0-4	<0.025	0.206	0.0745	0.447	0.127	0.0412	0.168	<0.025	117	<5.39	3
B-13 2	4-8	<0.025	0.0304	<0.025	0.0839	0.0396	0.0434	0.083	<0.025	84.2	<5.95	<1
B-14 1	0-4	0.0385	0.242	0.0743	0.542	0.205	0.0748	0.280	<0.025	318	6.00	2
B-14 2	4-8	<0.025	0.0974	<0.025	0.0461	<0.025	<0.025	<0.050	<0.025	54.6	<5.84	10
B-15 1	0-2	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<5.25	<5.25	<1
MW-8 2A	3.5-4.5	<0.025	0.0547	<0.025	0.141	0.0583	<0.025	0.0833	<0.025	39.1	<6.46	<1
NR720 Groundwater SSRCL		0.07*/0.190	1.5/~~1547~~	50*/154	716*/2205	~~(240~~	~~240)~~	80*/240				
NR 746 Table 1		8.5	38	4.6	42	83	11					
NR 746 Table 2		1.1										

Notes

Samples Collected on 9-26-01

Detected Groundwater RCL (SSRCL) Exceedance **Bold**

Detected Exceedance of Chapter NR 746 Table 1 or 2 Risk Screening Criteria [ ]

*SSRCL Calculated Based on Lowest Measured Site Specific Total Organic Carbon Result

<0.5 = Not Detected Above Indicated Method Detection Limit

.03g/g

MTBE = Methyl Tert-Butyl-Ether
TMB = Trimethylbenzene
DRO = Diesel Range Organics
GRO = Gasoline Range Organics
FID = Flame Ionization Detector
mg/kg=milligram per kilogram
bgs=below ground surface

Table 2
Soil Analytical Results - PAH, Lead and TOC
Former Langlade Oil Company, Inc.
Antigo, Wisconsin

Parameter	Ground-Water RCL	Non-Industrial Direct Contact RCL	B-3 1 0-4	B-9 1 0-4	B-12 1 0-4
TOC			24,000	9,500	56,000
Metals					
Lead		50**	458	8.02	104
PAH's					
Acenaphthene	38	900	<4.29	<0.00516	<0.104
Acenaphthylene	0.7	18	<0.515	<0.00725	<0.147
Anthracene	3000	5000	5.64	<0.0011	0.893
Benzo(a)anthracene	17	0.088	0.204	<0.00451	<0.0911
Benzo(b)fluoranthene	360	0.088	0.205	0.0037	<0.0467
Benzo(k)fluoranthene	870	0.88	0.0921	<0.00319	<0.0644
Benzo(a)pyrene	48	0.0088	0.121	0.00387	<0.0511
Benzo(g,h,i)perylene	6800	1.8	0.122	0.0091	<0.0467
Chrysene	37	8.8	<0.0525	<0.00253	<0.0511
Dibenzo(a,h)anthracene	38	0.0088	<0.0319	<0.00154	<0.0311
Fluoranthene	500	600	0.579	0.0121	<0.0222
Fluorene	100	600	11.4	0.0178	4.78
Indo(1,2,3-cd)pyrene	680	0.088	0.0634	<0.00176	<0.0356
Naphthalene	6*	20	**22**	0.0485	**8.91**
Phenanthrene	6*	600	**25.5**	0.0412	**16.8**
Pyrene	8700	500	0.889	0.00954	0.303
1-Methyl Naphthalene	229*	1100	98.5	0.125	38.6
2-Methyl Naphthalene	143*	600	13.9	0.215	56.8

All units in milligrams per kilogram (mg/kg)
Groundwater RCL (SSRCL) Exceedance= **38.6**
Non-Industrial Direct Contact RCL Exceedance =

Sources: Soil Cleanup Levels for Polycyclic Aromatic Hydrocarbonc (PAHs)-Interim Guidance, WDNR Publication RR-519-97, April 1997
NR 720, Wisconsin Administrative Code for Lead
*SSRCL Calculated Based on Lowest Measured Site Specific Total Organic Carbon Result

Table 3
Groundwater Analytical Results - Geoprobe Borings
Former Langlade Oil Company, Inc.
Antigo, Wisconsin

Sample ID	Sample Date	Benzene ug/L	Toluene ug/L	Ethylbenzene ug/L	Xylene (Total) ug/L	Total TMB ug/L	Naphthalene ug/L	MTBE ug/L	DRO ug/L	GRO ug/L
B-2	9/26/01	<0.16	<0.4	<0.5	<0.57	<0.57	<0.8	<0.3	13,000	<50.0
B-5	9/26/01	<0.16	0.442	<0.5	<0.57	<0.57	<0.8	<0.3	5,360	<50.0
B-6	9/26/01	<3.20	<8.00	<10.0	136	**713**	**244**	<6.00	185,000	1,190
B-7	9/26/01	<0.8	<2.00	<2.50	17.1	9.66	<4.00	<1.50	4,020	130
B-8	9/26/01	**419**	<40.0	87.3	**2,960**	**1,865**	**418**	<30.0	243,000	7,810
B-9	9/26/01	**241**	<80.0	**626**	**2,700**	**1,966**	**592**	<60.0	30,500	22,100
B-10	9/26/01	**231**	<40.0	**143**	779	**765**	**265**	<30.0	15,900	7,190
B-11	9/26/01	0.188	<0.4	<0.5	<0.57	<0.57	<0.8	<0.3	1,430	<50.0
B-13	9/26/01	**0.835**	<2.00	<2.50	7.27	23.2	5.34	<1.50	53,300	319
B-14	9/26/01	<1.60	<4.00	<5.00	107	47.5	<8.00	<3.00	4,640	200
Dup-1	9/26/01	**196**	<80.0	**427**	**1,790**	**1,292**	**365**	<60.0	25,100	14,900
FB-1	9/26/01	<0.16	<0.4	<0.5	<0.57	<0.57	<0.8	<0.3	<100	<50.0
	NR140 PAL	0.5	200	140	1000	96	8	12		
	NR 140 ES	5	1000	700	10000	480	40	60		

Detected PAL Exceedance **Bold**
Detected ES Exceedance

Notes
< = Not Detected
<0.5 = Not Detected Above Indicated Method Detection Limit
MTBE = Methyl Tert-Butyl-Ether
TMB = Trimethylbenzene
Dup 1 = Duplicate Sample of B-9

Table 4
Groundwater Analytical Results - Monitoring Wells
Former Langlade Oil Company, Inc.
Antigo, Wisconsin

Sample ID	Sample Date	Benzene ug/L	Toluene ug/L	Ethylbenzene ug/L	Xylene (Total) ug/L	Total TMB ug/L	Naphthalene ug/L	MTBE ug/L	DRO ug/L	GRO ug/L	Lead Dissolved ug/L
MW-1	11/8/01	<0.16	<0.4	<0.5	<0.57	<0.57	<0.8	<0.3	174	<50.0	<1.00
	1/28/02	<0.16	<0.4	<0.5	<0.57	<0.57		<0.3	<100	<50.0	
MW-2	11/8/01	<0.16	<0.4	<0.5	0.455	<0.57	<0.8	<0.3	511	<50.0	<1.00
	1/28/02	<0.16	<0.4	<0.5	<0.57	0.546		<0.3	498	<50.0	
MW-3	11/8/01	**2.17**	0.543	1.13	42.14	46.3	**28.9**	<0.3	4,820	326	<1.00
	1/28/02	**1.27**	<0.4	<0.5	11.2	16.38	7.713	<0.3	2,030	98.1	
MW-4	11/8/01	<0.16	<0.4	<0.5	<0.57	<0.57	<0.8	<0.3	375	<50.0	<1.00
	1/28/02	<0.16	<0.4	<0.5	<0.57	<0.57		<0.3	168	<50.0	
MW-5	11/8/01	<0.16	<0.4	<0.5	<0.57	<0.57	<0.8	<0.3	712	<50.0	<1.00
	1/28/02	<0.16	<0.4	<0.5	<0.57	<0.57		<0.3	441	<50.0	
MW-6	11/8/01	<0.16	<0.4	<0.5	1.25	4.15	0.832	<0.3	669	<50.0	<1.00
	1/28/02	<0.16	<0.4	<0.5	0.423	1.89	<0.8	<0.3	583	67.2	
MW-7	11/8/01	<0.16	<0.4	<0.5	<0.57	<0.57	<0.8	<0.3	187	<50.0	<1.00
	1/28/02	<0.16	<0.4	<0.5	<0.57	<0.57		<0.3	122	<50.0	
MW-8	11/8/01	<0.16	<0.4	<0.5	<0.57	<0.57	<0.8	<0.3	270	<50.0	<1.00
	1/28/02	<0.16	<0.4	<0.5	<0.57	<0.57		<0.3	238	<50.0	
Dup-1	11/8/01	**2.64**	<2.00	<2.50	51.3	80.3	**36.3**	<1.50	2,190	2,260	<1.00
	1/28/02	**1.11**	<0.4	<0.5	10.6	17.73	7.181	<0.3	949	106	
PZ-1	11/8/01	<0.16	<0.4	<0.5	<0.57	<0.57	<0.8	<0.3	197	<50.0	<1.00
	1/28/02	<0.16	<0.4	<0.5	<0.57	<0.57		<0.3	<100	<50.0	
	NR140 PAL	0.5	200	140	1000	96	8	12			1.5
	NR 140 ES	5	1000	700	10000	480	40	60			15

Detected PAL Exceedance **Bold**
Detected ES Exceedance

Notes
< = Not Detected
<0.5 = Not Detected Above Indicated Method Detection Limit
MTBE = Methyl Tert-Butyl-Ether
TMB = Trimethylbenzene
Dup 1 = Duplicate Sample of MW-3