MINNESOTA POLLUTION CONTROL AGENCY
520 Lafayette Road North
St. Paul, MN 55155-4194

Workplan

Project Title: Scenario B – Petroleum Only Environmental Services

1. Project Summary:

Investigate, locate and eliminate petroleum leak(s) at vintage 1950s service station, as well determine the extent and magnitude and receptor risk from on-site and off-site soil, ground water and vapor impacts.

2. Statement of Problems, Opportunities, and Existing Conditions

A vintage 1950s service station is reporting inventory shortages over the past few months. Staining has been observed near the pump islands and residents with 80-foot-deep private wells east of the service station have complained of petroleum odors in their well water.

An attached restaurant was constructed over the former UST basin in the 1990s, where strong petroleum odors and elevated PID readings were noted at the time the USTs were removed.

Based on private well records, interbedded sand and gravel overlie bedrock at a depth of 45 feet bgs. Ground-water flow appears to be influenced by the recreational lake located east of the residences on private wells.

3. Goals, Objectives, Tasks, and Subtasks

Objective 1: Assess Health Threats

The first tasks to be implemented are to assess the health threat to service station and restaurant employees and patrons, and at the off-site residences where the occupants may be exposed to hazardous substances on a round-the-clock basis.

The most urgent task is to ensure that residents, restaurant employees, and restaurant patrons are not exposed to levels of petroleum vapors that could cause acute or chronic health issues. Related to this task is to ensure petroleum vapors, if found in the residences or the restaurant, are not at levels that may create an explosive atmosphere. Finally, a related but less urgent task would be to conduct a vapor survey of the utilities and utility backfill materials at the site, including sanitary sewer, water lines, and a storm sewer.

Some nearby residential properties have reported petroleum odors in their drinking water from private supply wells. Four residences, located less than 100 feet east of the Service Road that runs south to north along the eastern property boundary of the gasoline station/restaurant, have reported petroleum odors in their drinking water. Two additional residences with private wells are located about 150 feet north of the gasoline station/restaurant. Antea Group will immediately coordinate an alternate supply of drinking water (bottled water service) to residences where petroleum odors have been observed in drinking water and collect samples from all private supply wells adjacent to the release site.

Task A: Initial Vapor Screening

Initial vapor screening will be conducted to evaluate potential vapor risk to occupants of both the commercial

property and the nearby residential properties. Initial vapor screening will include evaluation of indoor air through field screening to assess for potentially explosive conditions. Further, Antea Group will collect samples for laboratory analysis and evaluation of sub-slab vapor concentrations to determine if there is potential vapor intrusion risk at suspect properties.

Subtask 1: Residential and Commercial Property Indoor Air Screening

The initial vapor survey at the restaurant and the residences will be conducted using a photo-ionization detector (PID) and explosimeter. The restaurant is reported to be constructed as slab-on-grade, therefore, PID and explosimeter readings will be collected at several locations over the floor plan of the restaurant, near the floor and in the breathing zone. Readings will be collected in the early morning when building and sub-slab pressure differentials are expected to be at their greatest. For comparison, vapor readings using a PID and explosimeter will also be collected in the gasoline station office using the same procedure of near the floor and in the breathing zone. Background readings will be established outside the restaurant on the north, south and east side of the restaurant. The initial vapor screening in the restaurant and the residences will be completed to evaluate potential conditions that may be immediately hazardous to human health due to the presence of explosive vapors.

Subtask 2: Sub-slab sampling

Sub-slab vapor samples will be collected beneath the floor of the restaurant to ensure that a chronic source of organic vapors has not accumulated under the restaurant and compare the results to regulatory standards. Sub-slab vapor samples will be collected at five to seven locations under the floor of the restaurant, depending on interior building configuration and the size of the building foot print, in accordance with MCPA vapor intrusion (VI) best management practices (BMP) focusing especially in the area of the former underground storage tank (UST) basin.

Antea Group will install the appropriate number of sampling ports as prescribed by the MPCA VI BMP. Upon installation of the sampling ports, Antea Group will perform a shut-in confirmation test with a water dam leak test to ensure the integrity of the sampling train. Upon a successful shut in test, Antea Group will collect a sub-slab vapor sample from each sample port. Samples will be collected into an individually certified Summa® canister at a rate of 200 milliliters per minute (ml/min). At one location, a duplicate sample will be collected. Following collection of each sample a PID reading will be collected. A micromanometer reading will also be collected to evaluate the pressure differential between the sub-slab and indoor air.

Vapor intrusion samples will be collected into Summa® canisters provided by the laboratory. During sample collection Antea Group will record the time and canister vacuum at the start and end of each sample. Samples at each location will be collected until vacuum pressures recorded are under 4 inches of mercury but greater than zero to prevent the canister from reaching equilibrium resulting in sample loss.

The collected samples will be analyzed using EPA Method TO-15 for compounds on the Minnesota Soil Gas List and total hydrocarbons (THC). For the purposes of this work plan Antea Group assumes up to 12 sub slab samples will be collected.

Task B: Receptor Survey

Subtask 1: In conformance with MPCA GD 4-02, 4-07, 4-08 and 4-18, a receptor survey will be conducted to assess pathways and impacts for the petroleum. This survey will include source water assessment and wellhead protection areas, as well as utility corridors. Utilities corridors may enhance vapor transport and provide conduits for migration of impacts beyond the site boundaries. Accordingly, a vapor survey will be conducted of

the utilities at the access vaults or catchments. A PID and explosimeter will be used for the survey of the utility corridors.

The receptor survey will include:

- A walking survey
- Utility access point screening
- Public Water Supply Confirmation
- Well Records Search and review
- Assessment of Sensitive Groundwater Conditions

Task C: Assess Private Supply Wells

Some nearby residential properties have reported petroleum odors in their drinking water from private supply wells. Four residences, located less than 100 feet east of the Service Road that runs south to north along the eastern property boundary of the gasoline station/restaurant, have reported petroleum odors in their drinking water. Two additional residences with private wells are located about 150 feet north of the gasoline station/restaurant. Antea Group will immediately coordinate an alternate supply of drinking water (bottled water service) to residences where petroleum odors have been observed in drinking water and collect samples from all private supply wells adjacent to the release site.

It has been reported that the residential wells are 80 feet deep. Prior to sampling, Antea Group will review the County Well Index for well records to aid in understanding the actual residential well construction. Each residential well will be sampled from a faucet before any water treatment devices (such as softeners) and following sufficient flow time to ensure water is being withdrawn from the aquifer.

Samples will be submitted to a state approved laboratory for analysis of volatile organic compounds (VOC) by EPA Method 8260 and gasoline range organics (GRO) by WIDRO and diesel range organics (DRO) by WIDRO.

Sample results will be evaluated to determine if permanent alternative water supplies or water treatment methods are necessary. Alternative methods could include connection to the municipal water supply or point of entry treatment (POET) by carbon.

Objective 1 Timeline:
PID and explosimeter surveys will be conducted as soon as possible and the results will be available at that time. Recommendations regarding situations that are immediately dangerous to life and health (IDLH) will be reported to MPCA upon discovery.

Sub-slab sample ports will be installed and sampled within one week of initial screening, sample results will be available within two weeks of sample collection.

Objective 1 Deliverables:

Antea Group will report any conditions and provide recommendations where unacceptable risk is observed immediately upon receiving analytical or screening results. Results will be reported in a technical memorandum within two weeks of receiving analytical data. The technical memorandum will include:

- A brief project narrative
- A summary of laboratory data
- Appropriate figures depicting sample locations
- Laboratory reports

Objective 2: Ensure integrity of USTs, piping and dispensers

Station management has reported a loss of product over the past few months. Antea Group will evaluate potential release sources within the storage and dispensing system at the Site. Through interviews, review of inventory records, and tank gauging records an estimate of the volume, timing and source of the petroleum leak will attempt to be determined.

Task A: Review and evaluate inventory and UST system records

Through interviews, review of inventory records, and tank gauging records an estimate of the volume, timing and source of the petroleum leak will attempt to be determined.

Task B: Pressure test USTs, piping and inspect dispensers

Significant staining has been observed near the pump islands. The most expedient way to assess the integrity of the UST system is to perform pressure tests on each UST and piping run. This is especially applicable at the dispenser location where significant staining has been observed, which will also include internal inspection of the dispenser located nearest to the staining.

The UST basin sentinel wells will be checked for fluids, especially evidence of petroleum accumulation. The three USTs (2 Gasoline and 1 Diesel) located just to the west of the gasoline station will be tested, as will the piping runs to the pump islands.

Objective 2 Timeline:

Evaluation of inventory and UST system records will be completed at the earliest opportunity

Pressure testing and dispenser inspection should be achievable within 2 months

Objective 2 Deliverables:

Antea Group will provide a technical memorandum documenting the volume and timing of inventory loss, leak potential of USTs and piping and documentation of leak potential in dispensers

Objective 3: Assess extent and magnitude of petroleum impacts

Well logs for the residential wells report that the thickness of the overburden soil (interbedded sand and gravel) is about 40 to 45 feet, with bedrock nominally found at a depth of 45 feet. As noted earlier, the residential wells are reported to be 80 feet deep. The depth to the water table is not specified, but is assumed to be in the overburden soil.

The investigative techniques proposed to define the extent of petroleum impacts include a membrane interface probe (MIP), installation of monitor wells, collection of soil samples during monitoring well installation, and water sample collection from the monitor wells followed by laboratory analysis for VOC by EPA Method 8260 and GRO by WIDRO and DRO by WIDRO.

The recreational lake has been identified as a possible receptor of petroleum impacts. Conversations with residents may indicate where possible seeps of petroleum or sheens have been observed. In addition, a survey of the lake shoreline will be undertaken to note any observations of petroleum impacts on the shoreline (stressed vegetation) or on the water (sheen). This survey will be documented using photographic media (digital photographs or video), a PID and noting any odors.

A comprehensive approach to data management is proposed so that geo-referenced soil data, gauging data, and water-quality data will be archived in Antea's EQUiS database for three-dimensional analysis using geographic information system (GIS) software, such as ArcGIS and CTECH Earth Volumetric Studio (EVS).

Task A: MIP subsurface investigation

Following utility clearance, an initial subsurface investigation will be conducted using a membrane interface probe (MIP), and incorporating an Electrical Conductivity (EC) probe to obtain synoptic data on subsurface lithology. The MIP survey will be conducted to generate a downhole profile of PID readings to the overburden/bedrock contact. Initially, a MIP point will be installed west of the new UST basin, which is assumed to be hydraulically upgradient. The MIP survey then would be expanded to the stained area near the pump island and the out-of-service UST basin under the restaurant. The existing UST basin will also be a location for the subsurface survey to be conducted.

Noting that the recreational lake influences groundwater flow, the MIP survey is anticipated as starting at the site and then proceeding to the east. The MIP points will step out to the east, extending onto the residential properties and to the recreational lake, if necessary. Additional MIP points will be installed to the north and south of the gasoline station/restaurant to ensure the lateral extent of the petroleum impacts are defined. It is anticipated that approximately 20 MIP points would adequately define the lateral extent of petroleum impacts and allow for the strategic placement of monitor wells, though not all probe points are anticipated to be converted to monitor wells. The MIP locations will be marked so that they may be re-occupied for determining coordinates and elevations.

Task B: Inspect lake shoreline for seeps

The lake shoreline will be inspected for the presence of seeps and distressed vegetation along with identification of 'petroleum' sheen on the water. During the lake shore inspection, a potential location for staff gauge will be evaluated. If it is deemed beneficial, a staff gauge will be installed securely into the lake bottom or secured to a permanent structure (a dock, for instance) or dam. The staff gauge will be installed so that the measuring rod is clearly visible. The surface-water gauge will be read and recorded in the field book whenever a monitoring well gauging event is conducted at the site.

Task C: Monitor well installation

Following completion of the MIP survey, locations for monitor well installation will be selected. The water table is assumed to be within the interbedded sand and gravel. The initial phase of monitor well installation will

focus on the sediments overlying the bedrock, especially on the gasoline station/restaurant property. For the purposes of this work plan a total of seven wells are proposed.

It is assumed that based on the sub-surface survey and UST integrity testing, that 4 locations would be favorable for on-site monitor well installation. An upgradient monitor well west of the existing USTs, one well east southeast of the pump islands, one well between the previous UST basin and the northeastern residence (west of the service road), and one well east of the restaurant and west of the service road.

Additional on-site monitor well location, depending on the results of the UST integrity testing and inspection, and the MIPs survey, could be necessary near the existing Fuel Oil AST.

Off-site monitor well installations will be focused on assessing groundwater conditions and quality east of the site, in a hydraulically downgradient direction. After securing access agreements for the affected properties, a total of three off-site monitoring wells will be installed for the purposes of this work plan. It is anticipated that one monitor wells will be installed immediately east of the Service Road and between the central two lakeshore residences. The other two offsite wells are anticipated to be placed approximately equidistance north and south of the middle off-site well. The exact location of these monitoring wells will be adjusted based on the results of the residential well sampling and observations of the lake shoreline. The existing residential wells may be incorporated into the monitoring well network later.

It is not yet clear if any bedrock monitoring wells will be needed. For the purposes of this proposal we are assuming the impacts are isolated in the surficial overburden.

At each monitor well location, soil in split-spoon (or comparable sampling device) sample will be collected through the entire depth of the well borehole. Furthermore, the soil samples will be described using the Unified Soil Classification System (as described in ASTM D2488), especially noting distinct or gradational changes in lithology. Soil samples will be collected and stored in air-tight zip-close plastic bags for headspace evaluation of VOCs using a PID. Soil sampling and screening will be conducted following MPCA Guidance Documents. The soil samples will be collected at notable lithologic changes, discolored soil, at the water table, intervals noted by the field geologist as exhibiting characteristic petroleum odors or free-phase product, and at the bottom of the borehole. Following the field survey using a PID, soil samples will be selected from the well borehole for laboratory analysis based on the highest PID reading and at the water table. Samples collected for laboratory analysis will not be collected from the bags used for headspace screening. Each soil sample will be analyzed for petroleum volatile organic compounds (PVOCs), GRO and DRO. Additionally, samples for grain size analysis will be collected from three monitoring well locations from the groundwater table interface.

An important subtask is to survey (coordinates and elevations) all MIP locations, monitor wells, residential wells, and seep locations. Survey data would include coordinates based on a systematic, recognized grid, such as State Plane Coordinates or Latitude/Longitude. In addition, the ground surface elevation will be determined at each location, as well as the "top of casing" for each monitor well.

Objective 3 Timeline:

Residential well samples will be collected at the earliest opportunity in recognition of the potential health concerns.

MIP investigation will occur within a month of project initiation

The inspection of the lake shoreline is achievable within a month of project initiation

Monitoring well installation and staff gauge installation is anticipated to be achieved within 2 months, following the selection of suitable locations and securing off site access agreements.

Objective 3 Deliverables:

Antea Group proposes to submit documentation and results of the work plan described in Objective 3 in an Investigation report following MPCA Guidance Document 4-06. The document will include:

- Laboratory results for residential well samples, monitoring well samples, and soil samples
- Observation and evaluation of lake shoreline regarding seeps or potential occurrences of petroleum
- Staff gauge locations on lake evaluated
- Results of MIP Investigation
- Evaluation of aquifer conditions based on grain size samples
- A Site Conceptual Model
- A summary of results from Objectives 1 and 2.
- Figures
- Tables
- Lab and Field electronic data deliverables in EQuIS format
- Conclusions and recommendations

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Attachment B
*Example Scenario Project Spreadsheet

Project title: Scenario B: Petroleum Only Environmental Services

	1. Personnel						2. Subcontracting		3. Equipment	4. Other Expenses			Totals (Extended)
Project Budget	Project Manager	Engineer 2	Scientist 2	Scientist 1	Field Tech	GIS/CADD Specialist	Estimated Cost	Service	PID / Explo / WLI / IFP / etc.				
1: Assess Health Threats													
Initial Vapor Screening	8		6	16	10		$3,500.00	Env. Laboratory	$302.00				
Receptor Survey	2		4		6				$151.00				
Assess Private Supply Wells	4		10		8		$1,000.00	Env. Laboratory					
Tech Memo	4		4	8	4	4							
Total for Objective 1 (Hrs)	**18**	**0**	**24**	**24**	**28**	**4**							
2: Ensure Integrity of UST Systems													
Review inventory records	2		8										
Pressure test USTs, piping, dispenser inspection	8	6	6				$5,000.00	Petroleum Tank Contractor	$99.00				
Tech Memo	4	4	8			3							
Total for Objective 2 (Hrs)	**14**	**10**	**22**	**0**	**0**	**3**							
3: Assess Extent and Magnitude of Petroleum Impacts													
MIP subsurface investigation	4		45				$16,000.00	MIP Subcontractor					
Lake Shore Inspection	2		2	4									
Install Monitor Wells	4		6	32			$13,400.00	Well Drilling / Env Lab	$396.00				
Sample Monitor Wells	4		4		15		$1,200.00	Env lab	$552.00				
Reporting	6		8	32	6	7							
Total for Objective 3 (Hrs)	**20**	**0**	**65**	**68**	**21**	**7**							
Notes:	Travel time, lodging, perdiem and mileage not included in cost estimate as the actual site location is unknown												
	Subcontractor and equipment costs are estimates only for discussion purposes												
Total Project Hours	**52.0**	**10.0**	**111.0**	**92.0**	**49.0**	**14.0**							**328.0**