

# TABLE OF CONTENTS

EXECUTIVE SUMMARY .....	i
1.0 INTRODUCTION .....	1
1.1 SITE DESCRIPTION AND PHYSICAL SETTING .....	1
1.2 SITE HISTORY & CONCEPTUAL SITE MODEL .....	1
1.3 OBJECTIVES AND SCOPE OF WORK .....	2
2.0 INVESTIGATIVE PROCEDURES AND RESULTS .....	3
2.1 SOIL BORING / MONITORING WELL INSTALLATION .....	3
2.2 SOIL-SCREENING RESULTS .....	3
2.3 SOIL ANALYTICAL RESULTS .....	4
2.4 GROUNDWATER CHARACTERISTICS .....	4
2.5 GROUNDWATER SAMPLING AND ANALYSIS .....	4
3.0 SENSITIVE RECEPTOR SURVEY AND RISK ASSESSMENT .....	5
3.1 SENSITIVE RECEPTOR SURVEY .....	5
3.2 RISK ASSESSMENT .....	5
4.0 CONCLUSIONS .....	6
5.0 RECOMMENDATIONS .....	7

## **FIGURES**

Figure 1	Site Location Map
Figure 2	Site Plan
Figure 3	Groundwater Flow Direction Map
Figure 4	Contaminant Concentration Map

## **TABLES**

Table 1	Groundwater Elevation Calculations
Table 2	Summary of Analytical Results

## **APPENDICES**

Appendix A	Boring Logs / Monitoring Well Construction Diagrams and Field Notes
Appendix B	Photodocumentation
Appendix C	Soil Laboratory Analytical Report
Appendix D	Low-flow Sampling Field Forms and Field Notes
Appendix E	Groundwater Laboratory Analytical Results

## EXECUTIVE SUMMARY

Environmental Compliance Services, Inc. (ECS) has conducted an initial site investigation (ISI) in response to petroleum contamination encountered during the excavation of an abandoned underground storage tank (UST) on property owned by the Hannaford Bros. Company within the Kmart Plaza parking lot at 929 Shelburne Road in South Burlington, Vermont. This UST was discovered and removed during the installation of an underground utility line (storm water pipe line) in August 2008.

The ISI included the drilling of six soil borings (SB-A through SB-F) and subsequent installation of four monitoring wells (MW-1 through MW-4), and an evaluation of potential threats to nearby sensitive receptors. ECS's findings related to this work are summarized as follows:

- No volatile organic compounds (VOCs) were detected in any of the sampled wells. Total petroleum hydrocarbons - diesel range organics (TPH-DRO) were detected in source area monitoring well MW-2 at 9.6 mg/L.
- During the ISI, photoionization detector (PID) readings ranging from zero to 4.8 parts per million (ppm) were observed from soil samples collected from the soil borings. The native soils generally consisted of fill material overlying native glaciolacustrine silts and clays. The highest PID reading was recorded in the former UST excavation below the water table at approximately 8 feet below ground surface (bgs) in MW-2. The second highest PID reading was 1.1 ppm in MW-3.
- ECS performed a sensitive receptor survey and did not identify any threat to any potential sensitive receptors.

Based on the findings stated above, it is the opinion of ECS that the site meets the criteria of a Sites Management Activities Completed (SMAC) designation.

ECS recommends properly abandoning monitoring wells MW-1, MW-2, MW-3, and MW-4. Following this activity, ECS would document the well abandonment in a short letter report to the VT DEC and request a SMAC designation.

## **1.0 INTRODUCTION**

This report details the results of an Initial Site Investigation (ISI) performed by Environmental Compliance Services (ECS) in the parking lot of the Kmart Plaza at 929 Shelburne Road in South Burlington, Vermont (Figure 1). The property is owned by Hannaford Bros, and is leased to Merchants Bank.

The ISI was performed following the discovery of petroleum contamination stemming from an abandoned underground storage tank that was encountered while installing underground utilities onsite in August 2008.

This ISI included the drilling of six soil borings and subsequent installation of four monitoring wells (MW-1 through MW-4), and an evaluation of potential threats to nearby sensitive receptors. This work was conducted in general conformance with an ECS work plan dated 29 September 2008.

### **1.1 SITE DESCRIPTION AND PHYSICAL SETTING**

The site is located within the Kmart Plaza parking lot at 929 Shelburne Road in South Burlington, Vermont. There are no structures within the immediate vicinity of the monitoring wells; they are located at the northeast corner of the Kmart Plaza parking lot.

There are no water supply wells or springs onsite. According to the Vermont Agency of Natural Resources Internet Mapping Site of Private Wells, there is one private water supply well located within a ½-mile of the site; however, it is located upgradient. Potash Brook is located approximately ¼ mile south of the site.

### **1.2 SITE HISTORY & CONCEPTUAL SITE MODEL**

The previously unknown abandoned UST was discovered during site work associated with the construction of a new Merchants Bank facility at the subject property, which Merchants Bank leases from Hannaford Bros. A new storm water pipe line was being installed when the UST was discovered. The VT DEC was immediately notified and approval to remove the abandoned UST was granted by Mr. Ted Unkles following 10 VSA Section 1926 procedures.

The UST and it associated piping were found to be in poor condition. Soils consisted of approximately two feet of crushed stone fill underlain by silt and silty-clay to the excavation depth of eight feet. Groundwater was encountered at approximately 8 feet below ground surface. Weathered petroleum odors were observed from soils above and below the water table, with photoionization detector (PID) headspace readings ranging from zero to 10.3 parts per million (ppm).

Impacted soils removed during the UST removal were stockpiled on site. Due to the high silt content of the soil, it was determined it was not suitable backfill material for the storm water pipe, as it would not meet the compaction requirements. Impacted soils (151 tons, approx. 90 cubic yards) were disposed of as daily cover at Interstate Waste Services landfill located in Moretown, Vermont.

Due to the unknown nature and size of the UST, it was necessary to dewater the excavation in order to perform a safe UST removal. Approximately 3,000 gallons of petroleum-impacted groundwater was containerized on site in a portable Frac Tank, treated through carbon and discharged to the South Burlington sanitary sewer system. The onsite pump, treat, and discharge was approved by VT DEC and the City of South Burlington. The appropriate discharge application, public notice period, and discharge

reporting requirements were all met. Laboratory results indicated the groundwater dewatered from the excavation contained 65 ppm Total Petroleum Hydrocarbons – Diesel Range Organics (TPH-DRO) prior to carbon treatment. Post treatment laboratory results indicated all constituents tested for were below laboratory reporting limits (non-detect).

### **1.3 OBJECTIVES AND SCOPE OF WORK**

The objectives of this initial site investigation were to:

- Evaluate the degree and extent of petroleum contamination in soil and groundwater in the vicinity of the UST;
- Qualitatively assess the risks to environmental and public health via relevant sensitive receptors and potential contaminant migration pathways; and,
- Identify appropriate monitoring and/or remedial actions based on the site conditions.

To accomplish these objectives, ECS has:

- Supervised the advancement of six soil borings and subsequent installation of four water-table monitoring wells (MW-1 through MW-4);
- Screened subsurface soils from soil borings for the possible presence of volatile organic compounds (VOCs) using a PID;
- Identified sensitive receptors in the area, and assessed the risk posed by the contamination to these potential receptors; and,
- Prepared this summary report, which details the work performed, qualitatively assesses risks, provides conclusions, and offers recommendations for further action.

## **2.0 INVESTIGATIVE PROCEDURES AND RESULTS**

### **2.1 SOIL BORING / MONITORING WELL INSTALLATION**

On 28 October 2008, ECS supervised the completion of six soil borings (SB-A through SB-F) and subsequent installation of four monitoring wells (MW-1 through MW-4) to initially characterize contaminant and hydrogeologic conditions at the site. Soil boring and monitoring well locations are presented on Figure 2. Borings were installed using Geoprobe, hydraulic direct push methodology by ECS of Agawam, Massachusetts. Soils were collected and screened continuously.

During drilling activities, groundwater was encountered between approximately 4 to 8 feet bgs. The soils were fill material (sand, gravel, bricks, cement) overlying native glaciolacustrine silts and clays. Monitoring well SB-A/MW-1 was located upgradient of the UST. SB-B/MW-2 was located within the former UST excavation. SB-C, SB-D, SB-E/MW-3 and SB-F/MW-4 were located in the presumed downgradient direction of the UST excavation.

The monitoring wells were constructed with one-inch diameter polyvinyl chloride (PVC) casing and factory-slotted 0.010-inch slot screen. The screen sections were set approximately 5 feet above and below the presumed groundwater level. Sections of solid PVC riser were added to bring the tops of the well casings to approximately 0.5 feet bgs. Clean silica #1 filter sand was placed in the borehole annulus around each well approximately two feet above the slotted interval. A granular bentonite seal, approximately 6 inches thick, was set above the sand pack and the remainder of the annular space was backfilled with sand or native material.

Each well was capped with a watertight plug and a flush-mounted protective casing. The wells were developed using a bailer on 28 October 2008. All purge water was discharged to the ground surface in the vicinity of each well.

On 4 November 2008, the monitoring wells and soil boring locations were surveyed relative to existing site features, with an azimuth accuracy of  $\pm 1.0$  feet and an elevation accuracy of  $\pm 0.01$  feet. Monitoring-well construction details are included on the soil-boring and well-construction logs in Appendix A. Field notes are also presented in Appendix A. Photodocumentation is presented in Appendix B.

### **2.2 SOIL-SCREENING RESULTS**

During the soil-boring program on 28 October 2008, PID readings ranging from zero to 4.8 ppm were obtained from soil samples collected from the soil borings. The highest PID reading was recorded in the former UST excavation below the water at approximately 8 feet bgs in SB-B/MW-2. The second highest PID reading was 1.1 in SB-E/MW-3

No PID readings exceeding 1 ppm were obtained from the other borings onsite.

An ECS field scientist screened soil samples from discrete intervals in each soil boring for the possible presence of VOCs using an Ion Science Phocheck 1000 portable PID. The PID was calibrated in the field with an isobutylene standard gas to a benzene reference. Soil samples were placed into a polyethylene bag, which was then sealed, agitated, and allowed to equilibrate. The PID probe was inserted into the headspace, and the highest reading was recorded. PID screening results are included on the boring logs in Appendix A.

### **2.3 SOIL ANALYTICAL RESULTS**

A soil sample from MW-2 was submitted for laboratory analysis via EPA method 8260 for the Vermont 8021B list of petroleum-related VOCs, and EPA method 8015 for TPH-DRO. No target analytes were detected above laboratory reporting limits. Soil laboratory results are included as Appendix C.

The soil sample was transported under chain-of-custody in an ice-filled cooler to Spectrum Analytical, Inc. of Agawam, Massachusetts.

### **2.4 GROUNDWATER CHARACTERISTICS**

Based on the hydrogeologic data, the groundwater in the unconfined surficial aquifer at the site appears to flow generally west toward the Potash Brook (Figure 3). The average horizontal hydraulic gradient is 6 percent between MW-1 and MW-3. The vertical groundwater flow components at the site, and the hydraulic relationship between the shallow unconfined aquifer and the bedrock aquifer, are currently unknown.

Fluid levels were measured in the monitoring wells on 4 November 2008 to calculate the groundwater flow direction. Depths to groundwater in the on-site monitoring wells ranged from 5.10 feet in MW-1 to 6.62 feet in MW-3 below top-of-casing.

Static water-table elevations were computed for each monitoring well by subtracting the measured depth-to-water readings from the surveyed top-of-casing elevations, which are relative to an arbitrary site datum of 100.00 feet. Water-level measurements and elevation calculations are presented in Table 1. The groundwater flow direction map was prepared using these data (Figure 3).

### **2.5 GROUNDWATER SAMPLING AND ANALYSIS**

Groundwater samples were collected on 4 November 2008 from the four newly installed monitoring wells and analyzed for the possible presence of VOCs and TPH-DRO (Figure 4).

No VOCs were detected in samples collected from any of the wells at concentrations above laboratory reporting limits.

No TPH-DRO was detected in MW-1, MW-3, and MW-4. TPH-DRO was detected in MW-2 at 9.6 mg/L.

Prior to groundwater sample collection, the monitoring wells were low-flowed in general accordance with EPA standard operating procedures. Low-flow forms are included as Appendix D. Purge water was discharged directly to the ground in the vicinity of each well. A trip blank and a blind duplicate sample from MW-1 were collected to ensure that adequate quality assurance/quality control (QA/QC) standards were maintained.

All samples were transported under chain-of-custody in an ice-filled cooler to Spectrum Analytical, Inc. of Agawam, Massachusetts, where they were analyzed for the possible presence of VOCs by EPA Method 8260 and for TPH-DRO by EPA Method 8015.

Analytical results of the blind duplicate sample, collected from MW-1, were all reported below detection limits. No petroleum-related compounds were detected in the trip blank. Analytical results are included in Table 2 and the laboratory analytical reports are presented in Appendix E.

## 3.0 SENSITIVE RECEPTOR SURVEY AND RISK ASSESSMENT

### 3.1 SENSITIVE RECEPTOR SURVEY

ECS conducted a survey to identify sensitive receptors in the vicinity of the former UST that could potentially be impacted by contamination associated with the site. The following sensitive receptors were identified in the vicinity of the property.

- The soil and groundwater beneath the former UST excavation area;
- The Potash Brook;
- The indoor air quality of the apartment building to the south of the excavation,
- Underground utilities.

### 3.2 RISK ASSESSMENT

ECS qualitatively assessed the risks that the residual soil and dissolved-phase subsurface contamination poses to the receptors identified above. In general, human exposure to petroleum-related contamination is possible through inhalation, ingestion, or direct contact while impacts to environmental receptors are due either to a direct release or contaminant migration through one receptor to another or along a preferential pathway.

- Soil and Groundwater Beneath the Former UST Excavation - Elevated VOCs just above 10 ppm were detected by PID in soil samples collected during the former UST removal and soil boring activities. Access to impacted soils in this area is prevented by pavement and the risk of human exposure is very low. Groundwater analytical results indicate that the limited groundwater contamination is not migrating away from the source area in groundwater
- Potash Brook – The Potash Brook is located approximately ¼ mile west of the former UST excavation. Soil boring and groundwater quality data indicate that the limited contamination is not migrating away from the source area; therefore, it is highly unlikely that the Potash Brook is impacted by petroleum contamination from the site.
- Indoor Air Quality of the Downgradient Apartment Building – Soil boring and groundwater quality data indicate that the limited contamination is not migrating away from the source area. Additionally, the diesel range organics detected at low levels in the groundwater from MW-2 are not highly volatile, and no VOCs were detected. Therefore indoor air quality is not likely impacted.
- Underground Utilities – The underground utilities in the vicinity of the former UST excavation include water lines, sewer lines, but they are located upgradient of the source area, between MW-1 and MW-2. A storm water catch basin located 200 feet to the west of the source area was screened with a PID, and no VOCs were detected. The newly installed storm water pipe line is within close proximity to the former UST location, but laboratory results indicate very low concentration of contaminants in groundwater in this area. Also, approximately 90 ton of impacted soil were removed from the source area, further eliminating potential for exposure or migration of contaminants.

## 4.0 CONCLUSIONS

Based on the results of the site investigation described above, ECS concludes the following:

- No VOCs were detected in any of the sampled wells. TPH-DRO was detected in source area monitoring well MW-2 at 9.6 mg/L.
- During the soil-boring program, PID readings ranging from zero to 4.8 ppm were obtained from soil samples collected from the soil borings. The native soils generally consisted of fill material overlying native glaciolacustrine silts and clays. The highest PID reading was recorded in the former UST excavation below the water table at approximately 8 feet bgs in MW-2. The second highest PID reading was 1.1 ppm in MW-3.
- ECS performed a sensitive receptor survey and did not identify any threat to any potential sensitive receptors.



## **5.0 RECOMMENDATIONS**

Based on the conclusions stated above, it is the opinion of ECS that the site meets the criteria of a Sites Management Activities Completed (SMAC) designation.

ECS recommends properly abandoning monitoring wells MW-1, MW-2, MW-3, and MW-4. Following this activity, ECS would document the well abandonment in a short letter report to the VT DEC and request a SMAC designation.

## **FIGURES**

---



## **TABLES**

---

# **APPENDIX A**

---

## **BORING LOGS/MONITORING WELL CONSTRUCTION DIAGRAMS AND FIELD NOTES**

# **APPENDIX B**

---

## **PHOTODOCUMENTATION**

**APPENDIX C**

---

SOIL LABORATORY ANALYTICAL REPORT

## **APPENDIX D**

---

### LOW-FLOW SAMPLING FIELD FORMS AND FIELD NOTES



## **APPENDIX E**

---

### **GROUNDWATER LABORATORY ANALYTICAL RESULTS**