



Geotechnical
Environmental
Water Resources
Ecological

Analysis of Brownfields Clean-Up Alternatives

Parcel 5C2 – Howard and Shaw Street
New London, Connecticut
EPA Grant BF-96181801

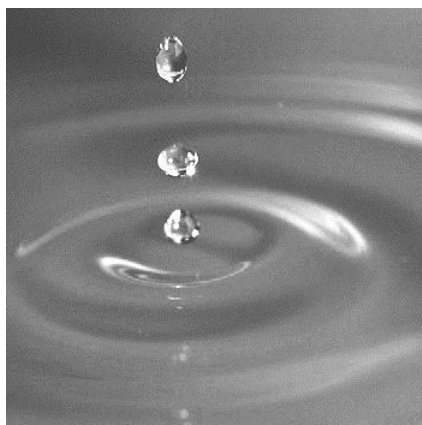
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1. INTRODUCTION AND BACKGROUND

1.1 Ownership and Location

The Renaissance City Development Association (former New London Development Corporation) (RCDA) is the owner of property located at Parcel 5C2 south of Hamilton Street and west of Howard Street, approximately 1 mile south of downtown New London, Connecticut. The Site is identified as Map F16, Block 101, Parcel 5C2 on the City of New London Tax Assessors Map.

A Site Location Map is provided as Figure 1 and a Site Plan is provided as Figure 2.

The RCDA has received a \$200,000 Brownfields clean-up grant to address contamination on a portion of the property. This Analysis of Brownfields Clean-up Alternatives is intended to communicate the environmental condition of the property, a review of potential clean-up options, and the selected remediation.

1.2 Site Description

The subject site consists of a 3.14 acre, undeveloped parcel consisting of vacant, grassed and overgrown land. A gravel/bare soil area is located in the northeastern portion of the site and a drainage right of way, containing a storm water pump station and associated storm water piping extends along the eastern boundary. A drainage ditch extends along the western portion of the Site and is generally oriented north to south. The ditch is constructed from contaminated fill materials including slag and solid waste and is located entirely on top of a solid waste disposal area. It receives stormwater from a residential neighborhood to the southwest and directs it northward in to a concrete culvert at the north end. Stormwater enters Shaw's Cove, part of New London Harbor and the Thames River, approximately 250 feet northeast of the north end of the ditch. An approximate ½ acre area located on the southern end of the parcel contains mature trees and is heavily overgrown with vines and other invasives. Heavy overgrowth also extends from the drainage ditch westward to the western property boundary. A narrow leg of the property extends off of the northwest corner and is grassed, extending to the rear of a residence along Shaw Street.

The Site is bordered to the west by residences, to the north by Hamilton Street, across which lies the Community Health Center (health clinic) and the Shaw's Cove office park. The Site is bordered to the east by Howard Street. Across Howard Street to the east is a three-story office building being converted to medical offices by L&M Hospital and a group of largely vacant industrial buildings (southeast corner of Howard and Hamilton). To the northeast, along Shaw's Cove, the former (now vacant) Minor and Alexander Lumber Yard and the Shaw's Cove Marina are located. A storm water outfall that receives storm water discharges from the site is located in the southwest corner of the cove. The Site is bordered to the south by an unused paved parking area associated with the L&M building. Vacant overgrown land is located further to the south

along the west side of Howard Street, and partially abuts the site to the southwest and is the subject of another USEPA Clean-up Grant being completed by RCDA.

1.3 Previous Site Uses

The Site previously consisted of 15 separate parcels, 12 of which were occupied by structures at some point in time. The majority of the structures were demolished in circa 2000 as part of the Fort Trumbull Municipal Development Project (MDP) that included approximately 100 properties. The majority of the Site consists of an area formerly occupied by the southern lobe of Shaw's Cove up until the late 1800s when the cove began to be filled. The last remnants of the cove were filled by the 1940s. The Site was previously developed with single and multi-family residences, and a mix of commercial and industrial/manufacturing businesses. Up to 11 residences were located on the Site as well as two bottling works, a cobbler, an antique/furniture repair shop, an auto radiator repair shop, a barrel refurbishing company, a chemical/manufacturing/cleaning company, a gasoline and service station, an appliance warehouse, a contractor's yard, and a used auto sales facility/junk yard.

1.4 Past Site Assessment Findings

1.4.1 Introduction

Various environmental studies have been conducted on and adjacent to the Site in association with MDP and the adjacent roadway improvement projects. These reports have been provided by the New London Development Corporation and the City of New London Office of Development and Planning. Additionally, a Phase I Environmental Site Assessment and Phase II/III Field Investigation and Remedial Action Plan were prepared for the site in 2011 and 2012 under a USEPA Assessment Grant.

1.4.2 Phase I Environmental Site Assessment – HRP Associates, Inc. – June 2001

A Phase I Environmental Site Assessment was prepared to support the MDP area consisting of approximately 100 properties over an estimated 95 acres and extending from Shaw Street east to the Thames River, and generally from Shaw's Cove south to New London Harbor. The Phase I included property inspections, municipal and regulatory reviews, and Site history development. The Site history and regulatory reviews that were developed for the individual parcels are consistent with the information summarized in this report.

With regard to RECs/AOCs on the Site, the Phase I identified the following:

23-33 Hamilton Street – This site was owned and operated by a bottling works company from 1915 to 1968.

- A #2 fuel oil spill of an unknown quantity was documented at the property on August 18, 1995.
- Suspected UST West - Vent piping for a UST was observed on the west side of the building. No information for the UST was available.
- Suspected UST East - A fill and vent for an underground storage tank were observed on the east side of the building. No information concerning this tank was identified.
- Sump - A sump was observed in the northeastern portion of the building.
- Trench Northeast – A trench was noted feeding to the sump.
- Paint and Solvent Storage - A 55-gallon plastic drum of unknown contents, and paint and solvent containers were stored within the north central portion of the building.
- Grate with Standing Liquid - A grate with unknown observed liquid was noted near the sump on the northeastern portion of the building.
- Trench Central - A trench was noted on the northern portion of the building. The trench extended from a hazardous storage room to the paint and solvent storage and sump areas.
- Hazardous Storage Room - Numerous unmarked and marked glass containers were observed in a room on the northwestern portion of the building. Bottles of ammonia, hydrochloric acid, and nitric acid were observed.
- Storm Water Drain - A storm water drain is located in the parking area opposite the east side of the building.
- 55-Gallon Drum of Unknown Contents - This drum was observed in the southwest corner of the building.
- 55-Gallon Plastic Drum - A half-full plastic 55-gallon plastic drum of unknown contents was observed in the north part of the building.
- Upright Engine 1912 Sanborn Map - An upright engine symbol for a boiler was noted on the 1912 Sanborn map.

163 Howard Street Rear (Former Rutberg & Sons Barrel Storage) - This property was operated as a bottle manufacturer (1915-1919), used car lot and radiator repair (1924-1938), and barrel storage and repair facility (1943-1985). The possibility of historical releases of automotive and barrel storage related wastes was cited. The Phase I identified the following RECs:

- Former Stained Area - Aerial photography identified a large stained area on the eastern portion of the property.
- Former Exterior Barrel Storage - Barrel storage was identified on the southern portion of the property and adjacent to the eastern portion of the building, based on historical aerial photographs.
- Suspected UST - A suspected UST was identified within the building on the southeastern corner.
- Fractured/Depressed Area – A fractured and depressed area of the concrete floor was identified in the southeastern portion of the building.
- Drainage Pipe - A drainage pipe was identified on the southwestern portion of the building. The pipe appeared to be connected to the drainage depression located at the south end of the building.
- Sump Area - A hole, possibly a sump area was observed on the southeastern corner of the building exterior.

- Concrete Pad and Pipe - A concrete pad and 1-inch diameter metal pipe was identified on the southwestern corner of the building interior. The pipe appeared to feed from the drainage swale to the exterior of the building.
- Oily Staining on Floor - Oily staining was observed throughout most of the building interior. A heavily petroleum stained area was observed on the southwestern portion of the building floor. Numerous joints and cracks were observed in the concrete flooring.
- Drainage Pipe - A drainage pipe was identified on the western portion of the building. The pipe appeared to be connected to the central swale area within the building.
- Southern Drainage Swale - A drainage swale in the concrete floor was identified in the southern portion of the building. The drainage swale appeared to slightly slope to the west towards the southwestern portion of the building. Gravel filled the western side of the drainage depression.
- Central Drainage Swale - A second drainage swale in the floor was identified in the central portion of the building.
- Chimney Stack - A chimney stack was identified on the northwestern portion of the building. The use of the stack was not identified.
- Hole - Possible Floor Drain - A hole that could possibly be a floor drain was observed in the southern swale.
- Upgradient Boiler Engine (1912 Sanborn) - An upgradient boiler engine indicates the former location of a boiler.

175 Howard Street (Leo's Service Station): This facility operated as a gasoline station from 1933 to the early part of 2000. The rear portion of the property has been used for residential purposes circa 1928 to 1972 and for a sheet metal/roofing business circa 1948 to 1958. The following RECs were identified:

- Former USTs - A CT DEEP UST registration form dated June 29, 1991 indicates two (2) 2,000 gallon steel USTs and one (1) 3,000 gallon steel UST were installed circa 1978 and removed in February of 1991. These USTs were replaced by two (2) 4,000 gallon steel gasoline USTs and one (1) 6,000 gallon steel gasoline UST in February 1991. These USTs were then removed on June 22, 2000.
- Former Waste Oil UST - A 500-gallon waste oil UST was identified adjacent to the southwest corner of the former building. The UST was reportedly removed in June of 2000.
- Former Dispenser Pump Island - A former dispenser pump island was identified east of the building. Sanborn maps identify the historical presence of three (3) USTs between the former Howard Street location and the fuel pump island that were presumably used until circa 1978. There was no removal documentation found for these USTs. Their presence was not detected by a ground penetrating radar (GPR) survey performed in April of 1999. However, it was noted that the GPR instrument could not penetrate the concrete of the fuel island and canopy area. Therefore, it was possible that the three USTs could have remained beneath this area.
- UST Piping - UST piping associated with the former dispenser island and former USTs was identified.

- Former Heating Oil Above Ground Storage Tanks (ASTs) - Two 275-gallon heating oil ASTs were identified in the basement of the building. These tanks were reportedly removed prior to demolition.
- Former Hydraulic Lift and Stained Trenches - A hydraulic lift was identified within the service station on the southwestern portion of the building. The lift was reportedly removed prior to building demolition.
- Stained Service Area - Floor staining was observed in the service area during the site inspection.

175 Howard Street Rear - This building is located on the west end of the 175 Howard Street property adjacent to the drainage ditch. Site inspection revealed the presence to two (2) AOCs:

- Storage Area Staining - Soil staining was observed behind the building where general material storage was present.
- Asphaltic Wastes Along Ditch - Asphaltic wastes were observed along the east side of the storm water drainage ditch.

195 Howard Street - City directories for the 195 Howard Street address indicate a used auto sales operation occupied the parcel from circa 1943 through 1977. Air photos of the area also indicate that the site was covered by automobiles during that time frame (1951-1975 photos). Although, there is no evidence to indicate that general auto repair or auto body work was performed at the site, the possibility of a historical release of automobile-related wastes (fuel, lubricants, paint, etc.) could not be discounted. In addition, Sanborn Fire Insurance Maps and aerial photographs indicate an elongated building on the site which was presumed to have been a garage and the likely focal point for any automotive maintenance activities and product/fluids storage.

The Phase I report also identified the drainage ditch as a REC due to the presence of visible slag and solid waste/fill along the banks of the ditch.

1.4.3 Subsurface Investigation Formers Leos Service Station – HRP Associates, Inc. – September 1999

HRP was retained to perform a Subsurface Investigation at Leo's Service Station in September of 1999. At the time of the investigation, the garage building, canopy, three gasoline USTs, and an underground waste oil UST remained on the property. The purpose of the investigation was to evaluate the potential subsurface contamination in the vicinity of the existing USTs located on the southwestern and western portions of the property, and to evaluate the location of former gasoline USTs located on the southeastern portion of the property and beneath the canopy on the east side of the building.

The investigation included the performance of a GPR survey to screen for the presence of underground tanks, and the installation of fifteen soil test borings and six ground water monitoring wells. The GPR survey confirmed the presence of the existing four tanks and

identified no other tanks on the property. However, the concrete pad beneath the canopy did not allow instrument penetration in the area of the three historic tanks east of the building.

Fifteen soil borings and six ground water monitoring wells were placed within and/or adjacent to former and existing UST locations and around the perimeter of the building. The analytical results indicated the presence of soil and groundwater contamination on the property including petroleum compounds and lead. AVOCs were found in soil and groundwater in the former gasoline tank grave southeast of the garage building. None of the detected concentrations were above CT DEEP Remediation Standard Regulation (RSR) numeric criteria. TPH were detected in a 2-4 foot sample from this former tank area at a concentration exceeding the RDEC. AVOCs were also found in soil and groundwater near the northeast corner of the building at concentrations below criteria. TPH was detected above the RDEC in a 6-8 foot sample from this area. TPH was found in a 0-2 foot soil sample collected from the southwest corner of the building at a concentration of 6,860 parts per million (ppm), which exceeds the RDEC of 500 ppm and the GBPMC and I/CDEC of 2,500 ppm. TPH was also found in a nearby 2-4 foot sample interval at a concentration above the RDEC. Lead was found in two 2-4 foot samples collected southwest of the building at concentrations in excess of the RDEC. Lead was found to exceed the Surface Water Protection Criteria (SWPC) in one groundwater sample collected from near the southwest corner of the building. No other groundwater exceedances were noted although AVOCs were detected in all six groundwater monitoring wells with the highest concentrations southeast, northwest and northeast of the building.

Overall, five soil samples and one ground water sample exhibited one or more exceedances of applicable RSR Criteria. The soil boring logs indicated that the surficial geology at the site consisted of sand, gravel and silt and verified a groundwater elevation of approximately 6 feet below grade. Groundwater flow direction was generally to the west at a nearly flat gradient.

HRP recommended that all 4 USTs and any contaminated soils be removed and disposed of properly and in accordance with DEP policies and regulations. HRP recommended that the six site monitoring wells be re-sampled. Also, HRP recommended that after demolition activities, soils beneath the present building, canopy and pump island, which were not accessible during the investigation, be inspected and sampled as appropriate.

1.4.4 Leos Service Station Tank Closure Report – EnviroMed Services, Inc. – August 2000

The following tank closure report was contained in the previously referenced 2001 HRP Phase I report. The complete report was provided as an appendix in the report, and was summarized therein.

EnviroMed Services, Inc. (EnviroMed) issued an UST Closure Report for the former Leo's Service Station in August 2000. The report documents the removal of two 4,000 gallon gasoline,

one 6,000 gallon gasoline, and one 500 gallon waste oil UST. The locations of the tanks were consistent with the previous HRP report. EnviroMed witnessed the removal of the four tanks, which were steel with STi-P₃ protection, and collected confirmatory samples from the UST graves. All samples were analyzed for TPH by USEPA Method 418.1 and AVOCs by USEPA Method 8021B. Bottom samples were analyzed for lead by mass analysis. Also, the waste oil UST samples were analyzed for halogenated VOCs, with one sample analyzed for the 8 Resource Conservation and Recovery Act (RCRA) metals by mass analysis. Analytical results indicated that all confirmatory soil samples, except waste oil tank grave sample WO-1 (910 milligrams per kilogram) were below the RDEC for TPH of 500 milligrams per kilogram (mg/kg). All other analyses were below the applicable RDEC. EnviroMed did not collect samples from associated UST piping to the former dispenser or below the former dispenser.

1.4.5 Summary of Previous Investigations Conducted Along Howard Street & Hamilton Street in New London, Connecticut – HRP Associates, Inc. – April 2004

New London Development Corporation retained HRP to summarize four environmental reports that were conducted with the Howard Street Reconstruction Project area between 1999 and 2001 to evaluate what contaminants could be encountered during the construction project. The four reports included:

- Subsurface Investigation Report, Leo's Service Station, September 1999;
- Subsurface Investigation Report for the Proposed Howard Street Storm water Pump Station Area, March 2001;
- Subsurface Investigation Report for the Utility Installations Peripheral to the Proposed Hamilton Street Electrical Duct Bank, Pipe Jacking Pit, and Other Utilities, October 2001, and;
- Subsurface Investigation Results for 195 Howard Street and 197-203 Howard Street, February and July 2001.

Leos Service Station Report

This report summary is consistent with what was previously summarized above.

Howard Street Pump Storm water Pump Station Investigation

The proposed construction activities within this area included the installation of a new storm water pump station and associated drainage structures in and along Howard Street. The purpose of this report was to document the potential for contamination in soils and ground water in the proposed Howard Street Pump Station Area. Twelve test borings were installed using a direct push, vibratory drill rig and three of the borings were completed as temporary monitoring wells. One existing monitoring well (RMW-1) was also sampled as part of this investigation. Fifteen soil samples and four ground water samples were submitted for analysis including VOCs via USEPA Method 8260B, Connecticut Extractable Total Petroleum Hydrocarbons (CT ETPH),

Semi-Volatile Organic Compounds (SVOCs) via USEPA Method 8270C, the 15 CT DEEP metals (i.e. Antimony, Arsenic, Beryllium, Barium, Cadmium, Chromium total, Copper, Lead, Mercury, Nickel, Selenium, Silver, Thallium, Vanadium, and Zinc) by mass analysis and Synthetic Precipitation Leaching Procedures (SPLP) as necessary.

Contaminant detections in soils included eleven metals (Arsenic, Barium, Beryllium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Vanadium, and Zinc), SVOCs (particularly PAHs), and ETPH. PAHs exceeded RDEC and GBPMC at TB-6 (0-4'), aromatic VOCs exceeded GBPMC in TB-3 (8-12'), and ETPH exceeded the RDEC in TB-3 (8-12'). All soil exceedances were located within the utility easement area, along the east side of the property. TB-6 was located in the area of a former residence and TB-3 was located near the former Leo's Service Station. A groundwater sample collected from a well south of the former service station contained lead and phenanthrene above the SWPC .

Based on these findings, it was recommended that properly trained personnel be utilized for implementation of the proposed construction activities.

Hamilton Street Utility Installations Investigation

This investigation was conducted by HRP in October of 2001 and consisted of 14 test borings (8 completed as groundwater monitoring wells) located along Hamilton Street and Howard Street (north of Hamilton). Only two borings were located adjacent to the Site including Ham-10 and Ham-11. One sample was collected from Ham-10 (0-4') and was analyzed for VOCs, PAHs, ETPH, and Polychlorinated Biphenyls (PCBs). Two samples were collected from Ham-11 (0-4') and (4-8') and were analyzed for the same parameters. PAHs, in excess of the RDEC and Industrial/Commercial DEC and GBPMC were found in both 0-4' samples. TPH was also detected in the Ham-10 (0-4') samples in excess of the RDEC. Tetrachloroethylene was detected in all three samples at concentrations below criteria.

195 Howard Street Investigation

The investigation described was reported initially completed to support the Phase 1B project further to the south, but extended to the Howard Street project area. Further, the investigation was expanded to target specific areas where utilities were to be located. Five borings were located on and near the east side of the 195 Howard Street property. Samples collected from these borings were analyzed for the 15 CT DEEP metals, PAHs, PCBs, and ETPH.

Thallium was detected at concentrations above the RDEC in borings B-59 (6-8') and B-61 (0-2' and 6-8'). Lead was also found in exceedance of the GBPMC in B-60 (0-2').

No PAHs were detected in B-32 (6-8'), B-61 (0-2' and 6-8'), and B-35 (6-8') and low PAH concentrations were detected in B-35 (0-2') and B-60 (0-2'). PAHs were detected above the RDEC and GBPMC in B-59(0-2')

ETPH was detected in 8 of the 9 samples analyzed from this area, but was found at concentrations at or below 160 ppm. No PCBs were detected in any of the samples.

1.4.6 Phase I Environmental Site Assessment – MBI November 2011

The determination of Recognized Environmental Conditions (RECs)/Areas of Environmental Concern (AOCs) for the Site was developed based on information contained in previous environmental reports, a Site reconnaissance, and historic and regulatory review information obtained as part of the current Phase I activities. A previous environmental report (2001 HRP Phase I) identified numerous AOCs in association with the inspection of buildings that remained on the property at that time. As these buildings and associated detailed features are no longer present, the building footprints and associated former lots are now cited as the RECs/AOCs. As such the following RECs/AOCs are provided:

- **Industrial Slag Deposits** - Deposits of industrial slag were observed throughout the MDP project area during the completion of the 2001 Phase I. Slag was observed within the drainage ditch during the previous Phase I. Other slag deposits could be located on the Site. Laboratory analysis of the slag material south of the Site, previously completed, indicated the presence of lead, arsenic and antimony above CT DEEP numeric criteria.
- **Other Fill Materials** - The majority of the subject Site consisted of a portion of Shaw's Cove and was filled in from approximately the 1860s until the 1940s. As such, the majority of the Site soils consist of imported materials of an unknown origin. Some solid waste and debris was observed within Site soils during the Site reconnaissance. Contaminants, including, but not limited to heavy metals, poly aromatic hydrocarbons (PAHs), methane and asbestos could be present in the fill/solid waste deposits.
- **Drainage Ditch/Former Lot 19** - A drainage ditch extends along the west side of the Site. It receives storm water from points west and south of the Site and receives some direct overland flows. The ditch was formerly, immediately bordered by two junk yards (one off-Site), a barrel refurbishing facility, two bottling works and other commercial facilities. It has likely received some oil/chemical discharges from storm water flows, and other direct and/or indirect discharges, including potential direct dumping. The ditch sidewalls and bottom contain slag and solid waste/fill materials. An auto junkyard extended across for Lot 19, up to the ditch in the 1960s and 1970s.
- **23 Hamilton Street** - The former 23 Hamilton Street property was occupied by a bottling works/dispensing machine facility for over 50 years. It was subsequently occupied by a chemical company and construction/lumber tenants. The 2001 Phase I identified several oil/chemical storage areas within the building as well as drains and sumps. The building also included a garage bay. Evidence of two underground storage tanks (USTs) was also observed. A gasoline (UST) was shown east of the building in a 1951 Sanborn Map and may be one of the identified USTs. The building has been demolished and the disposition of the former tanks is unknown. A CT DEEP spill report identified oil contamination on the property in the area of a storm drain culvert.
- **163 Howard Street (Rear)** – The former 163 Howard Street facility was originally occupied by a bottling works and later included automobile-related sales and service businesses. It was subsequently occupied for approximately 40 years by a barrel cleaning

and refurbishing company. “Rutberg Barrel” maintained exterior storage throughout the building lot. The 2001 Phase I identified a large surface stained area east of the building, heavy oil staining inside the building, various trenches, drains and sumps, and a suspected UST. CTDEP file information indicated that a catch basin south of the building discharged to a drywell.

- 175 Howard Street – A gasoline and service station occupied 175 Howard Street for approximately 60 years and included three generations of gasoline USTs. All identified tanks have been removed. Sampling in the tank grave areas indicated two CT DEEP numeric criteria exceedances including one in a former waste oil tank confirmation sample and one in the second generation gasoline UST grave from a boring sample. The service garage included two sub-grade lifts and stained flooring and the basement contained two above-ground oil tanks. A field investigation completed for soil and groundwater outside the building indicated total petroleum hydrocarbons (TPH) and Lead concentrations above CT DEEP Residential criteria in two locations each, and one location where TPH exceeded all CT DEEP regulatory criteria. Lead was found in groundwater at a concentration exceeding the CT DEEP Surface Water Protection Criteria. Aromatic Volatile Organic Compounds were found in several soil and groundwater samples however, none of the detected concentrations exceeded regulatory criteria.
- 175 Howard Street Rear (Former Lot 14) – This former parcel was occupied by various light industrial and storage/warehousing tenants from circa 1907 to 2001 including a sheet metal shop and various contractors. The specific oil/chemical waste handling practices of former tenants are unknown, and could have resulted in on Site disposal/spillage. The previous Phase I reported exterior staining in a storage area and asphaltic wastes on the west side of the lot, along the ditch.
- 195 Howard Street – This former Site parcel included an antique shop and furniture repair shop and was subsequently occupied by an automobile sales facility including extensive exterior vehicle storage/junk yard and an apparent garage building.
- USTs – No documentation was found for the removal of the apparent/suspect USTs identified during the 2001 Phase I. Further, additional USTs could have been utilized in association with former Site buildings/uses and could still remain on the property.
- Off Site Sources – The Site is located in an area of extensive historic fill placement and industrial uses. A Former Shaw’s Cove area north of Hamilton Street was filled and subsequently occupied by a junk yard, and areas east of the Site were occupied by various foundry facilities. Contamination at these sites could have impacted the subject property.

Overall, the presence of extensive fill material including apparent industrial fill and solid waste, has the potential to adversely impact the environment. Other, discrete RECs/AOCs associated with past uses could also have affected the environment. Analytical results document soil and groundwater impacts resulting from the former gasoline and service station.

1.4.7 Phase II/III and Remedial Action Plan – MBI January 2013

Based on the findings of the referenced Phase I report, a Phase II/III investigation was completed at the site in 2012 and a Phase II/III and Remedial Action Plan report was completed in January

of 2013. The field investigation consisted of the installation of test pits, test borings, groundwater monitoring wells, the collection of a sediment sample from the drainage ditch, and the completion of a methane screen.

The investigation indicated the presence of semi-volatile organic compounds, PCBs and heavy metals in soil/fill at concentrations exceeding CT DEEP Direct Exposure Criteria. Contamination in groundwater included VOCs, SVOCs and metals with only one SVOC and two metals exceeding criteria. Groundwater compliance using statistical evaluation and/or downgradient property boundary monitoring allowed under the CT DEEP regulations is expected to indicate groundwater compliance.

Based on the findings, the Remedial Action Plan called for the implementation of an Environmental Land Use Restriction and the placement of a soils cap to mitigate direct exposure to soils and sediments with contaminant concentrations in excess of Direct Exposure Criteria. The “closure” of an identified solid waste cell was also called for in the context of the cap placement and land use restriction.

1.5 Site Redevelopment Concept

A site redevelopment concept plan was prepared in October of 2012 after the results of the Phase II/III and RAP were reviewed by the property owners, project environmental consultant and a Landscape Architect. The plan, showing the subject site and the two parcels to the south, is provided as Figure 3. Based on the presence of a no build zone over the solid waste cell, and considering stormwater management and parking requirements, a site development scenario consisting of a 2-commercial buildings, 81 parking spaces, sidewalks/landscaping areas, and a grassed solid waste cap area occupying approximately 25,000 square feet was developed.

2. Regulations and Cleanup Standards

2.1 Regulatory Framework

Investigation and remediation at the site will take place in accordance with the CT DEEP RSRs; Connecticut General Statutes (CGS) 22a-133k-1 through 3 and associated CT DEEP Guidance Documents. Compliance with the RSRs will be achieved by the Site entering the Connecticut Voluntary Remediation Program (VRP) under CGS 22a-133y which will be implemented through a designated Licensed Environmental Professional (LEP). All documents generated in association with the investigation and remediation of the site will be submitted to the CT DEEP under the VRP site identity.

2.2 Remediation Standard Regulations (RSRs)

The RSRs provide numeric criteria for soil and groundwater compliance depending upon the classification and uses of groundwater and the sites proposed use. The RSRs also allow other strategies to achieve compliance besides the use of the baseline numerical soil standards. These strategies include site-specific alternatives, institutional controls such as environmental land-use restrictions (ELURs), and engineering controls such as soil caps, that may be used to protect human health and the environment. The RSRs have two categories of soil quality criteria:

1. *Direct Exposure Criteria* (DEC) - intended to protect human health from risks associated with direct exposure to pollutants in soil. The DEC are developed based on human health risks associated with ingestion, inhalation or dermal exposure to the pollutants. Because the potential risk associated with such exposure differs, depending on the setting, the DEC are divided into residential standards (RDEC) and industrial/commercial standards (I/C DEC). The use of less stringent I/C DEC is appropriate only when a property has an environmental land use restriction (ELUR) which precludes residential activities and uses. For this project, the more stringent RDEC are appropriate because of the intended use of the site as a public park.

2. *Pollutant Mobility Criteria* (PMC) - intended to protect groundwater from pollutants which may leach from unsaturated soils to the water table. The PMC are divided into two categories, depending on the groundwater quality classification of the area under the “Connecticut Water Quality Standards.” The Water Quality Standards are established by CTDEP under Section 22a-426 of the Connecticut General Statutes. Groundwater classified as “GA” is designated for use as a private or public water drinking water supply, without treatment; thus, soil release areas in GA areas must meet the “GAPMC.” Groundwater classified as “GB” is assumed to be unsuitable for use as a drinking water source without treatment, as a result of contamination resulting from long-term urban and/or industrial land use. GB groundwater is designated for non-drinking water uses, and the numeric GBPMC for most contaminants are less stringent than the GAPMC. The groundwater at the site is classified as “GB,” and there are no known water supply wells in the area; therefore, the “GBPMC” will apply. The PMC for GB areas generally apply to soils above

the seasonal high water table. As with the DEC, it is possible to use institutional controls and/or engineered controls to manage impacted soil and achieve compliance with the PMC. Furthermore, there are variances in the RSRs for contaminants associated with the presence of widespread polluted fill and fill materials that contain asphalt fragments, coal fragments, coal ash or wood ash.

However, groundwater compliance monitoring, compliance demonstrations, and post remedial groundwater monitoring will be required at the site to demonstrate RSR compliance. This will require the installation and sampling of additional wells. Compliance monitoring requires 4 consecutive quarters, and post remedial monitoring requires monitoring up to two years after soil remediation.

2.3 Applicable Laws and Regulations

Laws and regulations that are applicable to the proposed site remediation project include the Federal Small Business Liability Relief and Brownfields Revitalization Act, The Federal Davis-Bacon Act, CT DEEP Remediation Standard Regulations, and local land use laws and ordinances. Federal, state, and local laws regarding the hiring of contractors to conduct the remediation will be followed.

2.4 Remediation Considerations

The Phase II/III investigation results indicate that site soils/fill contain heavy metals, PCBs and semi-volatile organic compounds at concentrations exceeding Industrial/Commercial Direct Exposure Criteria established by the CT DEEP. No exceedances of Pollutant Mobility Criteria in soil were found so no remediation to mitigate contaminant transport through the soil profile and in to groundwater is required. An area of solid waste disposal was also found occupying the western portion of the site. Therefore, the overall, site remedial objectives are to (1) eliminate the long term Direct Exposure hazards and to (2) close the Solid Waste cell. Since the fill materials are deep and extensive, removal and replacement would not be feasible or prudent in light of costs weighed against benefits to the environment. Rendering the soils “inaccessible” (preventing direct exposure to them) in conformance with CT DEEP regulatory requirements is the selected remedial alternative (see justification in next section). Site-wide remediation (not entirely addressed by this grant proposal) will consist of: placing a building over contaminated soil; placing two feet of clean fill and pavement/sidewalks over contaminated soil; and, placing a geotextile warning layer and 2 feet of clean fill over grassed/landscaped and storm water management areas. The geotextile and 2 feet of clean fill are also proposed for the Solid Waste Closure Area. The implementation of the inaccessible soils approach will require an Environmental Land Use Restriction (ELUR) to be implemented. The ELUR will prohibit disturbance of the soil cap and describe the type and location of contamination on the property. A description of the cap and maintenance requirements will also be included in the ELUR documents along with an A-2 survey detailing the cap limits and provisions. The ELUR will be filed on the land records. Preliminary discussions with CT DEEP Solid Waste personnel indicate

that the Solid Waste Closure can be completed within the context of CT DEEP soils compliance implementation and the ELUR, provided that the solid waste area is located within the ELUR documentation including the need for any ongoing maintenance and limitations in use. The use of two feet of fill and a warning layer over unpaved areas (versus the prescribed 4 feet of clean fill) will require an Engineered Control approval from the CT DEEP.

The remediation approach may require the export/disposal or reuse of some contaminated fill/soil materials to accommodate the remediation of the drainage ditch. In order to maintain the ditch drainage elevations, two feet of contaminated materials must be removed from the ditch, the warning layer placed, and then two feet of clean material replaced and graded. The ditch has a drainage easement in place of it in favor of the City of New London. The remediation of the onsite 300 linear foot section of the ditch will be conducted with the cooperation of the City of New London Public Works Department. The remaining 60 linear feet of drainage ditch is located on the southerly/southwesterly adjacent vacant parcel (also the subject of a 2013 clean-up grant application submitted by RCDC). The drainage ditch is a delineated inland wetland and, based on elevation, is also subject to CT DEEP Tidal Wetland Permitting.

The specific grant proposal remediation objectives are to: remediate the 300 foot section of onsite ditch (6,000 s.f.) and cap the approximate 25,000 s.f. solid waste area located under and adjacent to the ditch. These project elements would include clearing and grubbing, grading, topsoil and seed, and placing a stone lining in the drainage ditch. The planting of native flowering shrubs along the remediated/restored ditch and along the perimeter of the capped area is also proposed. The placement of stone and or vegetation within the drainage ditch is also a detail that may be determined during the wetland permitting process.

The proposed cap/remediation area is shown on Figure 4.

The site Remedial Action Plan and this clean-up grant proposal are based on the site development concept plan. Specific clean-up grant objectives represent activities that would be undertaken under all development scenarios including solid waste closure, storm water volume compensation, drainage ditch remediation and “green space” soil capping. By addressing the bulk of the infrastructure-related remedial requirements through the grant funds, the remaining soil cap compliance elements, including the placement of buildings and pavement can be easily and cost effectively integrated in to any final site plan. Further, in the interim, the remediated areas can stand alone as stable components, capping nearly a quarter of the site, addressing the Solid Waste Closure and dramatically improving stormwater quality leaving the site.

3. Evaluation of Clean-up Alternatives

3.1 Clean-up Alternatives Considered

To address the identified contamination at the site, in excess of RSR criteria, the following remedial alternatives were identified:

Alternative # 1: No Action;
Alternative # 2: Soil Capping; and
Alternative # 3: Excavation and Offsite Disposal.

The alternatives were assessed given the sites proposed future use as a commercial property.

3.2 Effectiveness, Implementability and Preliminary Costs

3.2.1 Effectiveness

No Action: The “No Action” alternative is not an effective means of preventing users and other receptors from being exposed to contamination at the site. Further, it does not provide for the proper management of contaminated materials which may be encountered, handled or disturbed during site construction activities.

Soil Capping: Soil Capping is an effective way to prevent receptors from coming in to direct contact with site wide contaminated soils/fill. Such a cap serves as a physical boundary between the receptors and the contamination. The cap remains in place, is maintained, and is controlled through the property deed in perpetuity to avoid exposure issues in the future.

Excavation and Offsite Disposal: The removal of contaminated soil from the property and offsite disposal is an effective way to permanently eliminate the source of contamination and the associated exposure risks and potential groundwater quality impacts.

3.2.2 Implementability

No Action: The “No Action” alternative requires no implementation.

Soil Capping: Soil Capping is a relatively easy option to implement and consists of some soil/fill removal where grades need to be achieved due to engineering considerations associated with stormwater management, and the importation and placement of clean fill. The implementation of an Environmental Land Use Restriction on the property requires legal work including a title search, an A-2 survey demarcating the limits of cap and contamination, and the

preparation of various environmental documents that must be approved by the CTDEP/LEP, and filed on the land records. This process has been standardized in Connecticut.

Excavation and Offsite Disposal: The removal of contaminated soil from the property and offsite disposal would represent a significant construction project considering the depth and extent of the fill/contamination. It would require onsite processing of clean fill materials, extensive excavating, stockpiling, disposal characterization, and transportation to various facilities for disposal depending upon the waste category. The site would then require significant backfill, compaction and grading. Although not technically difficult from a construction perspective, this option represents implementation challenges due to the large scale of the operation.

3.2.3 Cost

No Action: The “No Action” alternative will not have any cost implications.

Soil Capping: The soil capping alternative requires some soil fill removal and the placement of a soil cap. Given the site boring and test pit data, analytical data, it is anticipated that the soil cap will need to cover the entire 3.14 acre (136,778 s.f.) property, except where buildings are present. Based on conversations with CT DEEP, it is assumed that the use of a 2 foot soil cap and a warning layer will be utilized for the entire site except for areas below buildings.

REMEDIATION COST SUMMARY			
Item	Quantities	Unit Cost	Total
Remediate Ditch	300x20x2 = 12,000 c.f./27 = 444 C.Y. 444 C.Y. *1.5 tons/C.Y. = 666 tons Non-hazardous soil, excavation, transportation and disposal	\$95/ton	\$63,270
Soil Cap (Not including estimated 17,500 s.f. buildings)	(119,278 s.f. x 2)/27 = 8835 C.Y. + 20% for compaction = 10,602C.Y.	\$25/yard placed	\$265,050
Geotextile Warning Layer (Same area as above)	119,278 s.f.	\$0.30/s.f.	\$35,783
Clear and Grub (estimated area)	1 acre	\$10,000/acre	\$10,000
Topsoil and Seed Green Areas	69,778 s.f = 1.6 acres (Based on concept plan).	\$30,000/acre	\$48,000
6” Stone Lining in	300 by 14 foot swale bottom and	\$35/ton	\$5,442

Swale	sides. 4200 s.f. = 2100 c.f. = 77.7 C.Y @ 2 tons/yard = 155.5 tons.	in place	
Filter Fabric Below Stone	4200 s.f.	\$0.30/s.f.	\$1,260
Engineering Fees – Plans and Specs., Bidding, Permitting and Oversight	Lump Sum	20% of Project	\$91,215
Estimated Total			\$520,020

In addition to the cost estimates provided above, the following remediation/closure items and estimated costs are provided, however, they are expected to be variable depending upon the final site development plan:

Paving – 20,000 s.f. at \$4/s.f. = \$80,000

Groundwater Monitoring/Confirmation & Closure Sampling – Estimated at \$50,000 - \$75,000

Excavation and Offsite Disposal: The removal of contaminated soil from the property considers an average depth of contamination of 10 feet over approximately $\frac{3}{4}$ of the site for an estimated 37,000 cubic yards of material or about 55,500 tons of material for offsite export and disposal. This amount of material estimated at \$80/ton for transportation and disposal (would not qualify for Massachusetts landfill cover due to content) alone is over \$4,400,000. Additional costs for excavation, loading, backfill, groundwater control, and engineering would bring the project in to the 6 to 8 million dollar range.

3.3 Recommended Clean-up Alternative

The recommended clean-up alternative is Soil Capping given the implementability and obvious cost differential. This alternative addresses the primary Direct Exposure concern resulting from the presence of soil contamination and can be implemented at a reasonable price with few long term maintenance concerns. Soil Capping requires a detailed review and approval by the CTDEEP under the “Engineered Control” requirements. In addition, review and approval by the CTDEEP Solid Waste Division will also be required prior to implementation. Once approved and implemented, along with an Environmental Land Use Restriction limiting the site to non-residential uses and no disturbance, and long term maintenance assurances for the cap, this option will meet the state and federal clean-up criteria and will be protective of human health and the environment. The remediation of the ditch will also be a significant improvement to surface water quality and wildlife enhancement.

Figures

0 ————— 0.5 miles



SOURCE: 1984 UNITED STATES GEOLOGIC SURVEY
TOPOGRAPHIC MAP OF THE NEW LONDON QUADRANGLE 1984
SOURCE SCALE: 1:24,000



MARTIN BROGIE, INC.
11 COMMODORE STREET, NORWICH, CT 06360

FIGURE 1
5C2 SITE LOCATION

HOWARD & HAMILTON STREETS
NEW LONDON, CT

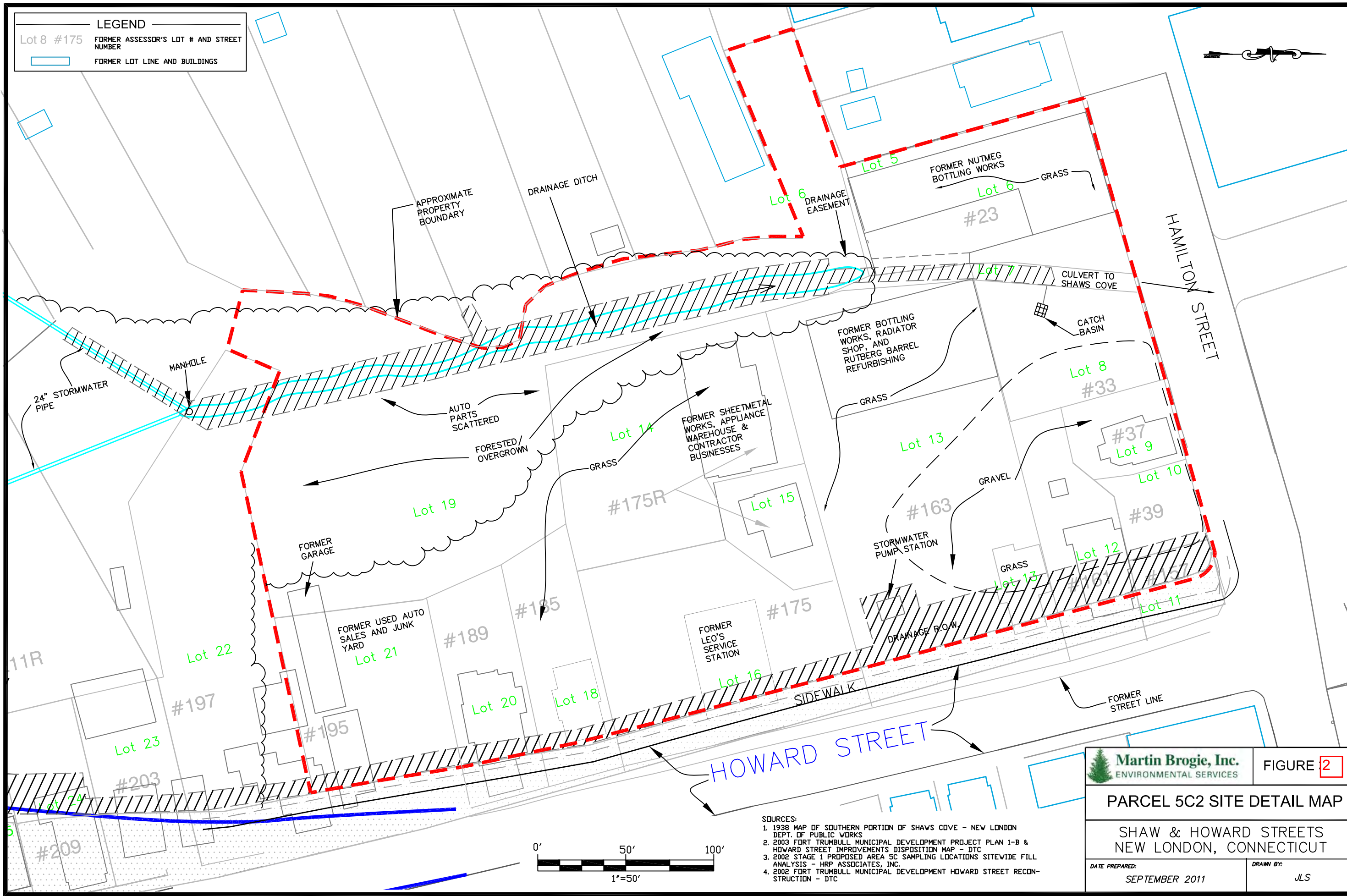
DATE: SEPTEMBER 2011

DRAWN BY: JLS

LEGEND

Lot 8 #175 FORMER ASSESSOR'S LOT # AND STREET NUMBER

FORMER LOT LINE AND BUILDINGS



- SOURCES:**
- 1938 MAP OF SOUTHERN PORTION OF SHAW'S COVE - NEW LONDON DEPT. OF PUBLIC WORKS
 - 2003 FORT TRUMBULL MUNICIPAL DEVELOPMENT PROJECT PLAN 1-B & HOWARD STREET IMPROVEMENTS DISPOSITION MAP - DTC
 - 2002 STAGE 1 PROPOSED AREA 5C SAMPLING LOCATIONS SITEWIDE FILL ANALYSIS - HRP ASSOCIATES, INC.
 - 2002 FORT TRUMBULL MUNICIPAL DEVELOPMENT HOWARD STREET RECONSTRUCTION - DTC

Martin Brogie, Inc.
ENVIRONMENTAL SERVICES

FIGURE 2

PARCEL 5C2 SITE DETAIL MAP

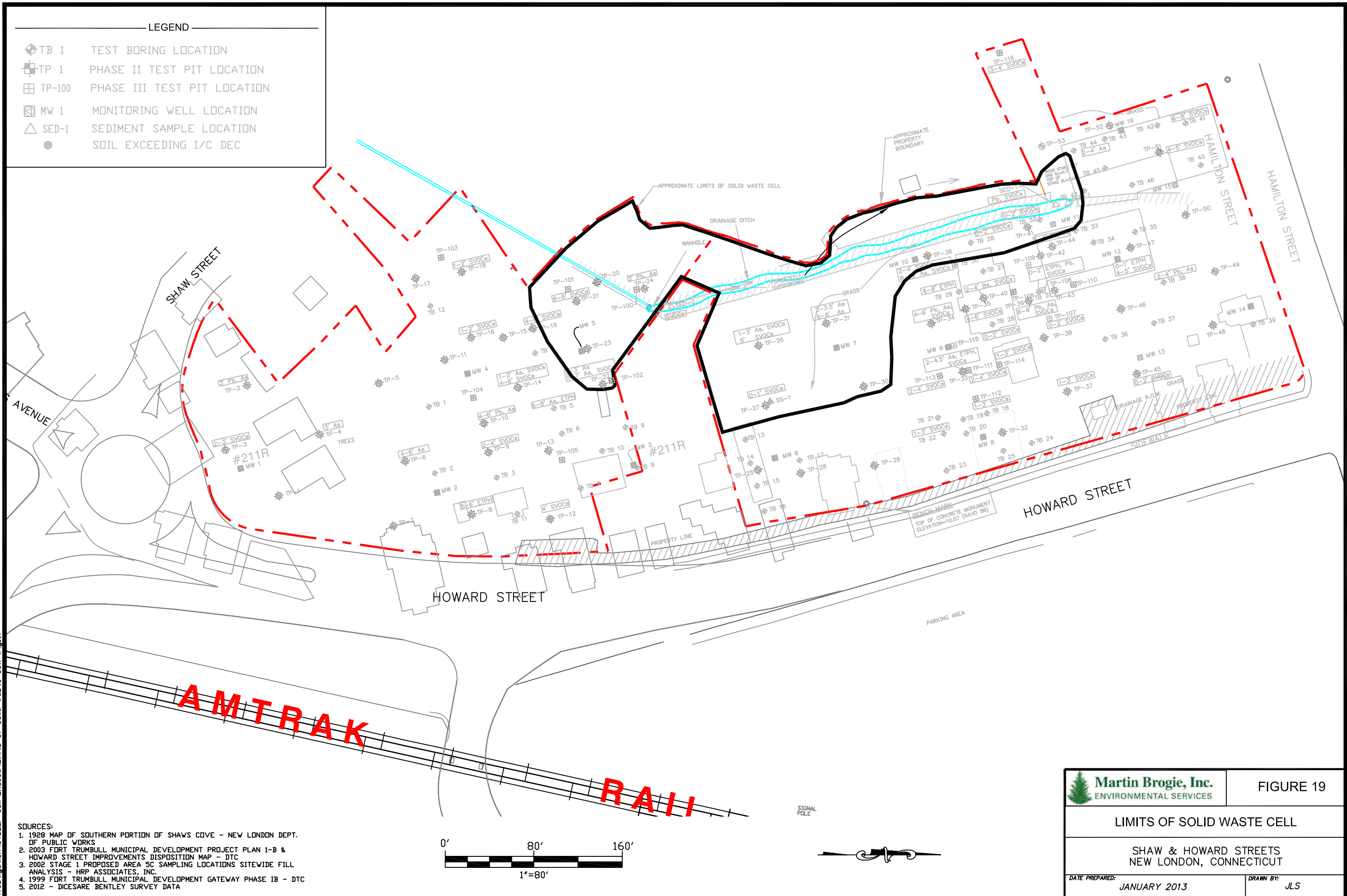
SHAW & HOWARD STREETS
NEW LONDON, CONNECTICUT

DATE PREPARED:
SEPTEMBER 2011

DRAWN BY:
JLS

LEGEND

- ⊕ TB 1 TEST BORING LOCATION
- ⊕ TP 1 PHASE II TEST PIT LOCATION
- ⊕ TP-100 PHASE III TEST PIT LOCATION
- ⊕ MW 1 MONITORING WELL LOCATION
- △ SED-1 SEDIMENT SAMPLE LOCATION
- SOIL EXCEEDING I/C DEC



Investigation\CTDEEP_Soil Exceed\Limits of Solid Waste Cell (Fig19)

- SOURCES:
1. 1928 MAP OF SOUTHERN PORTION OF SHAW'S COVE - NEW LONDON DEPT. OF PUBLIC WORKS
 2. 2003 FORT TRUMBULL MUNICIPAL DEVELOPMENT PROJECT PLAN 1-B & HOWARD STREET IMPROVEMENTS DISPOSITION MAP - DTC
 3. 2002 STAGE 1 PROPOSED AREA 5C SAMPLING LOCATIONS SITEWIDE FILL ANALYSIS - HRP ASSOCIATES, INC.
 4. 1999 FORT TRUMBULL MUNICIPAL DEVELOPMENT GATEWAY PHASE 1B - DTC
 5. 2012 - DICESARE BENTLEY SURVEY DATA

Martin Brogie, Inc. ENVIRONMENTAL SERVICES	FIGURE 19
LIMITS OF SOLID WASTE CELL	
SHAW & HOWARD STREETS NEW LONDON, CONNECTICUT	
DATE PREPARED:	DRAWN BY:
JANUARY 2013	JLS



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