Remedial Action Plan

Former Remington-Rand Facility

Middletown
Connecticut

Prepared for **Municipal Development Office**
Middletown, Connecticut 06457

Prepared by ***VHB*/Vanasse Hangen Brustlin, Inc.**
Transportation, Land Development, Environmental Services
Middletown, Connecticut 06457

October 2000

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October 13, 2000

Vanasse Hangen Brustlin, Inc.

Ref: 40328

Mr. Brian A. Dillon
Project Engineer
Connecticut Department of Economic and Community Development
505 Hudson Street
Hartford, CT 06106

Re: Remedial Action Plan
Former Remington Rand Facility

Dear Mr. Dillon:

Enclosed for your review is a copy of the Remedial Action Plan (RAP) for the former Remington Rand facility. I have also forwarded copies of the RAP to Bill Warner and Rick Kearney of the City of Middletown, and Tom RisCassi of the Connecticut Department of Environmental Protection (CTDEP). Mr. RisCassi is the Supervisor of the CTDEP Bureau of Water Management, Permitting, Enforcement and Remediation Division, South Central Region. He will be assigning this project to someone in his unit shortly.

If you have any questions regarding this information, please contact me.

Very truly yours,

VANASSE HANGEN BRUSTLIN, INC.

Michael Libertine

Michael Libertine, L.E.P.
Senior Project Manager

Enclosures

cc: William Warner, City of Middletown (w/o enclosures)
Richard Kearney, City of Middletown (w/o enclosures)

54 Tuttle Place
Middletown, Connecticut 06457-1847
860.632.1500 ■ FAX 860.632.7879
email: info@vhb.com
www.vhb.com

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October 13, 2000

Vanasse Hangen Brustlin, Inc.

Ref: 40328

Mr. William Warner
Director of Planning, Conservation and Development
City of Middletown
245 DeKoven Drive
Box 1300
Middletown, CT 06457-1300

Re: Remedial Action Plan
Former Remington Rand Facility

Dear Mr. Warner:

Enclosed for your files is a copy of the Remedial Action Plan (RAP) for the former Remington Rand facility. I have forwarded copies of the RAP to Brian Dillon of the Connecticut Department of Economic and Community Development (DECD) and Tom RisCassi of the Connecticut Department of Environmental Protection (CTDEP). Mr. RisCassi is the Supervisor of the CTDEP Bureau of Water Management, Permitting, Enforcement and Remediation Division, South Central Region and will assist DECD on this project.

In addition to the RAP, I have included a notification letter that has been sent to Mr. RisCassi notifying CTDEP of our recent findings in groundwater at the Site. The notification letter is required under State regulations.

If you have any questions regarding this information, please contact me.

Very truly yours,

VANASSE HANGEN BRUSTLIN, INC.

Michael Libertine

Michael Libertine, L.E.P.
Senior Project Manager

Enclosures

cc: Richard Kearney, City of Middletown

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860.632.1500 ▪ FAX 860.632.7879
email: info@vhb.com
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October 13, 2000

Vanasse Hangen Brustlin, Inc.

Ref: 40328

Mr. Tom RisCassi, Supervisor – South Central Region
Connecticut Department of Environmental Protection
Bureau of Water Management
Permitting, Enforcement and Remediation
79 Elm Street
Hartford, CT 06106-5127

Re: Remedial Action Plan
Former Remington Rand Facility

Dear Mr. Tom:

Enclosed for your files is a copy of the Remedial Action Plan (RAP) prepared by Vanasse Hangen Brustlin, Inc. for the City of Middletown regarding the former Remington Rand facility. I have also forwarded copies of the RAP to Brian Dillon of the Connecticut Department of Economic and Community Development (DECD) and the City. Craig Parks was formerly involved with this Site prior to his departure.

At your earliest convenience, could you please contact me to discuss this project? Specifically, I would like to know who will be the CTDEP's new liaison. I will be out of the office until next Friday, October 20th.

Thank you in advance for your attention.

Very truly yours,

VANASSE HANGEN BRUSTLIN, INC.

Michael Libertine

Michael Libertine, L.E.P.
Senior Project Manager

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Remedial Action Plan

Former Remington-Rand Facility
Middletown, Connecticut

Prepared for	**Municipal Development Office** Middletown, Connecticut
Prepared by	***VHB*/Vanasse Hangen Brustlin, Inc.** Transportation, Land Development, Environmental Services Middletown, Connecticut 06457
Senior Project Engineer	______________________ Matthew Waxworks, P.E.
Senior Hydrogeologist	______________________ Deborah Wojcicki, L.E.P.
Project Manager	______________________ Michael Libertine, LEP

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1 Introduction

Purpose

This Remedial Action Plan (RAP) has been prepared for the Remington Rand facility, located at 180 Johnson Street in Middletown, Connecticut (Site). The purpose of the RAP is to provide site background, summarize previous investigation data, identify and delineate areas of concern, develop operable units, identify potential applicable remedial technologies, evaluate technologies based on cost, effectiveness, and implementability, and synthesize appropriate remedial alternatives. The scope of services was based on the January 19, 2000 proposal to the Director of Planning (William Warner) for the City of Middletown.

This RAP is intended to identify a remediation program which will bring the Site into compliance with the Connecticut Department of Environmental Protection (CTDEP) Remediation Standard Regulations (RSRs) and other applicable environmental regulations. The RAP considers the need to undertake the remediation in stages, coincident with demolition and redevelopment activities, and in consideration of the day-to-day activities of property tenants. The RAP also considers feasible options for in-situ versus offsite treatment and/or disposal of contaminated media.

Site Background

■ Site Location and Description

The Site is located at 180 Johnson Street in Middletown, Connecticut in an area zoned for industrial redevelopment. The Site is bordered by the Middletown Landfill to the north, undeveloped wetlands and the Mattabasset River to the east, railroad right-of-way and E.I.S. Division of Standard Motor Products to the south, and the Hubert E. Butler Construction Company and the Coginchaug River to the west.

The Site consists of approximately 10.5 acres with roughly 119,000 square feet of building area. The majority of the Site buildings were constructed from 1897 to 1934.

Currently, the Site is serviced by City water, sanitary sewer, natural gas, telephone, and electric utilities.

The Site topography is flat with surface elevations generally sloping towards the Mattabasset River to the northeast. Native overburden consists of a light brown fine- to medium-grained sand with some silt to depths varying from 10 to 12 feet below grade across the Site. Below the sand layer, a light brown silty clay layer exists to an undetermined depth.

The Site is located within the Mattabasset and Coginchaug River drainage basin which are tributaries to the Connecticut River located roughly 1200 feet to the east. Water table elevations vary from approximately 4 to 10 feet below ground surface across the Site. Triangulation of apparent water table elevations between groundwater monitoring wells indicates that local groundwater flows across the Site in an easterly to northeasterly direction. Groundwater beneath the Site is classified by the CTDEP as GB, indicating groundwater within highly urbanized areas or areas of intense industrial activity and where public water supply service is available. GB classified groundwater may not be suitable for direct human consumption due to waste discharges, spills or leaks of chemicals or land use impacts. The CTDEP's goal is to avoid further degradation by preventing any additional discharges that would cause irreversible contamination. Figure 1, taken from the USGS Middletown Connecticut 7.5 minute topographic quadrangle, depicts the Site location.

■ Site History

The majority of the Site buildings were constructed from 1897 to 1934. According to previous assessment findings, historical industrial activities conducted at the Site included manufacture of automobiles, bicycles, typewriters, and munitions (during wartime). A coal-fired power plant provided electrical and/or steam generation for manufacturing activities at the Site.

Based upon a review of available aerial photographs, historic landfill activities have occurred in the Site's northeast sector (described herein as the "right-of-way waste disposal area").

The Site is presently leased to various tenants who use the facility for equipment storage, landscape services, furniture manufacturing, assembly, and office space.

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Previous Investigation Summary

Introduction

Three investigations have been conducted at the Site. A Phase I Environmental Site Assessment report, dated April 6, 1993, was conducted by Soil Science and Environmental Services of Cheshire, Connecticut. VHB conducted a Phase II Environmental Site Assessment in June, 21 1997, and a Phase III Subsurface Investigation in August 1998. VHB is currently performing supplemental groundwater monitoring at the Site. The results of these investigations are summarized below.

■ Phase I Investigation

Soil Science and Environmental Services of Cheshire, Connecticut prepared a Phase I Environmental Site Assessment (ESA) report, dated April 6, 1993. The following environmental concerns were summarized in the report:

- Four suspect existing or former underground storage tank locations;
- Two aboveground storage tanks;
- Five electrical transformers;
- Waste disposal area within a Northeast Utilities (NU) electrical right-of-way;
- Interior floor drains and inlet structures;
- Miscellaneous containers of hazardous and special wastes;
- Suspect asbestos and lead-based paint;
- Suspect polychlorinated biphenyl-containing equipment; and
- Surficial stained soils and stressed vegetation.

Reportedly, past industrial activities at the Site included the manufacturing of bicycles, automobiles, typewriters, metal goods, and munitions (during wartime). Industrial wastes, including ink, carbon, wax, oil, detergents, acetone, dye, and nickel, have been historically discharged to the Mattabasset River and the City sewer system.

■ Phase II Investigation

VHB Undertook a Phase II ESA of the property in 1997. The Phase II investigation was conducted to determine if contamination was present at the Site, assess subsurface conditions associated with suspect contaminant sources, identify regulated building components, inventory miscellaneous containers of hazardous and special wastes, and develop preliminary estimates of potential remediation costs.

Based on the results of the Phase II subsurface investigation, localized areas of residual soil and groundwater contamination were identified at the Site in the vicinity of known and suspect contaminant sources. Laboratory analytical testing confirmed contaminant concentrations that exceeded applicable CTDEP soil and groundwater standards in seven release areas at the Site, including three underground storage tank (UST) areas, one aboveground storage tank (AST) area, two areas of surficial soil staining and two waste disposal areas. Contaminants identified included total petroleum hydrocarbons (TPH), various heavy metals, volatile organic compounds (VOCS) and semi-volatile organic compounds (SVOCs).

Also identified during the Phase II Assessment were regulated building components and miscellaneous containers of hazardous and special waste. These included asbestos, lead based paint, PCB-containing electrical equipment, mercury-containing fluorescent tubes and vapor lamps and residual heavy metal dust within the Site buildings. These wastes were quantified and abatement/disposal costs were provided in VHB's Phase II report.

A Supplemental Groundwater Monitoring Well Installations report was prepared by VHB later in 1997 as an addendum to the Phase II investigation. The purpose of the supplemental installations was to determine if the presence of chlorinated solvents in groundwater at the Site was due to past on-site practices or potentially from off-site, upgradient sources. The results of the investigation indicated that the solvent source appeared to be located on the subject property, perhaps centrally located beneath the main building.

The following release areas and associated sources of contamination were identified at the Site during Phase II activities and were the primary focus of Phase III activities:

- Two Fill/Disposal Areas
  - *Right-Of-Way Waste Disposal Area:* Residual TPH, arsenic, copper, and lead in soil/fill.
  - *Railroad Spur Waste Disposal Area:* Residual TPH, SVOCS, and arsenic in soil/fill and, copper and zinc in groundwater.

- Three Underground Storage Tank (UST) Areas
  - *Suspect UST 2 Area:* Residual TPH in soil.
  - *UST 4 GasolinelSolvent Release Area:* Residual TPH in soil; and, VOCs and zinc in groundwater.
  - *Suspect UST 5 Area:* Residual TPH in subsurface soil.

- One Aboveground Storage Tank (AST) Area
  - *AST 2 Area:* Residual TPH and arsenic in subsurface soil.

- Two Areas of Surficial Soil Staining
  - *Surficial Stained Soil Areas I and 2:* Residual TPH and SVOCs from surface releases/railroad tie storage.

The relative locations of each of these release areas are depicted on Figure 2.

Phase III Investigation

Fill Disposal Areas

Right-of-Way Disposal Area

The Phase II investigation identified the presence of widespread fill consisting of three characteristically different material mixes – coal ash, slag-like melted metal/glass, and variable layered plastic resin/darkly stained soil – within the Northeast Utilities overhead electric right-of-way (ROW). A series of test pits were excavated as part of the Phase III investigation to further document the nature and extent of fill material previously identified in this area of the Site. Test pits were excavated to various depths, with most penetrating the existing fill material to its interface with underlying natural soil. Nineteen test pits were excavated within the ROW and vicinity to depths ranging from two to ten feet below existing grade. No borings were advanced in this area as part of the Phase III investigation, however, groundwater from monitoring well MW-3 was collected and analyzed to characterize potential impacts to groundwater.

Fill materials are highly variable across the ROW portion of the Site. In general, the fill includes ash, cinders, glass, automotive parts, metal scraps, ceramic pieces, construction materials (brick, wood, tile), and plastic. The overall character of the fill is of an industrial nature, with no domestic or residential waste observed. The central and southeastern portions of the ROW contain a mixture of the fill materials described above. Automotive wastes (rusted vehicle bodies and buried automotive parts) were observed in the eastern corner of the property, and higher percentages of ash, laboratory glassware, and polymer-like materials were noted in the northwestern portion of the ROW. The western edge of this disposal area overlaps with the petroleum release area associated with UST 4. Similar industrial wastes are also located along the eastern edge of the property, in the Railroad Spur Waste Disposal Area (further described below).

The extent of fill material to the northeast and southeast can be visually identified by the presence of a steep slope. Test pits and borings advanced for the delineation of the nearby UST 4 Area define the fill extent to the northwest and to the southwest. Although no soil samples were analyzed as part of Phase III activities in this area, eleven soil samples were submitted for analysis for various target analytes during Phase II. TPH, arsenic, copper, and lead were detected above applicable RSRs. Lead, measured by the Synthetic Precipitation Leaching Procedure (SPLP), was the only one of the 13 priority pollutant metals that exceeded the applicable Pollutant Mobility Criterion for GB (GB PMC) Areas. No corresponding groundwater impacts of lead above applicable RSR standards were identified at nearby monitoring well MW-3 during the Phase II investigation.

Groundwater was again collected from monitoring well MW-3 during Phase III. The results of the analyses conducted indicate that although measurable TPH and metals concentrations were detected in groundwater in the central portion of the ROW, only zinc was present in a concentration that exceeded an established RSR. Zinc, however, was detected in groundwater across the Site, even in upgradient and cross-gradient wells, indicating that the ROW fill material is not a likely source of this contaminant. Available data suggests that zinc may be present as a naturally occurring element at these concentrations.

Railroad Spur Disposal Area

Similar to the ROW Area, industrial wastes of varying character have been identified along the former railroad spur line. RSR exceedances of TPH, SVOCs, arsenic, copper, lead, nickel and thallium were identified during the Phase II investigation in this area. This area was further characterized during Phase III activities through the excavation of eleven test pits, advancement of two borings and construction of one additional monitoring well. One existing monitoring well was also resampled during this phase of investigation. As previously noted, the Railroad Spur Disposal Area is part of a solid waste disposal corridor that extends from the southern property fence line to the Right-of-Way Disposal Area located along the eastern property border. Test pit results indicated that the fill in this area is primarily limited to areas east of the former railroad spur line, extending approximately ten to fifteen feet to the east, beyond the existing fence line (still on the Site). The edge of the fill is distinguishable by a steep slope, with various fill materials eroding out of certain portions of the embankment. No test pits were excavated beyond the fence line to the east.

Soil analytical results from the Railroad Spur Line Disposal Area exhibit various exceedances of the RSRs for TPH, SVOCs, arsenic, copper, lead and nickel. One soil sample analyzed from this area exhibited TCLP lead concentrations in excess of the federal leachability standards, which classifies this material as hazardous for disposal purposes (if disposed off-site). Groundwater samples analyzed from this area exhibit exceedances of the RSRs for SVOCs, copper and zinc, but not lead or TPH.

■ Underground Storage Tank Investigation

To further investigate for the presence of, and impact from, USTs, additional test pits, soil borings and monitoring well installations were undertaken at the three UST Release Areas previously identified (UST 2, UST 4 and Suspect UST 5). Only one UST was documented during Phase II assessment activities; two additional USTs were discovered during Phase III activities. The first tank to be found is identified herein as UST 6, which is located in the same vicinity as UST 4 and is considered to be part of this release area. The second, newly discovered UST is identified as abandoned UST 7, which is located in the vicinity of the AST Release Area (associated with AST 2), and is considered to be at least a contributing source (prior to its abandonment) of hydrocarbon contamination (UST 7 is further discussed in the AST investigation narrative below).

Suspect UST 2 Area

The Phase II investigation identified evidence of historic gasoline releases in this area that impacted soil at concentrations in excess of applicable RSRs (no groundwater impacts were identified). A UST was reported in this area; however, a concrete pad and subsurface piping prevented access to further investigate the UST during Phase II. Subsequent to the Phase II investigation, the concrete pad was identified as a former electrical transformer switching station, and not necessarily associated with a UST.

During the Phase III investigation, three test pits were excavated in the vicinity of suspect UST 2, adjacent to the existing concrete slab. Given the former presence of electrical transformer equipment on this pad, soil samples were collected for PCB analysis, as well as TPH. TPH was identified in soil in concentrations exceeding the GB PMC and Industrial/Commercial Direct Exposure Criteria (DEC). PCBs were not detected in any of the test pit samples. Five soil borings were advanced to delineate the extent of the gasoline contamination associated with UST 2, with similar exceedances. Contamination of soil in this area is between the depths of approximately four and twelve feet. Groundwater was collected from existing monitoring well MW-2, downgradient of the identified release area and no impacts to groundwater were identified. The extent of gasoline contamination has been defined relative to the UST 2 Release Area.

UST 4/Solvent Release Area

UST 4, a 500-gallon, single-walled steel UST, is located on the east side of the main building. Gasoline and solvent contamination was identified in this area during the Phase II assessment. During the Phase III investigation, four soil borings were advanced and one monitoring well installed outside (downgradient) of the main building to delineate the extent of soil contamination in this area. Additionally, six soil borings and two monitoring wells were installed through the floor inside the building. These interior sampling locations were chosen in an attempt to locate and define the source area of solvent contamination previously detected in groundwater (at monitoring well MW-1). The Phase II investigation yielded no detectable solvent contamination in soil or groundwater to the west (upgradient) of the building, suggesting that the source may be beneath the structure.

Samples from each boring were submitted for analytical testing. TPH was present in three of the exterior borings at concentrations exceeding RSRs (GB PMC and Industrial/Commercial DEC). Low concentrations of VOCs were also detected in soil in this area, however at concentrations below applicable RSRs or for parameters without established RSRs. Groundwater results from the four monitoring wells indicate RSR exceedances in MW-1 (outside) and MW-21 (inside). Zinc was present in both wells in exceedance of the Surface Water Protection Criteria (SWPC). Chlorinated VOCs, including vinyl chloride, 1,1-dichloroethylene and trichloroethylene, were detected in MW-21 at concentrations in excess of both the Residential and Industrial/Commercial Volatilization Criteria (VC).

During reconnaissance for Phase III field work, a previously unknown UST (UST-6) was discovered adjacent to the building, approximately 45 feet to the northwest of UST 4. This tank was accessed and a sample collected. The tank, although unlikely to still be in use (based on the level of effort required to access the tank), appears to contain waste motor oil. A preliminary assessment indicates that the tank is likely of 550- or 1,000-gallon capacity, containing approximately 500 to 1,000 gallons of liquid (water and oil). This tank may be a contributing source of hydrocarbon contamination in this area. A boring advanced immediately downgradient of UST 6 exhibited evidence of hydrocarbon contamination at a depth of eight to twelve feet.

The aerial extent of the gasoline/hydrocarbon contamination in soil is defined upgradient by the USTs (UST 4 and UST 6). The plume extends downgradient to the east, under the Quonset building and towards the ROW Disposal Area. Groundwater impact by TPH contamination is limited to concentrations below applicable RSRs.

Solvent contamination in this area originates from a source (or former source) upgradient of the two USTs, likely beneath the main building, and extends downgradient and overlaps the hydrocarbon contamination in the direction of the Quonset building. The potential solvent source is considered to be the floor drains centrally located in the building. Although no chlorinated VOC exceedances were identified in soil anywhere beneath the structure, several solvent-related analytes were detected. Given the potential for downgradient migration of these contaminants as well as for degradation in soil, the floor drains appear to be a logical potential source.

Suspect UST 5 Area

The Phase II investigation yielded evidence of a gasoline/diesel fuel release in this portion of the Site. Six test pits, eight soil borings and one monitoring well were advanced/installed during Phase III to assist in delineating the extent of gasoline contamination in this area. The test pitting program defined the downgradient extent of contamination and was used in an attempt to locate a UST source. Although no UST was found, sandy fill material and two 10-inch diameter metal ports (possibly from previous tanks) were found. It is possible that any tank(s) occupying this area have been removed and that only residual hydrocarbon contamination remains.

Soil borings were advanced to further delineate the extent of the plume. Of the analyses conducted, only TPH was detected in soils in excess of applicable criteria. The extent of the plume has been delineated both up- and downgradient. From the data obtained, the upgradient portion of the plume abuts or slightly underlies the building wing closest to the release. An inspection of the inside of the building adjacent to the release area did not provide any evidence of a tank being located under the floor of the structure. Indoor air quality and the potential for off-gassing through floor drains have been preliminarily assessed with the use of a photoionization detector (PID) and no evidence of hydrocarbon impact within the building was identified.

Groundwater from two monitoring wells was analyzed to characterize this release area. Only zinc was detected at a concentration in excess of applicable RSRs. None of the RSRs were exceeded for the other analyzed parameters, including VOCs associated with gasoline and TPH.

Aboveground Storage Tank Investigation

A fuel oil release was identified in the vicinity of AST 2 during the Phase II investigation. During the Phase III assessment, eight soil borings and two monitoring wells were advanced/installed in the vicinity of AST 2 in an effort to delineate previously identified hydrocarbon contamination in subsurface soils. The hydrocarbon-contaminated zone is roughly 8' to 12' below grade, indicating that a surface release is not the likely contamination source. During reconnaissance of this area, a previously unidentified UST (UST 7) was found, located generally upgradient of the AST 2 release area. Upon inspection of the UST, it was found to be abandoned in-place and filled with cement. A boring advanced immediately downgradient of the UST exhibited TPH concentrations in excess of the RSRs. This tank likely contributed to the contamination in this area.

Two other borings advanced to the north of AST 2 exhibited TPH concentrations in excess of applicable criteria. As these concentrations are higher than those adjacent to UST 7 (as well as those detected in an intermediate boring located between UST 7 and the higher TPH concentrations), contamination to the north of AST 2 is likely due to a source other than UST 7. The specific source of contamination is unknown, but could be related to historic activities associated with AST 2 and its underground piping system. However, the depth of contamination also suggests the possibility of another UST/subsurface source in this area.

Arsenic was also detected above applicable RSRs in soil within the AST 2 Area. The borings in which the arsenic was detected were advanced into fill material, which extends roughly from the Right-of-Way Disposal Area to the southwestern-most end of the Railroad Spur Disposal Area. The fill along this corridor is highly variable, exhibiting characteristics of different industrial activities documented at the Site, representing separate time periods of disposal activities. The three borings with the arsenic exceedances are located in close proximity to each other, and were all advanced through cinder fill. As only two of these borings exhibited detectable concentrations of TPH, which appear unrelated, it is likely that the arsenic present is due to a source other than the hydrocarbon release.

Groundwater from this area was collected and analyzed for selected analytes (including VOC, TPH and metals). None of the RSRs were exceeded in groundwater in the vicinity of AST 2/UST 7.

■ Surficial Stained Soil

Two surficial stained soil areas with stressed vegetation were identified during previous investigations. Further delineation of these areas was accomplished by the advancement of five soil borings in Stained Soil Area 1 and one additional hand boring in Stained Soil Area 2. This information, combined with the data obtained during Phase II activities allowed for the delineation and characterization of these two areas.

Borings in Area 1 were advanced to depths of two to three feet, the apparent depth of surficial impact. Contamination was visually identified to depths ranging from 1.3 feet to 2.2 feet throughout the area. Analysis of stained soils indicated RSR exceedances of TPH, several SVOCs and arsenic. Neither downgradient monitoring well exhibits detectable arsenic concentrations in groundwater. The hydrocarbon contamination is likely attributable to the use and storage of oil-filled equipment and historic spill occurrences in this area. The arsenic, however, was only detected in elevated concentrations in a small area where scrap railroad ties are stored. Arsenic in soil in this area may be partially attributable to the presence of creosote on the railroad ties.

The boring in Area 2 was advanced to a depth of 1 foot, and visible staining stopped at 0.7'. Previous investigations indicated that the depth of contamination in this area was up to two feet. A sample of this stained material was collected for analysis and its extent was visually identified. Previously analyzed samples from this area detected arsenic and SVOCs above applicable RSRs. Lead was detected during the Phase III sampling event above the GB PMC when analyzed by the Toxicity Characteristic Leaching Procedure (TCLP). Reanalysis of this material by the Synthetic Precipitation Leaching Procedure (SPLP), as allowed under the RSRs, will likely yield a lower concentration. As the SVOC and arsenic concentrations are the remedial regulatory drivers, and the presence of the lead does not affect remediation costs, reanalysis of the sample for SPLP lead was not considered a necessary Phase III activity.

The closest monitoring wells to these surficially stained areas, although installed as part of the Railroad Spur Disposal Area investigation, are MW-4 and MW-19. Monitoring well MW-19 is located downgradient from Surficial Stained Soil Area 1 and neither of the soil contaminants detected in this area in excess of applicable RSRs (arsenic and SVOCs) were detected in groundwater in MW-19. MW-4, located downgradient of Surficial Stained Soil Area 2, exhibits SVOC concentrations in excess of the RSRs. However, SVOC concentrations in soil in the immediate vicinity of MW-4 contain significantly higher SVOC concentrations at a greater depth than those detected in Surfical Stained Soil Area 2. Additionally, no arsenic was detected in groundwater collected from MW-4. As such, the impact to groundwater detected in this well is considered to be from a source other than Surficial Stained Soil Area 2.

■ Supplemental Phase III Groundwater

Following the Phase III investigation, resampling of groundwater in the vicinity of UST 4 was recommended in order to verify a downward trend in chlorinated solvent concentrations in this area. Previously collected data (May 1997 and September 1998) had indicated that trichloroethene and related compounds had been detected, but that concentrations appeared to be decreasing due to natural attenuation. On August 28, 2000, groundwater was collected from monitoring wells MW-1, MW-20, MW-21 and MW-22 and analyzed for VOCs. The results of this round of sampling yielded a vinyl chloride concentration in excess of 30 times the Industrial/Commercial Volatilization Criteria, resulting in a reporting requirement to DEP.

As this area of the building is currently unoccupied, the human exposure to potential indoor air quality issues associated with the vinyl chloride concentrations is limited. Further, as no on-going industrial activities occur in this part of the structure and TCE concentrations have continued to decrease at the Site since 1997, it appears that the likelihood of an on-going source other than residual contaminated soil (i.e., an industrial process or an underground storage tank) is minimal. Vinyl chloride is a degradation product of TCE and other chlorinated solvents. This occurrence may be further evidence of natural attenuation of residual chlorinated compounds in soil and groundwater beneath the building. VHB recommends further evaluation, initially in the form of groundwater resampling, be conducted prior to the identification or implementation of remedial actions, if necessary.

3

Remedial Action Objectives

Introduction

The Remedial Action Objectives (RAOs) presented herein have been developed in consideration of applicable regulatory criteria based on a review of the Site analytical data. The RAOs for a specific area of concern (AOC) are also based on Site specific management/or operations criteria. RAOs at the Remington Rand Site are predicated on both and are summarized in the following paragraphs.

Applicable Soil and Groundwater Criteria

In order to determine if response actions are necessary for any portion of the Site, soil and groundwater analytical results obtained during Phase II and Phase III investigations have been compared to the Connecticut Remediation Standard Regulations (RSRs - Section 22a-133k). The RSRs are summarized (as applicable) herein, but the actual referenced document should be consulted for complete details.

The CTDEP's intent in developing these regulations is to define: minimum remediation performance standards, specific numeric cleanup criteria, and a process for establishing an alternative site-specific standard, where necessary.

CTDEP Residential Direct Exposure Criteria (Residential DEC), Industrial/Commercial Direct Exposure Criteria (Industrial/Commercial DEC), and Pollutant Mobility Criteria for GB Areas (GB PMC) apply to the Site's soil. Although the Site is occupied by an industrial facility, Residential DECs for soil apply to the Site since the RSRs require, whenever feasible, a reduction in residual soil contaminant concentrations to levels that pose no significant human health risk and to account for potential future uses. Under circumstances where remediation activities are prohibitively expensive or technically infeasible, the Site owner has the option to institute an Environmental Land Use Restriction (ELUR; ref. RSR Section 22a-133q-1) limiting future Site use solely for industrial/commercial purposes.

CTDEP Surface Water Protection Criteria (SWPC), Residential Volatilization Criteria (Residential VC), and Industrial/Commercial Volatilization Criteria (Industrial/Commercial VC) apply to the groundwater beneath the Site as a result of its GB groundwater classification. Groundwater analytical results have been compared to Residential VC for reasons similar to those noted above.

Based on the results of the previous investigations, localized areas of residual soil and groundwater contamination exist at the Site in association with identified contaminant sources. Laboratory analytical testing confirmed contaminant concentrations that exceed applicable RSR soil and groundwater standards in AOCs associated with USTs, ASTs, and waste disposal sites.

Areas of Concern and Operable Units

The AOCs are summarized in Table 3-1.

Site Operations/Management RAOs

The City has requested that RAOs include provisions to undertake the remediation in stages, coincident with demolition and redevelopment activities, and in consideration of the day-to-day activities of property tenants.

■ Operable Units

Upon review of the AOCs and their respective media and contaminants, site operations and management RAOs, and for the purpose of identifying and evaluating remedial technologies, VHB has reduced the Site to three operable units (OUs) as follows:

- OU#1 – Solid Waste Disposal Area, which includes the Railroad and ROW disposal areas.
- OU#2 – TPH/Inorganic Soils, which includes all UST, AST, and surficial stained soil areas.
- OU#3 – Site Groundwater.

Table 3-1
Areas of Concern

Areas of Concern	Contaminants	Media	Volume Estimate (Cubic Yards)	R DEC	I/C DEC	Regulatory Exceedances GB PMC	R VC	I/C VC	SWPC
Two Fill/Disposal Areas:									
Right-of-Way Disposal Area	TPH, arsenic, copper, lead	Soil/fill	1,500						X
Railroad Spur Waste Disposal Area	TPH, SVOCs, and arsenic	Soil/fill	400	X	X	X			X
	Copper and zinc	Groundwater	N/A						
Three Underground Storage Tank (UST) Areas:									
Suspect UST 2 Area	TPH	Subsurface soil	1,000	X	X	X			
UST 4 Gasoline/Solvent Release Area	TPH VOCs and zinc	Subsurface soil Groundwater	3,000 N/A	X	X	X	X	X	X (zinc)
Suspect UST 5 Area	TPH	Subsurface soil	2,000	X	X	X			X (zinc)
One Aboveground Storage Tank (AST) Area:									
AST 2 Area	TPH and arsenic	Subsurface soil	950	X	X	X			
Two Areas of Surficial Staining:									
Surficial Stained Soil Areas 1 and 2	TPH and SVOCs	Surface soil	165	X	X	X			

4

Remedial Alternatives

Introduction

The development of optimal remedial alternatives for cost effective remediation of the AOCs and OUs at the Site is broken down as follows:

1. Identification of potential remedial technologies;
2. Screening of technologies with respect to cost, effectiveness, and implementability; and
3. Detailed evaluation of retained alternatives (i.e., those alternatives deemed appropriate based on screening criteria).

The development of remedial alternatives for specific OUs are based on meeting the objectives which, when implemented, are protective of human health and the environment. The remedial alternatives which are identified to be protective of human health and the environment are further scrutinized with respect to cost, Site operations/management objectives, and integration with other remedial programs at the Site.

Groundwater (OU#3) has not been included as part of this plan because groundwater is currently under further investigation. Results to date indicate that groundwater remediation will not likely be required at the Site. GW monitoring will be incorporated into future activities.

Identification and Screening of Remedial Technologies

Remediation technologies which, when applied to the Site, may result in meeting target cleanup levels are screened to determine their applicability. Remedial alternatives are then developed using the technologies deemed applicable. For the purpose of developing a list of applicable remedial technologies, VHB referenced United States Environmental Protection Agency Site Remediation Technology Database. Based on the database review, technology reviews, trade publications, and experience with similar sites, VHB has developed a list of potential technologies for OUs #1 and #2. The technologies have been summarized in Tables 4-1 and 4-2, and are evaluated based on cost, effectiveness, and implementability.

Table 4-1
Technologies for OU#1 – Solid Waste Disposal Area

Technology	Cost	Effectiveness	Implementability	Retained (Y/N)
In-situ bioremediation	Low Cost, minimal equipment and materials required.	Proven effective on TPH soils, however, highly variable condition of fill soils may decrease overall effectiveness.	Relatively simple to install, but may take several years to implement due to variability of fill soils. Treatability study required.	No
Bioventing	Low Cost, minimal equipment and materials required.	Proven effective on TPH soils, however, highly variable condition of fill soils may decrease overall effectiveness.	Relatively simple to install, but may take several years to implement due to variability of fill soils. Treatability study required.	No
Natural Attenuation	Low cost	TPH may degrade within several years, but migration is possible/wetland degradation. Requires monitoring.	None	No
Soil Vapor Extraction (SVE)	Medium cost, increased costs due to off-gas treatment requirements.	Proven effective on TPH soils, however, highly variable condition of fill soils may decrease overall effectiveness.	Relatively easy to install. Off-gas treatment, permits required. Treatability study required.	No
Excavation and Off-site disposal	High Cost due to increased material handling and transportation	Proven effective but does not mitigate long-term liability for material.	Relatively easy. Monitoring during excavation required.	Yes
Excavation and off-site Thermal Treatment	High Cost due to increased material handling and transportation	Effective and minimized liability.	Relatively easy. Monitoring during excavation required. Pretreatment/screening for debris may generate large volumes of untreatable materials.	Yes
Excavation and off-site Asphalt Batch Treatment	High Cost due to increased material handling and transportation	Effective and minimized liability.	Relatively easy. Monitoring during excavation required. Pretreatment/screening for debris may generate large volumes of untreatable materials. Treatability study may be required.	Yes

Table 4-1
Technologies for OU#1 – Solid Waste Disposal Area (continued)

Technology	Cost	Effectiveness	Implementability	Retained (Y/N)
Excavation and on-site Thermal Treatment	High Cost due to increased material handling, and equipment mobilization	Proven effective	Monitoring during excavation and treatment system operation required. Pretreatment/screening for debris may generate large volumes of untreatable materials. Treatability study may be required.	No
Excavation and on-site Biological Treatment	Medium Costs due to excavation adjacent to wetlands.	Proven effective	Relatively easy. Monitoring during excavation required. Pretreatment/screening for debris may generate large volumes of untreatable materials. Treatability study required.	No
Capping	Low Cost, cover materials from on-site sources.	Effective in mitigating exposure. Land use restriction required.	Relatively easy to implement. Must integrate cap relative to wetland. Permits required. Maintenance and monitoring required.	Yes

■ Remedial Alternatives for OU#1

Based upon current information, four compliance options have been identified for management of OU#1:

- Alternative 1A - Soil excavation and off-site disposal of TPH, arsenic, copper and lead-contaminated soil above Residential DEC and GB PMC at a Subtitle C RCRA landfill or similar facility.
- Alternative 2A- Soil excavation and off-site treatment of TPH, arsenic, copper and lead-contaminated soil above Residential DEC and GB PMC at a Thermal Treatment facility.
- Alternative 3A - Soil excavation and off-site treatment of TPH, arsenic, copper and lead-contaminated soil above Residential DEC and GB PMC at an asphalt batch plant.
- Alternative 4A– Capping the solid waste area and implementing an environmental land use restriction.

Alternative 1A - Excavation and Off-site Disposal

Description

This alternative includes the excavation and disposal of approximately 1,900 cubic yards of contaminated soil at a Subtitle C RCRA landfill or similar facility. Air monitoring will be required during excavation. Erosion and sedimentation controls will be implemented to prevent migration of contaminated soils and sediments off-site or to the adjacent wetland. Water treatment and associated discharge permits may be required for perched and/or contaminated water encountered during excavation. Waste characterization and verification sampling would be required. Non-porous debris (scrap metal) may be decontaminated and recycled. Porous debris (concrete, wood) may have to be broken-up before loading. Excavation/removal activities would continue until clean-up goals have been achieved.

Clean fill from certified off-site sources would be placed to backfill excavation areas and allow for proper drainage. The area would then be restored as necessary for subsequent development.

Effectiveness

Removing the contaminated fill in this fashion would eliminate exceedances of RSRs, resulting in unrestricted future use of the ROW and Railroad disposal areas. However, the city would remain liable for the materials placed in the landfill.

Implementability

Can be implemented using standard environmental construction techniques. Could be performed without interfering significantly with current Site operations. Phasing work may be difficult since an excavation may have to remain open increasing backfill, water treatment, and management costs.

Cost

The estimated cost of this first option is $500,000 to $1,000,000. A range is provided because costs will vary depending on volume of debris encountered, volume of water encountered, moisture of waste, and the actual volume of contaminated materials. Segregation of soil according to contaminant concentrations during excavation could also decrease the disposal costs associated with this option. The cost estimate assumes that much of the non-contaminated fill/debris buried in the ROW and railroad spur area can remain in-place.

Alternative 2A - Excavation and Off-Site Thermal Treatment

Description

This alternative includes the excavation and off-site thermal treatment of approximately 1,900 cubic yards of contaminated soil at an approved thermal treatment facility. VHB contacted EMSI in Fort Edward, New York, and used information from their system to perform this analysis.

Excavated soils would be screened at the Site to ensure proper size and homogeneity of materials. The soils would then be transported off-site by approved haulers to the Fort Edward Facility. Once at the treatment facility the soils will be fed through a screen and into the treatment system. The contaminated soils would be treated using a thermal desorption unit. Soils are placed in an indirect fired heated chamber at a prescribed temperature in the absence of oxygen, for a predetermined period. Treatment parameters are established via bench scale testing. Unlike incineration, the soils are not burned, but heated to drive off (volatilize) the contaminants into an air stream which is subsequently condensed and collected or flared off. Treated soils are rendered free of organic contaminants, and become the property of the approved treatment facility.

Air monitoring will be required during excavation, and emission controls may be required for any on-site screening. Erosion and sedimentation controls will be implemented to prevent migration of contaminated soils and sediments off-site or to the adjacent wetland. Water treatment and associated discharge permits may be required for perched and/or contaminated water encountered during excavation. Waste characterization and verification sampling would be required. Non-porous debris (scrap metal) may be decontaminated and recycled. Porous debris (concrete, wood) may have to be broken-up prior to loading. Excavation/removal activities would continue until clean-up goals have been achieved.

Clean fill from certified off-site sources would be placed to backfill excavation areas and allow for proper drainage. The area would then be restored as necessary for subsequent development.

Effectiveness

Removing the contaminated fill in this fashion would eliminate applicable RSR exceedances, resulting in unrestricted future use of the ROW and Railroad disposal areas. Additionally, the city would minimize liability for the treated materials.

Implementability

Can be implemented using standard environmental construction techniques. Off-site thermal treatment systems are available in the region. Remediation could be performed without significantly interfering with current Site operations. Phasing work may be difficult since excavations may have to remain open (awaiting confirmation of analytical results) increasing backfill, water treatment, and management costs.

Cost

The estimated cost of this option is $325,000 to $800,000. A range is provided because costs will vary depending on volume of debris encountered, volume of water encountered, moisture of waste, and the actual volume of contaminated materials. The cost estimate assumes that much of the non-contaminated fill/debris buried in the ROW and railroad spur area can remain in-place.

Alternative 3A- Excavation and Off-Site Asphalt Batching

Description

This alternative includes the excavation and transportation of approximately 1,900 cubic yards of contaminated soil to an asphalt batching facility. The nearest permitted facilities that perform asphalt batching are located in Massachusetts.

Excavated soils would be screened at the site to ensure proper size and homogeneity of materials. The soils would then be transported off-site by approved haulers to the batching facility. Once at the treatment facility the soils will be fed through a screen and into the treatment system. The contaminated soils would be blended with an asphalt emulsion and incorporated into various bituminous products (paving materials). Samples of soils from the Site will require various physical testing (treatability study) prior to batching.

Air monitoring will be required during excavation, and emission controls may be required for any on-site soil screening. Erosion and sedimentation controls will be implemented to prevent migration of contaminated soils and sediments off-site or to the adjacent wetland. Water treatment and associated discharge permits may be required for perched and/or contaminated groundwater encountered during excavation. Waste characterization and verification sampling would be required. Non-porous debris (scrap metal) may be decontaminated and recycled. Porous debris (concrete, wood) may have to be broken-up prior to loading. Excavation/removal activities would continue until clean-up goals have been achieved.

Clean fill from certified off-site sources would be placed to backfill excavation areas and allow for proper drainage. The area would then be restored as necessary for subsequent development.

Effectiveness

Removing the contaminated fill in this fashion would eliminate exceedances of RSRs, resulting in unrestricted future use of the ROW and Railroad disposal areas. Additionally, the city's liability would be mitigated for the treated materials.

Implementability

Can be implemented using standard environmental construction techniques. Off-site asphalt batch facilities are available in the region. Remediation could be performed without interfering significantly with current Site operations. Phasing work may be difficult since an excavation may have to remain open increasing backfill, water treatment, and management costs.

Cost

The estimated cost of this option is $300,000 to $800,000. A range is provided because costs will vary depending on volume of debris encountered, volume of water encountered, moisture of waste, and the actual volume of contaminated materials. The cost estimate assumes that much of the non-contaminated fill/debris buried in the ROW and railroad spur area will remain in-place.

Alternative 4A – Consolidation and Capping

Description

This option includes constructing an impervious cap over the waste areas to prevent contact or migration. The railroad and ROW disposal areas would be cleared and grubbed. The debris and contaminated soils would be consolidated in a central portion of the area and capped to the specifications identified by the State of

Connecticut for solid waste disposal areas. Cap components could include impermeable membranes, geotextile, drainage layers, barrier protection soils, and vegetation layers. The cap would be designed to prevent exposure to contaminants, provide for positive drainage, maintain structural integrity, and minimize the formation and migration of leachate. Additionally, the cap can also be designed to account for future development (green space, parking, etc.). Post-construction operation and maintenance (sampling, inspection, restoration, mowing) will be required.

Effectiveness

The cap can mitigate exposures. Leachable sources (lead hotspots) must be excavated and disposed off-site.

Implementability

Can be implemented using standard environmental construction techniques. Remediation activities could be performed without interfering significantly with current Site operations. Phasing work can be easily accomplished.

This option includes pursuit of a variance from the CTDEP under exemptions provided for Engineered Control of Polluted Soil under RSR Section and 2(f)(2). This approach will require the City to restrict access to the impacted area (e.g., by fencing), or limit direct human contact with the area containing contaminated soil (e.g., by paving the area). RSR provisions will require the City to institute an Environmental Land Use Restriction (ELUR) on the ROW and Railroad Spur Area, representing an encumbrance on the Site.

The Engineered Control of Polluted Soil variance may be granted under circumstances where:

"...the cost of remediating the polluted soil at such release area is significantly greater than the cost of installing and maintaining an engineered control for such soil and conducting ground-water monitoring at such release area [in accordance with the groundwater remediation standards], and ...that the significantly greater cost outweighs the risk to the environment and human health if the engineered control fails to prevent the mobilization of a substance in the soil or human exposure to such substance."

The first part of this requirement appears to be true regarding the Site (active remediation costs significantly outweighing the cost of engineering controls), particularly since engineering controls would likely only include capping or paving. Given the aforementioned engineering controls, failure would increase accessibility to the soil from a direct exposure standpoint; however, as the future Site use will remain industrial/commercial, an argument can be made that the incremental increase in risk to adult workers is minimal, if any.

Cost

The cost to implement this alternative is approximately $250,000.

Table 4-2
Technologies for OU#2 – USTs, ASTs, and Surficial Stained Areas

Technology	Cost	Effectiveness	Implementability	Retained (Y/N)
In-situ bioremediation	Low Cost, minimal equipment and materials required.	Proven effective on TPH soils. On-going source removal required. UST removal required.	Relatively simple to install but requires source removal. Treatability study required.	No
Bioventing	Low Cost, minimal equipment and materials required.	Proven effective on TPH soils. On-going source removal required. UST removal required.	Relatively simple to install but requires source removal. Treatability study required.	No
Natural Attenuation	Low cost	TPH may degrade within several years. Source must be removed. UST removal required. Requires monitoring.	None	No
Soil Vapor Extraction (SVE)	Medium cost, increased costs due to off-gas treatment requirements.	Proven effective on TPH soils, however, source must be removed. UST removal required.	Relatively easy to install. Off-gas treatment, permits required. Treatability study required.	No
Excavation and Off-site disposal	High Cost due to increased material handling and transportation	Proven effective but does not mitigate long-term liability for material.	Relatively easy. Monitoring during excavation required.	Yes
Excavation and off-site Thermal Treatment	High Cost due to increased material handling and transportation	Effective and minimized liability.	Relatively easy. Monitoring during excavation required. Pretreatment/screening for debris may generate large volumes of untreatable materials.	Yes

Table 4-2
Technologies for OU#2 – USTs, ASTs, and Surficial Stained Areas (continued)

Technology	Cost	Effectiveness	Implementability	Retained (Y/N)
Excavation and off-site Asphalt Batch Treatment	High Cost due to increased material handling and transportation	Effective and minimized liability.	Relatively easy. Monitoring during excavation required. Pretreatment/screening for debris may generate large volumes of untreatable materials. Treatability study may be required.	Yes
Excavation and on-site Thermal Treatment	High Cost due to increased material handling, and equipment mobilization	Proven effective	Monitoring during excavation and treatment system operation required. Pretreatment/screening for debris may generate large volumes of untreatable materials. Treatability study may be required.	No
Excavation and on-site Biological Treatment	Medium Costs due to excavation adjacent to wetlands.	Proven effective	Relatively easy. Monitoring during excavation required. Pretreatment/screening for debris may generate large volumes of untreatable materials. Treatability study required.	Yes
Capping	High cost due to large volume of fill required.	Effective in mitigating exposure but may not prevent migration. Land use restriction required.	Relatively easy to implement, but does not lend itself to redevelopment. Consumes too much area. Requires O&M.	No

■ Remedial Alternatives for OU#2

The alternatives retained assume that existing USTs must be removed prior to remedial implementation. Based upon current information, four compliance options have been identified for management of OU#2:

- Alternative 1B - Soil excavation and off-site disposal of TPH contaminated soil above Residential DEC and GB PMC at a Subtitle C RCRA landfill or similar facility.

- Alternative 2B - Soil excavation and off-site treatment of TPH contaminated soil above Residential DEC and GB PMC at a Thermal Treatment facility.
- Alternative 3B - Soil excavation and off-site treatment of TPH contaminated soil above Residential DEC and GB PMC at an asphalt batch plant.
- Alternative 4B– Soil excavation and on-site biological treatment of TPH contaminated soil above Residential DEC and GB PMC.

Alternative 1B - Excavation and Off-site Disposal

Description

This alternative includes the excavation and disposal of approximately 7,100 cubic yards of contaminated soil at a Subtitle C RCRA landfill or similar facility. Excavation work will commence by removing clean soils above the USTs. The USTs will then be drained, purged, and removed using industry standard practices for UST removals. Recovered product will be sampled and recycled, as appropriate.

Air monitoring will be required during excavation. Erosion and sedimentation controls will be implemented to prevent migration of contaminated soils and sediments. Water treatment and associated discharge permits may be required for perched and/or contaminated water encountered during excavation. Waste characterization and verification sampling would be required. Non-porous debris (scrap metal/tanks) may be decontaminated and recycled. Porous debris (concrete, wood) may have to be broken-up prior to loading. Excavation/removal activities would continue until clean-up goals have been achieved.

Clean fill from certified off-site sources would be used to backfill excavation areas and allow for proper drainage. The area would then be restored as necessary for subsequent development.

Effectiveness

Removing the contaminated fill in this fashion would eliminate RSR exceedances, resulting in unrestricted future use of the UST, AST, and surface stained soil areas. However, the City would remain liable for the materials placed in the landfill.

Implementability

Can be implemented using standard environmental construction techniques. Remediation could be performed without interfering significantly with current Site operations. Phasing work may be done by remediating the Site one area at a time.

Cost

The estimated cost of this option is $750,000 to $1,300,000. A range is provided because costs vary depending on volume of debris encountered, volume of water encountered, moisture of waste, and the actual volume of contaminated materials. Segregation of soil according to contaminant concentrations during excavation could minimize the disposal costs associated with this option.

Alternative 2B - Excavation and Off-Site Thermal Treatment

Description

This alternative includes the excavation and off-site thermal treatment of approximately 7,100 cubic yards of contaminated soil at an approved thermal treatment facility. VHB contacted EMSI in Fort Edward, New York, and used information for their system to perform this analysis.

Excavation work will commence by removing clean soils above the USTs. The USTs will then be drained, purged, and removed using industry standard practices for UST removals. Recovered product will be sampled and recycled, as appropriate. Excavated soils would be screened at the Site to ensure proper size and homogeneity of materials. The soils would then be transported off-site by approved haulers to the Fort Edward facility. Once at the treatment facility the soils will be fed through a screen and into the treatment system. The contaminated soils would be treated utilizing a thermal desorption unit. Soils are placed in an indirect fire-heated chamber at a prescribed temperature in the absence of oxygen, for a predetermined period. Treatment parameters are established via bench scale testing. Unlike incineration, the soils are not burned, but heated to drive off (volatilize) the contaminants into an air stream which is subsequently condensed and collected or flared off. Treated soils are rendered free of organic contaminants, and remain the property of the approved treatment facility.

Air monitoring will be required during excavation. Erosion and sedimentation controls will be implemented to prevent migration of contaminated soils and sediments. Water treatment and associated discharge permits may be required for perched and/or contaminated water encountered during excavation. Waste characterization and verification sampling would be required. Non-porous debris (scrap metal/tanks) may be decontaminated and recycled. Porous debris (concrete, wood) may have to be broken-up prior to loading. Excavation/removal activities would continue until clean-up goals have been achieved.

Clean fill from certified off-site sources would be placed to backfill excavation areas and allow for proper drainage. The area would then be restored as necessary for subsequent development.

Effectiveness

Removing the contaminated fill in this fashion would eliminate RSR exceedances, resulting in unrestricted future use of the UST, AST, and surface stained soil areas. Additionally, the City's liability would be mitigated because the contaminants will be destroyed.

Implementability

Can be implemented using standard environmental construction techniques. Off-site thermal systems are available in the region. Remediation could be performed without interfering significantly with current Site operations. Phasing work may be done by remediating the Site one area at a time.

Cost

The estimated cost of this option is $540,000 to $750,000. A range is provided because costs vary depending on volume of debris encountered, volume of water encountered, moisture of waste, and the actual volume of contaminated materials.

Alternative 3B - Excavation and Off-Site Asphalt Batching

Description

This alternative includes the excavation and transportation of approximately 7,100 cubic yards of contaminated soil to an asphalt batching facility. The nearest permitted facilities which perform batching are located in Massachusetts.

Excavation work will commence by removing clean soils above the USTs. The USTs will then be drained, purged, and removed using industry standard practices for UST removals. Excavated soils would be screened at the Site to ensure proper size and homogeneity of materials. The soils would then be transported off-site by approved haulers to the batching facility. Once at the treatment facility the soils will be fed through a screen and into the treatment system. The contaminated soils would be blended with an asphalt emulsion and incorporated into various bituminous products (pavement materials). Samples of soils from the Site will require various physical testing (treatability study) prior to batching.

Air monitoring will be required during excavation, and emission controls may be required for any on-site soil screening. Erosion and sedimentation controls will be implemented to prevent migration of contaminated soils and sediments. Water treatment and associated discharge permits may be required for perched and/or contaminated water encountered during excavation. Waste characterization and verification sampling would be required. Non-porous debris (scrap metal) may be decontaminated and recycled. Porous debris (concrete, wood) may have to be broken-up prior to loading. Excavation/removal activities would continue until clean-up goals have been achieved.

Clean fill from certified off-site sources would be placed to backfill excavation areas and allow for proper drainage. The area would then be restored as necessary for subsequent development.

Effectiveness

Removing the contaminated fill in this fashion would eliminate exceedances of RSRs, resulting in unrestricted future use of the UST, AST, and surface stained soil areas. Additionally, the City's liability would be mitigated due to the destruction of the contaminants.

Implementability

Can be implemented using standard environmental construction techniques. Off-site asphalt batch facilities are available in the region. Phasing work may be done by remediating the Site one area at a time.

Cost

The estimated cost of this option is $500,000 to $700,000. A range is provided because costs will vary depending on volume of debris encountered, volume of water encountered, moisture of waste, and the actual volume of contaminated materials.

Alternative 4B - On-Site Bioremediation

Description

This alternative includes the excavation and on-site biological treatment of approximately 7,100 cubic yards of contaminated soil. Excavation work will commence by removing clean soils above the USTs. The USTs will then be drained, purged, and removed using industry standard practices for UST removals. Recovered product will be sampled and recycled, as appropriate.

Bioremediation involves the conversion of organic compounds (in this case, TPH) by microorganisms to carbon dioxide, water, biomass and inorganic salts. Excavated soils deemed contaminated will be placed in a "biocell" or cells located on-site. Bioremediation can be performed in a closed cell or "biopile" or on an open flat surface. The on-site treatment unit(s) will be constructed based on the results of pilot testing of the Site soils and an engineering analysis to determine optimal treatment parameters. In general, biological treatment options include an impermeable surface to stage the soils in a secure area. The surface is sloped to collect runoff. The soils may then be covered or exposed to the atmosphere based on the contaminant characteristics and treatment parameters. The biocell is then dosed with prescribed amounts of fertilizer that may be supplemented by water and air to enhance contaminant biodegradation. Off-gas treatment for highly volatile soil treatment may be required. Treatment periods may vary from 3 to 6 months.

Air monitoring will be required during excavation. Erosion and sedimentation controls will be implemented to prevent migration of contaminated soils and sediments. Water treatment and associated discharge permits may be required for perched and/or contaminated water encountered during excavation. Waste characterization and verification sampling would be required. Non-porous debris (scrap metal/tanks) may be decontaminated and recycled. Porous debris (concrete, wood) may have to be broken-up prior to loading. Excavation/removal activities would continue until clean-up goals have been achieved.

Clean fill from certified off-site sources would be placed to backfill excavation areas and allow for proper drainage. The area would then be restored as necessary for subsequent development.

Effectiveness

Bioremediation is a proven, effective remediation technology for TPH and SVOC contaminated soils. It may require some supplemental off-site disposal and treated soils could be suitable for backfill and re-use on-site. The long-term liability would be minimized.

Implementability

Can be implemented using standard environmental construction techniques, and is ideally suited for phased remediation approach. Outbuildings on-site may serve as supplemental secure treatment areas. This may require permit(s) from CTDEP.

Cost

The estimated cost of this alternative is $300,000 to $400,000. A range is provided because costs will vary depending on volume of debris encountered, volume of water encountered, moisture of waste, and the results of treatability testing.

5

Recommended Remedial Alternatives

Introduction

The recommended remedial alternatives for the Site are based on the preceding analysis and consideration with respect to the interdependency of the OUs.

The recommended alternative for OU#1 (Railroad and ROW disposal areas) is a combination of Alternatives 1A and 4A, consolidation and capping of the wastes supplemented by excavation and off-site disposal of lead contaminated soils.

The recommended alternative for OU#2 (UST, AST, and Stained soils areas) is Alternative 4B – On-Site Bioremediation.

These alternatives are effective in protecting human health and the environment, and have a good probability of meeting CTDEP requirements within a reasonable time frame. The alternatives are implementable without significantly disturbing existing Site operations, and are cost-effective and practical. The alternatives collaboratively are amenable to a phased approach and will allow for the subsequent redevelopment of the east portion of the Site for green space and/or increased parking.

The interdependency of the OUs lend themselves to these alternatives. The impermeable membrane to be installed as a cover for the cap can serve as an on-site contained treatment cell for the bioremediation of soils from OU#2. Conversely, treated soils from OU#2 will serve as a barrier protection layer for the liner installed to cap OU#1. The interdependency of these alternatives provides significant cost savings.

Specifically, after the Railroad and ROW areas have been consolidated and hotspot soils removed, the area will be appropriately graded and an impermeable membrane will be installed to allow the placement of TPH contaminated soils from OU#2. The TPH soils will be treated on the membrane, runoff will be captured and reintroduced to the media until cleanup goals have been achieved. When biotreatment is complete, the soils will be dispersed over that portion of the liner as barrier protection, and either a new lift or new area is started for treatment and closure.

Details of Recommended Alternative for OU#1

■ Excavation and Off-Site Disposal of Lead Contaminated Soil/Fill

The first step in the remediation of the ROW and RR areas is to remove lead contamination which exceeds regulatory criteria and is susceptible to leaching. The hotspots identified in Phase III, two locations in both the ROW and RR areas, will be reestablished via field survey. An excavator will be used to expose and remove the contaminated soils. Due to the limited quantities of soils anticipated, the contaminated materials will be directly loaded into lined trucks for off-site disposal. Materials will be disposed as hazardous waste at an approved disposal facility. A waste profile/characterization sample will be required prior to disposal. Air monitoring will be required at the point of excavation and at the perimeter of the Site. Verification samples will be required at the excavation base and sidewalls. Verification sampling will be performed in accordance with CTDEP protocols. Samples will be analyzed for total lead and SPLP lead with cleanup goals of 500 and 0.15 parts per million (ppm), respectively. The excavations shall remain open until analytical results are available. Upon receipt of analytical results which indicate cleanup goals have been achieved, consolidation of wastes will commence.

■ Consolidation of Wastes

Both solid waste disposal areas will be cleared and grubbed prior to consolidation. Cleared and grubbed materials will be chipped/mulched and stockpiled on-site for later use during Site restoration. Erosion and sedimentation controls will be placed upgradient and downgradient of the proposed work areas to prevent migration of soils/sediment or wastes from the work area.

Waste from the RR area will be excavated and transported to the proposed cap area adjacent to the ROW area. Waste removal limits in the RR area will be performed based on visual assessment and handheld screening instrument response. Air monitoring will be performed at the point of excavation, and at the Site perimeter. Verification sampling may be used to supplement visual assessment.

Upon completion of waste removal from the RR area, the area will be regraded to allow for positive drainage and subsequent placement of select fill. It is assumed that this area may be redeveloped as a parking area, therefore, some backfilling may be required to provide for subsequent finished grades. Backfill for this area may be provided from on-site sources which have been properly treated as part of OU#2.

Soils use on Site is subject to a soil balance analysis to determine how much, if any, additional fill material is required from off-site sources.

Waste transferred to the ROW area will be consolidated and graded in conjunction will soils/fill/wastes from the ROW area to the grades and limits defined in the design plans and specifications. Slope, thickness, permeability, and configuration of the cap system shall be in compliance with CTDEP Solid Waste Management Regulations. In general the material to be consolidated will be screened, spread and graded with a bulldozer and compacted. Large materials and debris will be placed in the cap area first. Fine soils (separated by screening) will be placed in the final foot below finished subgrade. Once proposed subgrades have been established, the waste will be covered with a geotextile and impermeable High Density Polyethylene (HDPE) membrane. A drainage netting will then be placed over the HDPE. At this point, the cap will be ready for cover soils.

■ Capping

Cover soils will be provided in stages from on-site soils from OU#2 as the soils are batch-treated biologically on the liner or at other locations on-site. The details of cover soil treatment are described in subsequent sections.

Cover soils will be placed to a minimum thickness of 2-feet over the drainage layer. The top six-inches of cover soils will be amended with the mulch generated during clearing and grubbing and seeded to provide a vegetative layer. Erosion control matting or additional protection may be required during re-vegetation. Once the cap is complete, maintenance is performed by cutting the grass and inspecting the cap for holes and/or seeps/failures once a year. Groundwater monitoring will be conducted in conformance with applicable regulations.

Details of Recommended Alternative for OU#2

■ Excavation of Contaminated Soils and Tank Removal

The first step in the remediation of the UST, AST, and Stained soils areas is to delineate the excavation limits. The hotspots identified in Phase III and previous investigations will be reestablished via field survey. Some areas will require limited demolition (concrete berms or slabs) and or tank removal (AST area) prior to excavation. Clean demolition debris (concrete) will be sized and staged on-site for use as fill. Excavations within each area will commence at the center point of the suspected tank location or contaminated area. An excavator will be used to expose and remove clean topsoil and overburden soils. The clean materials will be staged on-site and protected from degradation or cross-contamination until they are needed for Site restoration. Air monitoring will be performed at the excavation point, and at the Site perimeter.

Upon intercepting the USTs, soils will be screened using a handheld photo-ionization detector (PID) to determine the disposition of materials. Clean materials will be staged separately from contaminated soils. UST lines will be disconnected and purged with an inert gas (nitrogen). Care will be taken to ensure capture of any free liquids. The UST will be drained and purged in place. Recovered liquids, if any, will be staged in approved containers with secondary containment on-site. Recovered liquids will be sampled (TPH analysis/Hydrocarbon fingerprint) and subsequently recycled, sold, or disposed, pending analytical results.

After the tank has been drained and purged, soils adjacent to the tank will be excavated to allow for tank removal. Instrument screening of soils will be performed to ensure proper characterization and disposition. Once removed, the tank will be staged on-site for decontamination, fire marshal inspection, and subsequent salvage or dismantling and off-site disposal. Excavation of contaminated soils per visual assessment and instrumentation response will continue until satisfactory removal or proposed excavation limits have been reached. Groundwater may be encountered during excavation. Provisions for dewatering, treatment and discharge shall be prepared. Treatment may consist of an oil/water separator, carbon, and particulate filters; discharge can be performed under a permit to the local publicly owned treatment works (POTW) or surface water course.

Verification sampling of excavation base and sidewalls is required. Verification sampling will follow CTDEP protocols.

■ On-Site Biological Treatment

Certain OU#2 soils may require containment and/or different biological treatment techniques. A treatability study will be conducted on contaminated soils from the Site to examine the physical and chemical characteristics of the soil, and establish initial treatment parameters. Specific soil properties and characteristics to be determined in the study include:

- Particle size distribution
- Soil homogeneity and Isotropy
- Bulk Density
- Particle Density
- Permeability
- Moisture
- pH
- Oxidation-reduction potential (redox)
- Octanol-water partition coefficient

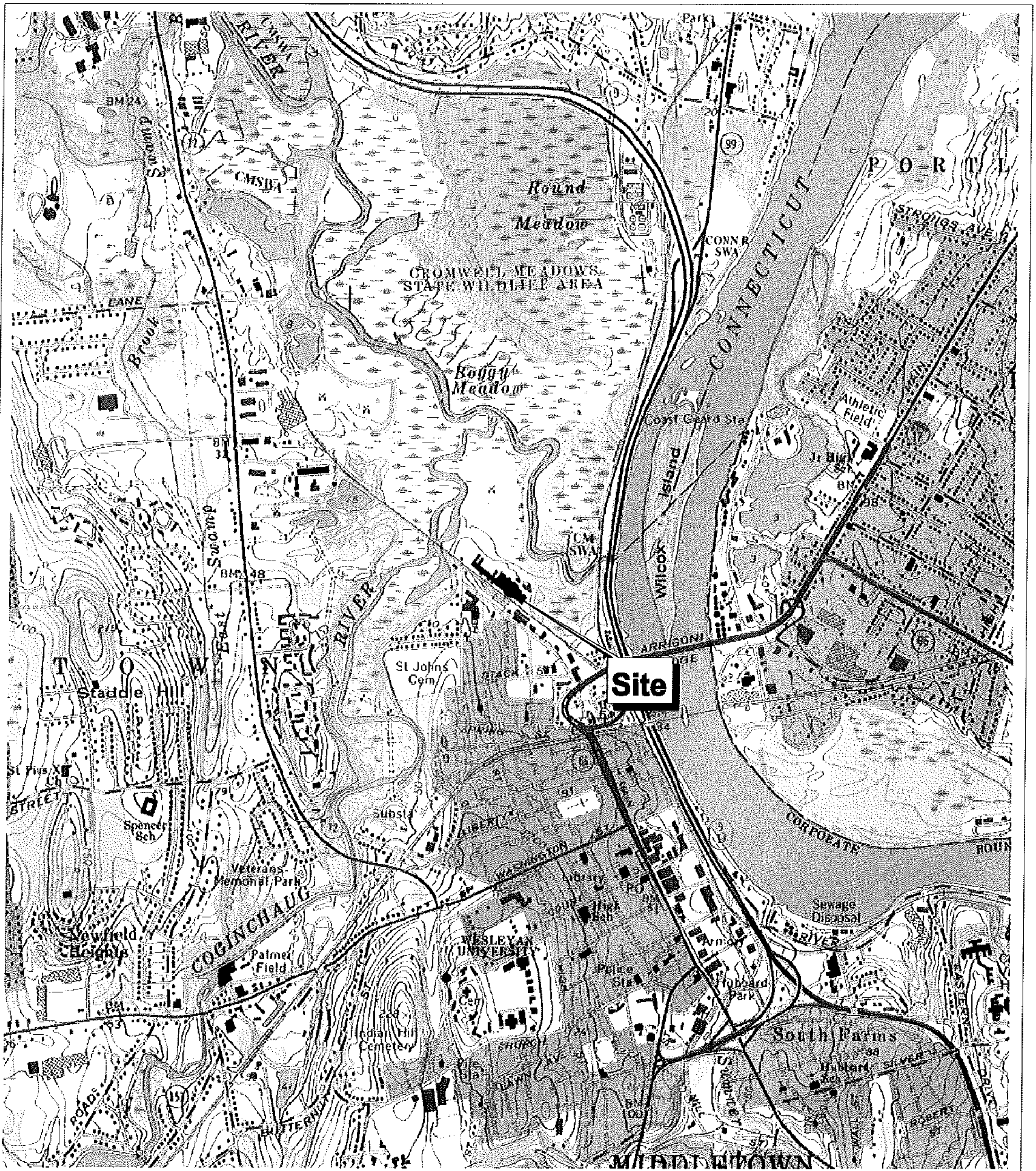
Table 5-1: Remington Rand - COST ESTIMATE
Recommended Alternative for OU#1 - Consolidation and Capping

Item	Units	Qty's	Unit Price	Extended Price	Source	Comment
Engineering - Oversight & Report						
TP-4	Hour	80	100.00	$8,000		
TP-1	Hour	40	155.00	$6,200		
Surveyor-2 - Inspector	Hour	200	70.00	$14,000		
TP-7	Hour	40	75.00	$3,000		
Administration	Hour	20	55.00	$1,100		
Data Validation	per sample	10	22.00	$220		
Copies	page	500	0.07	$35		
Shipping	package	50	45.00	$2,250		
Communications	minutes	500	0.50	$250		
Misc. Report Production	lot	1	0.00	$0		
Subtotal				**$35,055**		
TOTAL COST				**$286,539**		
TOTAL + CONTINGENCY		**25%**	**71,634.78**	**$358,174**		
*** = assumes cover soil from on-site sources**						

Table 5-1: Remington Rand - COST ESTIMATE
Recommended Alternative for OU#2 - Excavation and On-Site Biotreatment

Item	Units	Qty's	Unit Price	Extended Price	Source
Engineering - Design					
T-4	Hour	40	98.00	$3,920	Engineers Estimate
T-4	Hour	40	98.00	$3,920	Engineers Estimate
T-5	Hour	40	94.00	$3,760	Engineers Estimate
T-1	Hour	40	150.00	$6,000	Engineers Estimate
Surveyor-2 - CAD	Hour	20	70.00	$1,400	Engineers Estimate
TP-7 - GIS	Hour	20	75.00	$1,500	Engineers Estimate
Administration	Hour	20	55.00	$1,100	Engineers Estimate
Copies	page	2500	0.07	$175	Engineers Estimate
Shipping	package	20	45.00	$900	Engineers Estimate
Communications	minutes	500	0.50	$250	Engineers Estimate
Drawing & Specification Production	lot	1	15,000.00	$15,000	Engineers Estimate
Advertisement and Bid Support	lot	1	10,000.00	$10,000	Engineers Estimate
Subtotal				**$47,925**	
Construction - Excavation					
Mobilization/demobilization	LS	1	2,500.00	$2,500	Engineers Estimate
Strip clean topsoil	CY	100	1.50	$150	2000 Nat'l. Const. Dbase
Concrete Demolition	SF	500	3.00	$1,500	2000 Nat'l. Const. Dbase
Excavation of contaminated soil	CY	7100	9.26	$65,746	ENR Oct 2000
Material Handling	CY	7100	1.00	$7,100	2000 Nat'l. Const. Dbase
Tank removal	EA	4	15,000.00	$60,000	Engineers Estimate
Misc. Disposal	LS	1	1,000.00	$1,000	Engineers Estimate
Backfill from off-site source	CY	3000	9.26	$27,780	ENR Oct 2000
Backfill from on-site sources	CY	4100	1.00	$4,100	Engineers Estimate
Air Monitoring	LS	1	2,500.00	$2,500	Engineers Estimate
Characterization Sampling	EA	5	400.00	$2,000	Engineers Estimate
Verification Sampling	EA	100	100.00	$10,000	Engineers Estimate
Subtotal				**$184,376**	
Construction - Bioremediation*					
Mobilization/demobilization	LS	1	1,000.00	$1,000	Engineers Estimate
Set-up Cell(s)	LS	1	2,500.00	$2,500	Engineers Estimate
HDPE Cover	SY	1000	0.10	$100	Quote - In Line Plastic
Geotextile	SF	5000	0.10	$500	Quote - In Line Plastic

Figures



Source: U.S.G.S Quandrangle Middletown , Conn. (1992)

Vanasse Hangen Brustlin, Inc.

Quandrangle Location

N

0 1000 2000 Feet

Figure 1
Site Location Map
Remington Rand
Middletown, Connecticut

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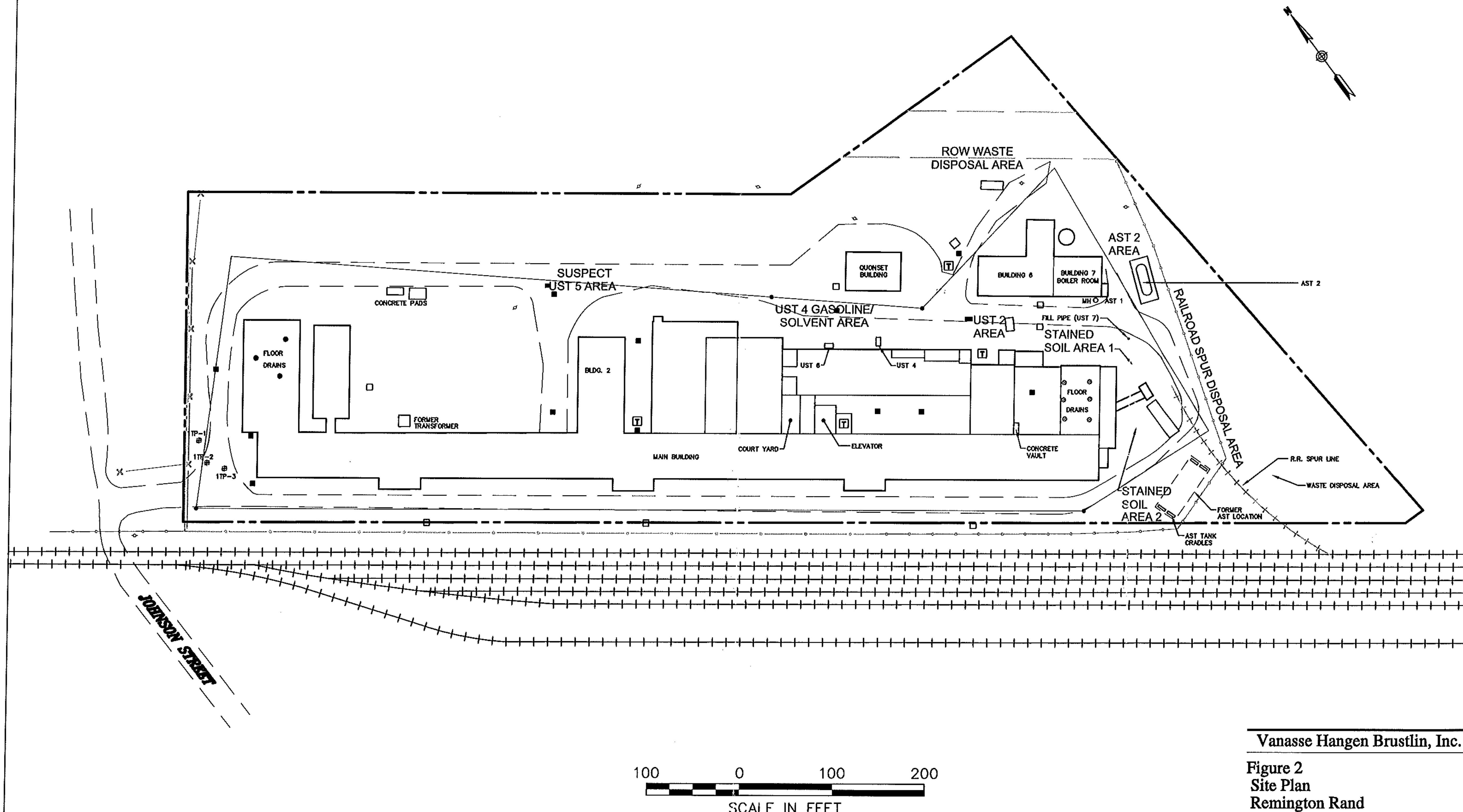

Vanasse Hangen Brustlin, Inc.

Figure 2
Site Plan
Remington Rand
Middletown, CT

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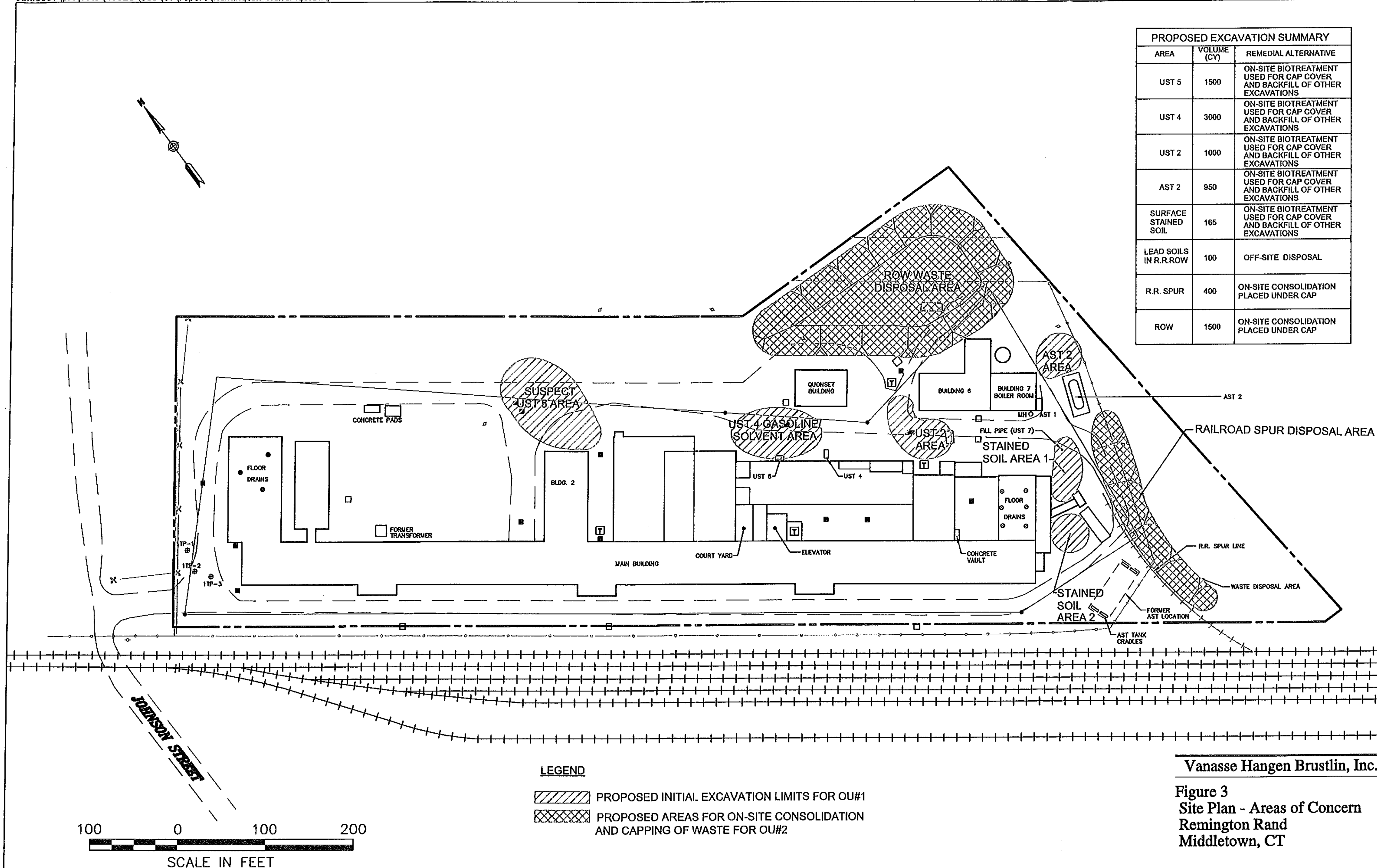

PROPOSED EXCAVATION SUMMARY

AREA	VOLUME (CY)	REMEDIAL ALTERNATIVE
UST 5	1500	ON-SITE BIOTREATMENT USED FOR CAP COVER AND BACKFILL OF OTHER EXCAVATIONS
UST 4	3000	ON-SITE BIOTREATMENT USED FOR CAP COVER AND BACKFILL OF OTHER EXCAVATIONS
UST 2	1000	ON-SITE BIOTREATMENT USED FOR CAP COVER AND BACKFILL OF OTHER EXCAVATIONS
AST 2	950	ON-SITE BIOTREATMENT USED FOR CAP COVER AND BACKFILL OF OTHER EXCAVATIONS
SURFACE STAINED SOIL	165	ON-SITE BIOTREATMENT USED FOR CAP COVER AND BACKFILL OF OTHER EXCAVATIONS
LEAD SOILS IN R.R.ROW	100	OFF-SITE DISPOSAL
R.R. SPUR	400	ON-SITE CONSOLIDATION PLACED UNDER CAP
ROW	1500	ON-SITE CONSOLIDATION PLACED UNDER CAP

LEGEND

PROPOSED INITIAL EXCAVATION LIMITS FOR OU#1

PROPOSED AREAS FOR ON-SITE CONSOLIDATION AND CAPPING OF WASTE FOR OU#2

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Figure 3
Site Plan - Areas of Concern
Remington Rand
Middletown, CT