RBS

Pennsylvania tectonics

April 23, 2009

Ms. Bethany Smith
Claim Investigator
ICF International
4000 Vine Street
Middletown, PA 17057

RE: **Remedial Action Plan:**
Lakewood Oil Company Property;
PA Route 370
Preston Township, Wayne County, Pennsylvania
PADEP Facility ID#64-13651
USTIF Claim Number: #2006-0205(F))
Pennsylvania Tectonics Project Number: 27041

Dear Ms. Smith,

Enclosed, please find one (1) copy of the Remedial Action Plan for the above referenced Lakewood Oil Company Property. Two (2) copies of this report have been forwarded to the PADEP, as required.

I trust this information meets your needs. Please do not hesitate to contact me with any questions or comments concerning the contents of this report or the project in general.

Sincerely,

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
MARTIN PATRICK GILGALLON
GEOLOGIST
NO. PG002089G

Martin Gilgallon, P.G.
Project Director
Pennsylvania Tectonics, Incorporated

MG/mg – 27041 / Remedial Action Plan

Enclosure

cc: Mr. Steve Firmstone / Firmstone Oil Company
Pennsylvania Tectonics Project File #27041

826 Main Street/ Peckville, PA 18452/ p. 570.487.1959/ f. 570.487.1961/ patectonics@hotmail.com

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ICF, Inc.
PAUSTIF

April 23, 2009

Mr. Michael Benner, P.G.
Professional Geologist
Environmental Cleanup Program
Pennsylvania Department of Environmental Protection
2 Public Square
Wilkes-Barre, PA 18711-0790

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Project Director
Pennsylvania Tectonics, Incorporated

MG/mg – 27041 / Remedial Action Plan

Enclosures

cc: Mr. Steve Firmstone / Firmstone Oil Company
Ms. Bethany Smith / ICF International
Pennsylvania Tectonics Project File #27041

Pennsylvania tectonics

REMEDIAL ACTION PLAN WITH PILOT TEST

LAKEWOOD OIL COMPANY PROPERTY

PA ROUTE 370

PRESTON TOWNSHIP, WAYNE COUNTY, PENNSYLVANIA

PADEP FACILITY ID# 64-13651

USTIF CLAIM #2006-0205(f)

PREPARED FOR

FIRMSTONE OIL COMPANY

HONESDALE, PENNSYLVANIA

PREPARED BY

PENNSYLVANIA TECTONICS, INCORPORATED

PECKVILLE, PENNSYLVANIA

APRIL 2009

Submitted By: ____________________
Martin P. Gilgallon, P.G.
Project Director
Pennsylvania Tectonics, Incorporated

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
MARTIN PATRICK GILGALLON
GEOLOGIST

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1.0 Introduction

The purpose of this Remedial Action Plan is to provide Mr. Steven Firmstone of Firmstone Oil Company (Property Owner), the Pennsylvania Department of Environmental Protection (PADEP), and the Pennsylvania Underground Storage Tank Indemnification Fund (PAUSTIF) with the with recommendations to remediate the site in following the requirements of Title 25, §245.311 and demonstrate attainment of the cleanup standards in accordance with the requirements of the Land Recycling and Environmental Remediation Standards Act (Act 2) and the regulations set forth in Title 25, §250. [1, 2, 3] A site location map is provided as Figure 1 and a site plan is provided as Figure 2.

2.0 Site Background

The Lakewood Oil Company Property consists of one (1) structure situated on 1.143 *(+/-)* acres of land. The subject property is bounded to the north by a picnic grove/baseball field; to the east by a commercial/residential property; to the south by PA Route 370; and to the west by a combination of commercial and residential properties. In general, the subject property has a distinct surficial gradient from north to south. The subject property is provided electrical service from Penelec. Heat for the garage structure is provided by the fuel oil that is stored in a 275-gallon aboveground storage tank. The subject property does not have water or sewer service connected to it. Water to surrounding properties is provided by private groundwater wells and the disposition of sewage waste is via on-lot septic systems. The elevation of the subject property is approximately 1,800 feet above Mean Sea Level as indicated on the USGS Orson, PA 7.5 Minute Series Quadrangle.[4]

The subject property can be best described as a tiered site, with an upper and lower level. The upper level contains the site improvements and is secured with a chain link fence. The lower level, located along PA Route 370, is a grass covered area with a small wetland (~1,000 square feet). The garage building, located in the western portion of the upper level, encompasses approximately 700 square feet of space. The garage is a pre-engineered steel building built slab on grade. The structure is heated via a fuel oil fired heater and is connected to electrical service. The structure is not connected to water service or septic service. The garage is utilized to store a fuel delivery truck.

The subject property is located in a mountainous portion of northern Wayne County, Pennsylvania. The site is situated in a small village known as Lakewood. Sparse industrial, commercial and residential properties characterize this village. Regional lands are predominately characterized as large tracts of forest land and agricultural land.

In December 2006, Pundock Construction Services of Olyphant, Pennsylvania (Pundock) completed the closure, via removal, of two (2) UST systems at the subject property. These UST systems included a 10,000-gallon UST containing unleaded gasoline (Tank #001) and an 8,000-gallon UST containing diesel fuel (Tank #002). Field observations identified distinct localized soil and extensive groundwater contamination in the excavation cavity. Field observations also indicated that groundwater was present at an approximate depth of 6.0 feet below grade. In addition, it appeared that bedrock was located at an approximate depth of 6.0 feet below grade and that bedrock had been excavated to accommodate the historical UST systems.

In January 2007, Pundock prepared and submitted a UST Closure Report for the subject property. In general, Pundock collected four (4) soil samples and two (2) groundwater samples from the excavation cavity. Interim remedial activities included the excavation and disposal of soils and the pumping and disposal of impacted groundwater. The soil samples were collected from the sidewalls at the soil / groundwater interface. No contamination, in excess of the Residential Statewide Health Standard MSCs, was identified in the soils. The groundwater samples were collected from the excavation cavity. The benzene concentrations in each sample exceeded the Residential Statewide Health Standard MSC of 5.0 ug/L. Based on these results, the PADEP submitted a Notice of Violation requiring that site characterization activities be implemented.

Two (2) new UST systems were re-installed in the common excavation cavity for the storage of unleaded gasoline and diesel fuel. Three (3) aboveground storage tank systems are currently located in the upper level. These ASTs contain diesel fuel (Tank #003A - 20,000-gallon), kerosene (Tank 004A - 10,000-gallon) and diesel fuel (Tank #005A - 4,000-gallon). These AST systems are located within an earthen secondary containment dike. The two (2) new UST systems are also located in the upper level. Tank #003 is 8,000 gallons in size and contains diesel fuel, while Tank #004 is 5,000 gallons in size and contains gasoline. The USTs and ASTs are connected to a loading rack located in the upper level. The subject property was active at the time of this investigation. The subject property serves as a bulk storage and distribution facility for the Firmstone Oil Company.

3.0 Summary of Site Characterization Activities

The field activities associated with the completion of the Site Characterization Activities were conducted at the subject property between May 9, 2007 and March 19, 2009 under the supervision of Mr. Martin Gilgallon, P.G. of Pennsylvania Tectonics. The field activities conducted as part of the Site Characterization Activities included the drilling of twenty-five (25) test borings, the collection and analysis of twenty (20) soil samples, the installation of twelve (12) shallow Geoprobe® groundwater monitoring wells, the installation of eleven (11) bedrock groundwater monitoring wells, the collection and analysis of nine (9) rounds of groundwater samples, the collection and analysis of groundwater samples from five (5) private wells and the completion of soil-gas monitoring. A monitoring well location map is provided as Figure 4.

The study area is underlain by 5.0 to 15.0 feet of brown sand and silt with varying percentages of sandstone pebbles, cobbles and boulders typical of a glacial drift. A shallow perched water table has been identified at the unconsolidated overburden/bedrock interface. The bedrock geology is consistent with the gray fine to medium-grained sandstones, gray shales and red shales associated with the Catskill Formation. The depth to competent bedrock is approximately 6.0 feet to 12.0 feet below grade. The first detected water bearing zone in the bedrock was encountered at depths less than 20 feet below grade.

The results of the soil sampling activities identified the presence of petroleum-related contamination, in excess of the Residential Statewide Health Standard MSCs, in the soils located downgradient of the UST field. However, since the impacted site soils were fully excavated during the UST removal activities, these soil results are merely an indicator of shallow perched water-table contamination. PA Tectonics contends that the shallow perched water-bearing zone, located in the former UST cavity, migrated downgradient along the top of shallow bedrock carrying dissolved-phase constituents through the unconsolidated overburden. Further migration of the perched water table occurred in a vertical manner through the weathered bedrock into the shallow bedrock aquifer. A comparison of elevation data from well pairs confirms a vertically downward gradient exists onsite.

The results of the groundwater investigation identified the presence of groundwater contamination, in excess of the Residential Statewide Health Standards, in the bedrock aquifer. No offsite groundwater impacts have been identified. MTBE and Benzene are present in MW-8s, which is located on a property downgradient of the subject property. However, this property (herein the Bird property) was the historical location of a gasoline station. According to PADEP records, soil and groundwater contamination was identified on the Bird property. The PADEP has required (of Mr. Russell Bird) that site characterization of the Bird property be completed. Due to the financial constraints of the owner, no site characterization activities have been completed to date. The groundwater contamination identified in MW-8s may be associated with the historical operations conducted at the Bird property.

The soil and groundwater analytical data was compared to the PA Default Values for residential properties as part of a Vapor Intrusion Evaluation. This comparison indicates there is no complete vapor pathway present in association with the groundwater contamination. The vapor screening indicated additional investigation was required to determine if a complete soil-vapor pathway exists. The completion of two (2) rounds of soil-gas sampling has not confirmed that no complete vapor pathway is present. Elevated concentrations of isooctane have been documented at the subject property. However, isooctane does not currently have a published MSC. Further vapor intrusion evaluation should be conducted following the completion of the soil and groundwater remediation activities.

In summary, soil and groundwater contamination, in excess of current Residential Statewide Health Standards, is identified on the subject property. Potential offsite impacts have been identified on the Bird property located downgradient of the subject property. However, these impacts are most probably associated with the historical use of the Bird property as a gasoline station and will not be addressed as part of this RAP. Recently, access to the Zegers Property, which is located to the east of the subject property, was obtained and the groundwater contamination was delineated in this direction. Therefore, the groundwater contaminant plume has been delineated in all directions.

4.0 Conceptual Site Model

- Compounds of Concern: Unleaded Gasoline and Diesel Fuel.
- Volume Released: Unknown.
- Date of Release: Prior to December 2006.
- Source of Release: UST System.
- Migration Pathways:
    - The petroleum contaminants leaked from the UST system directly into the shallow, perched water table.
    - Further horizontal migration of dissolved-phase contaminants occurred along the top of bedrock through the perched water table.
    - Vertical migration of dissolved-phase contaminants occurred into bedrock impacting the bedrock aquifer.
    - The monitoring of a small tributary along the western property boundary identified the absence of contamination. A small wetland located in the southern portion of the subject property has not been investigated for impacts. This wetland has no obvious, surficial discharge point. Aqueous and sediment samples will be collected.
- Contaminated Media: Groundwater
- Potential Exposure Pathways for Each Contaminated Media: [5]
    - Dissolved groundwater plume - inhalation and potable water use

Figure 3 illustrates the potential exposure pathways.

5.0 Proposed PADEP Cleanup Standard

According to Act 2, a remediation cleanup standard can be selected for each media of concern and furthermore for each compound of concern. The four (4) standards provided in Act 2 include the Statewide health standard, site-specific standard, background standard and special industrial area provision. Since no onsite migration of contaminants from an offsite source is present, the background standard cannot be attained. In addition, the site does not qualify as a special industrial area. Therefore, the Statewide health and site-specific standards are viable options for the subject site.

To demonstrate attainment of the Statewide health standard, site groundwater must be remediated to concentrations equivalent to the EPA drinking water standards. However, the selection of the site-specific standard requires the elimination of risks associated with elevated target compounds. Due to the lack of a public water system, the elimination of risks cannot be completed without institutional and/or engineering controls placed on the property. Therefore, the property owner has chosen to demonstrate attainment of the residential, used aquifer, TDS<2500, Statewide health standard for the following unleaded gasoline and diesel fuel target compounds (March 18, 2008 PADEP short list) for the site groundwater. Please note, this compound list was approved by Mr. Michael Benner, P.G. of the PADEP via email dated February 19, 2009.

- Benzene
- Toluene
- Ethylbenzene
- Xylenes
- Isopropylbenzene (a/k/a Cumene)
- Naphthalene
- MTBE
- 1,2,4-Trimethylbenzene
- 1,3,5-Trimethylbenzene

As the Site Characterization Report indicates, several shallow wells were dry during sampling events. Furthermore, during well purging activities, the shallow wells routinely did not recharge enough water to allow the collection of groundwater samples. As per Title 25, Chapter 250, Section 704(b), "well locations shall be selected to yield an adequate amount of water to produce statistically valid results". The current 0.75-inch diameter, shallow well points do not provide representative groundwater data. Therefore, PA Tectonics proposes the installation of four (4) overburden **point of compliance** wells (MW-1SS, MW-2SS, MW-6SS, and MW-13S) and one bedrock **point of compliance** monitoring well (MW-13) to provide statistically valid data at the downgradient property boundaries for future attainment of the Statewide health standard. The wells will be constructed using 4-inch diameter Schedule 40 PVC. This wells will be installed to the top of the competent bedrock. Current monitoring wells MW-1, MW-2, and MW-6 will also be considered **point of compliance** monitoring wells. Figure 4 illustrates the proposed monitoring well locations. Monitoring well points MW-1S, MW-2S, MW-5S and MW-6S will be properly abandoned. Please note, prior to the initiation of any drilling activity, PA Tectonics will identify the locations of public utilities via the completion of the PA 1 Call notification, as required by law. Private, onsite utilities will be located by a subcontractor procured by PA Tectonics.

Since no soil contamination was identified during site characterization activities, no remedial/attainment activities will be completed for the site soils.

6.0 Remedial Alternatives

The following sections provide a summary of the remedial alternatives considered to lower the concentrations of target compounds to demonstrate attainment of the Statewide health standard at the Lakewood Oil Company Site.

6.1 Monitored Natural Attenuation

Natural subsurface processes such as dilution, volatilization, biodegradation, adsorption, and chemical reactions with subsurface materials are allowed to reduce contaminant concentrations to acceptable levels. Natural attenuation is not a "technology" per se, and there is significant debate among technical experts about its use at hazardous waste sites. Consideration of this option usually requires modeling and evaluation of contaminant degradation rates and pathways and predicting contaminant concentration at down gradient receptor points, especially when plume is still expanding/migrating. The primary objective of site modeling is to demonstrate that natural processes of contaminant degradation will reduce contaminant concentrations below regulatory standards or risk-based levels before potential exposure pathways are completed. In addition, long term monitoring must be conducted throughout the process to confirm that degradation is proceeding at rates consistent with meeting cleanup objectives.

Compared with other remediation technologies, natural attenuation has the following advantages:

- Less generation or transfer of remediation wastes;
- Less intrusive as few surface structures are required;
- May be applied to all or part of a given site, depending on site conditions and cleanup objectives;
- Natural attenuation may be used in conjunction with, or as a follow-up to, other (active) remedial measures; and
- Overall cost will likely be lower than active remediation.

Limitations include:

- Data used as input parameters for modeling need be collected.
- Natural attenuation is not appropriate where imminent site risks are present.
- Contaminants may migrate before they are degraded.
- Institutional controls may be required,
- Long term monitoring and associated costs.
- Longer time frames may be required to achieve remediation objectives, compared to active remediation.

- The hydrologic and geochemical conditions amenable to natural attenuation are likely to change over time and could result in renewed mobility of previously stabilized contaminants and may adversely impact remedial effectiveness; and

The suitability of monitored natural attenuation is low due to the presence of potable water wells which may be impacted in the future. The perched water table prohibits the ability to accurately model the vertical migration of contaminants to the bedrock aquifer.

6.2 Excavation or Excavation Coupled with Monitored Natural Attenuation

Since no soil contamination is present, the use of excavation coupled with monitored natural attenuation is not applicable.

6.3 Soil Vapor Extraction

Soil vapor extraction (SVE) is an in situ unsaturated (vadose) zone soil remediation technology in which a vacuum is applied to the soil to induce the controlled flow of air and remove volatile and some semivolatile contaminants from the soil. The gas leaving the soil may be treated to recover or destroy the contaminants, depending on local and state air discharge regulations. Vertical extraction vents are typically used at depths of 1.5 meters (5 feet) or greater and have been successfully applied as deep as 91 meters (300 feet). Horizontal extraction vents (installed in trenches or horizontal borings) can be used as warranted by contaminant zone geometry, drill rig access, or other site-specific factors. No soils are impacted at the Site therefore Soil Vapor Extraction is not applicable.

6.4 Air Sparging coupled with Soil Vapor Extraction

Soil venting is a general term that refers to any technique that removes contaminant vapors from the unsaturated soil. Active venting uses an induced pressure gradient to move vapors through the soil and is more effective than passive venting. Extraction points or wells are installed in the contaminated area and a vacuum is applied to the extraction points. The success of a vacuum extraction program depends both on the properties of the contaminants and the properties of the soil. Of particular importance are three equilibrium relationships:

1) The contaminant-air equilibrium, described by the contaminant's partial vapor pressure;
2) The equilibrium between contaminant dissolved in pore water and the soil vapor, described by the contaminant's Henry's law constant
3) The equilibrium between the contaminant dissolved in pore water and contaminant adsorbed to soil particles, described by the soil-sorption constant (Koc).

Compounds with high vapor pressures (i.e. benzene) are more likely to be removed by vacuum extraction than those with low vapor pressure (i.e. MTBE). Course materials, such as sand and gravel, which have low soil sorption coefficients (i.e. surface area) are also more likely to be affected by the vacuum extraction than fine-grained materials like clay or silt.

The water solubility of each contaminant will also affect the success of venting. Highly soluble compounds like MTBE may tend to exist predominantly dissolved in the pore water, with less in the vapor phase. Vacuum extraction tends to dry out the soil, and over time dissolved contaminants will likely volatilize and be removed.

Currently, PA Tectonics has found no case studies which indicate vapor extraction with air sparging will effectively remediate low levels of MTBE to concentrations below the Statewide health standard. Furthermore, no contaminated soil is present onsite; therefore, the suitability of this technology at this site is low due to the presence of MTBE in groundwater.

6.5 Pump and Treat with Bioremediation

Aboveground treatment of groundwater is generally accomplished by bringing the groundwater to the surface where it can be treated (i.e., pump and treat). The groundwater is then either disposed, or discharged into the subsurface. Prior to the discharge into the subsurface, the groundwater must be run through an activated carbon treatment system or air stripper capable of removing the petroleum compounds to non-detect levels. However, due to the presence of MTBE in the groundwater which has a low adsorption rate, the use of carbon or air strippers is not cost effective.

In addition, remediation by pump and treat is a slow process and cleanup times are often very long. System design, such as pumping rate, is one factor to consider when estimating cleanup times. A system pumping at very low rates may have a very long predicted cleanup time, while one operating at higher rates may have a shorter predicted cleanup time. Also, estimating the cleanup time is difficult and is subject to a large number of uncertainties; typical methods used to calculate cleanup time often result in underestimates because they neglect processes that can add years to the cleanup. The suitability of pump and treat at this site is low due to the presence of MTBE in groundwater and low well yields.

6.6 Chemical Oxidation

The chemical oxidation process involves free radical generation and direct oxidation. The contaminants are treated in-situ and are converted to innocuous and/or naturally occurring compounds (i.e. H_2O, CO_2, O_2, halide ions). As a side benefit, aerobic biodegradation of contaminants can benefit from the increase in dissolved oxygen released through peroxide degradation. The oxidation of contaminants involves a variety of competing reactions as follows (where RH is the contaminant of concern):

$$H_2O_2 + OH\bullet \rightarrow H_2O + HO_2\bullet$$
$$RH + OH\bullet \rightarrow H_2O + R\bullet$$

Typically, a 5% hydrogen peroxide solution would effectively reduce the contaminant concentrations to levels below the PADEP residential used aquifer Statewide health standards.

In-situ chemical oxidation (ISCO) involves the addition of chemical reagents into groundwater via injection wells. The reagents attack the petroleum contamination by chemical oxidation which breaks the organic compounds down into smaller molecules that are innocuous in nature. The reagents may be hydrogen peroxide or permanganate which are effective oxidizing agents. The process involves free radical generation and direct oxidation. The oxidation process is fast acting, taking several days to a few weeks. The contaminants are treated in situ and are converted to innocuous and/or naturally occurring compounds (i.e. H_2O, CO_2, O_2, halide ions).

The effectiveness of ISCO may be limited by low soil permeability, subsurface heterogeneities, and highly alkaline soils where carbonate ions are free radical scavengers. Low soil permeability may be overcome with the use of hydraulic fracturing of the subsurface geology. The reagent may also be consumed by natural organic matter or by reduced inorganic before effectively treating the contamination of concern. To perform the chemical oxidation, a pH between 2 and 4 is preferable, but not necessary. If necessary, the pH of the groundwater may be lowered by using acetic acid to achieve the desired range.

The potential side effects of ISCO remediation include evolution of gas, increase in temperature, resolubilization of reduced metals and reduction in biomass. Due to a possible increase in pressure, there is a potential for an explosion if the peroxide is added at a concentration greater than 10% by weight. Due to the presence of active gasoline USTs and the elevated risks associated with the evolution of gas and increased temperature, ISCO is not be a suitable technology for this site.

6.7 Oxygen Injection

The injection of pure oxygen into groundwater using oxygen generators is a patented groundwater remediation process (U.S. Patent No. 5,874,001) developed by Matrix Environmental Technologies, Inc. (Matrix). It is a proven remediation technique for sites in which physical remediation processes (such as air sparging) are no longer effective or efficient, thus a biological process is more favorable. Oxygen injection rapidly enhances the biodegradation of organic contaminants such as petroleum hydrocarbons and most chlorinated solvents biodegradable under aerobic conditions. The system produces 95% oxygen, which is injected at flow rates and pressures to achieve breakout only. The primary mechanisms of oxygen transport are advection and dispersion, the same mechanisms that facilitated contaminant migration. The dissolution of nearly pure oxygen at a controlled rate has resulted in measured dissolved oxygen concentrations up to 40 mg/L. Oxygen injection is suitable for shallow groundwater conditions since there is no generation of hazardous vapors eliminating the need for vapor control. Biodegradation of MTBE and TBA, fuel additives that degrade slowly or not at all under anaerobic conditions, has been optimized at many sites.

Oxygen injection provides a very efficient process to stimulate the aerobic biodegradation of groundwater contaminants. The high solubility of oxygen gas overcomes the mass transfer limitation of air injection and other oxygen supplying techniques. This technology produces dissolved oxygen concentrations significantly higher than the total oxygen demand. This results in oxygen transport and geochemical conditions that are ideal for biodegradation. The oxygen injection rates and intervals are automated and fully adjustable for optimization to the site-specific conditions. Dissolved oxygen and oxidation-reduction potential (ORP) are monitored for system optimization and as indicators of biomass growth and contaminant utilization. Dissolved inorganics, such as ferrous iron, are often found at high concentrations at contaminated sites and will precipitate in an aerobic environment. However, ferrous iron is formed by obligate anaerobic bacteria, which are intolerant of oxygen and become inhibited once oxygen is introduced to groundwater. The available ferrous iron that precipitates in the formation does not result in fouling because the mass is not concentrated as with pumping systems.

This technology is suitable for many geologic conditions including sand and gravel, silty sand, and fractured bedrock. It is used for source treatment and biobarriers, but unlike other oxygen supplying technologies, oxygen injection treats the entire contaminant plume. Due to past success with this remediation technology on low levels of MTBE and benzene in groundwater, PA Tectonics recommends implementing an oxygen injection system to remediate the site groundwater.

7.0 Pilot Test

As per the recent meeting and conversation with both the PAUSTIF fund administrator, ICF International, Inc., and their third-party consultant, Mr. Brian Evans of B&B Diversified Enterprises, Inc., a pilot test must be performed. The overall objective of the pilot test is to determine if biostimulation using oxygen injection is a feasible technology for reducing VOC concentrations in groundwater at the site and to collect data for potential full scale design.

7.1 Oxygen Injection Wells

For the Lakewood Oil Site, two (2) the oxygen injection wells (IW-1 and IW-2) will be installed to intercept both the overburden unconsolidated water-bearing zone and the shallow bedrock aquifer (Figure 5). The injection wells will be installed as nested wells in a single borehole. The borehole for each injection well will be advanced to approximately 22 feet below grade. The oxygen injection points will be constructed of 1-inch diameter Schedule 40 PVC with threaded connections installed to the bottom of the borehole.

The bottoms of the points contain a one-foot long solid sump followed by a one-foot long 0.010 inch-slotted diffuser with solid PVC riser to the surface. A filter pack (#00N silica sand) will be placed from the bottom of the boring to one foot above the top of screen followed by approximately 10 feet of hydrated bentonite seal to top of bedrock. A second 1-inch diameter Schedule 40 PVC injection point will be installed from at the top of bedrock with a one-foot long solid sump followed by a one-foot long 0.010 inch-slotted diffuser with solid PVC riser to the surface. A filter pack (#00N silica sand) will be placed from the top of bedrock to one foot above the top of screen followed by a hydrated bentonite seal to approximately 1 foot below the ground surface.

Aerobic biodegradation will occur at dissolved oxygen above 2 mg/L, but to completely oxygenate the plume, an optimum dissolved oxygen of 5 mg/L or greater is the objective. Therefore, to determine the optimum point spacing, groundwater monitoring wells (MW-14, MW-14S, MW-15, MW-15S, MW-16, and MW-16S), intercepting both the overburden unconsolidated water-bearing zone and the shallow bedrock aquifer, will be installed downgradient of the injection points at distances of 10, 20, and 30 feet. A site plan showing the pilot test layout is provided as Figure 5.

The injection points are designed to provide an efficient method of dissolving oxygen in groundwater at concentrations approaching the site-specific solubility, which is up to 40 mg/L. The diffuser (screen) length and slot size are chosen to disperse the oxygen into the formation at a depth consistent with the vertical extent of contamination. The oxygen gas will dissolve as it disperses and a percentage of the oxygen will become trapped in the formation and continue to provide a dissolved oxygen supply during injection cycle resting periods. Injection points may require periodic flushing to remove accumulated fines.

Groundwater collected from the injection points provides pertinent monitoring data which aids in the evaluation of system performance. Since oxygen flow is pulsed, groundwater samples are collected from the injection points during resting periods and analyzed on-site for DO and ORP concentrations. This data is used to evaluate the efficiency of the injection system and to determine if the oxygen flow rates and pulse cycles are adequate to oxygenate groundwater.

7.2 Oxygen Delivery Tubing

Oxygen will be delivered to the injection points through individual ½-inch diameter high-density polyethylene (HDPE) tubing for runs up to 350 feet. Longer runs require ¾-inch diameter tubing. The tubing can be installed above or below grade and will extend from the injection point to the trailer-mounted remediation system located adjacent to the garage building situated on the western side of the property. The end of each injection point will be finished with a PVC male adaptor and threaded tee for the tubing connection and riser to the ground surface. For the purpose of the Pilot Test, the tubing will be run above grade, which will eliminate the need for trenching. The tubing will be located in such a manner that it will not interrupt site activities and will not be located in areas susceptible to truck traffic. The tubing runs will be clearly marked to avoid accidental contact.

7.3 Oxygen Injection System

Matrix Environmental will provide a trailer mounted oxygen injection system with a 15 SCFH pressure-swing adsorption oxygen generator and oxygen delivery system equipped for 6 injection points. The power requirement is 100-amp 230-volt single-phase electric supply. The oxygen generator separates nitrogen using clean dry air from the compressor. The nitrogen is purged to the atmosphere and the resulting gas stream, containing 90 to 95% pure oxygen gas, is stored in a 60-gallon American Society of Mechanical Engineers (ASME) rated (200 PSI) steel tank. The pressure in the tank is self-regulated by the oxygen generator at a maximum of 58 PSI and the oxygen pressure leaving the tank is set to approximately 30 PSI using a manual regulator valve. Oxygen is pulsed from the storage tank using mechanical timers and solenoid valves. The oxygen flow to each injection point is metered using Dwyer variable-area flow meters. The HDPE tubing in the header box is connected to the flow meters through the floor of the trailer using ½-inch diameter rubber hose and quick-connect fittings. One mechanical timer and solenoid valve controls a bank of up to two injection points. The system is fully automated and operates unattended once the flow rates are adjusted and timers set.

The oxygen injection system is mounted in a single axle cargo trailer and includes the following components/features:

- Four foot by six-foot insulated cargo trailer with rear double doors, heater, ventilator and inside lighting.
- AirSep Reliant oxygen generator with a 30-gallon surge tank and regulator. The generator produces 15 SCFH of oxygen at 90-95% purity. Single phase/60 Hz/120 volts.
- Compressor assembly included with oxygen generator
- Oxygen purity alarm
- Manifold for 6 injection points to include individual pressure gauge (0-30 PSI) and Dwyer variable area flow meters.
- Three adjustable timers and solenoid valves (per set of two points) to control oxygen flow for pulse injection.
- 125-amp electrical panel with breakers, two 120-volt duplex receptacles and 50-foot power cord.
- Fully integrated remediation system with all plumbing, electrical, and mechanical components installed.
- All pressure tanks are ASME National Board Certified for compressed gas storage.
- Plumbing and instrumentation diagrams and operations manual are included.

7.4 Oxygen Injection System Operation

Startup of the system will consist of testing and monitoring all of the electrical and mechanical components until operating within a defined set of parameters. The oxygen purity will be measured using real time instrumentation and operating data at startup will be recorded. Oxygen flow will then commence and the points will be monitored for flow and pressure. If pressure buildup occurs during startup due to silt accumulation in the points, oxygen flow will be temporarily terminated and the points flushed. The oxygen flow rate to each injection point will be set to 30 SCFH at startup. This flow rate has been determined to provide the most efficient oxygen dispersion without causing the volatilization of VOCs from groundwater. The flow rate will be modified during the test based on the DO monitoring data. However, the system will always operate at a flow rate between and 15 and 50 SCFH per point. The timers will be set to pulse oxygen so the total oxygen output from the system does not exceed 75% of the production capacity. This will provide adequate output pressure during a complete run cycle and prevent excessive motor starts on the compressor.

The duration of the pilot test will be three (3) months. The system will be inspected weekly during the testing duration to monitor system operation, record operating parameters, perform maintenance (if necessary) and collect monitoring data. The flow meters should be adjusted to the desired flow during each site check and the injection points flushed with water or purged with nitrogen if the pressure exceeds 10 PSI. Variations in pressure are normal based on the groundwater elevation, length of tubing, backpressure from the formation and accumulation of fines in the injection points.

7.5 Groundwater Monitoring

Baseline groundwater data should be collected prior to startup of the system and include DO, ORP, temperature, pH, nitrate, manganese, ferrous iron, and sulfate measurements to establish baseline groundwater quality. The samples should be collected from each injection point, and the following monitoring wells: MW-3S, MW-3, MW-4S, MW-4, MW-14S, MW-14, MW-15S, MW-15, MW-16S, and MW-16.

Groundwater samples will be obtained on a weekly basis for the first month of operation and twice per month thereafter for measurement of the field parameters list above using a Horiba U-22 multimeter capable of measuring pH, conductivity, turbidity, DO, temperature, TDS, and ORP.

Groundwater samples will be field analyzed for nitrate, manganese, ferrous iron, and sulfate using a Hach DR820 colorimeter monthly. The following provides the methodology for the field analyses:

- Nitrate – Hach Method 8039 (calcium reduction method)
- Manganese - Hach Method 8034 (EPA-accepted periodate oxidation colorimetric method)
- Ferrous Iron – Hach Method 8146 (1,10 phenanthroline method)
- Sulfate – Hach Method (EPA-accepted SulfaVer4 method)

Groundwater samples for the PADEP unleaded gasoline and diesel fuel target compounds (March 18, 2009 PADEP short list) will collected and analyzed monthly.

7.6 System Feasibility Evaluation

The overall objective of the pilot test is to determine if biostimulation using oxygen injection is a feasible technology for reducing contaminant concentrations in groundwater at the site and to collect data for potential full scale design. The primary mechanism for reducing the mass and concentration of petroleum contaminants is biodegradation, which is the degradation of the contaminants by microorganisms. To convert (or consume) contaminants, microorganisms require the proper environmental conditions, nutrients and electron acceptors. Nutrients, which include trace levels of phosphorus, potassium, and nitrogen, are usually available within most soil and groundwater systems. The availability of electron acceptors usually controls the extent of contaminant biodegradation. Therefore, it is important to assess electron acceptor distribution and concentration in groundwater.

Microorganisms use electron acceptors (e.g., oxygen, nitrate, iron, and sulfate) to "breathe". Biodegradation generally proceeds at a greater rate in an aerobic (oxygen-rich) environment than under anaerobic (oxygen-depleted) conditions. As long as sufficient oxygen is present, aerobic biodegradation will dominate as indicated by the following **Primary Lines of Evidence evaluation**.

- **Oxygen Solubility** - Most sites have the potential to dissolve up to 40 mg/L of dissolved oxygen using pure oxygen gas. DO data will be collected from the injection points and averaged to determine the site-specific solubility. This data will be used to optimize the flow rate of oxygen to the injection points and the frequency of injection.

- **Radius of DO Dispersion** - The injected oxygen gas is dispersed into the formation and dissolved. DO in groundwater monitoring wells will be monitored during the pilot test to determine the effective radius of dispersion from the injection points. DO concentrations above 5 mg/L are the target. The dispersion data is necessary to determine the injection point spacing and for sizing the oxygen generator and compressor.

- **DO Efficacy** - For efficient and complete remediation of a site the mass of oxygen dissolved in the plume must be substantially greater that the total oxygen demand. Otherwise, DO concentrations will be cyclical and conditions will vary from anaerobic to aerobic. Dissolved oxygen concentrations from injection points and nearby monitoring wells will be collected on a routine basis until the levels decline to background. Rapid depletion of DO indicates a very high oxygen demand at the site and/or poor efficacy of the oxygen source. This data will be used to evaluate the technology and to determine the frequency of injection (cycle times) required to maintain high DO in the plume.

Once oxygen has been sufficiently consumed, anaerobic biodegradation, which relies upon electron acceptors other than oxygen to metabolize petroleum contaminants, will dominate. The availability of electron acceptors usually controls the extent of contaminant biodegradation. Therefore, it is important to measure electron acceptor distribution and concentrations in groundwater.

Some petroleum compounds are only slowly degradable by microorganisms, or may not be degradable at all. The chemical structure of the contaminant, the concentration and competition between contaminants, and the ability of the natural microbes to "eat" a contaminant while "breathing" various electron acceptors, control the speed and extent of degradation. For instance, benzene is most easily degraded when sufficient oxygen is present.

Secondary Lines of Evidence evaluation will be used to supplement the Primary Lines of Evidence to demonstrate that biodegradation is occurring. The Secondary Lines of Evidence evaluation requires the following data be collected.

In situations where DO has been consumed, anaerobic processes will dominate. In the absence, or near absence of DO, nitrate (NO_3^-), manganese (Mn^{+4}), ferric iron (Fe^{+3}), sulfate (SO_4^{-2}) or carbon dioxide (CO_2) may serve, if available, as electron acceptors. The sequential use of electron acceptors as microorganisms consume petroleum contaminants is:

$$DO \rightarrow NO_3^- \rightarrow Mn^{+4} \rightarrow Fe^{+3} \rightarrow SO4^{-2} \rightarrow CO_2$$

The use of a specific electron acceptor is closely related to the oxidation-reduction potential of the groundwater. The more reducing the groundwater conditions, the greater the depletion of the available electron acceptors. Source zone groundwater usually exhibits the greatest depletion of electron acceptors.

Geochemical indicators monitor electron acceptors directly (e.g., DO, NO_3^- and $SO4^{-2}$) or monitor the byproduct of the metabolized electron acceptor (e.g., Mn^{+2}, Fe^{+2}, and methane).

One additional Lines of Evidence will be used to evaluate the remedial effectiveness of the oxygen injection remediation. The Oxidation-Reduction Potential of groundwater is a measure of the relative tendency of a solution to accept or donate electrons. Oxidation-Reduction Potential is usually presented in terms of Eh values.

Although not always true, a positive Eh value generally indicates that the solution is oxidizing (aerobic) while a negative value indicates that the solution is chemically reducing (anaerobic). If the ORP measurements taken outside the plume are higher than the ORP measurements in the plume, it is an indication that biodegradation may be occurring. Dissolved Oxygen and ORP readings should agree. Dissolved Oxygen should be less than 1 ppm when ORP is negative.

7.7 Pilot Test Reports and Final RAP

PA Tectonics will provide monthly system reports that will summarize all available data. These reports will provide a preliminary evaluation of the effectiveness of the system. Subsequent to the completion of the Pilot Test, PA Tectonics will prepare and submit a formal report summarizing the results of the study. This report will include the design details and associated cost summary pursuant to the implementation of the full scale remedial system. An addendum to this RAP will be prepared and submitted to the PADEP for approval. This addendum will be prepared within thirty (30) days of the completion of the Pilot Test.

8.0 Remedial Action Schedule

Site work will begin within approximately thirty (30) days upon approval of the Remedial Action Plan.

9.0 Quarterly Groundwater Surface Water / Wetland Sampling

Quarterly groundwater sampling will continue throughout the pilot testing for all monitoring wells (i.e. both shallow and deep) and the surface water feature located onsite. In addition, the initial sampling will include the collection of one (1) aqueous and one (1) sediment sample from the small wetland located on the southern portion of the site. Sampling procedures will continue in accordance with previous sampling protocol at the site. The samples will be analyzed for the PADEP unleaded gasoline and diesel fuel target compounds, in accordance with the March 18, 2008 PADEP short list of parameters. In addition, field analysis of pH, conductivity, turbidity, dissolved oxygen (DO), temperature, oxidation reduction potential (ORP), nitrate, manganese, ferrous iron and sulfate will be completed for all monitoring wells. These additional parameters are required to determine the remedial effectiveness of the oxygen injection.

10.0 Health and Safety Plan

A copy of the site-specific Health and Safety Plan (HASP) is provided in Appendix A. PA Tectonics will require a task-specific HASP from each individual subcontractor.

11.0 Management of Wastes Generated

The purge water generated during the monitoring well development activities will be staged in DOT-approved, 55-gallon drums and transported offsite for disposal. In addition, all soil generated during the installation of the injection wells and POC wells will be transported offsite for disposal. Disposal certification will be provided upon receipt. Purge water generated during the groundwater monitoring activities will be treated onsite with a 55-gallon carbon drum and discharged to the ground surface.

12.0 Permits

PA Tectonics will submit a request for any permits, which may be required by the United States Environmental Protection Agency (USEPA) and the PADEP regarding the implementation of the remedial technology. In addition, Preston Township and Wayne County will be contacted to determine if any permits are required. PA Tectonics anticipates no permits will be required.

13.0 References

[1] Pennsylvania Code, Title 25 Environmental Protection, Chapter 245 Administration of the Storage Tank and Spill Prevention Program, Commonwealth of Pennsylvania, Department of Environmental Protection, Bureau of Watershed Conservation, Division of Storage Tanks, Harrisburg, December 18th, 1999, revised September 18th, 2001.

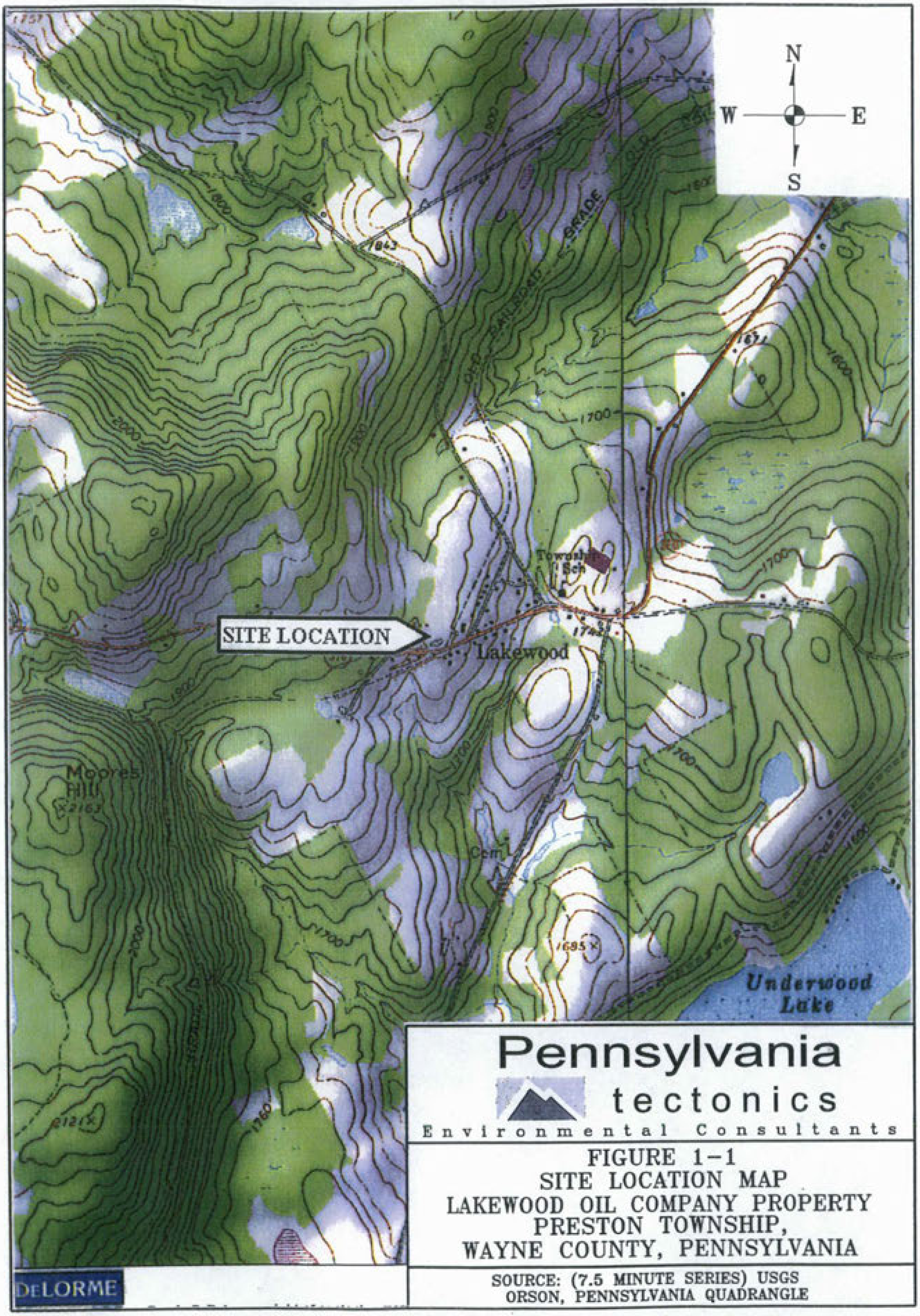
[2] 35 P.S. §§ 6026.104(a), 6026.301(c) and 6026.303(a), Act 2 of 1995, The Land Recycling and Environmental Remediation Standards Act, Commonwealth of Pennsylvania, Harrisburg, May 19th, 1995.

[3] Pennsylvania Code, Title 25 Environmental Protection, Chapter 250 Administration of Land Recycling Program, Commonwealth of Pennsylvania, Department of Environmental Protection, Bureau of Land Recycling and Waste Management, Land Recycling and Cleanup Program, Harrisburg, November 24th, 2001.

[4] Orson Quadrangle, Pennsylvania 7.5-Minute Series (Topographic), United States Department of the Interior, Geological Survey, Reston, VA, 1996.

[5] Standard Guide for Risk-based Corrective Action at Petroleum Release Site, E 1739-95, ASTM International, West Conshohocken, PA, 1995, Edited December 1996.

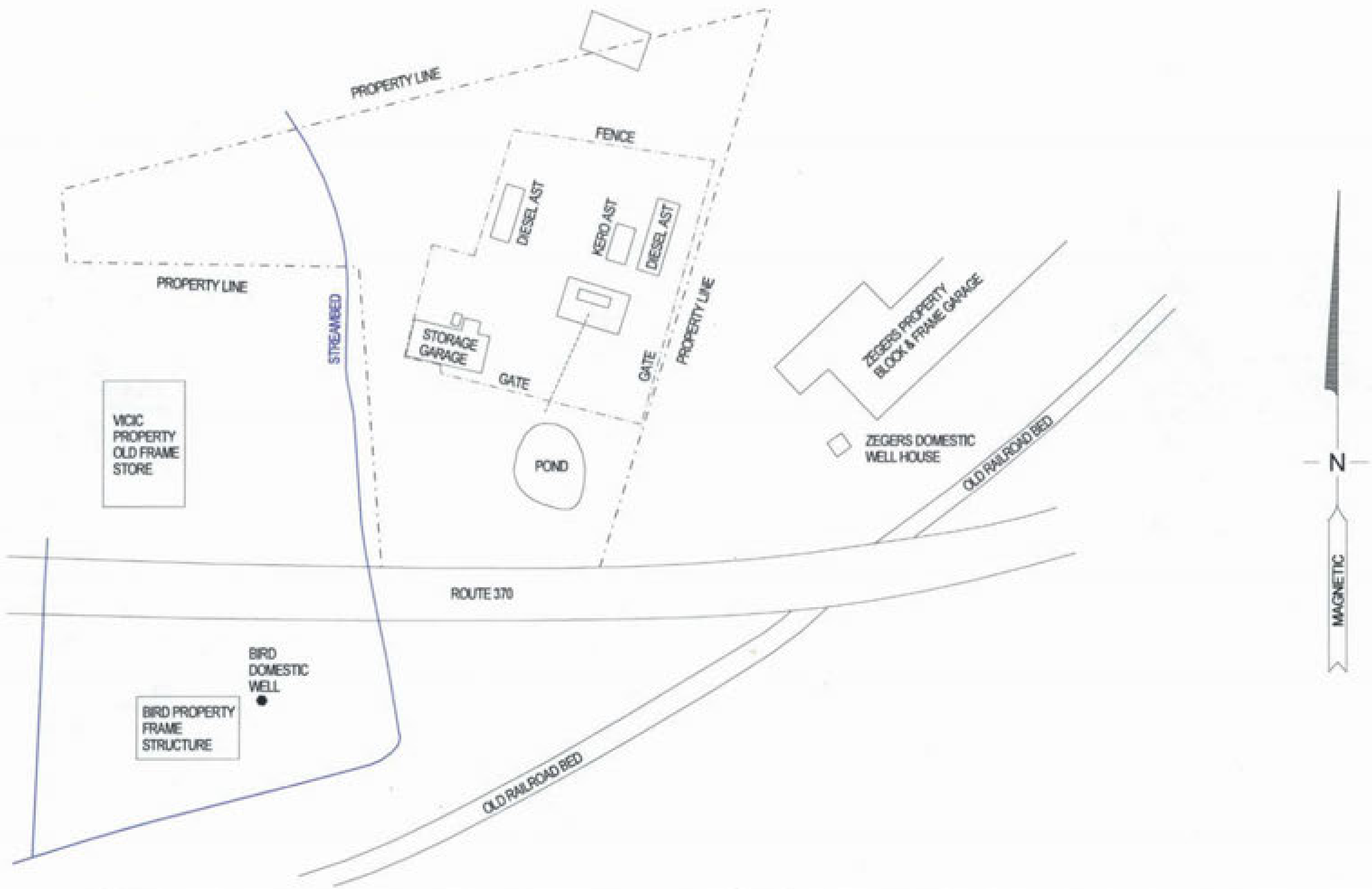
Figures



Pennsylvania tectonics
Environmental Consultants

FIGURE 1-1
SITE LOCATION MAP
LAKEWOOD OIL COMPANY PROPERTY
PRESTON TOWNSHIP,
WAYNE COUNTY, PENNSYLVANIA

SOURCE: (7.5 MINUTE SERIES) USGS
ORSON, PENNSYLVANIA QUADRANGLE



GRAPHIC SCALE: 0 25 50 75 100

FIGURE NAME: SITE PLAN

PREPARED BY:
PENNSYLVANIA TECTONICS, INC.
826 MAIN STREET
PECKVILLE, PA 18452

PROJECT:
LAKEWOOD OIL COMPANY
STATE ROUTE 370
PRESTON TOWNSHIP, WAYNE COUNTY

SOURCE:
SALEM CONSULTANTS & SALES, INC.
521 STATE SCHOOL ROAD
SELINSGROVE, PA 17870-9778
DATE: OCTOBER 5, 2007
REVISED: MAY 20, 2008 & JULY 20, 2008

REVISED BY: D. CROWTHER

SCALE: 1 INCH = 50 FEET

FIGURE NUMBER: 2

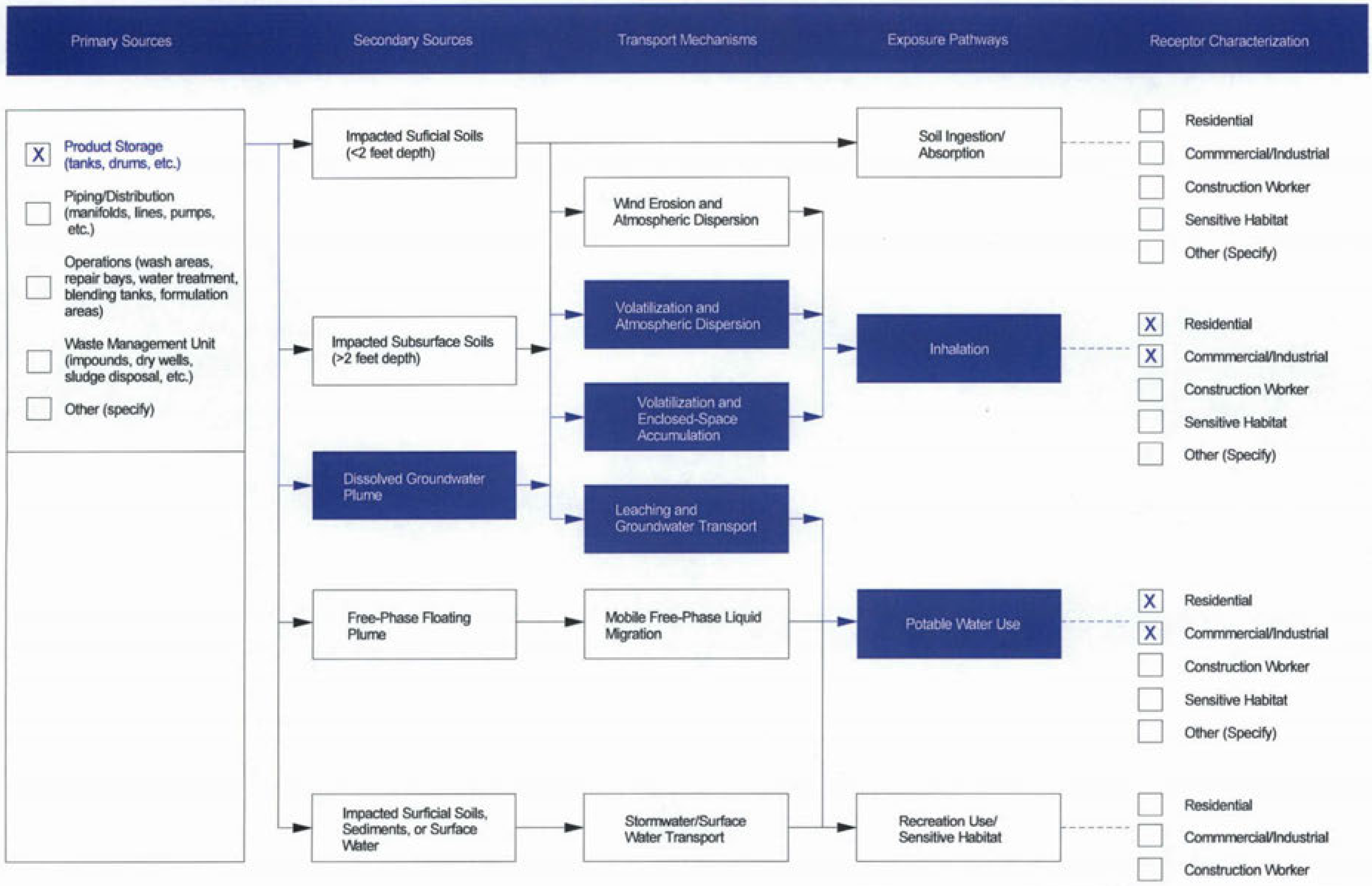


FIGURE NAME: POTENTIAL EXPOSURE PATHWAYS

PREPARED BY:
PENNSYLVANIA TECTONICS, INC.
826 MAIN STREET
PECKVILLE, PA 18452

PROJECT:
LAKEWOOD OIL COMPANY
STATE ROUTE 370
PRESTON TOWNSHIP, WAYNE COUNTY

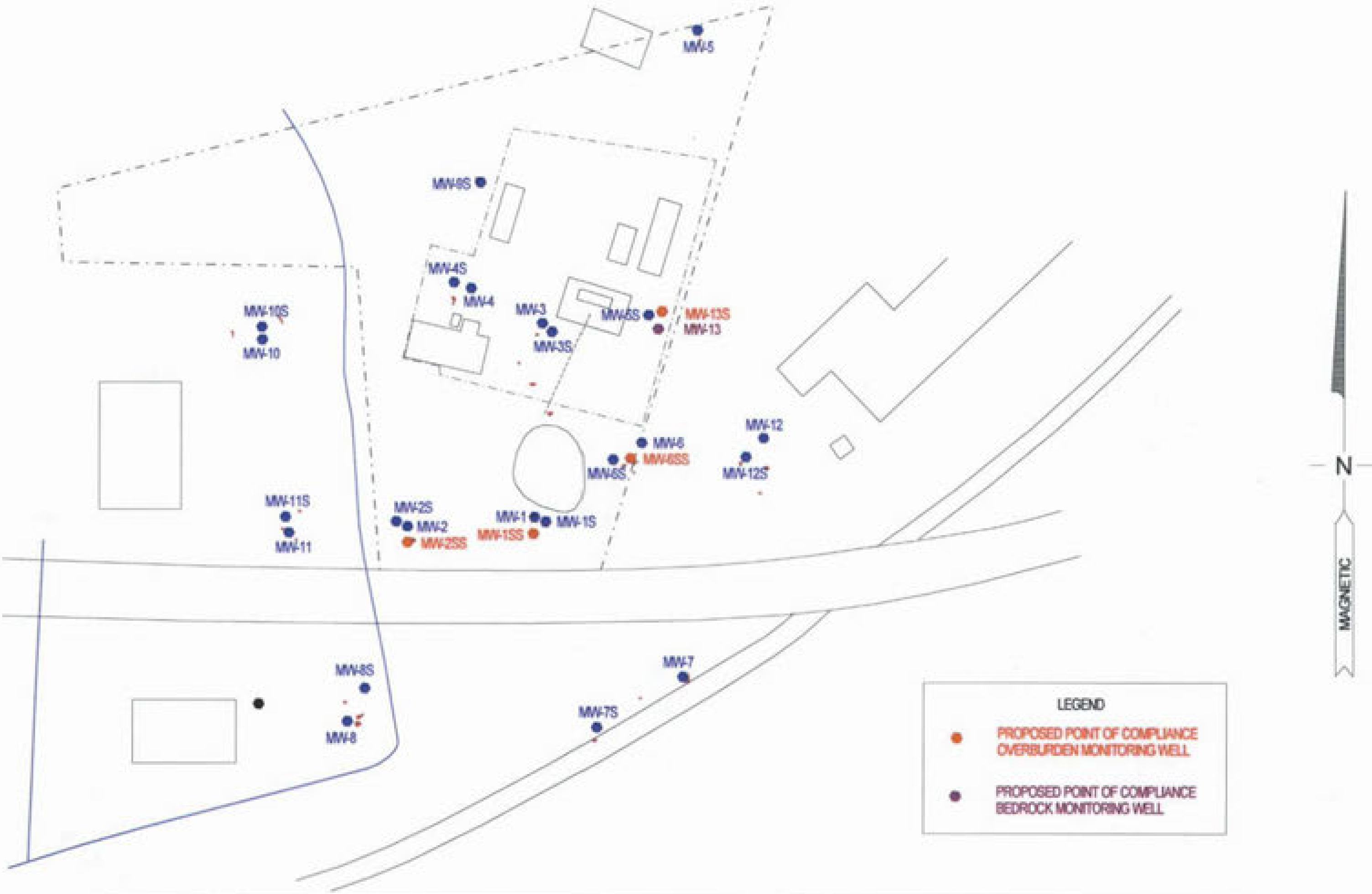
SOURCE:
STANDARD GUIDE FOR RISK-BASED CORRECTIVE ACTION AT PETROLEM RELEASE SITES, E1739-95, AMERICAN SOCIETY FOR TESTING AND MATERIALS, WEST CONSHOHOCKEN, PA 1995, DECEMBER 1996.

REVISED BY: D. CROWTHER

SCALE: NA

FIGURE NUMBER: 3

4/24/2009 3:45:23 PM



GRAPHIC SCALE: 0 25 50 75 100

FIGURE NAME: MONITORING WELL LOCATION MAP

PREPARED BY:
PENNSYLVANIA TECTONICS, INC.
826 MAIN STREET
PECKVILLE, PA 18452

PROJECT:
LAKEWOOD OIL COMPANY
STATE ROUTE 370
PRESTON TOWNSHIP, WAYNE COUNTY

SOURCE:
SALEM CONSULTANTS & SALES, INC.
521 STATE SCHOOL ROAD
SELINSGROVE, PA 17870-9778
DATE: OCTOBER 5, 2007
REVISED: MAY 20, 2008 & JULY 20, 2008

REVISED BY: D. CROWTHER

SCALE: 1 INCH = 50 FEET

FIGURE NUMBER: 4

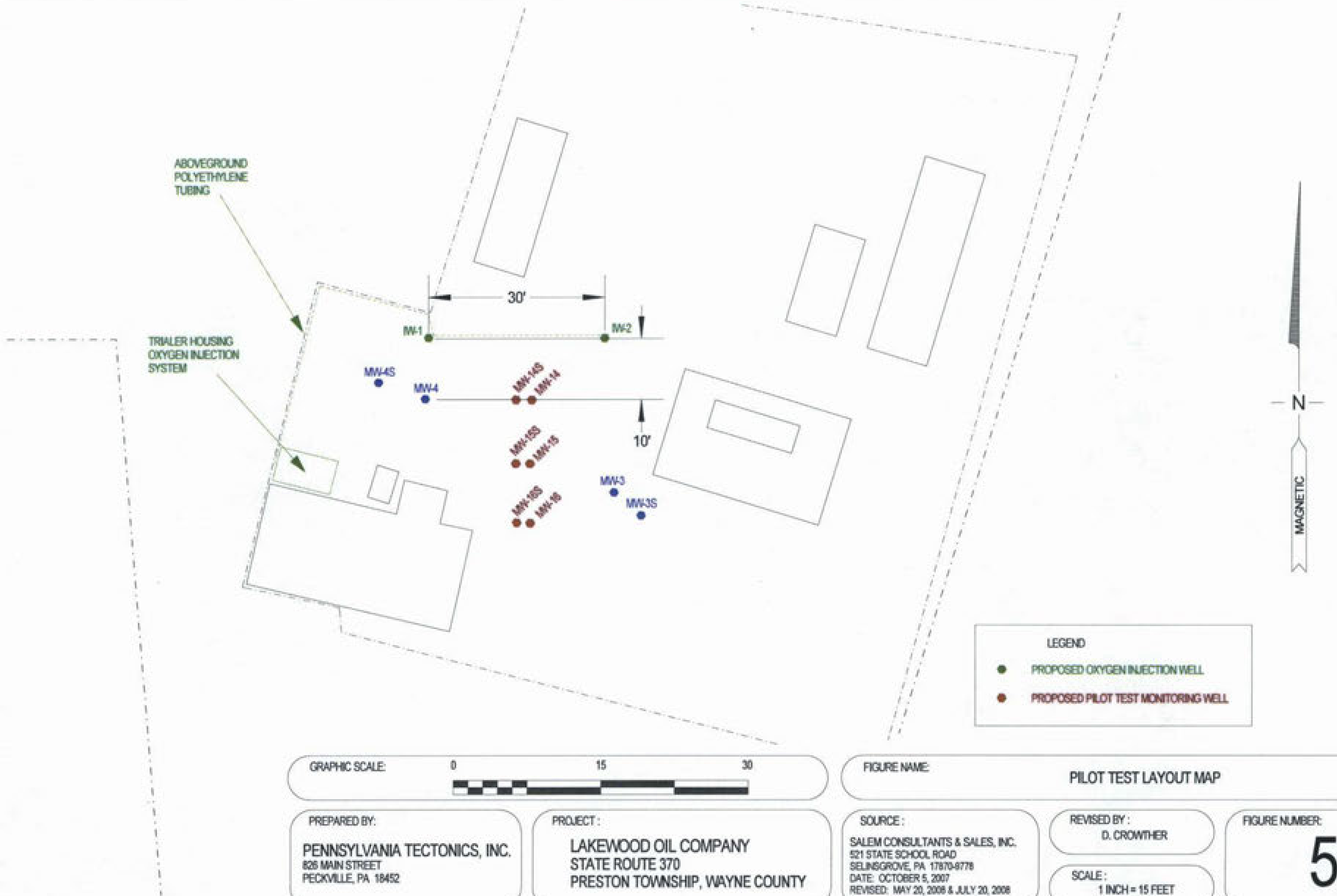


FIGURE NAME: PILOT TEST LAYOUT MAP

PREPARED BY:
PENNSYLVANIA TECTONICS, INC.
826 MAIN STREET
PECKVILLE, PA 18452

PROJECT:
LAKEWOOD OIL COMPANY
STATE ROUTE 370
PRESTON TOWNSHIP, WAYNE COUNTY

SOURCE:
SALEM CONSULTANTS & SALES, INC.
521 STATE SCHOOL ROAD
SELINSGROVE, PA 17870-9778
DATE: OCTOBER 5, 2007
REVISED: MAY 20, 2008 & JULY 20, 2008

REVISED BY: D. CROWTHER

SCALE: 1 INCH = 15 FEET

FIGURE NUMBER: 5

Appendix A

Site-Specific Health and Safety Plan

SITE-SPECIFIC HEALTH AND SAFETY PLAN

Lakewood Oil Company
Facility ID: 64-13651

I. Project Information

Date Prepared: March 30, 2009

Site Location: State Route 370
Preston Towship
Wayne County, Pennsylvania

Site Activities: Task 1. Collect quarterly groundwater samples.
Task 2. Provide project management/contractor oversight during remedial activities by subcontractors.

Project Manager:	Martin Gilgallon, PG - PA Tectonics	**Phone #:**	570-487-1959
Site Safety Officer:	Martin Gilgallon, PG - PA Tectonics	**Phone #:**	570-487-1959
Site Contact:	Martin Gilgallon, PG - PA Tectonics	**Phone #:**	570-487-1959

II. Safety Training

All personnel arriving onsite will log in with the Site Safety Officer

The Site Safety Officer will maintain a copy of all current training certificates of all personnel.

Prior to allowing any personnel onsite, the Site Safety Officer will ensure that all personnel and subcontractors have received a site-specific safety briefing .

All subcontractors are required to prepare a separate Task-Specific Health & Safety Plan prior to arriving onsite regarding their contracted scope of work. The Task-Specific Health & Safety Plan must be provided to Pennsylvania Tectonics for review and approval prior to arriving onsite. Pennsylvania Tectonics will provide all subcontractors a copy of this Health & Safety Plan for preparation of their own Health & Safety Plan.

III. Hazard Assessment

[ ] Confined Space	[x] Extreme cold	[x] Trench excavation
[x] Heavy Equipment	[ ] Surface waters	[x] Electrical hazards
[x] Falling/Flying Objects	[x] Drum handling	[x] Heat stress
[ ] Steep/Uneven Terrain	[x] Noise	

[x] Other — Remedial activities to be completed by subcontractors

Contaminants of Concern:	Route of Entry	Permissible Exposure Level
Volatile Organic Compounds	Ingestion	To be determined by Site Safety Officer
Volatile Organic Compounds	Dermal Contact	To be determined by Site Safety Officer
Volatile Organic Compounds	Inhalation	To be determined by Site Safety Officer

Hazard Assessment & Equipment Selection - Personal Protective Equipment	Task	Level
Nitrile Gloves (N-DEX 7005)	Task 1 & 2	D
Steel-Tipped Boots (ANSI Z41 compliant)	Task 1 & 2	D
Safety Glasses (ANSI Z87.1 compliant)	Task 2	D
Hard Hat (ANSI Z89.1 compliant)	Task 2	D
Hearing Protection	Task 2	D
Protective clothing covering lower body (pants, coveralls, etc.)	Task 2	D

Note: Site Safety Officer will determine when PPE should be used.

SITE-SPECIFIC HEALTH AND SAFETY PLAN
Lakewood Oil Company
Facility ID: 64-13651

IV. Air Monitoring

Is air monitoring required? ☐ Yes ☒ No*

Types of monitoring equipment to be used:

☐ Organic Vapor Analyzer (OVA)
☐ Photo ionization Detector (PID)
☐ Detector tubes & pump
☐ Explosimeter/O2 meter
☐ Particulate monitor
☐ Personal dosimeters
☐ List other: ______________________

Air monitoring protocol: ______________________

** Past experiences at sites with similar activities, contaminants & concentrations indicates the use of air monitoring & respirators is not required. Should site conditions change, the Site Safety Officer may cease site activities and reevaluate air monitoring/respirator use.*

V. Engineering Controls for Hazard Reduction

The following engineering controls will be used during site activities (as necessary):

☐ Ventilation (fan) ☐ Other ______________________

VI. Site/Boundary Control

Describe task-specific site/boundary control: Task 2 - Cones and/or marking tape with provide boundary control

VII. Confined Space Entry

Will confined space entry take place? ☐ Yes ☒ No

VIII. Hazard Communication Program

Material Safety Data Sheets (MSDSs) shall be readily available for each chemical introduced to the site.

IX. Safe Work Practices

Personnel on-site must follow the following general work practices:

1. Smoking is forbidden during site activities.
2. Eating and drinking are only permitted in designated areas.
3. Contact with excavated materials or other contaminated media must be minimized.
4. Housekeeping in the work area is a priority.
5. Identify equipment emergency stop switches prior to using equipment.
6. Other (list): ______________________

SITE-SPECIFIC HEALTH AND SAFETY PLAN

Lakewood Oil Company
Facility ID: 64-13651

X. Decontamination and Disposal Procedures

Is decontamination required? [x] Yes [ ] No

Required decontamination solutions:

[x] Tap water [x] Detergent Solution [ ] Solvent

[ ] Other: ______

Decontamination will take place for all locations where contamination was encountered and prior to leaving the exclusion zone. It will involve two phases.

1. The first phase is the gross decontamination of equipment & personnel, and shall include the removal of visible contamination.
2. The second phase is a full decontamination of equipment as follows:

[ ] Tap water rinse
[ ] Detergent solution
[ ] Solvent
[x] Steam Cleaner
[ ] Other ______

Disposal procedures:

Decontamination fluids: Drum all liquids
Decontamination solids: Place solids on plastic and cover with plastic
Disposable personal protective equipment: NA

XI. Medical Monitoring/Surveillance Requirements

	Yes	No
Is a baseline physical required?	[ ]	[x]
Is respirator clearance required?	[ ]	[x]
Is contaminant-specific monitoring required?	[ ]	[x]

XII. Spill Containment Requirements

Site Soils:

[x] Place soil on 6-mil poly [x] Cover Soil Pile with 6-mil poly
[ ] Place soil in dump truck [ ] Place soil in 55-gallon drums
[x] Place soil in roll-off container
[ ] Other ______

Site Groundwater:

[x] Transfer into 55-gallon drums [ ] Transfer into holding tank
[ ] Build a retention berm [ ] Place booms around discharge area
[ ] Other ______

Site Emergency Actions

The evacuation signal for the office facility is as follows:

1. **Initial:** verbal/local evaluation
2. **Comprehensive:** Vehicle horn blast/one minute

When an evacuation order is given, all BlackRock employees will shut down operations, leave the facility by the means of the closest exit, and assemble at the company vehicles or other area directed by the BlackRock Site Safety Officer.

The BlackRock Site Safety Officer will account for BlackRock employees and notify the appropriate emergency services. Re-entry into the facility shall not occur without approval of the municipal emergency official.

Site Emergency Coordinator

Martin Gilgallon

Work:	570-487-1959
Home:	570-230-1955
Mobile:	570-241-4020

Emergency Contacts

Agency	Name	Phone Number
Fire Department:	Northern Wayne Fire & EMS	911 *or* 570-798-2335
Local Police:	Pennsylvania State Police - No Local Police	911 *or* 570-253-7126
State Police:	Honesdale Barracks	911 *or* 570-253-7126
Ambulance:	Northern Wayne Fire & EMS	911 *or* 570-798-2335
State DEP:	Northeastern Regional Office	570-826-2511
Poison Control:	Poison Control Center	800-722-7112
Local Hospital:	Wayne Memorial - Directions Attached	570-253-8100

SITE SPECIFIC HEALTH & SAFETY PLAN
Lakewood Oil Company
Facility ID: 64-13651

Health & Safety Plan Signature Form for Onsite BlackRock Personnel

Name	Title	Signature	Date
Martin P. Gilgallon	Geologist		
Dave Crowther	Geologist		
Dean Cruciani	Project Manager		
Kevin Cucura	Site Supervisor		
Jerry Luchansky	Environmental Specialist		
Edward Brozoski	Environmental Specialist		
Marie Rhoads	Technician		

Note: By signing this form, individuals are acknowledging that they have read and are familiar with the provisions of this site specific Health and Safety Plan.

MAPQUEST.

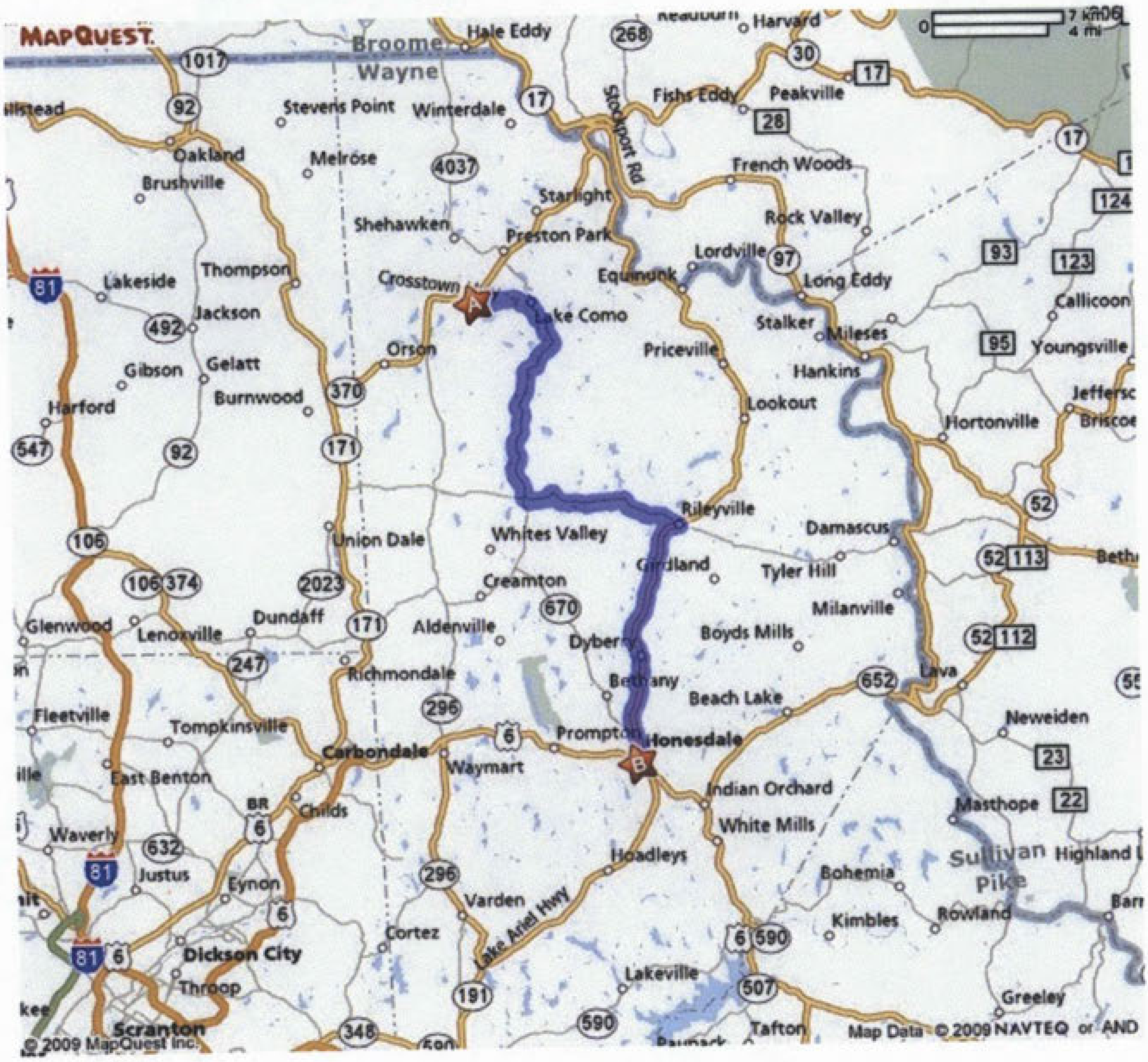
Total Time: 44 minutes **Total Distance: 29.43 miles**

A: Lakewood, PA

START	1: Start out going EAST on PA-370/CROSSTOWN HWY toward WEED ST/TOWNSHIP RD 708.	0.4 mi
	2: Turn RIGHT onto COMO RD.	1.7 mi
	3: COMO RD becomes ROSE HILL RD.	0.3 mi
	4: Turn RIGHT onto PA-247/WHITE ROCK DR. Continue to follow PA-247.	9.3 mi
	5: Turn LEFT onto PA-371/GREAT BEND TURNPIKE.	6.8 mi
	6: Turn RIGHT onto PA-191.	10.5 mi
	7: Turn RIGHT onto W PARK ST/US-6.	0.3 mi
END	8: End at 601 Park St Honesdale, PA 18431-1445	

B: 601 Park St, Honesdale, PA 18431-1445

Total Time: 44 minutes **Total Distance: 29.43 miles**


MAPQUEST.
Broome
Wayne
Hale Eddy
Harvard
Stevens Point
Winterdale
Stockport Rd
Fishs Eddy
Peakville
Oakland
Brushville
Melrose
French Woods
Starlight
Shehawken
Preston Park
Rock Valley
Thompson
Lakeside
Jackson
Crosstown
Equinunk
Lordville
Long Eddy
Callicoon
Lake Como
Stalker
Mileses
Priceville
Youngsville
Gibson
Gelatt
Orson
Hankins
Burnwood
Harford
Lookout
Hortonville
Rileyville
Union Dale
Whites Valley
Damascus
Girdland
Tyler Hill
Creamton
Milanville
Glenwood
Lenoxville
Dundaff
Aldenville
Dyberry
Boyds Mills
Richmondale
Bethany
Beach Lake
Lava
Fleetville
Tompkinsville
Neweiden
Carbondale
Waymart
Prompton
Honesdale
East Benton
Indian Orchard
Childs
Masthope
Waverly
White Mills
Justus
Hoadleys
Sullivan
Pike
Eynon
Bohemia
Varden
Lake Ariel Hwy
Kimbles
Rowland
Cortez
Dickson City
Throop
Lakeville
Greeley
Scranton
Tafton
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