

**PHASE II INVESTIGATION REPORT
WATERBURY DEVELOPMENT CORPORATION
39 CHERRY AVENUE, 177 AND 215 CHERRY STREET
WATERBURY, CONNECTICUT**

1.0 INTRODUCTION

Leggette, Brashears & Graham, Inc. (LBG) was retained by the Waterbury Development Corporation (WDC) (City of Waterbury), the Grantee, to conduct a Phase II Environmental Site Assessment at 0 and 39 Cherry Avenue, and 215 and 177 Cherry Street, in Waterbury, Connecticut, hereinafter referred to as the "Site". The Grantee received a brownfield assessment grant (BF 96111001) from the United States Environmental Protection Agency (USEPA) to complete a Phase II investigation of the Site. LBG prepared a Quality Assurance Project Plan (QAPP) Addendum A-1, outlining the scope of the Phase II Investigation that was approved by the USEPA on July 28, 2010. The Phase II investigation of the Site was executed in accordance with the methods and procedures outlined in the QAPP.

North Square Gateway Development, Inc. owns the properties located at 0 and 39 Cherry Avenue and 215 Cherry Street. New Opportunities, Inc., an affiliated company, owns the 177 Cherry Street property. Refer to figure 1 for a site location map and figure 2 for location of specific properties and buildings. A Phase I Environmental Site Assessment (ESA) conducted in 2005 and a report pertaining to assessment and partial removal of radium-impacted building materials in 2004/2005 were provided to LBG. A Phase I ESA completed by LBG in March 2010 identified twenty specific areas of concern (AOC) and contaminants of concern, including volatile organic compounds (VOC), semi-volatile organic compounds (SVOC), metals, polychlorinated biphenyls (PCBs) and total petroleum hydrocarbons (TPH).

The purpose of the Phase II investigation is to determine whether releases of petroleum or hazardous substances to soil and/or groundwater have occurred in the AOC that may require remediation to comply with the Connecticut Department of Environmental Protection (CTDEP) remediation standard regulations (RSR) contained in Regulations of Connecticut State Agencies (RCSA) Section 22a-133k-1 through 22a-133k-3.

Data gathered from the Phase II investigation will be used to develop a remedial action plan (RAP) to address potential soil and groundwater impacts. The investigation will also be used to determine the appropriate sequence of building demolition with respect to potential soil and/or groundwater remediation that may be necessary, in addition to the sequence for radium and asbestos removal.

2.0 PRELIMINARY CONCEPTUAL SITE MODEL

A preliminary conceptual site model was prepared to understand the environmental system as a basis for the Phase II sampling rationale. The site development history, list of AOCs and hydrogeologic information for the Site, which comprise the environmental system, are summarized below. Table 1 presents a summary of the description, release mechanism, sampling rationale and results for each AOC. The Site was developed with its current configuration during the late 1800's and early 1900's as part of a larger factory complex used for watch and clock manufacturing. The Site was used primarily for watch and clock manufacturing between approximately 1895 and 1945. Later uses included manufacturing of metal products, tools, plastics and production of leather goods, clothing and neckties. The Site is currently vacant and the building structures are in poor condition. The surrounding properties include a mix of commercial, high density residential and former industrial land uses.

The Phase I ESA report completed by LBG in March 2010 identified the following 20 AOCs .

1. Suspected Boiler Room and Drum Storage Area
2. Floor Pit
3. Loading Areas
4. Radium Paint on Building Surfaces
5. Possible Underground Storage Tank (UST)
6. Boiler Room
7. Compressors
8. Fuel-Oil Aboveground Storage Tank (AST)
9. Paint Spray Booth
10. Former Trailers and Hazardous Material Storage Area
11. Storage Trailer and Solid Waste Dumpster

12. Former Fuel-Oil Storage Building
13. Former Boiler Room
14. Urban Fill Materials
15. Catch Basins
16. Site-Wide Groundwater
17. CL&P Substation/Former Coal Storage Area (offsite)
18. UST Located at 205 Cherry Street (offsite)
19. Former Transformer Area at 197 Cherry Street (offsite)
20. Pole-Mounted Electrical Transformers (offsite)

The location of each AOC is shown on figure 2. There was no previous soil-quality or groundwater-quality data available for any of the AOC identified. The Phase I ESA revealed evidence of the historical use and storage of hazardous materials and petroleum products that present a material threat of release.

Buildings #1, #3 and #6 contain radium from watch dial painting that will require removal and disposal as low-level radioactive waste. The radium is located primarily in sub-floor materials where asbestos felt underlayment is also located. Assessment of hazardous materials within the buildings, including radium, asbestos, and lead-based paint, and inventory of containerized hazardous materials, is not the subject of this Phase II investigation. A survey of Hazardous Building Materials (HBM) for these materials was being conducted by others.

Table 1 is a summary of the Site Conceptual Model with sampling rationale for each AOC and findings from the Phase II investigation.

Bedrock below the Site is mapped as the Waterbury Gneiss, which is described as a gray to dark-gray, fine to medium-grained schist and gneiss (Rodgers, 1985). The unconsolidated sediments overlying the bedrock are mapped as thin glacial till consisting of variable amounts of fine to coarse sand, silt, and gravel, generally less than 10 to 15 feet thick (Stone et al., 1992). The soils at the Site are classified as Urban Land and Udrothents-Urban Land Complex by the Natural Resources Conservation Service (NRCS). These soils are typical for an industrial commercial area and are generally described as well drained with a loam to very gravelly sandy loam composition with other materials of anthropogenic origin. There were no mapped wetland soils at the site and no wetland soils were observed during the site investigation.

The bedrock sediment and soil descriptions in the published literature were confirmed during the Phase II investigation through completion of test borings.

The Site is located in an urban section of Waterbury where groundwater is classified by the CTDEP as GB. Groundwater exists under phreatic, water table conditions in the overburden till deposits. Water-level measurements made in Site monitoring wells on September 14, 2010 indicate the depth to groundwater ranges from 4.71 ft bg (feet below grade) to 8.58 ft bg (table 3). Groundwater flow is to the south/southwest at an average hydraulic gradient of 0.04 foot/foot (figure 3).

The nearest mapped surface water body is an unnamed pond located approximately 200 feet north of the Site. The CTDEP surface water quality classification for this pond is "A". The pond discharges into Great Brook, located approximately 50 feet west of the Site, which is enclosed in a subsurface conduit beginning at the culvert on Cherry Street. Class "A" designated uses include habitat for fish and other aquatic life and wildlife; potential drinking water supplies; recreation; navigation; and water supply for industry and agriculture.

3.0 DATA QUALITY OBJECTIVES

Data will be used to determine if a release to soil or groundwater has occurred and will be compared to cleanup standards established in the RSR.

4.0 FIELD ACTIVITIES

The sampling program included drilling of soil borings, installation of groundwater-monitoring wells, and collection of soil and groundwater samples to determine if releases of petroleum or hazardous substances have occurred in each of the AOC depicted on figure 2. The sampling rationale for each AOC, the detected COC and reference sample locations is described in table 1. Field activities were conducted in accordance with the standard operating procedures outline in the USEPA Approved Generic QAPP and Site-Specific QAPP Addendum A-1.

Forty-three sample locations were proposed as part of the Phase II investigation, including 25 soil borings to be completed using a direct-push soil probe; two sludge samples from catch basins; two sludge samples from the floor-pits; six surficial soil samples to be collected in proximity to historical or existing electrical transformers; and eight sub-slab soil

samples to be collected beneath buildings. Eight groundwater-monitoring wells were proposed to be installed to characterize groundwater quality within the onsite AOC and potential offsite impacts.

Soil samples were collected from accessible areas using a direct-push soil probe equipped with a 2-inch diameter by 4-foot long macro-core sample tube fitted with a dedicated acrylic liner. The sample tube was driven into the soil in 4-foot intervals and was retrieved. A new acrylic liner was inserted into the macro core sample tube after collection of each sample to prevent cross-contamination. Disposable gloves and soil handling utensils were discarded after each use to prevent cross-contamination of samples.

Soil from each interval was screened for ionizable VOCs using a photoionization detector (PID) equipped with a 10.2 electron-volt bulb. Soil exhibiting elevated levels of VOCs or visual or olfactory evidence of release was transferred to sample jars for laboratory analysis. Soil descriptions, observations, and PID measurements were recorded by field personnel on geologic logs. The geologic logs are included in Appendix I.

Interior soil samples and soil samples collected from areas that were not accessible to the drill rig were collected using a hand-auger sampler. Interior samples were collected by first coring through the floor using a 8-inch diameter coring machine with a diamond cutting bit. Hand-auger samples were collected at the shallow target depths listed in table 1 or refusal was encountered for deeper samples.

The soil samples were delivered to the laboratory each day that they were collected. Each sample was analyzed based on the proposed sampling design rationale provided in the QAPP.

4.1 Soil Sample Collection

“Shallow” soil samples, as referenced in table 1, were collected from an estimated depth of 1 to 3 ft bg where the release mechanism for the particular AOC (i.e., surface spill and seepage of hazardous substances) would most likely impact the soil. “Deep” soil samples were collected from continuous borings advanced from grade to the water table where releases from sumps and tanks, in addition to onsite and offsite groundwater impacts would be detected.

One sample from each soil boring was selected for laboratory analysis based on visual or olfactory evidence of release or elevated PID readings. If a soil core for a deep-soil sample did not exhibit evidence of a release the laboratory sample was collected from the vadose zone immediately above the water table if present, or from the bottom of the boring. Additional soil samples were collected where evidence of a potential release was observed.

Surficial-soil samples were collected from 0 to 1 ft bg where surface release mechanisms are present, except for VOC samples, which were collected at a depth of at least 1 ft bg. Surficial-soil samples were collected where accessible around the former electrical-transformer substation to detect potential releases of polychlorinated biphenyls (PCBs).

4.2 Sludge Samples

Sludge samples were collected from catch basins, floor pits or sumps where accessible. The sludge samples were collected where petroleum or hazardous substances may have accumulated from historical discharges. A subsurface-soil sample was collected adjacent to the sump at FP-1 using boring location C-2 from the depth that coincides with the bottom of the pit because the sump was full of water.

A sludge sample from the floor pit at FP-2 was not collected because the pit was inaccessible. In lieu of the sludge sample a subsurface soil sample from boring FP-2 was collected adjacent to the pit outside the building as depicted on figure 4 to determine if a release from the floor pit area had occurred.

4.3 Groundwater Samples

Of the eight groundwater-monitoring wells proposed as part of the Phase II investigation only five wells were installed at the Site. Wells were not completed at three proposed locations due to shallow refusals observed at exterior borings B-15 and B-25 and interior borings C-2, C-3, C-4 and C-5. An additional well (MW-9) was installed to provide downgradient coverage but subsequently resulted in a dry well. A total of five groundwater monitoring wells were installed to characterize the groundwater configuration and evaluate potential onsite release from AOC and offsite impacts (figure 3). Groundwater-monitoring well MW-1 is the furthest upgradient well and will be used to evaluate potential impacts from offsite sources including AOC-17, the CL&P Substation/Former Coal Storage Area.

The monitoring wells were installed in soil borings advanced with a direct-push probe. The wells were constructed using one-inch diameter PVC riser pipe and a ten-foot or five-foot long screen with 0.01-inch slots. Screen lengths and settings were determined based on the boring depth to groundwater. The bottom of the well was capped to prevent sediment infiltration. A #2 Morie[®] sand pack was installed in the annular space surrounding the screen and extended 1 to 2 feet above the screen. A 1-foot thick bentonite seal was installed above the sand pack. The remaining bore hole above the bentonite seal was backfilled with clean soil removed from the boring. Well heads located in traffic areas were protected with a flush-mounted curb-box and those in non-traffic areas were protected with a steel stick-up casing. Both road boxes and stick-up casings were set in concrete to protect against surface-water infiltration and damage. A water tight, lockable cap was installed in the top of the riser pipe. Each well was developed using the surge and purge method with purge water from the wells was placed in a 55-gallon drum for offsite disposal. Well construction details are summarized in table 2.

The well locations and top of casing and grade elevation were surveyed to an arbitrary onsite benchmark. This information was used to prepare a groundwater-contour map and to determine the groundwater-flow direction.

Groundwater sampling was conducted 18 days after well development to allow sufficient time for aquifer stabilization. The groundwater samples were collected from each monitoring well using the low-flow-low-stress sampling method. The aforementioned sampling technique is not intended for collection of groundwater in instances where a non-aqueous phase liquid (NAPL) is present. Light NAPL (LNAPL) was measured in MW-8 with an accumulated thickness on September 14, 2010 of 0.13 foot (table 3). The LNAPL was sampled using a disposable polyethylene bailer. Groundwater and LNAPL was removed from the monitoring well using the bailer then a groundwater sample was collected from a deeper portion of the well screen using the low-flow sampling method. Copies of the low flow sampling logs are included in Appendix I.

4.4 Deviations from QAPP

Deviations from the proposed boring and monitoring-well locations were made due to refusal encountered in several soil borings after multiple attempts were made to reach the desired completion depths. Several attempts were made in areas where target depths were not obtained. Figure 4 shows the boring and well locations. Failed boring attempts are designated as “Boring Attempted (Not Sampled).” The following is a summary of deviations from the QAPP.

- Borings B-20, B-21, B-22 were moved based on field observations indicating the potential UST was located below a concrete pad adjacent to the potential fill pipe.
- Boring B23/MW-8 was not drilled. MW-8 was moved to location B-20 due to shallow refusal at the proposed location and presence of a brick surface underlain by concrete in the courtyard area.
- Deep samples were not collected from borings B-15, B-16 and B-17 due to shallow refusals. However, a soil sample was collected from boring B-16 at a depth of 6.2 to 7.2 ft bg, the deepest sample collected among the three borings in this AOC.
- Proposed groundwater-monitoring well MW-5 was not installed due to shallow refusals within the area.
- Boring B-11 was not completed due to the location being inaccessible to the drilling equipment and the concrete sub-floor being greater than 24-inches thick.
- MW-2 was not completed due to shallow refusals at the proposed location.
- MW-6 was not completed due to shallow refusal at the proposed and nearby locations.
- A sludge sample from FP-1 was not collected directly from the floor pit due to standing water within the sump.
- Surficial soil samples were not collected from SS-1 or SS-2 due to access limitations posed by equipment staged in the area and the concrete covering the ground surface along the exterior wall.

5.0 FINDINGS

Compliance with the RDEC and I/C DEC for soil was determined by comparing the results of total mass analysis to the criteria established in the RSR.

Compliance with the GBPMC for soil was determined by comparing the result of the total mass analysis to the GBPMC established in the RSR. The Synthetic Precipitate Leaching

Procedure (SPLP) was used to evaluate the leachability of samples containing greater-than 20-times the GBPMC total mass criteria. Samples subjected to SPLP analysis were selected based on the highest concentrations reported from the total mass analysis. The samples analyzed using SPLP included: B-5 (2-3) for lead (0.014 mg/l) and boring B-26 (2-3) for lead (0.041 mg/l), copper (0.16 mg/l) and chromium (0.12 mg/l) analysis. The results of the SPLP analysis were compared to 10-times the Groundwater Protection Criteria (GWPC) to determine compliance with the GBPMC. In each case, the concentrations detected were less than 10-times the GWPC. These worst-case sample results were used to evaluate samples containing lower concentrations of metals that also exceeded the GBPMC based on total mass analysis. Because SPLP results for the worst-case samples were less-than 10-times the GWPC, it was assumed that samples exhibiting lesser concentrations of metals would also yield compliant results.

Compliance with the residential and industrial/commercial groundwater volatilization criteria (RGWVC and I/C GWVC) and surface water protection criteria (SWPC) was determined by comparing the groundwater sample results to the criteria established in the RSRs.

The laboratory results for total metals, SPLP metals, ETPH, PCBs, VOCs and SVOCs in soil are summarized in tables 4 through 9, respectively. The laboratory results for metals, ETPH, VOCs, SVOCs and PCBs in groundwater are summarized in tables 10 through 13, respectively. Copies of the laboratory reports are included in Appendix III. The data-quality assessment and data usability evaluation narrative and report are included in Appendix IV.

5.1 Materials Encountered Beneath Site

A total of 34 borings were drilled on Site as part of the Phase II investigation, ranging in depth from 1.8-12.0 ft bg; not including borings attempted but not sampled. Twelve borings were terminated due to refusal.

The overburden material encountered in the soil borings was glacial till described as brown to red, fine to medium sand, with some silt. Some anthropogenic (fill) material was observed within several borings along the eastern portion of the site and shallow boring refusals were encountered as a result of boulders and/or bedrock. Copies of the geologic logs with material description are included in Appendix II.

5.2 Groundwater Configuration

Groundwater was encountered in the overburden materials in soil borings and was measured in the five monitoring wells at depths ranging from 4.71 to 8.58 ft bg (table 3). Water level measurements made on September 14, 2010 and summary data were used to construct a groundwater elevation contour map (figure 3). Groundwater beneath the Site flows in a south/southwesterly direction, with an average hydraulic gradient of 0.04 foot/foot.

5.3 AOC #1 – Suspected Boiler Room and Drum Storage

Based on further investigation conducted during the Phase II ESA, this AOC is no longer suspected of being a boiler room and the suspected UST is no longer thought to be present. This conclusion is based on the absence of fill and vent piping, boiler makeup water pipes, blow down pipes, and exhaust stack. The room was used for storage of drums containing paint waste and chemical waste that were present during this investigation. Subsurface investigation of potential releases from the drums was conducted. Hence forth, this AOC will be referred to as the Drum Storage Area.

The concrete floor in the room was cored at stress cracks to gain access to the subsurface soil for sampling purposes. Shallow sub-slab soil samples were collected from C-6 (1-2), C-7 (1-2) and C-8 (2-3), and a deep sample was collected at C-6 (8-9). The purpose of these samples was to determine if a release had occurred from the drums stored within the room and to evaluate potential fill material under the concrete floor. The samples were analyzed for ETPH, VOCs, SVOCs and metals.

No ETPH was detected. Low levels of SVOCs were detected in boring C-7 (1-2), including benzo(b)fluoranthene, fluoranthene and pyrene at concentrations of 109 ug/kg, 138 ug/kg and 121 ug/kg, respectively. The only VOC compound detected in soil samples collected from the three borings was toluene in C-7 (1-2) at a concentration of 28 ug/kg. The detected SVOCs and VOCs were below applicable RSR standards.

Soil samples C-6, C-7 and C-8 contained arsenic at concentrations ranging from 1.7 to 3.2 mg/kg, chromium (7.7 to 14.3 mg/kg), copper (29.4 to 181 mg/kg), lead (5.3 to 23.5), nickel (9.6 to 25.7 mg/kg), and zinc (36.0 to 57.1 mg/kg). Mercury was also detected in the sample collected from C-7 (1-2) at a concentration of 1.3 mg/kg. The concentrations of metals detected were below the RDEC and GBPMC.

The presence of low level SVOCs and VOCs indicate a release, but the source or extent of release is not certain. Results from boring C-7 (1-2), located nearest to the surface, suggests the drums may be the source, but the possibility of polluted fill beneath the building cannot be ruled out. Waste material was observed leaking from drums onto the concrete floor during the Phase II investigation.

Additional soil sampling is recommended to determine the source and extent of the VOC and SVOC-impacted soil. Installation of a groundwater monitoring well downgradient of this AOC may be necessary. Removal and disposal of all waste containers stored within this AOC and cleanup of surface spills is recommended to eliminate a potential ongoing source of pollution.

5.4 AOC #2 – Floor Pits

Surficial-sludge samples were proposed to be collected from floor-pits #1 and #2 to determine if these low points within the building may have collected releases of hazardous materials from production processes. A sample was not collected from FP-1 due to standing water present in the pit during the Phase II sampling period. In lieu of this sample, subsurface soil samples C-1 (1-2) and C-2 (8-9) were collected adjacent to the pit. The samples were analyzed for VOC, SVOC, ETPH, and metals.

Trichloroethylene (TCE) was detected in the shallow sample C-1 (1-2) at a concentration of 15 ug/kg and in the deeper sample C-1 (8-9) at a concentration of 37 ug/kg, which are less-than the RDEC and GBPMC. Several metals were detected in C-1 and C-2 at naturally occurring levels, below the RSR criteria. No SVOCs or ETPH were detected in samples for FP-1. The TCE may have resulted from a release from the storage cabinet near the floor pit FP-1.

The groundwater sample from monitoring well MW-3, located immediately outside and upgradient of this AOC, contained TCE at a concentration of 16.9 ug/l, which is less-than the RGWVC and SWPC. Because the well is upgradient of floor pit FP-1, the TCE may be attributed to upgradient sources, including AOC #9 (paint-spray booth) where VOCs were also detected in shallow soil sample B-9 1-2. The occurrence of TCE in groundwater upgradient of FP-1 also suggests that the TCE occurrence in shallow soil may be associated with volatilization from TCE-impacted groundwater and not an interior release.

Additional soil and groundwater sampling may be needed around floor pit #1 to determine the extent of the VOC impact. The scope of additional sampling should consider the results of additional investigation of upgradient VOC occurrences.

Floor pit #2 did not contain any accumulated material. The pit could not be accessed with drilling equipment to collect a subsurface sample. A subsurface soil sample (FP-2) was collected immediately outside of the building near floor pit #2. The soil sample was collected at 4.5 to 5.5 ft bg (the approximate depth of the pit bottom). The soil sample was analyzed for ETPH, SVOCs, metals and VOCs. No ETPH, SVOCs or VOCs were detected. Metals detected in the sample included arsenic (2.9 mg/kg), chromium (58.6 mg/kg), copper (329mg/kg), lead (6.5 mg/kg), nickel (14.9 mg/kg) and zinc (312 mg/kg). The concentrations of metals detected were below the RDEC and are also presumed to be in compliance with the GBPMC based on an extrapolation of SPLP analysis for samples B-5 and B-26. Based on the absence of organic pollutants and metals concentrations that are within naturally occurring levels, there does not appear to have been a release of hazardous materials from floor pit #2. Therefore, no further investigation is recommended.

5.5 AOC #3 – Loading Areas

Soil samples were collected near the loading docks and doors throughout the facility to determine if releases occurred during loading/unloading of raw materials and manufactured materials. Loading dock/door areas were investigated outside of the garage door of Building #1 (B-24), outside of the loading elevator and stairway at Building #6 (B-18 and B-19), outside of doorway in the alley way into Building #1 (B-26), at the staircase into Building #3 (B-15) and outside of the garage doorways at Building #2 (B-5, B-6 and B-7). The soil samples were analyzed for ETPH, VOCs, SVOCs and metals. In addition, the sample collected from B-7 (2-3) was analyzed for PCBs.

ETPH was detected in the soil samples collected from borings B-19 (2-3), B-26 (2-3), B-7 (0.8-1.8) and B-5 (2-3) at concentrations of 130 mg/kg, 286 mg/kg, 292 mg/kg and 400 mg/kg, respectively. The concentrations detected were below RDEC and GBPMC. The highest detections of ETPH were found in the shallow soils outside of the garage area of Building #2 in borings B-5 and B-7.

The soil sample from boring B-7 (0.8-1.8) contained TCE (7,180 ug/kg) and PCE (1,830 ug/kg) at concentrations above the GBPMC. The groundwater sample from MW-4 located downgradient of B-7 contained TCE and vinyl chloride at concentrations above the RGWVC. TCE was also detected in B-24 (2-3) (6,790 ug/kg) at a concentration above the GBPMC.

One or a combination of the VOCs 1,1,1-trichloroethane, cis-1,2-dichloroethene (12DEC), 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene were detected in B-24 (2-3), B-7 (0.8-1.8), B-26 (2-3), B-5 (2-3) at concentrations below the RDEC and GBPMC.

SVOCs were detected in soil samples collected from borings B-26 (2-3), B-7 (0.8-1.8) and B-5 (2-3) at concentrations above the RDEC and GBPMC. SVOCs were detected in soil samples B-24 (2-3) and B-6 (2-3) at concentrations below the RDEC and GBPMC.

Metals were detected in soil samples from AOC #3 at naturally occurring levels, with the possible exception of chromium and copper in B-26 and lead in B-5, which appears slightly elevated but below the RSR cleanup criteria. SPLP analysis confirmed the elevated total metal detection are below the GBPMC.

No PCBs were detected in soil sample B-7.

The detection of ETPH, VOCs and SVOCs in soil samples and a groundwater sample collected from loading dock areas indicates possible releases from handling raw materials and manufactured materials. Additional soil investigation is recommended to determine the extent of the releases. Installation of a groundwater monitoring well downgradient of B-24, and B-26 is recommended to determine the extent of the groundwater plume from these release areas.

5.6 AOC #4 – Radium Paint on Building Surfaces

Radium paint sampling was not included as part of the Phase II investigation. Refer to the HBM survey and Scientech Radium Cleanup Report for results and findings pertaining to radium contamination.

5.7 AOC #5 – Possible UST

Deep soil samples were collected from three sides of the suspected UST and a groundwater sample was collected from monitoring well MW-8 to determine if a release from

the tank had occurred. Samples B-20 (3-4), B-20 (10.5-11.5), B-21 (10-10.5), B-22 (10-11) and MW-8 were analyzed for ETPH and VOCs.

ETPH was detected in each soil sample from the three borings surrounding the suspected UST at concentrations above the RDEC ranging from 900 mg/kg in B-20 (10.5-11.5) to 1,700 mg/kg in B-22 (10-11). VOCs associated with petroleum were detected in B-21 (10-10.5), B-20 (3-4) and B-20 (10.5-11.5) at concentrations below the RSR criteria.

Free-phase LNAPL that exhibited a petroleum odor and appearance was measured in MW-8, with an accumulation thickness of 0.13 foot (table 3). The LNAPL was removed by bailing. A groundwater sample collected from MW-8 several feet below the water surface contained phenanthrene (an SVOC) at a concentration above the SWPC.

The detection of ETPH, petroleum VOCs, and free-phase petroleum in proximity to the suspected UST indicates a possible release from the UST. The status of the UST system is not known. Closure of the UST system if present, including post-closure soil and groundwater sampling, is recommended. If release requiring significant remedial action is found during UST closure, additional soil and groundwater investigation may be necessary.

5.8 AOC #6 – Boiler Room, AOC #7 - Compressor Room and AOC #8 - AST

Building #2 contains an inactive boiler room with an inactive boiler and a more recent oil-fired furnace, in addition to a compressor room and fuel-oil AST. Shallow-soil samples were collected at B-10 (1-2), B-12 (2-3) and B-25 (1-2) located along the outside wall of the boiler room to determine if a petroleum release may have occurred during filling or operation of the heating systems, compressor, and AST. The soil samples were analyzed for ETPH and none was detected. Soil samples collected from B-14 (2-3) and (7.5-8) analyzed for ETPH, VOCs and SVOCs were also used to evaluate these AOCs. The deeper sample from B-14 contained 97 mg/kg of ETPH, below the RSR criteria. No VOCs and SVOCs were detected. Copper was detected in groundwater at a concentration below the RSR criteria.

A groundwater sample from monitoring well MW-3, located downgradient of the boiler room was analyzed for VOCs, SVOCs, ETPH, PCBs and metals. Results of the analysis indicate groundwater contained chlorinated VOCs, including TCE (16.9 ug/l), chloroform (0.8 ug/l) and 12DCE (0.9 ug/l). The detected VOCs are present at concentrations that are less-than the RGWVC and SWPC. No SVOCs, ETPH, or PCBs were detected.

Phase II investigation provided no definitive evidence of release from AOC#6, #7, and #8. The source for VOCs in MW-3 is not suspected to be associated with these AOCs. Additional investigation using the hollow-stem auger or sonic drilling method is recommended to obtain deeper soil samples downgradient of the AOC. If successful, installation of an additional groundwater monitoring well may be recommended to evaluate these AOC and the VOC occurrence.

5.9 AOC #9 – Paint-Spray Booth

A paint-spray booth was located within Building #2. The area contained several containers of paint and other unidentified containers. The concrete floor near the paint spray booth remnants was cored at the lowest point observed to gain access to the subsurface soil for sampling purposes. A shallow sub-slab soil sample was collected from B-9 (1-2) and analyzed for VOCs, SVOCs, ETPH and metals.

ETPH was detected in the sample (14,600 mg/kg) at a concentration that exceeds the I/C DEC and GBPMC. Metals were detected at concentrations that are typical of naturally occurring levels for arsenic (2.8 mg/kg), chromium (10.0 mg/kg), copper (28.9 mg/kg), lead (8.9 mg/kg), nickel (8.5 mg/kg), silver (0.4 mg/kg) and zinc (22.9 mg/kg). Isophorone and TCE were detected in sample B-9 (1-2) at concentrations of 1,100 ug/kg and 249 ug/kg, respectively.

Detections of ETPH, SVOCs and VOCs indicate a possible release from the paint booth area. Additional soil and groundwater sampling is recommended for this area to determine the extent of the release.

5.10 AOC #10 - Former Trailers and Hazardous Material Storage Area

Two former trailers, located just north of Building #2, were potentially used for storage of hazardous materials. A shallow-soil sample was collected from boring B-4 (2-3) to determine if a release may have occurred. The sample was analyzed for ETPH, SVOCs, VOCs and metals.

No ETPH, SVOCs or VOCs was detected in the soil sample. The concentration of metals detected is typical of naturally occurring levels. No release was detected in AOC #10. No additional investigation is recommended in this area.

5.11 AOC #11 - Storage Trailer and Solid Waste Dumpster

A storage trailer and solid waste dumpster were located west of Building #2. A shallow soil sample collected from boring B-8 (3.5-4.5) and a groundwater sample collected from MW-4 were used to determine if a release may have occurred. The soil and groundwater samples were analyzed for ETPH, VOCs, SVOCs and metals. The groundwater sample was also analyzed for PCBs.

Soil sample B-8 contained ETPH (1,557 mg/kg) and TCE (7,380 ug/kg) at concentration above the RDEC and GBPMC, respectively. Additional chlorinated VOCs were detected at concentrations below the RDEC and GBPMC based on total mass analysis. Several SVOCs were detected in this soil sample at concentrations that exceeded the RDEC and GBPMC based on total mass analysis.

The groundwater sample from MW-4 contained VC and TCE at concentration above the RGWVC and several SVOCs at concentrations above the SWPC. No PCBs or metals were detected in the groundwater sample.

The detection of ETPH, VOCs, and SVOCs in shallow soil and VOCs and SVOCs in groundwater suggests that a release may have occurred from the storage of hazardous substances in this area. The constituents detected are also similar to those detected near the overhead doors in this building. Additional soil and groundwater sampling is recommended to determine the source and extent of the release.

5.12 AOC #12 - Former Fuel-Oil Storage Building

The northern portion of the site contained a former fuel-oil storage building adjacent to the existing CL&P Substation. Borings were completed downgradient of the approximate location to evaluate potential releases from the historical fuel-oil storage building. Shallow soil samples were collected from B-1 (2.8-3.8), B-2 (2-3) and B-3 (2.5-3.5) and were analyzed for ETPH. Soil sample B-1 was also analyzed for PCBs, VOCs and SVOCs. ETPH was not detected in any of the soil samples, except the duplicate sample for B-1 (2.8-3.8), which contained 80 mg/kg of ETPH. No PCBs, VOCs or SVOCs were detected in soil sample B-1 (2.8-3.8). Fill material was noted on the boring logs at depths up to 12 ft bg. Although not originally included as part of the AOC #12 investigation, the soil sample from B-4 (2-3) is positioned to provide additional information for evaluation of AOC #12. Soil sample B-4 was

analyzed for metals, ETPH, VOCs, SVOCs. Several metals were detected in B-4 at low, natural levels. No ETPH, VOCs or SVOCs were detected in B-4.

The groundwater sample from monitoring well MW-1 was analyzed for metals, ETPH, VOCs, SVOCs, and PCBs. The groundwater sample contained low levels of copper, lead, and nickel and trichloroethane (TCA) and TCE at concentrations below the RSR criteria. No ETPH, SVOCs, or PCBs were detected in the groundwater sample. Phase II investigation did not find significant evidence of release from AOC #12. The source of the TCA and TCE will be further evaluated as part of the site-wide groundwater investigation. No further investigation is recommended.

5.13 AOC #13 - Former Boiler Room

A former boiler room is located within Building #3. An UST is suspected to be beneath the floor of the building because fill and vent pipes are present. A floor-drain, sump pump and small cabinet of hazardous materials were also present in the boiler room (refer to AOC-2). Concrete coring was completed within the room to provide access for soil sampling beneath the floor. Surficial soil samples were collected from accessible areas to determine if a surficial release may have occurred from handling hazardous materials stored in the cabinet. Deeper soil samples were also collected to determine if a release may have occurred from the suspected UST.

The location of the UST was estimated and care was taken to avoid contact with the tank. Concrete coring and soil sampling was completed at the perimeter of the room. An attempt was made to install a groundwater-monitoring well in boring C-2, however, the drill-stem became lodged in the boring and was not retrievable. Attempts to install the well in other borings were unsuccessful due to shallow refusal and dry boreholes. Therefore a well was not installed in this AOC. Deep soil samples were collected inside the room at C-2 (8-9) and outside the former boiler room at B-14 (7.5-8). Shallow refusals were encountered at C-4, C-5 and B-13 preventing deep sample collection. Shallow soils were collected at B-14 (2-3), B-13 (2-3), C-1 (1-2) and C-5 (1-2). All samples were analyzed for metals, ETPH, VOCs and SVOCs.

Metals were detected at naturally occurring levels and at concentrations less than the RDEC. Boring B-13 exhibited higher levels of copper (85 mg/kg), nickel (58.1 mg/kg) and zinc

(385 mg/kg) compared to the other samples in the AOC, but below the RDEC. The elevated metal concentrations may be associated with fill materials observed in this area.

Soil sample B-14 (7.5-8) contained ETPH (97 mg/kg) and isophorone (215 ug/kg) at concentrations below the RDEC. Sample B-14 (7.5-8) was collected near the water table, therefore, the source of the ETPH and isophorone may be attributed to AOC #6, #7, #8, or #9, which are all located upgradient of boring B-14. Isophorone is commonly used as a fire retardant in urethane and acrylic finishes that were likely to have been handled in the former paint spray booth. Additional investigation of AOCs #6, #7, #8, and #9 is recommended to confirm the source and extent of the ETPH and isophorone-impacted soil at the groundwater table after Building #2 is demolished.

Low level TCE was detected in soil samples C-1 (1-2) (15 ug/kg) and C-2 (1-2) (37 ug/kg), located near the floor pit and hazardous material storage cabinet, below RSR criteria. The source for TCE may be a release from the storage cabinet or it could be associated with volatilization of the TCE groundwater plume from an upgradient source; possibly AOC #6.

Phase II investigation found no definitive evidence of release from AOC #13. Investigation was limited by shallow refusal. Additional investigation is recommended and could be combined with UST closure following building demolition.

5.14 AOC #14 - Urban Fill Materials

Fill material was encountered in 19 borings during the Phase II investigation (see sample id list in Table 1) consisting of crushed concrete, brick and to a limited extent coal ash (B-20 and 24). Fill beneath the northern portion of the Site (north of Buildings #1 and #3) was encountered from grade to 12 ft bg. Fill beneath the southern portion of the Site (south of Building #1 and #6 and 100 feet west of Building #7) was encountered from grade to a maximum of 6 ft bg. With the exception of C-6 beneath Building #1, fill was not encountered beneath the site buildings although sample limitations may have impacted this assessment.

Fill samples were analyzed for metals (10 samples), ETPH, VOCs, SVOCs and PCBs (1 sample). Metal results were within the range of naturally occurring concentrations, with a few exceptions, but all below the RSR criteria. Detections of ETPH, VOCs, and SVOCs above the RSR criteria were localized to suspected release areas and do not appear to be associated with the fill material.

The fill does not appear to be a source for contamination on the Site. Future site investigations should include evaluation of the fill where encountered, especially beneath the building footprint or other areas where Phase II sample collection was limited.

5.15 AOC #15 - Catch Basins

The Phase I ESA indicated the potential for a release to the catch basins located near Building #1. Two samples of accumulated material, CB-1 (0.5-1.5) and CB-2 (0.5-1.5), were collected from the catch basins. The samples were analyzed for ETPH, SVOCs, VOCs, metals and PCBs to determine if the catch basins received contaminants from on-site processes.

PCBs were detected in sample CB-1 (2.0 mg/kg), at concentrations above the RDEC. ETPH was detected in CB-1 and CB-2 at concentrations of 8,854 and 8,518 mg/kg, respectively, which exceeds the RDEC and GBPMC. Several SVOCs were also detected at concentrations that exceed the RDEC and GBPMC based on total mass analysis. The detected concentrations were less-than 20-times the GBPMC, therefore, SPLP analysis was not necessary to evaluate compliance with the GBPMC. Both chlorinated and non-chlorinated VOCs were detected at concentrations that are less than the RDEC and GBPMC.

The detected COCs indicate the catch basins have been impacted by Site operation and are a potential source for release to the subsurface. Soils retained in the catch basins should be removed regularly to avoid leaching to surrounding soils. Additional soil sampling around the catch basins is recommended to evaluate the potential for release to the subsurface.

5.16 AOC #16 - Site-Wide Groundwater

Historical processes and handling of hazardous materials indicate a potential for site-wide groundwater impacts. Site-wide groundwater was evaluated by the installation of five overburden, groundwater-monitoring wells (MW-1, 3, 4, 7 and 8). Repeated attempts to install wells MW-2, MW-5, and MW-6 were unsuccessful due to refusal in the overburden. Groundwater samples were collected from five wells (MW-1, MW-3, MW-4, MW-7 and MW-8) on September 14, 2010. MW-9 was dry at the time of sampling and was not sampled. Groundwater samples collected from Site wells were analyzed for ETPH, VOCs, SVOCs, metals and PCBs.

Free-phase petroleum was measured in MW-8 at an accumulated thickness of approximately 0.13 feet. A suspected UST is the likely source of the free-phase petroleum. The petroleum was removed from the monitoring well using a disposable bailer prior to sampling the well.

The groundwater sample from the upgradient well (MW-1) contained TCE and TCA at concentrations below the GWVC and SWPC. Chlorinated VOCs, including TCE were detected in wells MW-3 and MW-4. The concentration of TCE and VC in groundwater from MW-4 exceeds the GWPC and RGWVC. Well MW-7, located near the loading dock at 177 Cherry Street, contained chlorinated VOCs, including chloroform and TCE at concentrations of 20.1 and 0.7 ug/l, respectively, below the RSR criteria. Chloroform may be attributed to releases from chlorinated municipal water and/or sewer lines.

The groundwater quality indicates release of COCs from Site AOC and the potential for impact from adjacent properties. The monitoring well network as currently configured is not adequate to fully characterize the groundwater configuration and extent and degree of identified impacts.

Additional groundwater investigation is recommended. Due to the presence of chlorinated VOCs and the potential for offsite impacts, characterization should include wells screened in the deeper portions of the overburden or shallow bedrock.

A well receptor survey is recommended to confirm the absence of groundwater receptors and the applicability of the GWPC. Site investigation may include collection of soil vapor samples to further evaluate source areas and compliance with the RGWVC.

SVOCs were detected in groundwater from MW-4 and MW-8 at concentrations above the GWPC and SWPC. Detected metals concentration were low, below the RSR criteria, and likely reflect natural conditions. No ETPH or PCBs were detected in groundwater.

5.17 AOC #17 - CL&P Substation/Former Coal Storage Area (offsite)

Prior to installation of the existing electrical substation, the area to the north of the site was used for coal storage based on Phase I ESA findings. Shallow-soil samples were collected downgradient of the former coal storage area at borings B-1 (2.8-3.8), B-2 (2-3) and B-3 (2.5-3.5). The samples were analyzed for ETPH. The sample collected from B-1 was also analyzed for VOCs, SVOCs and metals. Groundwater quality from MW-1, installed in B-2, was

also used to evaluate this AOC. The groundwater sample was analyzed for metals, ETPH, VOCs, and PCBs.

ETPH was not detected in soil samples collected from B-1, B-2 and B-3, however, ETPH was detected at a concentration of 80 mg/kg in the duplicate sample from B-1 (2.8-3.8). There were no VOCs or SVOCs detected in sample B-1 (2.8-3.8). Metals detected in the soil sample from B-1 were at concentrations that are typical of naturally occurring levels.

The groundwater sample from MW-1 contained low levels of copper and lead TCE and 1,1,1-TCA below the RSR criteria. No ETPH, SVOCs or PCBs were detected in the groundwater sample.

Phase II investigations provided no definitive evidence of release. No further investigation is recommended.

5.18 AOC #18 - UST Located at 205 Cherry Street (offsite)

An UST is located at the adjacent property at 205 Cherry Street. The UST is located in an upgradient position to a portion of the site and a release from the UST has the potential to impact soil and groundwater quality at the subject site. Deep soil samples were proposed upgradient of the tank at borings B-15, B-16 and B-17 to determine if a release had occurred. Due to shallow refusals encountered at the site only one deep soil sample was collected from B-16 (6.2-7.2). The B-16 sample was analyzed for ETPH, VOCs, SVOCs and metals.

The soil sample from B-16 contained several metals at ETPH, SVOCs and VOCs were not detected in the soil sample.

Phase II investigation provided no definitive evidence of release from AOC #18. Additional investigation using the hollow stem auger or sonic drilling method is recommended to obtain deeper soil samples and possible groundwater near the UST.

5.19 AOC #19 - Former Transformer Area at 197 Cherry Street (offsite)

A transformer building was identified in the Phase I ESA at 197 Cherry Street upgradient of Building #6. Surficial-soils were sampled at SS-3 and SS-4 to evaluate potential PCB releases to the nearby soils from the former transformer area. Surficial soil samples proposed to the west of the transformer area were not collected due to the concrete subsurface along Building #1 and inaccessibility posed by equipment staged in that area by the adjoining property owner.

PCBs were detected in surficial-soil sample SS-4 (0.5-1.5) at a concentration of 0.5 mg/kg; identified as Aroclor 1254. The detected PCB concentration is less than the RDEC, but is evidence of a PCB release. Aroclor 1254 was commonly used in transformer dielectric fluid, plasticizer in resin and rubber. Potential sources of the PCB are the former transformer substation at the adjoining 197-205 Cherry Street and building caulk.

Investigation confirmed the potential for release of PCBs. Additional surficial and shallow soil samples are recommended in the area of SS-4 to determine the extent of the release and whether other areas below the building may have PCBs from degrading building caulk. Sampling of the building caulk is recommended to determine if the caulk may be the source of the PCB in soil surrounding the building.

5.20 AOC #20 - Pole-Mounted Electrical Transformers (offsite)

The Phase I ESA identified two utility pole locations with pole-mounted electrical transformers. Surficial-soil samples were collected at SS-5 and SS-6 to determine if a PCB release had occurred from the pole-mounted transformers.

PCBs were detected in the surficial-soil samples at SS-5 (0.5-1.5) at a concentration of 1.2 mg/kg, which exceeds the RDEC. The PCB was identified as Aroclor 1268. Common uses of Aroclor 1268 include plasticizer in resins and rubber, and wax extender. Potential sources of the PCB are the pole-mounted electrical transformer substation on Cherry Street and building caulk.

Investigation confirmed the potential for release of PCBs. Additional surficial and shallow-soil sampling is recommended to determine the extent of PCB contamination in the area of SS-5. Sampling of the building caulk is recommended to determine if the caulk may be the source of the PCB in soil surrounding the building.

6.0 SUMMARY OF FINDINGS

Releases of petroleum and/or hazardous substances were detected in nine of the 20 AOC investigated, including site-wide groundwater (see table below). Drilling limitations due to shallow refusal prevented full evaluation of release potential in 6 AOC. Additional investigation is recommended in 15 AOC to determine the nature, degree and extent of identified releases and confirm no-release determinations. Additional data is also needed to determine if environmental land use restrictions prohibiting demolition of Site buildings should be considered as potential remedies for environmental compliance.

USTs are suspected in AOCs #5 and #13 based on the presence of fill and vent pipes. Out-of-service closure of both USTs will be necessary to achieve compliance with the RSR. Phase II investigation confirmed a release from the UST in AOC #5. Investigation in AOC #13 was limited by shallow refusal and was not sufficient to confirm the release status. Additional investigation of these AOC could be completed during closure activities.

Impacts from petroleum and/or chlorinated VOCs were observed in groundwater samples collected from the five Site monitoring wells. Applicable RSR cleanup standards were exceeded in two of the groundwater samples. Additional investigation is recommended to determine the source, nature, degree and extent of groundwater impacts and will consider the potential for offsite sources.

Removal of building materials impacted by radium (^{226}Ra) paint that was started in 2004, has not been completed.


Building #	AOC #	AOC Description	Release Detected	Exceeds RSR Standard	Additional Investigation Needed	No Further Investigation Needed
1	1	Drum Storage Area			✓	
3	2	Floor Pit (FP-1)	✓		✓	
1, 2, 3, 6	3	Loading Area	✓	✓	✓	
1, 3, 6	4	Radium Paint on Building Surfaces*	Not investigated by LBG			
6	5	UST (Building #1)	✓	✓	✓	
2	6	Boiler Room (Building #2)			✓	
2	7	Compressor Room			✓	
2	8	Fuel-Oil AST			✓	
2	9	Paint-Spray Booth	✓	✓	✓	
2	10	Former Trailer and Haz Mat Storage Area				✓
2	11	Storage Trailer and Dumpster	✓	✓	✓	
2	12	Former Fuel-oil Storage Building				✓
3	13	Former Boiler Room UST (Building 3)			✓	
Site-wide	14	Fill Materials				✓
1	15	Catch Basins	✓	✓	✓	
1, 2, 3, 6	16	Site-Wide Groundwater	✓	✓	✓	
Offsite	17	CL&P Substation/Formal Coal Storage Area				✓
Offsite	18	UST at 205 Cherry Street			✓	
6	19	Former Transformer at 197 Cherry Street	✓		✓	
4, 7	20	Pole-Mounted Transformers on Cherry Street	✓	✓	✓	
Total			9	7	15	4

*Investigation of radium paint on building surfaces was not performed by LBG during this investigation.


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November 16, 2011

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**PHASE II INVESTIGATION REPORT
WATERBURY DEVELOPMENT CORPORATION
39 CHERRY AVENUE, 177 AND 215 CHERRY STREET
WATERBURY, CONNECTICUT**

Prepared For:

Waterbury Development Corporation
(City of Waterbury)

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APPENDIX I

LOW FLOW SAMPLING LOGS

APPENDIX II
GEOLOGIC LOGS

APPENDIX III
LABORATORY REPORTS

APPENDIX IV

DQA/DUE NARRATIVE AND REPORT

FIGURES

TABLES

TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION	1
2.0 PRELIMINARY CONCEPTUAL SITE MODEL	2
3.0 DATA QUALITY OBJECTIVES	4
4.0 FIELD ACTIVITIES	4
4.1 Soil Sample Collection	5
4.2 Sludge Samples	6
4.3 Groundwater Samples	6
4.4 Deviations from QAPP	8
5.0 FINDINGS	8
5.1 Materials Encountered Beneath Site	9
5.2 Groundwater Configuration	10
5.3 AOC #1 – Suspected Boiler Room and Drum Storage	10
5.4 AOC #2 – Floor Pits	11
5.5 AOC #3 – Loading Areas	12
5.6 AOC #4 – Radium Paint on Building Surfaces	13
5.7 AOC #5 – Possible UST	13
5.8 AOC #6 – Boiler Room, AOC #7 - Compressor Room and AOC #8 – AST.....	14
5.9 AOC #9 – Paint-Spray Booth	15
5.10 AOC #10 - Former Trailers and Hazardous Material Storage Area	15
5.11 AOC #11 - Storage Trailer and Solid Waste Dumpster	16
5.12 AOC #12 - Former Fuel-Oil Storage Building	16
5.13 AOC #13 - Former Boiler Room	17
5.14 AOC #14 - Urban Fill Materials	18
5.15 AOC #15 - Catch Basins	19
5.16 AOC #16 - Site-Wide Groundwater	19
5.17 AOC #17 - CL&P Substation/Formal Coal Storage Area (offsite)	20
5.18 AOC #18 - UST Located at 205 Cherry Street (offsite)	21
5.19 AOC #19 - Former Transformer Area at 197 Cherry Street (offsite)	21
5.20 AOC #20 - Pole-Mounted Electrical Transformers (offsite)	22
6.0 SUMMARY OF FINDINGS	23

LIST OF TABLES
(at end of report)

Table

1	Conceptual Site Model
2	Well Construction Details
3	Groundwater Elevations
4	Summary of Total Metals in Soil
5	Summary of SPLP Metals in Soil
6	Summary of Extractable Total Petroleum Hydrocarbons in Soil
7	Summary of Polychlorinated Biphenyls in Soil
8	Summary of Volatile Organic Compounds in Soil
9	Summary of Semi-Volatile Organic Compounds in Soil
10	Summary of Metals and Extractable Total Petroleum Hydrocarbons in Groundwater
11	Summary of Volatile Organic Compounds in Groundwater
12	Summary of Semi-Volatile Organic Compounds and Polychlorinated Biphenyls in Groundwater

LIST OF FIGURES
(at end of report)

Figure

1	Site Location Map
2	Site Map Showing Areas of Concern
3	Groundwater Elevation Contour Map September 18, 2010
4	Soil Boring and Well Location Map

LIST OF APPENDICES
(at end of report)

Appendix

I	Low Flow Sampling Logs
II	Geologic Logs
III	Laboratory Reports
IV	DQA/DUE Narrative and Report