Feasibility Study Report

Former Town of Clinton Landfill
Old Nod Road
Clinton, Connecticut

June 2014

Prepared for
Town of Clinton, Connecticut
54 East Main Street
Clinton, Connecticut 06413

Prepared by

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ACRONYMS

DEEP	Connecticut Department of Energy and Environmental Protection
DEC	Direct Exposure Criteria
DECD	Department of Economic and Community Development
DQA	Data Quality Assessments
DQO	Data Quality Objective
DUE	Data Usability Evaluations
ESA	Environmental Site Assessment
ETPH	Extractable Total Petroleum Hydrocarbons
FBG	Feet Below Grade
GIS	Geographic Information System
IDEC	Industrial/Commercial Direct Exposure Criteria
IVC	Industrial/Commercial Volatilization Criteria
LEA	Loureiro Engineering Associates
LEP	Licensed Environmental Professional
LNAPL	Light Non-Aqueous Phase Liquid
MDC	Metropolitan District Commission
NAPL	Non-Aqueous Phase Liquid
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethylene
PCSA	Potential Contaminant Source Area
PMC	Pollutant Mobility Criteria
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RCP	Reasonable Confidence Protocol
RCRA	Resource Conservation and Recovery Act

RDEC	Residential Direct Exposure Criteria
RSR	Remediation Standard Regulation
RVC	Residential Volatilization Criteria
SCGD	Site Characterization Guidance Document
SPLP	Synthetic Precipitation Leaching Procedure
SVOC	Semivolatile Organic Compound
SWPC	Surface Water Protection Criteria
TCE	Trichloroethylene
TPH	Total Petroleum Hydrocarbons
USGS	United States Geological Survey
UST	Underground Storage Tank
VC	Volatilization Criteria
VOC	Volatile Organic Compound

UNITS

µg/kg	micrograms per kilogram
µg/m^3	micrograms per cubic meter
mg/kg	milligrams per kilogram
mg/l	milligrams per liter
mg/m^3	milligrams per cubic meter
ppmV	parts per million by volume

1. INTRODUCTION

The team of Payne Environmental, LLC (Payne) and Loureiro Engineering Associates, Inc. (Loureiro) was retained by the Town of Clinton (the Town) in April 2014 to perform a Feasibility Study and Remedial Options Evaluation at the former Town landfill, located at Old Nod Road in Clinton, Connecticut (hereinafter referred to as the Site).

This Feasibility Study report has been prepared to document the findings of the Feasibility Study, and to provide the Town with planning level cost estimates associated with three identified remedial options for the Site. It is anticipated that the findings of this report may be utilized by the Town to support an application for a municipal brownfield remediation and redevelopment grant from OBRD. The Feasibility Study was funded by a $200,000 municipal brownfield assessment grant provided by the Connecticut Department of Economic and Community Development (DECD) Office of Brownfields Remediation and Development (OBRD).

1.1 Purpose and Scope

The Payne / Loureiro team performed supplemental environmental and geotechnical investigations, preliminary engineering, and remedial options evaluations for the Site from April 2014 through June 2014. The primary goal of the work performed was to evaluate the feasibility and estimated cost of performing landfill remediation / closure activities that incorporate construction of a twin ice hockey / skating facility on Site. The scope of work for the project included completion of the following tasks:

- Supplemental geotechnical investigation to evaluate bedrock depth and competency;
- Supplemental environmental sampling and analysis to confirm current concentrations of contaminants of concern in soil, groundwater, surface water, and soil vapor;
- Site survey work to confirm subject parcel boundaries, proposed ice rink facility, and perform desktop site grading for proposed landfill closure;
- Structural engineering analysis of geotechnical survey information and development of proposed ice rink facility foundation requirements;
- Review historical reports, identify remedial options, and develop preliminary remedial cost estimates for each option;

1.2 Report Organization

This report has been organized such that tables, figures and appendices are presented following the text portion of the main body of the report. The following is a summary of the information provided in each section of this Feasibility Study report:

- Background information is provided in Section 2, including a brief summary of historical site uses, previous environmental investigations, regulatory requirements, and recent remediation and redevelopment efforts.
- A description of the Site and the environmental setting of the Site is provided in Section 3.
- A summary of the supplemental subsurface investigation and environmental sampling activities is provided in Section 4.
- Site Development constraints, landfill closure requirements, existing cover material descriptions, proposed cover material, and overall closure approach are summarized in Section 5.
- Geotechnical and Structural items of concern are presented in Section 6.
- A remedial options evaluation is provided in Section 7.
- Conclusions and recommendations are provided in Section 8.

2. BACKGROUND INFORMATION

2.1 Historical Site Use

Historically the Site was utilized as a municipal solid waste landfill from approximately 1960 until 1979. During that time municipal solid waste, as well as industrial waste generated by local businesses, were disposed at the landfill. In 1980, the Town of Clinton placed an earthen cap over the landfill and the Site has been unused since that time.

2.2 Previous Environmental Investigations

Previous environmental investigations were completed at the Site between 1974 and 2012 to evaluate environmental conditions at the former landfill, and to delineate landfill leachate impacts at the Site and surrounding area. Pollutants detected in groundwater samples collected from bedrock and overburden wells included volatile organic compounds (VOCs) (mainly benzene), ammonia, iron and manganese. Suspected primary routes of exposure were identified as potential groundwater consumption, contact with nearby surface water, and direct contact with contaminated soil and exposed solid waste at the landfill. Sampling of nearby residential drinking water supply wells confirmed that a number of nearby residential supply wells were impacted by landfill leachate. As such, the impacted properties were connected to a public water supply system.

2.3 Regulatory Requirements

Based on the findings of previous investigations, the Connecticut DEP (now known as the Department of Energy and Environmental Protection / DEEP) issued a Consent Order (WC 4956) to the Town in June of 1990. The DEP Consent Order requires that the Town complete an investigation and remediation of the former landfill. Based on that order an investigation of the effects of the landfill on groundwater and surface was completed by Metcalf and Eddy, Inc. Metcalf and Eddy also performed an evaluation of options to close the landfill in a manner that would minimize the contamination emanating from the landfill. However, to date the Town has not implemented any of the recommended landfill closure options due to municipal financial constraints. Based on the findings of previous investigations, the current condition of the unclosed landfill represents an ongoing direct and environmental hazard to the community and its residents. Based upon discussions with representatives from the DEEP Waste Engineering and Enforcement Division (WEED), it is anticipated that the Clinton landfill closure will be transitioned into a Stewardship Permit to capture the outstanding items associated with the existing order and to define the future monitoring and maintenance responsibilities.

2.4 Recent Redevelopment Efforts

In 2012, Shoreline Ice, LLC, (the developer) approached the Town with a proposal to redevelop the former landfill with the construction of a twin ice hockey / skating facility. The Town subsequently leased the property to the developer for the purpose of conducting feasibility testing. Subsequent to leasing the Site to the developer, the Town and the developer jointly applied for a DECD brownfields remediation grant for the Site as co-applicants in December 2012. Although the DECD did not award the requested amount of $1,850,000 to the co-applicants, the DECD did award the Town a grant in the amount of $200,000 in October of 2013 for the purpose of conducting a Feasibility Study and Remedial Options Evaluation at the site, with the primary goal of attempting to determine the feasibility of remediating and redeveloping the landfill for future use as a twin ice rink.

3. SITE DESCRIPTION AND ENVIRONMENTAL SETTING

3.1 Site Description

The Site is a 9.26-acre parcel of land located in the western portion of Clinton on Old Nod Road. The Site is identified in the Town of Clinton land records as Map 14, Block 3, Lot 18. The Site, which is the former Town of Clinton Landfill, is currently vacant land. The land is undeveloped and vegetated. Figure 1 shows the topographic contours, major access routes, watercourses, and other relevant features in the vicinity of the Site. Relevant site features and property boundaries are depicted on Figure 2, Proposed Site Plan Redevelopment with Storm Drain and Sewage Utilities.

3.1.1 Surrounding Area

Properties in the vicinity of the Site are zoned for residential and commercial uses.

Properties and streets abutting the Site are described below:

North:	Old Nod Road
East:	Residential Homes (Old Nod Road), as well as vegetated land
South:	Town of Clinton Public Works (Nod Rod)
West:	Residential Homes (E. Shore Drive), as well as vegetated land

3.2 Environmental Setting

3.2.1 Topography

Waste material at the Site was originally deposited in a ravine, as a result the top of the landfill is at an elevation slightly above that of Old Nod Road, and is relatively flat or dipping slightly towards the north. The southeasterly and southerly sides of the landfill dip steeply to the south and southeast with slopes that are approximately 2:1. with flatter slopes found on the remaining sides. The top of the landfill is graded relatively flat.

3.2.2 Surface Water Drainage and Wetlands

There are no surface water bodies located on the Site. However, wetlands occupy the southern portion of the landfill according to the *U.S. Fish & Wildlife National Wetlands Inventory* online mapping system and,drainage from the landfill flows south to the wetlands and ultimately to a small is a small stream which flows into the Hammonasset River south of the Site. In addition, there is a small lake called Boulder Lake, which is located approximately 500-feet southwest of the Site. However, Boulder Lake is located in a separate drainage basin and is not hydraulically connected to the unnamed intermittent stream to which the landfill drains.

3.2.3 Ground Water Quality Classification

Based upon a review of the map entitled; *Water Quality Classifications Clinton, CT* provided by DEEP (DEEP 2013), the groundwater beneath, and in the vicinity of, the Site has a classification of "GA may not meet current standards". Groundwater with a "GA" classification is described as groundwater within the area of existing private water supply wells or an area with the potential to provide water to public or private water supply wells. The goal of the DEEP for groundwater in a "GA" designated area is to restore groundwater to a quality that is at least suitable for drinking without treatment. .

3.2.4 Surface Water Quality Classification

Based upon a review of the map entitled; *Water Quality Classifications Clinton, CT* provided by DEEP (DEEP 2013), the intermittent stream and wetlands have a water quality classification of "A." Designated uses for Class A water include habitat for fish and other aquatic life and wildlife, potential drinking water supplies, recreation, navigation, and water supply for industry and agriculture.

3.2.5 Surficial and Unconsolidated Geology

The surficial geology of the Site is mapped as bedrock outcrops and glacial till (Flint 1971). The outcrop area is characterized by thin discontinuous patched of till separated by bedrock outcrops. Till is a compact, unsorted sediment composed of sand, silt, gravel, cobbles, boulders, and clay, deposited by a glacier.

3.2.6 Bedrock Geology

The bedrock underlying the Site is mapped as Monson Gneiss (Lundgren and Thurell, 1973). The rock is described as dark gray hornblendic plagioclase-quartz rock. Gneiss is generally a very hard, crystalline rock that is resistant to decomposition by weathering. It is characterized by light and dark bands resulting from parallel alignments of light and dark minerals. Groundwater movement through gneiss is flow through rock fractures. The bedrock below the Clinton Landfill can be described as moderately fractured.

3.2.7 Hydrology

Based on the previous monitoring well gauging, and as depicted on the bedrock contour maps in Figure 4 of this report, the direction of groundwater flow has been inferred to flow in a southeasterly direction. The recent monitoring well gauging shows elevations of the water table that are consistent with elevations previously measured. This confirms that the direction of groundwater flow continues to be to the southeast across the site.

4. SUPPLEMENTAL SUBSURFACE INVESTIGATION

Supplemental subsurface investigation activities were conducted in June 2014 to evaluate the current environmental conditions and to gather information needed to evaluate the feasibility of redevelopment of the Town of Clinton landfill. The purpose of the subsurface investigation was to assess current impacts to groundwater, surface water, soil, and soil vapor so that the feasibility of remediating the landfill in conjunction with the redevelopment could be evaluated. The scope of work included the sampling of existing groundwater monitoring wells, sampling of the existing cover material, surface water sampling, and the installation and sampling of temporary soil vapor points.

4.1 Groundwater Sampling and Analytical Results

A total of eleven groundwater monitoring wells were intended to be sampled on the Site (ME-BR1, ME-BR2, ME-OB3A, ME-BR3, ME-BR4, ME-BR5, ME-BR6, ME-BR7, ME-OB3B, ME-OB4, and SW-2). The groundwater well locations are situated along the perimeter of the landfill and are depicted in Figure 2. Nine monitoring wells were sampled during the course of the investigation. Two wells, ME-BR1 and ME-OB3A, were either damaged so no samples could be collected or could not be located. A duplicate sample was collected at ME-BR6 in order to evaluate quality assurance/quality control (QA/QC) considerations.

All groundwater samples were submitted to Contest Laboratories to be analyzed for VOCs, SVOCs, CT ETPH, Metals, Cyanide, Ammonia, Alkalinity, Total Dissolved Solids, and Total Suspended Solids. In addition all groundwater samples were tested in the field for dissolved oxygen, specific conductivity, turbidity and pH. The summary of all groundwater and surface water sampling and analytical information is presented on Table 4-3. A complete list of constituents detected in groundwater is presented in Table 4-6.

The analytical results indicate that the groundwater in both overburden and bedrock continue to be affected by leachate emanating from the landfill. The samples from the bedrock monitoring wells ME-BR3, ME-BR4 and ME-BR6 and the overburden wells ME-OB3B, ME-OB4 and SW-2 (note that SW-2 is a groundwater well, not a surface water sampling location) contained concentrations of ammonia, iron, manganese and total dissolved solids that indicate landfill leachate. The highest concentration of leachate indicator parameters were detected in the wells located on the south and southeast side of the landfill which is the downgradient direction. In addition, VOCs including benzene, chlorobenzene, chloroethane, and zylenes were detected in both overburden and bedrock wells, and cyanide was detected in the samples from ME-OB3A and ME-OB4

In order to assess quality of the groundwater affected by landfill leachate, the analytical results were compared to the applicable criteria for groundwater established in the Remediation Standard Regulations adopted pursuant Section 22a-133k of the Connecticut General Statutes. The applicable criteria for this Site are the following:

- Groundwater Protection Criteria (GWPC) which define the concentration considered safe for drinking without treatment,

- Volatilization Criteria (VC) which define the concentration that will not pose a risk to human health from the migration of volatile substances into overlying buildings, and

- Surface Water Protection Criteria (SWPC) as well as the Ambient Water Quality Criteria (AWQC) which define the concentrations considered necessary for the protection of the surface water to which groundwater discharges.

The samples from seven wells, including ME-BR2, ME-BR3, ME-BR4, ME-BR6, ME-OB3B, ME-OB4, and SW-2, had concentrations of total petroleum hydrocarbons, or benzene that exceeded the Groundwater Protection Criteria as shown on Table 4-16. In addition, elevated concentrations of chloroethane and Tetrahydrofuran for which no GWPC have not been promulgated were detected in most of the groundwater samples. However, if a GWPC were developed for chloroethane then concentrations in the samples from the most downgradient wells would likely exceed a level that would be protective of human health for drinking. On the other hand, Tetrahydrofuran is believed to be related the PVC material used to construct the monitoring wells and most likely does not represent the quality of groundwater emanating from the Site.

Arsenic concentrations exceeded the SWPC in samples from three wells, ME-BR3, ME-BR4, and ME-OB4 as shown on Table 4-17. Each of these wells is located on the downgradient side of the landfill. In addition, since the groundwater discharges to a wetland and intermittent stream and no dilution within the surface water is available, the applicable criteria are the AWCQ. Samples from several of wells on the downgradient side of the landfill exceed the AWQC for cyanide, arsenic, ammonia, and benzene. Further the concentrations of iron and manganese in groundwater in the downgradient wells are such that when groundwater discharges to the intermittent stream or wetlands, they will precipitate causing degradation of the surface water that is inconsistent with the AWQC.

In general, the results of this site assessment indicate that landfill leachate is continues to affect the quality groundwater emanating downgradient of the landfill and the groundwater does not comply with RSRs or the AWQC.

4.2 Surface Water Sampling and Analysis

In addition to the groundwater monitoring wells, two surface water samples were collected from the southern portion of the Site. The purpose of these samples was to assess surficial leachate seeps. The samples were collected from areas where visual evidence of potential leachate was present. Surface water sampling locations are depicted in Figure 2.

All aqueous samples were submitted to Contest Laboratories to be analyzed for VOCs, SVOCs, CT ETPH, CT DEEP Metals, Cyanide, Ammonia, Alkalinity, Total Dissolved Solids, and Total Suspended Solids. The summary of all ground and surface water sampling and analytical information is presented on Table 4-3. A list of constituents detected in surface water is presented in Table 4-6.

Generally, the analytical results of the surface water samples indicate that contaminated groundwater is adversely affected the surface water to which it discharges. Constituents detected in surface water were similar to those detected in groundwater. Benzene, arsenic and cyanide were detected in one sample, LEA-SW-01. In addition, concentrations of iron, manganese and ammonia were detected in both surface water samples at concentration significantly higher than concentrations that are typical of natural surface water. The concentrations of cyanide, ammonia and benzene exceed the AWQC such that the surface water does not meet the requirements of Water Quality Standards regulations adopted pursuant to Section 22a-426 of the Connecticut General Statutes.

4.3 Soil Sampling and Analytical Results

A total of ten hand auger borings were performed by Payne / Loureiro field staff. The soil boring locations are depicted in Figure 2. Soil samples were collected to evaluate potential contamination within the surficial soil cap as well as to assess the thickness of the soil cap at various locations throughout the Site. The advancement of the hand auger ceased as signs of the solid waste material were encountered. The depths of the encountered material were noted on field boring logs. The depths of the borings ranged from 0.5 feet below grade (fbg.) to 2.5fbg.

Samples were submitted to Contest Laboratories and analyzed for VOCs, SVOCs, CT DEEP Metals, Herbicides, Pesticides, Cyanide, and PCBs. The summary of all soil sampling and analytical information is presented on Table 4-1.

The primary constituents detected in soil samples were various metals and TPH. Concentrations of metals can be attributed to naturally occurring background levels that are present in the soil used for the cap. Concentrations of TPH ranged from 32 mg/kg to 210mg/kg. A summary of all constituents detected in soil is presented in Table 4-4. There were no exceedances of any applicable CT Remediation Standard Regulations (RSR) pertaining to soil.

Copies of the geologic boring logs are presented in Appendix A of this document.

4.4 Soil Vapor Sampling and Analysis

A total of twelve temporary vapor monitoring points were installed and sampled as part of the subsurface investigation. The locations, depicted on Figure 2, were arranged within the original proposed footprint of the proposed facility to assess the potential hazards associated with methane and other soil vapors. The depths of the points varied across the footprint from depths of 4fbg to 8.5fbg. Prior to the collection of the grab samples, each probe was monitored for multiple gaseous constituents including, methane, carbon dioxide, oxygen, carbon monoxide, and hydrogen sulfide, using a Landtec GEM 5000 gas monitor.

Samples were collected and submitted to Contest Laboratories to be analyzed for VOCs by TO-15. A summary of all soil vapor sampling and analytical information is presented in Table 4-2. Vapor gas monitoring information is presented in Table 4-20. Copies of the vapor probe construction diagrams are presented in Appendix A of this document.

The results indicate that, in general, concentrations of gases generated from the decomposition of solid waste persist in the soil vapor. Methane and carbon dioxide make up 40-70% of the landfill gas, with other gases, such as hydrogen sulfide and carbon monoxide making up for fewer than 10% of the gas.

VOCs were detected in every soil vapor sample collected. The samples from LEA-VP-06, LEA-VP-08, and LEA-VP-09 have the highest concentrations of various constituents, including xylenes, chloroethane as well as concentrations of methane and carbon dioxide detected during the initial vapor gas monitoring performed before sampling.. There were no exceedances of any CT RSRs pertaining to soil vapor. Exceedance summaries are presented in Tables 4-18 and 4-19, respectively. However, the VC for chloroethane is not included in the RSRs, but will have to be developed for the DEEP approval as an additional polluting substance. It is likely that the concentrations of chloroethane would exceed the calculated VC.

Copies of all laboratory analyses and reports are presented in Appendix B.

4.5 Defined Solid Waste Area

Based on the 1991 Metcalf and Eddy report, as well as recent geotechnical borings, the extent of solid waste material spans the entire site. Depths of the solid waste material range from 10fbg to

40fbg. During the most recent subsurface investigation, no solid waste material was observed at or above the surface. However, as a part of the recent cap assessment, solid waste material was noted across the Site at various shallow depths below grade.

4.6 Quality Assurance/Quality Control

Quality Assurance/Quality Control (QA/QC) samples were collected with the soil and groundwater samples during the sampling. The purpose of the QA/QC samples was to confirm the reliability of the data collected during the course of the investigation.

4.7 Data Quality Assessment and Data Usability Evaluation

All data generated during supplemental subsurface investigation were analyzed using the Connecticut Reasonable Confidence Protocols (RCPs), which are analytical methods based on the respective EPA or other appropriate methods. QA/QC information provided by laboratories using the RCP methods was assessed and evaluated in accordance with the guidelines for performing Data Quality Assessments (DQAs) and Data Usability Evaluations (DUEs) in accordance with the methodology described in the November 2007 guidance document entitled, *Reasonable Confidence Protocols* and presented in more detail in the May 2009 document (revised December 2010) entitled, *Laboratory Quality Assurance Quality Control, Data Quality Assessment, Data Usability Evaluation Guidance Document*. All associated DQA/DUE documents are presented in Appendix B of this report..

5. SITE DEVELOPMENT

5.1 Landfill Closure Requirements

The requirements for landfill establishment and closure are detailed in the Regulations of Connecticut State Agencies section 22a-209 referred to as the Solid Waste Management Regulations (SWMRs). Specifically important to proper closure are the references to Grading, Cover Operations, Closing of Solid Waste Facilities, and the definitions. The closure requirements are generally prescriptive and as of late have been coupled into a DEEP issued Stewardship Permits with the intent of developing and defining the closure requirements and the long-term monitoring and maintenance requirements. Based upon discussions with representatives from the DEEP Waste Engineering and Enforcement Division (WEED), it is anticipated that the Clinton landfill closure will be transitioned into a Stewardship Permit to capture some of the outstanding items associated with the existing Consent Order and to define the future monitoring and maintenance responsibilities.

5.1.1 Stewardship Program

The Stewardship Program, administered by the WEED of the Bureau of Materials Management and Compliance Assurance, regulates the closure and post-closure care of solid waste disposal areas; site wide environmental investigation and clean up ("closure and corrective action") and the performance of long-term stewardship activities, that includes but is not limited to the maintenance of financial assurance, post-remediation (closure) groundwater monitoring and the maintenance of the cap.

There are six types of Stewardship Permits issued by the DEEP. The "Solid Waste Land Disposal Facility" would be most appropriate fit for the Clinton landfill. Once approved by the DEEP, the permit may be issued for a 10-year period.

Assuming this particular project proceeds under a Stewardship Permit, the town will be required to prepare and submit an application with a closure plan and a variety of other supporting attachments along with a fee. A pre-application meeting is imperative in that the DEEP may reduce the permit attachment schedule, thereby reducing the overall initial application effort. Public notice and public outreach meetings are typically required to ensure the public is aware of the proposed activities and the long-term obligations of the applicant. The Stewardship Permit application process will endure for an extended period of time and should be anticipated to extend well beyond 180-days. Upon receipt of the Stewardship Permit, the applicant may initiate the closure activities.

5.2 Existing Landfill Cover Conditions

5.2.1 Extent of Municipal Solid Waste

The extent of municipal solid waste has been determined using test pits and soil borings. The recent round of geotechnical borings advanced by Heller and Johnsen found the depth of municipal solid waste to range from 19-feet to 51-feet. Figure 5, Approximate Solid Waste Limits and Depth presents a depiction of the breadth and depth of municipal solid waste present based upon historical and recent investigation data.

5.2.2 Cover Material

The existing soil cover over the landfill was generally evaluated against the Cover Material requirements of section 22a-209-1 of the SWMRs as follows.

> ‘‘Cover material’’ means soil, or other suitable material as approved by the Commissioner, which is used to cover compacted solid waste in a solid or special waste disposal area. Any soils used shall be classified as GM, silty gravels, poorly graded gravel-sand-silt mixtures; GC, clayey gravels, poorly graded gravel-sandclay mixtures; SM, silty sands, poorly graded sand-silt mixtures; SC, clayey sands, poorly graded sand-clay mixtures; ML, inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity in accordance with the unified soil classification system.

Four separate samples of the cover material were acquired from the locations depicted on Figures 2 and 3. The samples were delivered to a material testing laboratory for gradation and classification. Three of the samples acquired from locations LEA-SA-01, LEA-SA-03 and LEA-SA-04 were classified as silty sands or silty sands with gravel or “SM” meeting the cover material requirements defined above. One sample, from location LEA-SA-02, was classified as poorly graded sand with gravel “SP”, which classification does not meet the cover material definition.

Based upon the limited investigations performed, the cover material used to cover the landfill is not consistent throughout the cap and certain areas have been capped with material that does not satisfy the state’s requirement for cover material. One particular location assessed contained material that was too sandy, which lends to excessive infiltration of rainwater.

5.2.3 Grades

The existing landfill is generally graded to drain. The side slopes of the landfill are prescribed to be 3 horizontal to 1 vertical or 33% grade, unless otherwise approved by the Commissioner of the DEEP in accordance with the SWMRs. The slopes primarily located along the south vary from 27 to 35% with more moderate slopes located toward the north. The top of the landfill is graded with a slope of between 2.5 and 3%, which is below the minimum grade of 4% prescribed in the SWMRs, unless otherwise approved by the Commissioner of the DEEP.

Based upon the existing topography, the grades of the existing landfill are not consistent with the state's requirements for side slopes and surface grades. The side slopes are steeper that the default requirement lending to erosion and the surface is not steep enough, lending to infiltration of rainwater.

5.2.4 Depth of Cover Material

The depth of cover on the existing landfill has been evaluated historically and as part of this feasibility study with highly variable findings. Cover material has historically been assessed and found to range from 6-inches to 8-feet. Based upon the geotechnical borings advanced by Heller & Johnsen in 2014, the depth of cover ranged with a maximum depth of 8-feet as documented in their geotechnical report included in Appendix C. Further, soil borings advanced throughout the cover by Loureiro found the cover material to range in depths across the top portion of the landfill from 6-inches to 2.5-feet. In accordance with the Final Cover requirements in the SWMRs, the minimum depth of final cover material shall be compacted to a minimum depth of 2-feet.

Based upon the historical cover depth investigations, coupled with the additional investigations performed to support this feasibility study, the depth of cover is variable ranging in depth from 6-inches to 8-feet. Some areas of the landfill have inadequate cover material to satisfy the SWMRs, lending to potential infiltration of rainwater and exposure to waste materials.

5.3 **Proposed Landfill Cover**

Specific cap alternatives were assessed and detailed in the January 1993 Remedial Alternatives Assessment Report prepared by Metcalf & Eddy. Their final recommendation, includes the installation of a geomembrane. Payne and Loureiro agree with this recommendation and as such, no additional assessment related to this approach is warranted. Subsequent to the issuance of the 1993 report, the industry has generally leaned toward the HDPE materials as they typically provide much better longevity than lower density more flexible products.

The SWMRs allow for operation of various activities upon a closed landfill, provided the surface is maintained to mitigate erosion, puddling and infiltration of rainwater and melting snow/ice. Certain activities, such as leaf composting facilities require the addition of a 2-foot working pad constructed of well-drained soil. The pad may be set at a grade of between 2-5% to promote runoff. This working pad is in addition to the 2-foot final cover. This working pad is designed to mitigate disruption of the landfill cap, since loading, scraping and the operation of heavy equipment will inevitably be active on the surface.

Discussions with representatives from WEED have concurred that reuse of the landfill for the construction of a new building is feasible, provided proper engineering and protective measures are incorporated into the project design and construction. The following written response was submitted by DEEP on June 24, 2014 to a request for concurrence in support of a DECD funding application.

> "DEEP encourages and supports the responsible reuse and redevelopment of closed landfills. From a conceptual viewpoint, the potential redevelopment of the Clinton Landfill for the construction of an ice skating facility is feasible, provided that proper engineering and protective measures are incorporated into the project design and construction. In addition, the Town will need the Commissioner's written approval for the proposed redevelopment of the landfill."

5.3.1 Cap

The proposed cap for the Clinton landfill will include the installation of a geomembrane liner consisting of a system including a 40 mil high-density polyethylene (HDPE) liner over the entirety of the municipal waste deposits in the landfill. The intent is to generally grade the existing cover material to meet the final grades proposed minus 18-inches. The underlying cover material will be utilized as a bearing surface for the geomembrane and will be compacted to a smooth and uniform finish to mitigate puncture of the geomembrane. A minimum of 12-inches of cover material shall be maintained below the geomembrane resulting in a minimum landfill cap depth of 30-inches.

The geomembrane liner will be equipped with a non-woven geotextile underlayment to provide a cushion/protective surface. It will be overlain by a single sided geocomposite drainage layer. This layer will provide surface drainage without the need for sand over the geomembrane. Our experience with this product is extensive and the cost savings as opposed to a sand drainage layer is considerable. Further, the quality control of the single sided geocomposite drainage layer is factory controlled thereby eliminating the need for extensive gradation testing and inspection associated with sand.

Drainage pipes are provided immediately above the geomembrane typically located within depressed trenches (Detail 2 on Figure 6) to convey the intercepted water to surface outlets. The spacing of the drains is typically 75-feet, but this spacing may be extended due to the presence of pavement on the top and the side slope grade on this particular project.

Due to the 2:1 side slopes provided along the south and southwestern portions of the landfill, specific engineering considerations will be required to maintain the stability of the cover material placed above the geomembrane liner. Further, the use of textured liner material at such locations will be necessary to enhance the interface frictional property between the overburden and the geomembrane. Geomembrane anchoring will be critical.

5.3.2 Stormwater Management

Surface water (stormwater) drainage of the landfill will be address using surface drainage features including reverse benches along the side slopes, down slope drainage ways with water flow energy dissipaters, permanently lined diversion channels, stormwater quality/attenuation basins and adequate slope stabilization as necessary to mitigate soil erosion and the resulting sedimentation. Stormwater quality/attenuation facilities would be provided at locations that facilitate gravity discharge and as such, are typically provided at the lower portions of the site. Two such basins are envisioned for this particular site, one at the north end and the second located to the south on other lands owned by the Town of Clinton. These basins would serve as sedimentation basins during construction and would be converted to quality/attenuation facilities upon completion of the construction activities.

The basins are conceptually depicted on Figure 3. Other measures to collect and route the stormwater to these treatment features would be detailed in the detailed design phase of this project.

5.3.3 Landfill Gas Venting

Landfill gas and vapor monitoring activities were performed as part of this feasibility study to calibrate the level of potential vapor intrusion that may be expected within the proposed building. The investigation data will be similarly useful in supporting the detailed design of the gas and vapor mitigation systems. As expected, the primary constituent of concern at this location is methane, as detailed in Section 4.

The proposed building must be equipped with a subslab ventilation system (SSVS) designed to sequester the landfill gasses and vapors and discharge them to the atmosphere, thereby mitigating vapor intrusion into the building. The SSVS collection network will be located below a passive vapor barrier consisting of a similar HDPE liner battened and sealed at all penetrations including pipes and conduits, grade beams, pile caps or other penetrations.

The Environmental Protection Agency recommends two separate means of defense from vapor intrusion. Both of these measures have been determined to be suitable stand-alone measures coupled with an indoor air monitoring program as a secondary measure. SSVS coupled with a passive vapor barrier negates the need for indoor air monitoring.

Additional exterior venting may also be necessary. The possibility of active venting coupled with methane collection for reuse through a combined heat and power unit or the like should be further evaluated. Other alternatives could include a flare or simple discharge, all of which would need to be further evaluated in accordance with the applicable state and federal air compliance regulations applicable to Municipal Solid Waste Landfills (specifically 40 CFR Parts 60, 62, 63 and 98).

5.3.4 Surficial Features

Geomembrane penetrations are relatively simple to incorporate into the initial design. Light pole bases, landscaping stock and related features can be incorporated into the design through the use of boots or cold, spray-applied, water-based membrane products. Provisions for landscape stock can typically be made by providing depressions within the geomembrane to facilitate a 4-foot depth. The depressed areas are typically provided as longer trenches or tree-belts to facilitate row plantings. Drainage of the depressed sections must be provided so as to avoid subsurface perching of infiltrated water.

Assuming this project is indeed engaged into the Stewardship Program, we would envision that some form of land-use restriction will be required to protect the landfill cap from disruption. The restriction will typically outline the limitations, which would typically include excavation, drilling, or any other penetration of the ground surface. Such activities may be permitted, provided the DEEP executes a release or a disruption authorization for the prescribed activities.

5.3.5 Utilities.

Utility runs are typically provided using “clean-corridors” which may similarly be depressed paths or trenches in the geomembrane within which the utilities may be located. Clean fill material is used to bed the utilities and access may be achieved without intercepting or disrupting the underlying geomembrane liner materials. The actual depth of the clean corridors will be defined by the specific utilities involved.

For this particular project, water, communications, and power are anticipated to be bundled into one clean corridor routed from Old Nod Road to the proposed building, with sanitary service running from the building to the south to an off-site subsurface sewage disposal system. Based upon previous project experience, Loureiro anticipates the development of a simplified land-use restriction release specifically for utility repair. This approach would be consistent with previous endeavors.

Sections and details of the proposed landfill cap are included on in Figures 6-8.

6. GEOTECHNICAL AND STRUCTURAL

6.1 Foundation Impacts or Implications

A preliminary geotechnical report was prepared for this site by Heller and Johnsen in June of 2014. Based on a limited number of borings the report provides a general outline of the materials encountered during the investigation; the surface layer (cover material) consisting of poorly graded sands and gravel up to 8 feet thick, next is the landfill materials that is up to 51 feet thick, and finally naturally granular soils or bedrock was encountered. The summary of their findings focuses on the fact that the landfill material is highly compressible and not suited for support of building loads. They recommend supporting the building on concrete filled steel piles that extend to bedrock. To overcome the potential corrosion factor, it would be prudent to provide a pile that has an additional thickness of at least 1/8 inch to offset the potential loss of material resulting from corrosion. Post-construction settlement can be reduced by either surcharging the site, or employing deep dynamic compaction to greatly reduce the expected long term settlements.

Due to the compressible nature of the landfill, it is not practical or prudent to assume that the materials making up the landfill have any ability to support loading of any type. This sentiment was echoed in the geotechnical report (prepared by Heller and Johnsen), which stated that due to the compressibility of the landfill materials a pile foundation would be the most practical means to support a structure over the landfill. Based on the preliminary subsurface investigations, it is reasonable to anticipated bedrock at between 30 feet to 50 feet below the surface of the landfill. It is expected that a twin ice arena would be constructed on this site. In order to support this long span type of superstructure, the foundation would be constructed using a one-way concrete slab that would be supported by grade beams, which span between pile caps. Depending on the allowable rock bearing value a series of circular piles (10-inches to 12-inch diameter) would be driven to bedrock. The number of piles per pile cap would depend on building loads and code prescribed allowable loads per pile. This foundation approach would provide a working platform to erect the superstructure without concern for settlements.

7. REMEDIAL OPTIONS EVALUATION

The primary goal of the study was to evaluate the economic, environmental, and structural feasibility of redevelopment of the former landfill for use as an ice hockey / skating facility, while achieving the necessary closure of the landfill. In the process of evaluating site redevelopment feasibility, a comprehensive remedial options evaluation was performed to define benefits and costs associated with various options. Through our evaluation, a number of primary components were identified that, when selected independently, represent various options for site closure. These are presented below.

7.1 Landfill Cap Options

- Redevelopment v. No Development

Construction of a building on top of the landfill creates an impervious surface, therefore providing a cap over the landfill material. The building structure, in turn, acts as a long-term barrier preventing the direct exposure of contaminated soils and gases. However, the construction of the building foundation requires grading and relocation of soils, which can potentially create temporary direct exposure avenues for workers. Due to the development of an impervious structural cap, storm water control issues are generated, which would require further mitigation controls to be implemented.

- Geomembrane Cap v. Traditional Cap

Geomembrane caps are composed of low-permeability polymer liners used to control and lessen gas and liquid migration. Due to the highly effective leachate mitigation properties of geomembranes, leachate control systems are not necessary for closures. Geomembranes, however, are expensive and difficult to install and stabilize in sloped areas.

Traditional caps, as required by regulatory agencies, are comprised of using natural materials, such as gravel and soils, to create a barrier that protects humans and the environment from direct exposure. Traditional capping measures tend to be less expensive, but in turn, do not mitigate infiltration and leachate, resulting in the need for continued monitoring and maintenance.

- Grade Existing v. Import Material

If a structural cap is chosen as the preferred remedial option, the existing site will need to be graded in order to create a level surface for which the building can be built. The site can be graded in two ways: grade and level using existing material or importing grading soils. Using the current soils on site is a cost effective alternative, however, it must be considered that this requires the exposure and movement of potentially contaminated solid waste material from the landfill. Relocation of the landfill material not only poses an immediate health hazard to those working on the site, but has the potential to disturb the subsurface material, creating more leachate discharge into ground and surface waters around the site.

Importing soils to add on to the site for grading prevents any direct exposure health hazards by allowing the fill material to remain undisturbed. Importing soils does, however, cost much more than re-grading existing material. Costs of imported soils can be alleviated as the soils imported for grading can also be used as a capping material. Therefore, the imported soil serves both as an approved structural support as well as a necessary component in the cap.

- Pile Foundation v. Floating Foundation

Pile foundations require the base of the facility to be supported by several hundred structural piles that are anchored to the bedrock. Although costly, the use of piles ensures zero settling of the structure over time. As a result, zero settling equates to no pressure on landfill material and minimizes leachate discharge.

The concept of a floating foundations has been discussed for this site, but is not a practical alternative foundation system for a landfill. With a floating foundation the idea is to remove enough soil material from under the building so that the weight of the building and the weight of the material removed is essentially equal. In this way the soil supporting the building will not perceive any additional loading. Because the nature of landfill materials cannot be relied upon for consistency of bearing values the floating foundation concept does not work. In addition, many acres of landfill material would have to be disturbed and relocated. These facts make this type of foundation choice very undesirable for use in this type of environment. The fact that this type of foundation system would require disturbance to such a large volume of landfill material the potential for an increase of leachate discharge is greatly increased as more landfill deposits would be disturbed.

Upon reviewing the various remedial and closure alternatives, we have identified the following three primary remedial options.

7.2 Remedial Option 1 – Landfill Closure with Redevelopment

The following option incorporates the capping and redevelopment of the Former Town of Clinton landfill. The cost analysis for the following option is provided in Table 7-1. This option includes the redevelopment of the site with an ice hockey / skating facility. The building and parking lot would act a part of the cap on the landfill. Although this option is costly, once the facility is up and running it will generate revenue for the town of Clinton. A pile foundation set into bedrock would be used, as it eliminates any settling of the building over time, which is vital to the facility’s primary function as an ice skating facility. Soils will be imported to grade the Site. By importing the soil to grade, it reduces direct exposure to contaminated material and minimizes any associated health risk. In addition, the imported soil will act as one level of the cap. An impermeable geomembrane cap will also be used to cap the solid waste material and mitigate any leachate, eliminating any need for an additional mitigation system to be installed. Both the storm water and waste water will be disposed of offsite in order to comply with the DEP.

7.3 Remedial Option 2 – Traditional Landfill Closure without Redevelopment

The second option entails the capping of the landfill per the Consent Order WC 4956 given by the DEP. This option does not entail the redevelopment of the Site, and therefore, does not qualify for eligibility of the state grant. All costs of capping activities will be placed upon the Town of Clinton. In addition to the financial burden placed upon the Town for capping and closure costs, the Town of Clinton loses an opportunity to generate revenue through taxes and sales generated by the proposed ice skating facility. The cost analysis for this option is provided in Table 7-2.

7.4 Remedial Option 3 – No Action

The third option requires that the town of Clinton take no action with the landfill. The “no action” option does not satisfy the Consent Order WC 4956 given by the DEP, and therefore does not qualify for eligibility of grant money from the DECD. Foregoing any remedial, or redevelopment options, leaves the Site with considerable direct exposure hazards pertaining to exposed fill material and methane releases. Even though this option does not cost the town of Clinton any money, it does, however, prevent any new revenue from being gained. The cost analysis for this option is provided in Table 7-3.

8. CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of the results of the recent environmental, geotechnical, and cost estimating evaluations, it is environmentally and technically feasible to remediate the former Town of Clinton landfill to incorporate construction of an ice hockey / skating facility.

The environmental constraints associated with redevelopment of a landfill are easily addressed through utilization of various capping materials and sub-slab depressurization systems. Installation of an HDPE liner system would remove the direct exposure hazard, as well as reduce and or eliminate ongoing issues associate with landfill leachate resulting from rainwater and surface water migrating through the uncapped landfill.

Based on the subsurface geotechnical investigations, depth to bedrock beneath the site ranges from 30 feet to 50 feet below the surface of the landfill in the area of the proposed ice rink facility. Bedrock beneath the site was determined to be extremely competent, and would be suitable for construction of an overlying building using a pile-supported foundation. In order to support the long span type of an ice arena superstructure, the foundation would require a one-way concrete slab that would be supported by grade beams, which span between concrete pile caps. Pile caps would be supported by 3 to 5 piles each, with a direct connection to bedrock at each pile location.

In closing, remediation of the former landfill is recommended. As presented in Remedial Option 1, remediation and redevelopment of the former landfill for use as an ice hockey / skating facility is feasible, with the understanding the certain site development constraints would need to be addressed, as presented herein. Should the Town elect to not pursue redevelopment of the landfill with the proposed ice arena, remediation of the landfill is, however, recommended (Option 2). Remedial Option 3, no action, is not recommended, as this will result in continued risks to human health and to the environmental within the community.

TABLE 4-1
SUMMARY OF SOIL SAMPLING AND ANALYTICAL INFORMATION
Town of Clinton Landfill, Clinton, Connecticut

Loureiro
Engineering • Construction • EH&S • Energy • Waste

Sample Information					Analysis Information							
Location ID	Sample ID	Sample Date	Sampled Interval (ft)	Sample Class	LEAAnalyt. Lab.	Volatile Organics	Semivolatile Organics	Herbicides	Pesticides/ PCBs	Fuels/Oils	Metals	Miscellaneous Analyses
LEA-SB-01	1328273	06/12/2014	0.00 - 2.25	SB		x	X	x	x	X	X	x
LEA-SB-02	1328274	06/12/2014	0 - 2	SB		x	x	x	x	X	X	x
LEA-SB-03	1328272	06/12/2014	0.0 - 0.5	SB		x	x	x	x	X	X	x
LEA-SB-04	1328271	06/12/2014	0 - 0.75	SB		X	x	x	x	X	X	x
LEA-SB-05	1328268	06/12/2014	0.0 - 2.0	SB		x	x	x	x	X	X	x
LEA-SB-05	1328269	06/12/2014	0.0 - 2.0	SB		x	x	x	x	X	X	x
LEA-SB-06	1328267	06/12/2014	0 - 0.5	SB		X	x	x	x	X	X	X
LEA-SB-07	1328266	06/12/2014	0 - 0.5	SB		X	x	x	x	X	X	x
LEA-SB-08	1328264	06/12/2014	0 - 2	SB		x	x	x	x	X	X	x
LEA-SB-09	1328265	06/12/2014	0 - 2	SB		x	x	x	x	X	X	x
LEA-SB-10	1328270	06/12/2014	0 - 1	SB		X	x	x	x	X	X	x

Printed on 06/25/2014

TABLE 4-2
SUMMARY OF SOIL VAPOR SAMPLING AND ANALYTICAL INFORMATION
Town of Clinton Landfill, Clinton, Connecticut

Sample Information					Analysis Information							
Location ID	Sample ID	Sample Date	Sampled Interval (ft)	Sample Class	LEAAnalyt. Lab.	Volatile Organics	Semivolatile Organics	Herbicides	Pesticides/ PCBs	Fuels/Oils	Metals	Miscellaneous Analyses
LEA-VP-01	1328353	06/13/2014		VP		X						
LEA-VP-02	1328354	06/13/2014		VP		X						
LEA-VP-03	1328355	06/13/2014		VP		X						
LEA-VP-04	1328356	06/13/2014		VP		X						
LEA-VP-05	1328357	06/13/2014		VP		X						
LEA-VP-06	1328358	06/13/2014		VP		X						
LEA-VP-07	1328359	06/13/2014		VP		X						
LEA-VP-08	1328360	06/13/2014		VP		X						
LEA-VP-09	1328361	06/13/2014		VP		X						
LEA-VP-10	1328362	06/13/2014		VP		X						
LEA-VP-11	1328363	06/13/2014		VP		X						
LEA-VP-12	1328364	06/13/2014		VP		X						

Printed on 06/25/2014

Table 4-3

SUMMARY OF GROUNDWATER AND SURFACE WATER SAMPLING AND ANALYTICAL

Town of Clinton Landfill, Clinton, Connecticut

Sample Information					Analysis Information							
Location ID	Sample ID	Sample Date	Sampled Interval (ft)	Sample Class	LEAAnalyt. Lab.	Volatile Organics	Semivolatile Organics	Herbicides	Pesticides/ PCBs	Fuels/Oils	Metals	Miscellaneous Analyses
LEA-SW-01	1328336	06/11/2014		SW		X	x			X	X	X
LEA-SW-02	1328337	06/11/2014		SW		X	x			X	X	X
ME-BR2	1328322	06/11/2014		GWS		X	x			X	X	X
ME-BR3	1328320	06/10/2014		GWS		X	X			X	X	X
ME-BR4	1328324	06/11/2014		GWS		X	x			X	X	X
ME-BR5	1328323	06/11/2014		GWS		X	x			X	X	X
ME-BR6	1328325	06/11/2014		GWS		X	X			X	X	X
ME-BR6	1328335	06/11/2014		GWS		X	X			X	X	X
ME-BR7	1328319	06/11/2014		GWS		x	x			X	X	X
ME-OB3B	1328321	06/10/2014		GWS		X	X			X	X	X
ME-OB4	1328326	06/11/2014		GWS		X	X			X	X	X
SW-2	1328318	06/11/2014		GWS		X	X			X	X	X

TABLE 4-4
CONSTITUENTS DETECTED IN SOIL
Town of Clinton Landfill, Clinton, Connecticut

Loureiro
Engineering • Construction • EH&S • Energy • Waste

	Location ID	LEA-SB-01	LEA-SB-02	LEA-SB-03	LEA-SB-04	LEA-SB-05	LEA-SB-05	LEA-SB-06
	Sample ID	1328273	1328274	1328272	1328271	1328268	1328269	1328267
	Sample Date	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014
	Sample Time	14:30	14:49	14:20	14:09	13:40	13:40	13:25
	Sample Depth	0.00' - 2.25'	0' - 2'	0.0' - 0.5'	0' - 0.75'	0.0' - 2.5'	0' - 2.5'	0' - 0.5'
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0616-11	14F0616-12	14F0616-10	14F0616-09	14F0616-06	14F0616-07	14F0616-05
Constituent	Units							
Date Metals Analyzed	-	06/16/2014	06/16/2014	06/16/2014	06/16/2014	06/16/2014	06/16/2014	06/16/2014
Date Organics Analyzed	-				06/14/2014			06/14/2014
Date Physical Analyzed	-	06/16/2014	06/16/2014	06/16/2014	06/16/2014	06/16/2014	06/16/2014	06/17/2014
Date Semivolatile Organics Analyzed	-	06/19/2014						
Antimony	mg/kg	3.9	3.2		2.9	3.6		
Barium	mg/kg	37	32	42	40	23	21	34
Beryllium	mg/kg	1.3	1.7	0.77	0.64	1.7	1.7	0.53
Cadmium	mg/kg	0.61	0.69	0.48	0.37	0.66	0.69	
Chromium, Total	mg/kg	4.9	1.9	8.7	8.4	1.3	1.2	7.7
Copper	mg/kg	34	50	8.7	5.7	51	50	7.8
Lead	mg/kg	5.8	2.4	24	14	1.8	1.8	17
Mercury	mg/kg			0.077	0.081			0.037
Nickel	mg/kg	6.8	7.1	6.2	4.7	6.5	5.7	4.8
Vanadium	mg/kg	65	97	26	22	95	95	19
Zinc	mg/kg	34	38	39	27	37	37	24
Cyanide	mg/kg							0.86
Total Petroleum Hydrocarbons (CT ETPH)	mg/kg	32	58	78	54	60	50	160
Fluoranthene	ug/kg	220						
Acetone	ug/kg				1200			260
2-Butanone (MEK)	ug/kg				68			
4-Isopropyltoluene	ug/kg							
Toluene	ug/kg				6.5			
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TABLE 4-4
CONSTITUENTS DETECTED IN SOIL
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	LEA-SB-07	LEA-SB-08	LEA-SB-09	LEA-SB-10	LEA-SB-10		
	Sample ID	1328266	1328264	1328265	1328270	1328270		
	Sample Date	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014		
	Sample Time	13:10	11:50	12:10	13:58	13:58		
	Sample Depth	0' - 0.5'	0' - 2'	0' - 2'	0' - 1'	0' - 1'		
	Laboratory	CONT	CONT	CONT	CONT	CONT		
	Lab. Number	14F0616-04	14F0616-02	14F0616-03	14F0616-08	14F0616-08RE1		
Constituent	Units							
Date Metals Analyzed	-	06/16/2014	06/16/2014	06/16/2014	06/16/2014			
Date Organics Analyzed	-	06/14/2014			06/14/2014			
Date Physical Analyzed	-	06/17/2014	06/16/2014	06/17/2014		06/18/2014		
Date Semivolatile Organics Analyzed	-							
Antimony	mg/kg							
Barium	mg/kg	29	38	53	37			
Beryllium	mg/kg	0.43	0.72	0.55	0.57			
Cadmium	mg/kg		0.40	0.34	0.33			
Chromium, Total	mg/kg	10	16	12	6.9			
Copper	mg/kg	9.7	14	10	8.2			
Lead	mg/kg	6.9	9.8	8.0	14			
Mercury	mg/kg		0.045	0.045				
Nickel	mg/kg	3.2	5.8	6.3	4.5			
Vanadium	mg/kg	20	27	24	21			
Zinc	mg/kg	15	31	24	23			
Cyanide	mg/kg							
Total Petroleum Hydrocarbons (CT ETPH)	mg/kg	210	110	180		130		
Fluoranthene	ug/kg							
Acetone	ug/kg	750			240			
2-Butanone (MEK)	ug/kg							
4-Isopropyltoluene	ug/kg	3.2						
Toluene	ug/kg							
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TABLE 4-5
CONSTITUENTS DETECTED IN SOIL VAPOR
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	LEA-VP-01	LEA-VP-02	LEA-VP-03	LEA-VP-04	LEA-VP-04	LEA-VP-05	LEA-VP-06
	Sample ID	1328353	1328354	1328355	1328356	1328356	1328357	1328358
	Sample Date	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014
	Sample Time	08:40	08:44	08:49	08:52	08:52	08:57	09:00
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0632-01	14F0632-02	14F0632-03	14F0632-04	14F0632-04RE1	14F0632-05	14F0632-06
Constituent	Units							
Date Organics Analyzed	-	06/23/2014	06/23/2014	06/23/2014	06/21/2014	06/23/2014	06/23/2014	06/21/2014
1,2-Dichloropropane	ug/m3							
Acetone	ug/m3	410	250	320	970		120	1900
Benzene	ug/m3	9.4	15	18	22		1.2	820
1,2,4-Trimethylbenzene	ug/m3	19	44	32	36		4.6	4300
1,2-Dichlorobenzene	ug/m3							93
1,3,5-Trimethylbenzene	ug/m3	1.3	7.9	24	20		1.8	1900
1,3-Dichlorobenzene	ug/m3							77
1,4-Dichlorobenzene	ug/m3			4.1				320
Chlorobenzene	ug/m3		96	41	32			6200
Ethylbenzene	ug/m3	2.5	19	9	23		1.3	36
Isopropylbenzene (Cumene)	ug/m3	67	18	27				770
sec-Butylbenzene	ug/m3	40	27	9.8				
2-Butanone (MEK)	ug/m3			31				
4-Isopropyltoluene	ug/m3		24	11			9.7	580
Dichlorodifluoromethane	ug/m3	49	15	4.4	100		34	180
1,1,1-Trichloroethane	ug/m3						88	
1,1,2-Trichloroethane	ug/m3							
1,1-Dichloroethane	ug/m3	2.4	1.4	1.1			7.2	84
1,2-Dichloroethane	ug/m3	2.9	3.1					18
Chloroethane	ug/m3	49	20	25	23000 E	17000	2.7	59000 E
1,1-Dichloroethylene	ug/m3	2.4	2.3					19
trans-1,2-Dichloroethylene	ug/m3							
Vinyl Chloride	ug/m3	0.87	1.5	0.92	16			100
Tetrachloroethylene	ug/m3	2	3.3	2.6			0.79	
Chloromethane	ug/m3			0.74			0.64	
Methylene Chloride	ug/m3						66	
Chloroform	ug/m3			0.81			3.1	
Trichlorofluoromethane	ug/m3			1.3			2.8	

TABLE 4-5
CONSTITUENTS DETECTED IN SOIL VAPOR
Town of Clinton Landfill, Clinton, Connecticut

Loureiro
Engineering • Construction • EH&S • Energy • Waste

	Location ID	LEA-VP-01	LEA-VP-02	LEA-VP-03	LEA-VP-04	LEA-VP-04	LEA-VP-05	LEA-VP-06
	Sample ID	1328353	1328354	1328355	1328356	1328356	1328357	1328358
	Sample Date	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014
	Sample Time	08:40	08:44	08:49	08:52	08:52	08:57	09:00
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0632-01	14F0632-02	14F0632-03	14F0632-04	14F0632-04RE1	14F0632-05	14F0632-06
Constituent	Units							
Total Trihalomethanes (Calc.)	ug/m3			0.81			3.1	
Methyl Isobutyl ketone	ug/m3						0.58	
Styrene	ug/m3	0.95	1.5	0.94			0.76	
Toluene	ug/m3	10	28	30	40		39	110
Trichloroethylene	ug/m3		2.1	3.9			0.78	
o-Xylene	ug/m3		12	8.2			2.8	620
Xylenes, Total (Calc.)	ug/m3	15	53	300	3400	2500	15	7700
Xylenes,m- & p-	ug/m3	15	41	290	3400	2500	12	7100
cis-1,2-Dichloroethylene	ug/m3	1.8	3.1	0.48			2.1	19
n-Butylbenzene	ug/m3	18	13	5.3				280
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TABLE 4-5
CONSTITUENTS DETECTED IN SOIL VAPOR
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	LEA-VP-06	LEA-VP-07	LEA-VP-07	LEA-VP-08	LEA-VP-08	LEA-VP-09	LEA-VP-09
	Sample ID	1328358	1328359	1328359	1328360	1328360	1328361	1328361
	Sample Date	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014
	Sample Time	09:00	09:05	09:05	09:08	09:08	09:11	09:11
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0632-06RE1	14F0632-07	14F0632-07RE1	14F0632-08	14F0632-08RE1	14F0632-09	14F0632-09RE1
Constituent	Units							
Date Organics Analyzed	-	06/24/2014	06/24/2014	06/21/2014	06/24/2014	06/24/2014	06/24/2014	06/24/2014
1,2-Dichloropropane	ug/m3							
Acetone	ug/m3			990		600		540
Benzene	ug/m3	530	150	210	240	280	810	980
1,2,4-Trimethylbenzene	ug/m3	1300	440	610	1100	1400	2600	3100
1,2-Dichlorobenzene	ug/m3							
1,3,5-Trimethylbenzene	ug/m3	740	190	250	370	460	1100	1300
1,3-Dichlorobenzene	ug/m3							
1,4-Dichlorobenzene	ug/m3		5.9		250	300	16	
Chlorobenzene	ug/m3	3900			2000	2300		
Ethylbenzene	ug/m3		100	130	46	55	3800	5100
Isopropylbenzene (Cumene)	ug/m3		160	230	480		680	830
sec-Butylbenzene	ug/m3		25		160		99	120
2-Butanone (MEK)	ug/m3							
4-Isopropyltoluene	ug/m3		140 E	210	310		1300 E	1600
Dichlorodifluoromethane	ug/m3		8.6	50	130		68	
1,1,1-Trichloroethane	ug/m3							
1,1,2-Trichloroethane	ug/m3		30					
1,1-Dichloroethane	ug/m3		6.6		21	26	13	
1,2-Dichloroethane	ug/m3							
Chloroethane	ug/m3	48000	29	56	3000 E	3900	240	290
1,1-Dichloroethylene	ug/m3		8		6.3			
trans-1,2-Dichloroethylene	ug/m3		0.9					
Vinyl Chloride	ug/m3		23	35	27	17	45	67
Tetrachloroethylene	ug/m3	4100	2.3				13	
Chloromethane	ug/m3					200		
Methylene Chloride	ug/m3		10					
Chloroform	ug/m3							
Trichlorofluoromethane	ug/m3							

TABLE 4-5
CONSTITUENTS DETECTED IN SOIL VAPOR
Town of Clinton Landfill, Clinton, Connecticut

Loureiro
Engineering • Construction • EH&S • Energy • Waste

	Location ID	LEA-VP-06	LEA-VP-07	LEA-VP-07	LEA-VP-08	LEA-VP-08	LEA-VP-09	LEA-VP-09
	Sample ID	1328358	1328359	1328359	1328360	1328360	1328361	1328361
	Sample Date	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014
	Sample Time	09:00	09:05	09:05	09:08	09:08	09:11	09:11
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0632-06RE1	14F0632-07	14F0632-07RE1	14F0632-08	14F0632-08RE1	14F0632-09	14F0632-09RE1
Constituent	Units							
Total Trihalomethanes (Calc.)	ug/m3							
Methyl Isobutyl ketone	ug/m3					29		17
Styrene	ug/m3		4.2		31	39	36	44
Toluene	ug/m3		110	150	73	89	740	900
Trichloroethylene	ug/m3		3					
o-Xylene	ug/m3	350	220	260	280	330	1300	1600
Xylenes, Total (Calc.)	ug/m3	4600	1300	1800	1500	1600	5000	6200
Xylenes,m- & p-	ug/m3	4200	1100	1500	1200	1300	3700	4600
cis-1,2-Dichloroethylene	ug/m3		5		10		23	27
n-Butylbenzene	ug/m3		14		130		130	
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TABLE 4-5
CONSTITUENTS DETECTED IN SOIL VAPOR
Town of Clinton Landfill, Clinton, Connecticut

Loureiro
Engineering • Construction • EH&S • Energy • Waste

	Location ID	LEA-VP-10	LEA-VP-10	LEA-VP-11	LEA-VP-12	LEA-VP-12		
	Sample ID	1328362	1328362	1328363	1328364	1328364		
	Sample Date	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014		
	Sample Time	09:15	09:15	09:19	09:21	09:21		
	Laboratory	CONT	CONT	CONT	CONT	CONT		
	Lab. Number	14F0632-10	14F0632-10RE1	14F0632-11	14F0632-12	14F0632-12RE1		
Constituent	Units							
Date Organics Analyzed	-	06/24/2014	06/24/2014	06/24/2014	06/24/2014	06/21/2014		
1,2-Dichloropropane	ug/m3	1.2						
Acetone	ug/m3	1900	2500	100	54			
Benzene	ug/m3	180	190	0.69	0.86			
1,2,4-Trimethylbenzene	ug/m3	21	26	5.9	7.1			
1,2-Dichlorobenzene	ug/m3							
1,3,5-Trimethylbenzene	ug/m3	16	19	2	2.5			
1,3-Dichlorobenzene	ug/m3							
1,4-Dichlorobenzene	ug/m3							
Chlorobenzene	ug/m3	150	160		2			
Ethylbenzene	ug/m3	65	71	3.6	4.1			
Isopropylbenzene (Cumene)	ug/m3	120	150					
sec-Butylbenzene	ug/m3	38	48					
2-Butanone (MEK)	ug/m3							
4-Isopropyltoluene	ug/m3	23	30		2.8			
Dichlorodifluoromethane	ug/m3	72	110	63	7.6			
1,1,1-Trichloroethane	ug/m3				1300 E	850		
1,1,2-Trichloroethane	ug/m3							
1,1-Dichloroethane	ug/m3	15	16		23			
1,2-Dichloroethane	ug/m3							
Chloroethane	ug/m3	83	91	34	3.9			
1,1-Dichloroethylene	ug/m3				1.4			
trans-1,2-Dichloroethylene	ug/m3	1.3						
Vinyl Chloride	ug/m3	65	74	2.6				
Tetrachloroethylene	ug/m3	2.3			5.2			
Chloromethane	ug/m3					20		
Methylene Chloride	ug/m3				16			
Chloroform	ug/m3			2.4				
Trichlorofluoromethane	ug/m3	1.7		2.5	5.3			

TABLE 4-5
CONSTITUENTS DETECTED IN SOIL VAPOR
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	LEA-VP-10	LEA-VP-10	LEA-VP-11	LEA-VP-12	LEA-VP-12		
	Sample ID	1328362	1328362	1328363	1328364	1328364		
	Sample Date	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014		
	Sample Time	09:15	09:15	09:19	09:21	09:21		
	Laboratory	CONT	CONT	CONT	CONT	CONT		
	Lab. Number	14F0632-10	14F0632-10RE1	14F0632-11	14F0632-12	14F0632-12RE1		
Constituent	Units							
Total Trihalomethanes (Calc.)	ug/m3			2.4				
Methyl Isobutyl ketone	ug/m3		12	1.1	1.3			
Styrene	ug/m3							
Toluene	ug/m3	140	150	1.9	2.9			
Trichloroethylene	ug/m3	3.8						
o-Xylene	ug/m3	54	57	2	2.3			
Xylenes, Total (Calc.)	ug/m3	490	550	8	10.1			
Xylenes,m- & p-	ug/m3	440	490	6.3	7.8			
cis-1,2-Dichloroethylene	ug/m3	14	14					
n-Butylbenzene	ug/m3	6						
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Table 4-6

CONSTITUENTS DETECTED IN GROUNDWATER AND SURFACE WATER SAMPLES

Town of Clinton Landfill, Clinton, Connecticut

	Location ID	LEA-SW-01	LEA-SW-02	ME-BR2	ME-BR3	ME-BR4	ME-BR5	ME-BR6
	Sample ID	1328336	1328337	1328322	1328320	1328324	1328323	1328325
	Sample Date	06/11/2014	06/11/2014	06/11/2014	06/10/2014	06/11/2014	06/11/2014	06/11/2014
	Sample Time	10:10	14:10	13:40	12:05	15:50	11:35	14:00
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0541-06	14F0541-07	14F0541-08	14F0440-01	14F0541-05	14F0541-01	14F0541-02
Constituent	Units							
Depth of Well	Ft			26.50	30.01	33.21	24.85	
Depth to Water	Ft			13.58	3.52	1.34	14.40	4.37
Oxygen, Dissolved (field)	mg/L			5.32	0.0	5.38	0.17	0.0
Specific Conductivity (field)	uS/cm			1022	2568	1936	166.4	1326
Temperature	C			12.7	11.9	14.0	12.4	11.9
Turbidity (field)	NTU			71.09	1.33	4.91	4.68	5.76
pH (field measurement)	SU			6.88	8.21	6.43	5.29	7.67
Date Metals Analyzed	-	06/17/2014	06/17/2014	06/13/2014	06/16/2014	06/16/2014	06/17/2014	06/17/2014
Date Organics Analyzed	-	06/12/2014	06/12/2014	06/13/2014	06/11/2014	06/12/2014	06/12/2014	06/12/2014
Date Physical Analyzed	-	06/13/2014	06/13/2014	06/13/2014	06/11/2014	06/13/2014	06/12/2014	06/12/2014
Date Semivolatile Organics Analyzed	-				06/13/2014			06/16/2014
Arsenic	mg/L	0.0025			0.0044	0.014		0.0029
Barium	mg/L	0.12	0.057		0.14	0.22		0.2
Cadmium	mg/L					0.0026		
Iron	mg/L	21	6.2	12	39	33	8.8	63
Manganese	mg/L	1.5	1.1	3.5	0.70	0.87	1.4	0.92
Nickel	mg/L				0.026	0.034		
Zinc	mg/L			0.098				
Ammonia	mg/L	16	4.0	0.80	48	32	0.53	26
Carbonate	mg/L	730	260	140	1200	840	60	630
Cyanide	mg/L	0.013						
Oxidation-Reduction Potential	mV			-86.8	63.5	68.2	107.1	79.2
Total Petroleum Hydrocarbons (CT ETPH)	mg/L	0.49	0.26	0.38	1.5	0.96	0.14	1.2
Total Dissolved Solids	mg/L	840	270	150	1300	790	74	520
Total Suspended Solids	mg/L	70	30	32	820	77	7.0	40
Naphthalene	ug/L				7.1	8.0		10
Naphthalene	ug/L				2.5			6.6
Phenanthrene	ug/L							
Acetone	ug/L	9.0	6.3	160		6.1		7.1

Table 4-6
CONSTITUENTS DETECTED IN GROUNDWATER AND SURFACE WATER SAMPLES
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	LEA-SW-01	LEA-SW-02	ME-BR2	ME-BR3	ME-BR4	ME-BR5	ME-BR6
	Sample ID	1328336	1328337	1328322	1328320	1328324	1328323	1328325
	Sample Date	06/11/2014	06/11/2014	06/11/2014	06/10/2014	06/11/2014	06/11/2014	06/11/2014
	Sample Time	10:10	14:10	13:40	12:05	15:50	11:35	14:00
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0541-06	14F0541-07	14F0541-08	14F0440-01	14F0541-05	14F0541-01	14F0541-02
Constituent	Units							
Benzene	ug/L	1.9			12	11		18
1,2,4-Trimethylbenzene	ug/L				1.3	4.3		17
1,2-Dichlorobenzene	ug/L							0.65
1,3,5-Trimethylbenzene	ug/L							2.4
1,4-Dichlorobenzene	ug/L	0.57			3.0	2.1		5.2
Chlorobenzene	ug/L	2.1			8.4	3.8	0.77	9.5
Ethylbenzene	ug/L							
Isopropylbenzene (Cumene)	ug/L				1.8	4.8		4.3
n-Propylbenzene	ug/L				1.0	2.8		4.0
2-Butanone (MEK)	ug/L			6.9				
Dichlorodifluoromethane	ug/L			1.7		0.96		2.3
1,1-Dichloroethane	ug/L							0.73
Chloroethane	ug/L	7.7	0.55		16	51	7.8	130 E
Methyl tert-Butyl ether	ug/L				0.64			
Tetrahydrofuran	ug/L	49			56	180	36	500 E
Methyl Isobutyl ketone	ug/L							
Xylenes,m- & p-	ug/L					14		23
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Table 4-6
CONSTITUENTS DETECTED IN GROUNDWATER AND SURFACE WATER SAMPLES
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	ME-BR6	ME-BR6	ME-BR6	ME-BR7	ME-OB3B	ME-OB4	ME-OB4
	Sample ID	1328325	1328335	1328335	1328319	1328321	1328326	1328326
	Sample Date	06/11/2014	06/11/2014	06/11/2014	06/11/2014	06/10/2014	06/11/2014	06/11/2014
	Sample Time	14:00	14:00	14:00	12:51	12:15	14:20	14:20
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0541-02RE1	14F0541-03	14F0541-03RE1	14F0541-10	14F0440-02	14F0541-04	14F0541-04RE1
Constituent	Units							
Depth of Well	Ft				30.15	21.67	10.92	10.92
Depth to Water	Ft	4.37	4.37	4.37	5.72	2.01	0.91	0.91
Oxygen, Dissolved (field)	mg/L	0.0	0.0	0.0	0.36	0.0	6.24	6.24
Specific Conductivity (field)	uS/cm	1326	1326	1326	292.8	1011	1982	1982
Temperature	C	11.9	11.9	11.9	12.6	12.4	12.4	12.4
Turbidity (field)	NTU	5.76	5.76	5.76	4.76	1.29	4.88	4.88
pH (field measurement)	SU	7.67	7.67	7.67	5.31	8.44	6.79	6.79
Date Metals Analyzed	-		06/17/2014		06/17/2014	06/13/2014	06/16/2014	
Date Organics Analyzed	-	06/13/2014	06/12/2014	06/13/2014		06/11/2014	06/12/2014	06/13/2014
Date Physical Analyzed	-		06/12/2014		06/14/2014	06/11/2014	06/12/2014	
Date Semivolatile Organics Analyzed	-		06/16/2014			06/13/2014	06/16/2014	
Arsenic	mg/L		0.0031			0.0032	0.012	
Barium	mg/L		0.19			0.16	0.58	
Cadmium	mg/L							
Iron	mg/L		63		10	51	40	
Manganese	mg/L		0.92		1.5	2.5	1.3	
Nickel	mg/L						0.034	
Zinc	mg/L							
Ammonia	mg/L		26		0.80	16	41	
Carbonate	mg/L		630		52	450	910	
Cyanide	mg/L		0.014			0.011	0.019	
Oxidation-Reduction Potential	mV	79.2	79.2	79.2	26.7	9.7	64.4	64.4
Total Petroleum Hydrocarbons (CT ETPH)	mg/L		1.3		0.11	0.67	1.6	
Total Dissolved Solids	mg/L		480		52	520	780	
Total Suspended Solids	mg/L		40			33	210	
Naphthalene	ug/L		10			4.6	9.8	
Naphthalene	ug/L		9.5			1.5	4.7	
Phenanthrene	ug/L						0.066	
Acetone	ug/L		6.2				9.7	

Table 4-6
CONSTITUENTS DETECTED IN GROUNDWATER AND SURFACE WATER SAMPLES
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	ME-BR6	ME-BR6	ME-BR6	ME-BR7	ME-OB3B	ME-OB4	ME-OB4
	Sample ID	1328325	1328335	1328335	1328319	1328321	1328326	1328326
	Sample Date	06/11/2014	06/11/2014	06/11/2014	06/11/2014	06/10/2014	06/11/2014	06/11/2014
	Sample Time	14:00	14:00	14:00	12:51	12:15	14:20	14:20
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0541-02RE1	14F0541-03	14F0541-03RE1	14F0541-10	14F0440-02	14F0541-04	14F0541-04RE1
Constituent	Units							
Benzene	ug/L	22	17	22		6.5	16	19
1,2,4-Trimethylbenzene	ug/L	16	16	16			3.4	
1,2-Dichlorobenzene	ug/L		0.60					
1,3,5-Trimethylbenzene	ug/L		2.4					
1,4-Dichlorobenzene	ug/L		5.0			2.9	3.0	
Chlorobenzene	ug/L	12	9.3	12		2.4	4.9	5.7
Ethylbenzene	ug/L							
Isopropylbenzene (Cumene)	ug/L		4.3			1.0	9.1	8.3
n-Propylbenzene	ug/L		3.8				4.5	
2-Butanone (MEK)	ug/L							
Dichlorodifluoromethane	ug/L		2.3				1.3	
1,1-Dichloroethane	ug/L		0.73			0.56		
Chloroethane	ug/L	190	130 E	190		20	77	99
Methyl tert-Butyl ether	ug/L							
Tetrahydrofuran	ug/L	510	470 E	560		18	250 E	250
Methyl Isobutyl ketone	ug/L							
Xylenes,m- & p-	ug/L		22				18	
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Table 4-6
CONSTITUENTS DETECTED IN GROUNDWATER AND SURFACE WATER SAMPLES
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	SW-2	SW-2					
	Sample ID	1328318	1328318					
	Sample Date	06/11/2014	06/11/2014					
	Sample Time	15:31	15:31					
	Laboratory	CONT	CONT					
	Lab. Number	14F0541-09	14F0541-09RE1					
Constituent	Units							
Depth of Well	Ft	14.85	14.85					
Depth to Water	Ft	5.18	5.18					
Oxygen, Dissolved (field)	mg/L	4.09	4.09					
Specific Conductivity (field)	uS/cm	1288	1288					
Temperature	C	13.5	13.5					
Turbidity (field)	NTU	5.99	5.99					
pH (field measurement)	SU	5.90	5.90					
Date Metals Analyzed	-	06/17/2014						
Date Organics Analyzed	-	06/12/2014	06/13/2014					
Date Physical Analyzed	-	06/13/2014						
Date Semivolatile Organics Analyzed	-	06/17/2014						
Arsenic	mg/L	0.0032						
Barium	mg/L							
Cadmium	mg/L							
Iron	mg/L	81						
Manganese	mg/L	1.4						
Nickel	mg/L							
Zinc	mg/L							
Ammonia	mg/L	20						
Carbonate	mg/L	560						
Cyanide	mg/L							
Oxidation-Reduction Potential	mV	-42.1	-42.1					
Total Petroleum Hydrocarbons (CT ETPH)	mg/L	1.2						
Total Dissolved Solids	mg/L	550						
Total Suspended Solids	mg/L	110						
Naphthalene	ug/L							
Naphthalene	ug/L	2.3						
Phenanthrene	ug/L							
Acetone	ug/L	9.5						

Table 4-6
CONSTITUENTS DETECTED IN GROUNDWATER AND SURFACE WATER SAMPLES
Town of Clinton Landfill, Clinton, Connecticut

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	Location ID	SW-2	SW-2						
	Sample ID	1328318	1328318						
	Sample Date	06/11/2014	06/11/2014						
	Sample Time	15:31	15:31						
	Laboratory	CONT	CONT						
	Lab. Number	14F0541-09	14F0541-09RE1						
Constituent	Units								
Benzene	ug/L	19	23						
1,2,4-Trimethylbenzene	ug/L	3.5							
1,2-Dichlorobenzene	ug/L								
1,3,5-Trimethylbenzene	ug/L								
1,4-Dichlorobenzene	ug/L	1.6							
Chlorobenzene	ug/L	3.5							
Ethylbenzene	ug/L	0.71							
Isopropylbenzene (Cumene)	ug/L	4.4							
n-Propylbenzene	ug/L	2.2							
2-Butanone (MEK)	ug/L								
Dichlorodifluoromethane	ug/L	1.5							
1,1-Dichloroethane	ug/L	1.0							
Chloroethane	ug/L	52	70						
Methyl tert-Butyl ether	ug/L								
Tetrahydrofuran	ug/L	720 E	790						
Methyl Isobutyl ketone	ug/L	6.1							
Xylenes,m- & p-	ug/L								
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TABLE 4-7
ALL ANALYTICAL RESULTS FOR SOIL
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	LEA-SB-01	LEA-SB-02	LEA-SB-03	LEA-SB-04	LEA-SB-05	LEA-SB-05	LEA-SB-05
	Sample ID	1328273	1328274	1328272	1328271	1328268	1328268	1328269
	Sample Date	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014
	Sample Time	14:30	14:49	14:20	14:09	13:40	13:40	13:40
	Sample Depth	0.00' - 2.25'	0' - 2'	0.0' - 0.5'	0' - 0.75'	0.0' - 2.5'	0.0' - 2.5'	0' - 2.5'
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0616-11	14F0616-12	14F0616-10	14F0616-09	14F0616-06	14F0616-06RE1	14F0616-07
Constituent	Units							
Date PCBs Analyzed	-	06/16/2014	06/16/2014	06/16/2014	06/16/2014	06/16/2014		06/16/2014
Date Metals Analyzed	-	06/16/2014	06/16/2014	06/16/2014	06/16/2014	06/16/2014		06/16/2014
Date Organics Analyzed	-	06/14/2014	06/14/2014	06/14/2014	06/14/2014	06/14/2014		06/14/2014
Date Pesticides/Herbicides Analyzed	-	06/19/2014	06/20/2014	06/19/2014	06/19/2014	06/19/2014		06/19/2014
Date Physical Analyzed	-	06/16/2014	06/16/2014	06/16/2014	06/16/2014	06/16/2014		06/16/2014
Date Semivolatile Organics Analyzed	-	06/19/2014	06/20/2014	06/19/2014	06/19/2014		06/21/2014	06/19/2014
Alachlor	ug/kg	<23	<24	<25	<23	<23		<23
2,4,5-Trichlorophenoxyacetic acid	ug/kg	<2.8	<2.9	<3.3	<3.0	<2.9		<3.0
2,4-D	ug/kg	<28	<29	<33	<30	<29		<30
Dicamba	ug/kg	<2.8	<2.9	<3.3	<3.0	<2.9		<3.0
Dalapon	ug/kg	<71	<74	<82	<74	<73		<74
Silvex	ug/kg	<2.8	<2.9	<3.3	<3.0	<2.9		<3.0
Antimony	mg/kg	3.9	3.2	<3.2	2.9	3.6		<2.9
Arsenic	mg/kg	<2.9	<2.9	<3.2	<2.9	<2.9		<2.9
Barium	mg/kg	37	32	42	40	23		21
Beryllium	mg/kg	1.3	1.7	0.77	0.64	1.7		1.7
Cadmium	mg/kg	0.61	0.69	0.48	0.37	0.66		0.69
Chromium, Total	mg/kg	4.9	1.9	8.7	8.4	1.3		1.2
Copper	mg/kg	34	50	8.7	5.7	51		50
Lead	mg/kg	5.8	2.4	24	14	1.8		1.8
Mercury	mg/kg	<0.027	<0.029	0.077	0.081	<0.029		<0.029
Nickel	mg/kg	6.8	7.1	6.2	4.7	6.5		5.7
Selenium	mg/kg	<5.7	<5.7	<6.4	<5.7	<5.8		<5.9
Silver	mg/kg	<0.57	<0.57	<0.64	<0.57	<0.58		<0.59
Thallium	mg/kg	<2.9	<2.9	<3.2	<2.9	<2.9		<2.9
Vanadium	mg/kg	65	97	26	22	95		95
Zinc	mg/kg	34	38	39	27	37		37
Arochlor 1016	ug/kg	<110	<120	<130	<120	<120		<120

Table 4-7
ALL ANALYTICAL RESULTS FOR SOIL
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	LEA-SB-01	LEA-SB-02	LEA-SB-03	LEA-SB-04	LEA-SB-05	LEA-SB-05	LEA-SB-05
	Sample ID	1328273	1328274	1328272	1328271	1328268	1328268	1328269
	Sample Date	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014
	Sample Time	14:30	14:49	14:20	14:09	13:40	13:40	13:40
	Sample Depth	0.00' - 2.25'	0' - 2'	0.0' - 0.5'	0' - 0.75'	0.0' - 2.5'	0.0' - 2.5'	0' - 2.5'
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0616-11	14F0616-12	14F0616-10	14F0616-09	14F0616-06	14F0616-06RE1	14F0616-07
Constituent	Units							
Arochlor 1221	ug/kg	<110	<120	<130	<120	<120		<120
Arochlor 1232	ug/kg	<110	<120	<130	<120	<120		<120
Arochlor 1242	ug/kg	<110	<120	<130	<120	<120		<120
Arochlor 1248	ug/kg	<110	<120	<130	<120	<120		<120
Arochlor 1254	ug/kg	<110	<120	<130	<120	<120		<120
Arochlor 1260	ug/kg	<110	<120	<130	<120	<120		<120
Arochlor 1262	ug/kg	<110	<120	<130	<120	<120		<120
Arochlor 1268	ug/kg	<110	<120	<130	<120	<120		<120
Polychlorinated biphenyls (Total) (Calc.)	ug/kg	<110	<120	<130	<120	<120		<120
Aldrin	ug/kg	<5.7	<6.0	<6.4	<5.8	<5.8		<5.8
Hexachlorobenzene	ug/kg	<6.9	<7.2	<7.6	<6.9	<7.0		<6.9
Chlordane	ug/kg	<23	<24	<25	<23	<23		<23
alpha-Hexachlorocyclohexane	ug/kg	<5.7	<6.0	<6.4	<5.8	<5.8		<5.8
beta-Hexachlorocyclohexane	ug/kg	<5.7	<6.0	<6.4	<5.8	<5.8		<5.8
delta-Hexachlorocyclohexane	ug/kg	<5.7	<6.0	<6.4	<5.8	<5.8		<5.8
Lindane	ug/kg	<2.3	<2.4	<2.5	<2.3	<2.3		<2.3
Dieldrin	ug/kg	<4.6	<4.8	<5.1	<4.6	<4.7		<4.6
Endosulfan I	ug/kg	<5.7	<6.0	<6.4	<5.8	<5.8		<5.8
Endrin	ug/kg	<9.2	<9.6	<10	<9.2	<9.3		<9.3
Endrin aldehyde	ug/kg	<9.2	<9.6	<10	<9.2	<9.3		<9.3
Endrin ketone	ug/kg	<9.2	<9.6	<10	<9.2	<9.3		<9.3
4,4-DDT	ug/kg	<4.6	<4.8	<5.1	<4.6	<4.7		<4.6
Methoxychlor	ug/kg	<57	<60	<64	<58	<58		<58
4,4-DDD	ug/kg	<4.6	<4.8	<5.1	<4.6	<4.7		<4.6
4,4-DDE	ug/kg	<4.6	<4.8	<5.1	<4.6	<4.7		<4.6
Heptachlor Epoxide	ug/kg	<5.7	<6.0	<6.4	<5.8	<5.8		<5.8
Heptachlor	ug/kg	<5.7	<6.0	<6.4	<5.8	<5.8		<5.8
Endosulfan Sulfate	ug/kg	<9.2	<9.6	<10	<9.2	<9.3		<9.3

Table 4-7
ALL ANALYTICAL RESULTS FOR SOIL
Town of Clinton Landfill, Clinton, Connecticut

Loureiro
Engineering • Construction • EH&S • Energy • Waste

	Location ID	LEA-SB-01	LEA-SB-02	LEA-SB-03	LEA-SB-04	LEA-SB-05	LEA-SB-05	LEA-SB-05
	Sample ID	1328273	1328274	1328272	1328271	1328268	1328268	1328269
	Sample Date	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014
	Sample Time	14:30	14:49	14:20	14:09	13:40	13:40	13:40
	Sample Depth	0.00' - 2.25'	0' - 2'	0.0' - 0.5'	0' - 0.75'	0.0' - 2.5'	0.0' - 2.5'	0' - 2.5'
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0616-11	14F0616-12	14F0616-10	14F0616-09	14F0616-06	14F0616-06RE1	14F0616-07
Constituent	Units							
Toxaphene	ug/kg	<110	<120	<130	<120	<120		<120
Cyanide	mg/kg	<0.56	<0.56	<0.63	<0.52	<0.54		<0.54
Total Petroleum Hydrocarbons (CT ETPH)	mg/kg	32	58	78	54	60		50
Acenaphthylene	ug/kg	<190	<200	<220	<200		<200	<200
Benzo[a]anthracene	ug/kg	<190	<200	<220	<200		<200	<200
Benzo[b]fluoranthene	ug/kg	<190	<200	<220	<200		<200	<200
Benzo(a)pyrene	ug/kg	<190	<200	<220	<200		<200	<200
Benzo(g,h,i)perylene	ug/kg	<190	<200	<220	<200		<200	<200
Benzo(k)fluoranthene	ug/kg	<190	<200	<220	<200		<200	<200
Chrysene	ug/kg	<190	<200	<220	<200		<200	<200
Dibenz(a,h)anthracene	ug/kg	<190	<200	<220	<200		<200	<200
Fluoranthene	ug/kg	220	<200	<220	<200		<200	<200
Fluorene	ug/kg	<190	<200	<220	<200		<200	<200
Indeno(1,2,3-c,d)pyrene	ug/kg	<190	<200	<220	<200		<200	<200
Naphthalene	ug/kg	<3.9	<4.0	<3.8	<3.9	<3.7		<4.0
Naphthalene	ug/kg	<190	<200	<220	<200		<200	<200
Phenanthrene	ug/kg	<190	<200	<220	<200		<200	<200
Pyrene	ug/kg	<190	<200	<220	<200		<200	<200
1,2-Dichloropropane	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
Acenaphthene	ug/kg	<190	<200	<220	<200		<200	<200
Acetone	ug/kg	<97	<100	<95	1200	<94		<100
Acrylonitrile	ug/kg	<5.8	<6.1	<5.7	<5.8	<5.6		<6.0
Anthracene	ug/kg	<190	<200	<220	<200		<200	<200
Benzene	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
1,2,3-Trichlorobenzene	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
1,2,4-Trichlorobenzene	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
1,2,4-Trimethylbenzene	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
1,2-Dichlorobenzene	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0

Table 4-7
ALL ANALYTICAL RESULTS FOR SOIL
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	LEA-SB-01	LEA-SB-02	LEA-SB-03	LEA-SB-04	LEA-SB-05	LEA-SB-05	LEA-SB-05
	Sample ID	1328273	1328274	1328272	1328271	1328268	1328268	1328269
	Sample Date	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014
	Sample Time	14:30	14:49	14:20	14:09	13:40	13:40	13:40
	Sample Depth	0.00' - 2.25'	0' - 2'	0.0' - 0.5'	0' - 0.75'	0.0' - 2.5'	0.0' - 2.5'	0' - 2.5'
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0616-11	14F0616-12	14F0616-10	14F0616-09	14F0616-06	14F0616-06RE1	14F0616-07
Constituent	Units							
1,3,5-Trimethylbenzene	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
1,3-Dichlorobenzene	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
1,4-Dichlorobenzene	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
Bromobenzene	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
Chlorobenzene	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
Ethylbenzene	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
Isopropylbenzene (Cumene)	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
n-Propylbenzene	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
sec-Butylbenzene	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
tert-Butylbenzene	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
Hexachlorobutadiene	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
2-Butanone (MEK)	ug/kg	<39	<40	<38	68	<37		<40
trans-1,4-Dichloro-2-Butene	ug/kg	<3.9	<4.0	<3.8	<3.9	<3.7		<4.0
Carbon Disulfide	ug/kg	<5.8	<6.1	<5.7	<5.8	<5.6		<6.0
Carbon Tetrachloride	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
4-Isopropyltoluene	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
Dichlorodifluoromethane	ug/kg	<19	<20	<19	<19	<19		<20
1,1,1,2-Tetrachloroethane	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
1,1,1-Trichloroethane	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
1,1,2,2-Tetrachloroethane	ug/kg	<0.97	<1.0	<0.95	<0.97	<0.94		<1.0
1,1,2-Trichloroethane	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/kg	<9.7	<10	<9.5	<9.7	<9.4		<10
1,1-Dichloroethane	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
Ethylene Dibromide	ug/kg	<0.97	<1.0	<0.95	<0.97	<0.94		<1.0
1,2-Dichloroethane	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
Chloroethane	ug/kg	<19	<20	<19	<19	<19		<20
Methyl tert-Butyl ether	ug/kg	<3.9	<4.0	<3.8	<3.9	<3.7		<4.0
1,1-Dichloroethylene	ug/kg	<3.9	<4.0	<3.8	<3.9	<3.7		<4.0

Table 4-7
ALL ANALYTICAL RESULTS FOR SOIL
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	LEA-SB-01	LEA-SB-02	LEA-SB-03	LEA-SB-04	LEA-SB-05	LEA-SB-05	LEA-SB-05
	Sample ID	1328273	1328274	1328272	1328271	1328268	1328268	1328269
	Sample Date	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014
	Sample Time	14:30	14:49	14:20	14:09	13:40	13:40	13:40
	Sample Depth	0.00' - 2.25'	0' - 2'	0.0' - 0.5'	0' - 0.75'	0.0' - 2.5'	0.0' - 2.5'	0' - 2.5'
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0616-11	14F0616-12	14F0616-10	14F0616-09	14F0616-06	14F0616-06RE1	14F0616-07
Constituent	Units							
trans-1,2-Dichloroethylene	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
Vinyl Chloride	ug/kg	<9.7	<10	<9.5	<9.7	<9.4		<10
Tetrachloroethylene	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
Tetrahydrofuran	ug/kg	<9.7	<10	<9.5	<9.7	<9.4		<10
Hexanone, 2-	ug/kg	<19	<20	<19	<19	<19		<20
Bromomethane	ug/kg	<9.7	<10	<9.5	<9.7	<9.4		<10
Bromodichloromethane	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
Chloromethane	ug/kg	<9.7	<10	<9.5	<9.7	<9.4		<10
Dibromochloromethane	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
Methylene Dibromide	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
Methylene Chloride	ug/kg	<19	<20	<19	<19	<19		<20
Bromoform	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
Chloroform	ug/kg	<3.9	<4.0	<3.8	<3.9	<3.7		<4.0
Trichlorofluoromethane	ug/kg	<9.7	<10	<9.5	<9.7	<9.4		<10
Total Trihalomethanes (Calc.)	ug/kg	<3.9	<4.0	<3.8	<3.9	<3.7		<4.0
2-Methylnaphthalene	ug/kg	<190	<200	<220	<200		<200	<200
Methyl Isobutyl ketone	ug/kg	<19	<20	<19	<19	<19		<20
1,2,3-Trichloropropane	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
1,2-Dibromo-3-Chloropropane	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
1,3-Dichloropropane	ug/kg	<0.97	<1.0	<0.95	<0.97	<0.94		<1.0
sec-Dichloropropane	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
1,1-Dichloropropene	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
trans-1,3-Dichloropropene	ug/kg	<0.97	<1.0	<0.95	<0.97	<0.94		<1.0
cis-1,3-Dichloropropene	ug/kg	<3.9	<4.0	<3.8	<3.9	<3.7		<4.0
Styrene	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
Toluene	ug/kg	<1.9	<2.0	<1.9	6.5	<1.9		<2.0
2-Chlorotoluene	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
4-Chlorotoluene	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0

Table 4-7
ALL ANALYTICAL RESULTS FOR SOIL
Town of Clinton Landfill, Clinton, Connecticut

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	Location ID	LEA-SB-01	LEA-SB-02	LEA-SB-03	LEA-SB-04	LEA-SB-05	LEA-SB-05	LEA-SB-05
	Sample ID	1328273	1328274	1328272	1328271	1328268	1328268	1328269
	Sample Date	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014
	Sample Time	14:30	14:49	14:20	14:09	13:40	13:40	13:40
	Sample Depth	0.00' - 2.25'	0' - 2'	0.0' - 0.5'	0' - 0.75'	0.0' - 2.5'	0.0' - 2.5'	0' - 2.5'
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0616-11	14F0616-12	14F0616-10	14F0616-09	14F0616-06	14F0616-06RE1	14F0616-07
Constituent	Units							
Trichloroethylene	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
o-Xylene	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
Xylenes, Total (Calc.)	ug/kg	<3.9	<4.0	<3.8	<3.9	<3.7		<4.0
Xylenes,m- & p-	ug/kg	<3.9	<4.0	<3.8	<3.9	<3.7		<4.0
cis-1,2-Dichloroethylene	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
n-Butylbenzene	ug/kg	<1.9	<2.0	<1.9	<1.9	<1.9		<2.0
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Table 4-7
ALL ANALYTICAL RESULTS FOR SOIL
Town of Clinton Landfill, Clinton, Connecticut

Loureiro
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	Location ID	LEA-SB-06	LEA-SB-07	LEA-SB-08	LEA-SB-09	LEA-SB-10	LEA-SB-10	
	Sample ID	1328267	1328266	1328264	1328265	1328270	1328270	
	Sample Date	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014	
	Sample Time	13:25	13:10	11:50	12:10	13:58	13:58	
	Sample Depth	0' - 0.5'	0' - 0.5'	0' - 2'	0' - 2'	0' - 1'	0' - 1'	
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	
	Lab. Number	14F0616-05	14F0616-04	14F0616-02	14F0616-03	14F0616-08	14F0616-08RE1	
Constituent	Units							
Date PCBs Analyzed	-	06/16/2014	06/16/2014	06/16/2014	06/16/2014	06/16/2014		
Date Metals Analyzed	-	06/16/2014	06/16/2014	06/16/2014	06/16/2014	06/16/2014		
Date Organics Analyzed	-	06/14/2014	06/14/2014	06/14/2014	06/14/2014	06/14/2014		
Date Pesticides/Herbicides Analyzed	-	06/19/2014	06/19/2014	06/19/2014	06/19/2014	06/19/2014		
Date Physical Analyzed	-	06/17/2014	06/17/2014	06/16/2014	06/17/2014	06/20/2014	06/18/2014	
Date Semivolatile Organics Analyzed	-	06/20/2014	06/20/2014	06/20/2014	06/20/2014	06/20/2014		
Alachlor	ug/kg	<29	<31	<24	<26	<26		
2,4,5-Trichlorophenoxyacetic acid	ug/kg	<3.5	<3.9	<3.1	<3.2	<3.2		
2,4-D	ug/kg	<35	<39	<31	<32	<32		
Dicamba	ug/kg	<3.5	<3.9	<3.1	<3.2	<3.2		
Dalapon	ug/kg	<89	<96	<78	<81	<81		
Silvex	ug/kg	<3.5	<3.9	<3.1	<3.2	<3.2		
Antimony	mg/kg	<3.5	<3.8	<3.1	<3.1	<3.2		
Arsenic	mg/kg	<3.5	<3.8	<3.1	<3.1	<3.2		
Barium	mg/kg	34	29	38	53	37		
Beryllium	mg/kg	0.53	0.43	0.72	0.55	0.57		
Cadmium	mg/kg	<0.35	<0.38	0.40	0.34	0.33		
Chromium, Total	mg/kg	7.7	10	16	12	6.9		
Copper	mg/kg	7.8	9.7	14	10	8.2		
Lead	mg/kg	17	6.9	9.8	8.0	14		
Mercury	mg/kg	0.037	<0.039	0.045	0.045	<0.031		
Nickel	mg/kg	4.8	3.2	5.8	6.3	4.5		
Selenium	mg/kg	<7.1	<7.7	<6.3	<6.2	<6.4		
Silver	mg/kg	<0.71	<0.77	<0.63	<0.62	<0.64		
Thallium	mg/kg	<3.5	<3.8	<3.1	<3.1	<3.2		
Vanadium	mg/kg	19	20	27	24	21		
Zinc	mg/kg	24	15	31	24	23		
Arochlor 1016	ug/kg	<140	<160	<120	<130	<130		

Table 4-7
ALL ANALYTICAL RESULTS FOR SOIL
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	LEA-SB-06	LEA-SB-07	LEA-SB-08	LEA-SB-09	LEA-SB-10	LEA-SB-10	
	Sample ID	1328267	1328266	1328264	1328265	1328270	1328270	
	Sample Date	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014	
	Sample Time	13:25	13:10	11:50	12:10	13:58	13:58	
	Sample Depth	0' - 0.5'	0' - 0.5'	0' - 2'	0' - 2'	0' - 1'	0' - 1'	
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	
	Lab. Number	14F0616-05	14F0616-04	14F0616-02	14F0616-03	14F0616-08	14F0616-08RE1	
Constituent	Units							
Arochlor 1221	ug/kg	<140	<160	<120	<130	<130		
Arochlor 1232	ug/kg	<140	<160	<120	<130	<130		
Arochlor 1242	ug/kg	<140	<160	<120	<130	<130		
Arochlor 1248	ug/kg	<140	<160	<120	<130	<130		
Arochlor 1254	ug/kg	<140	<160	<120	<130	<130		
Arochlor 1260	ug/kg	<140	<160	<120	<130	<130		
Arochlor 1262	ug/kg	<140	<160	<120	<130	<130		
Arochlor 1268	ug/kg	<140	<160	<120	<130	<130		
Polychlorinated biphenyls (Total) (Calc.)	ug/kg	<140	<160	<120	<130	<130		
Aldrin	ug/kg	<7.2	<7.8	<6.1	<6.6	<6.6		
Hexachlorobenzene	ug/kg	<8.7	<9.4	<7.3	<7.9	<7.9		
Chlordane	ug/kg	<29	<31	<24	<26	<26		
alpha-Hexachlorocyclohexane	ug/kg	<7.2	<7.8	<6.1	<6.6	<6.6		
beta-Hexachlorocyclohexane	ug/kg	<7.2	<7.8	<6.1	<6.6	<6.6		
delta-Hexachlorocyclohexane	ug/kg	<7.2	<7.8	<6.1	<6.6	<6.6		
Lindane	ug/kg	<2.9	<3.1	<2.4	<2.6	<2.6		
Dieldrin	ug/kg	<5.8	<6.3	<4.8	<5.2	<5.3		
Endosulfan I	ug/kg	<7.2	<7.8	<6.1	<6.6	<6.6		
Endrin	ug/kg	<12	<13	<9.7	<10	<11		
Endrin aldehyde	ug/kg	<12	<13	<9.7	<10	<11		
Endrin ketone	ug/kg	<12	<13	<9.7	<10	<11		
4,4-DDT	ug/kg	<5.8	<6.3	<4.8	<5.2	<5.3		
Methoxychlor	ug/kg	<72	<78	<61	<66	<66		
4,4-DDD	ug/kg	<5.8	<6.3	<4.8	<5.2	<5.3		
4,4-DDE	ug/kg	<5.8	<6.3	<4.8	<5.2	<5.3		
Heptachlor Epoxide	ug/kg	<7.2	<7.8	<6.1	<6.6	<6.6		
Heptachlor	ug/kg	<7.2	<7.8	<6.1	<6.6	<6.6		
Endosulfan Sulfate	ug/kg	<12	<13	<9.7	<10	<11		

Table 4-7
ALL ANALYTICAL RESULTS FOR SOIL
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	LEA-SB-06	LEA-SB-07	LEA-SB-08	LEA-SB-09	LEA-SB-10	LEA-SB-10	
	Sample ID	1328267	1328266	1328264	1328265	1328270	1328270	
	Sample Date	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014	
	Sample Time	13:25	13:10	11:50	12:10	13:58	13:58	
	Sample Depth	0' - 0.5'	0' - 0.5'	0' - 2'	0' - 2'	0' - 1'	0' - 1'	
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	
	Lab. Number	14F0616-05	14F0616-04	14F0616-02	14F0616-03	14F0616-08	14F0616-08RE1	
Constituent	Units							
Toxaphene	ug/kg	<140	<160	<120	<130	<130		
Cyanide	mg/kg	0.86	<0.47	<0.51	<0.55	<0.64		
Total Petroleum Hydrocarbons (CT ETPH)	mg/kg	160	210	110	180		130	
Acenaphthylene	ug/kg	<240	<270	<210	<220	<220		
Benzo[a]anthracene	ug/kg	<240	<270	<210	<220	<220		
Benzo[b]fluoranthene	ug/kg	<240	<270	<210	<220	<220		
Benzo(a)pyrene	ug/kg	<240	<270	<210	<220	<220		
Benzo(g,h,i)perylene	ug/kg	<240	<270	<210	<220	<220		
Benzo(k)fluoranthene	ug/kg	<240	<270	<210	<220	<220		
Chrysene	ug/kg	<240	<270	<210	<220	<220		
Dibenz(a,h)anthracene	ug/kg	<240	<270	<210	<220	<220		
Fluoranthene	ug/kg	<240	<270	<210	<220	<220		
Fluorene	ug/kg	<240	<270	<210	<220	<220		
Indeno(1,2,3-c,d)pyrene	ug/kg	<240	<270	<210	<220	<220		
Naphthalene	ug/kg	<5.7	<5.2	<5.2	<5.0	<5.2		
Naphthalene	ug/kg	<240	<270	<210	<220	<220		
Phenanthrene	ug/kg	<240	<270	<210	<220	<220		
Pyrene	ug/kg	<240	<270	<210	<220	<220		
1,2-Dichloropropane	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
Acenaphthene	ug/kg	<240	<270	<210	<220	<220		
Acetone	ug/kg	260	750	<130	<130	240		
Acrylonitrile	ug/kg	<8.5	<7.8	<7.9	<7.5	<7.8		
Anthracene	ug/kg	<240	<270	<210	<220	<220		
Benzene	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
1,2,3-Trichlorobenzene	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
1,2,4-Trichlorobenzene	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
1,2,4-Trimethylbenzene	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
1,2-Dichlorobenzene	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		

Table 4-7
ALL ANALYTICAL RESULTS FOR SOIL
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	LEA-SB-06	LEA-SB-07	LEA-SB-08	LEA-SB-09	LEA-SB-10	LEA-SB-10	
	Sample ID	1328267	1328266	1328264	1328265	1328270	1328270	
	Sample Date	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014	
	Sample Time	13:25	13:10	11:50	12:10	13:58	13:58	
	Sample Depth	0' - 0.5'	0' - 0.5'	0' - 2'	0' - 2'	0' - 1'	0' - 1'	
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	
	Lab. Number	14F0616-05	14F0616-04	14F0616-02	14F0616-03	14F0616-08	14F0616-08RE1	
Constituent	Units							
1,3,5-Trimethylbenzene	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
1,3-Dichlorobenzene	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
1,4-Dichlorobenzene	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
Bromobenzene	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
Chlorobenzene	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
Ethylbenzene	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
Isopropylbenzene (Cumene)	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
n-Propylbenzene	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
sec-Butylbenzene	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
tert-Butylbenzene	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
Hexachlorobutadiene	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
2-Butanone (MEK)	ug/kg	<57	<52	<52	<50	<52		
trans-1,4-Dichloro-2-Butene	ug/kg	<5.7	<5.2	<5.2	<5.0	<5.2		
Carbon Disulfide	ug/kg	<8.5	<7.8	<7.9	<7.5	<7.8		
Carbon Tetrachloride	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
4-Isopropyltoluene	ug/kg	<2.8	3.2	<2.6	<2.5	<2.6		
Dichlorodifluoromethane	ug/kg	<28	<26	<26	<25	<26		
1,1,1,2-Tetrachloroethane	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
1,1,1-Trichloroethane	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
1,1,2,2-Tetrachloroethane	ug/kg	<1.4	<1.3	<1.3	<1.3	<1.3		
1,1,2-Trichloroethane	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/kg	<14	<13	<13	<13	<13		
1,1-Dichloroethane	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
Ethylene Dibromide	ug/kg	<1.4	<1.3	<1.3	<1.3	<1.3		
1,2-Dichloroethane	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
Chloroethane	ug/kg	<28	<26	<26	<25	<26		
Methyl tert-Butyl ether	ug/kg	<5.7	<5.2	<5.2	<5.0	<5.2		
1,1-Dichloroethylene	ug/kg	<5.7	<5.2	<5.2	<5.0	<5.2		

Table 4-7
ALL ANALYTICAL RESULTS FOR SOIL
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	LEA-SB-06	LEA-SB-07	LEA-SB-08	LEA-SB-09	LEA-SB-10	LEA-SB-10	
	Sample ID	1328267	1328266	1328264	1328265	1328270	1328270	
	Sample Date	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014	
	Sample Time	13:25	13:10	11:50	12:10	13:58	13:58	
	Sample Depth	0' - 0.5'	0' - 0.5'	0' - 2'	0' - 2'	0' - 1'	0' - 1'	
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	
	Lab. Number	14F0616-05	14F0616-04	14F0616-02	14F0616-03	14F0616-08	14F0616-08RE1	
Constituent	Units							
trans-1,2-Dichloroethylene	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
Vinyl Chloride	ug/kg	<14	<13	<13	<13	<13		
Tetrachloroethylene	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
Tetrahydrofuran	ug/kg	<14	<13	<13	<13	<13		
Hexanone, 2-	ug/kg	<28	<26	<26	<25	<26		
Bromomethane	ug/kg	<14	<13	<13	<13	<13		
Bromodichloromethane	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
Chloromethane	ug/kg	<14	<13	<13	<13	<13		
Dibromochloromethane	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
Methylene Dibromide	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
Methylene Chloride	ug/kg	<28	<26	<26	<25	<26		
Bromoform	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
Chloroform	ug/kg	<5.7	<5.2	<5.2	<5.0	<5.2		
Trichlorofluoromethane	ug/kg	<14	<13	<13	<13	<13		
Total Trihalomethanes (Calc.)	ug/kg	<5.7	<5.2	<5.2	<5.0	<5.2		
2-Methylnaphthalene	ug/kg	<240	<270	<210	<220	<220		
Methyl Isobutyl ketone	ug/kg	<28	<26	<26	<25	<26		
1,2,3-Trichloropropane	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
1,2-Dibromo-3-Chloropropane	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
1,3-Dichloropropane	ug/kg	<1.4	<1.3	<1.3	<1.3	<1.3		
sec-Dichloropropane	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
1,1-Dichloropropene	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
trans-1,3-Dichloropropene	ug/kg	<1.4	<1.3	<1.3	<1.3	<1.3		
cis-1,3-Dichloropropene	ug/kg	<5.7	<5.2	<5.2	<5.0	<5.2		
Styrene	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
Toluene	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
2-Chlorotoluene	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
4-Chlorotoluene	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		

Table 4-7
ALL ANALYTICAL RESULTS FOR SOIL
Town of Clinton Landfill, Clinton, Connecticut

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	Location ID	LEA-SB-06	LEA-SB-07	LEA-SB-08	LEA-SB-09	LEA-SB-10	LEA-SB-10	
	Sample ID	1328267	1328266	1328264	1328265	1328270	1328270	
	Sample Date	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014	06/12/2014	
	Sample Time	13:25	13:10	11:50	12:10	13:58	13:58	
	Sample Depth	0' - 0.5'	0' - 0.5'	0' - 2'	0' - 2'	0' - 1'	0' - 1'	
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	
	Lab. Number	14F0616-05	14F0616-04	14F0616-02	14F0616-03	14F0616-08	14F0616-08RE1	
Constituent	Units							
Trichloroethylene	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
o-Xylene	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
Xylenes, Total (Calc.)	ug/kg	<5.7	<5.2	<5.2	<5.0	<5.2		
Xylenes,m- & p-	ug/kg	<5.7	<5.2	<5.2	<5.0	<5.2		
cis-1,2-Dichloroethylene	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
n-Butylbenzene	ug/kg	<2.8	<2.6	<2.6	<2.5	<2.6		
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TABLE 4-8
ALL ANALYTICAL RESULTS FOR SOIL VAPOR
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	LEA-VP-01	LEA-VP-02	LEA-VP-03	LEA-VP-04	LEA-VP-04	LEA-VP-05	LEA-VP-06
	Sample ID	1328353	1328354	1328355	1328356	1328356	1328357	1328358
	Sample Date	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014
	Sample Time	08:40	08:44	08:49	08:52	08:52	08:57	09:00
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0632-01	14F0632-02	14F0632-03	14F0632-04	14F0632-04RE1	14F0632-05	14F0632-06
Constituent	Units							
Date Organics Analyzed	-	06/23/2014	06/23/2014	06/23/2014	06/21/2014	06/23/2014	06/23/2014	06/21/2014
1,2-Dichloropropane	ug/m3	<0.92	<0.92	<0.46	<18	<180	<0.46	<18
Acetone	ug/m3	410	250	320	970	<3800	120	1900
Acrylonitrile	ug/m3	<2.5	<2.5	<1.2	<50	<500	<1.2	<50
Benzene	ug/m3	9.4	15	18	22	<130	1.2	820
1,2,4-Trimethylbenzene	ug/m3	19	44	32	36	<200	4.6	4300
1,2-Dichlorobenzene	ug/m3	<1.2	<1.2	<0.6	<24	<240	<0.6	93
1,3,5-Trimethylbenzene	ug/m3	1.3	7.9	24	20	<200	1.8	1900
1,3-Dichlorobenzene	ug/m3	<1.2	<1.2	<0.6	<24	<240	<0.6	77
1,4-Dichlorobenzene	ug/m3	<1.2	<1.2	4.1	<24	<240	<0.6	320
Chlorobenzene	ug/m3	<0.92	96	41	32	<180	<0.46	6200
Ethylbenzene	ug/m3	2.5	19	9	23	<170	1.3	36
Isopropylbenzene (Cumene)	ug/m3	67	18	27	<50	<500	<1.2	770
sec-Butylbenzene	ug/m3	40	27	9.8	<50	<500	<1.3	<50
2-Butanone (MEK)	ug/m3	<24	<24	31	<470	<4700	<12	<470
Carbon Tetrachloride	ug/m3	<1.3	<1.3	<0.63	<25	<250	<0.63	<25
4-Isopropyltoluene	ug/m3	<2.5	24	11	<50	<500	9.7	580
Dichlorodifluoromethane	ug/m3	49	15	4.4	100	<200	34	180
1,1,1,2-Tetrachloroethane	ug/m3	<2.5	<2.5	<1.2	<50	<500	<1.2	<50
1,1,1-Trichloroethane	ug/m3	<1.1	<1.1	<0.55	<22	<220	88	<22
1,1,2,2-Tetrachloroethane	ug/m3	<1.4	<1.4	<0.69	<27	<270	<0.69	<27
1,1,2-Trichloroethane	ug/m3	<1.1	<1.1	<0.55	<22	<220	<0.55	<22
1,1-Dichloroethane	ug/m3	2.4	1.4	1.1	<16	<160	7.2	84
Ethylene Dibromide	ug/m3	<1.5	<1.5	<0.77	<31	<310	<0.77	<31
1,2-Dichloroethane	ug/m3	2.9	3.1	<0.4	<16	<160	<0.4	18
Chloroethane	ug/m3	49	20	25	23000 E	17000	2.7	59000 E
Methyl tert-Butyl ether	ug/m3	<0.72	<0.72	<0.36	<14	<140	<0.36	<14
1,1-Dichloroethylene	ug/m3	2.4	2.3	<0.4	<16	<160	<0.4	19
trans-1,2-Dichloroethylene	ug/m3	<0.79	<0.79	<0.4	<16	<160	<0.4	<16

Table 4-8
ALL ANALYTICAL RESULTS FOR SOIL VAPOR
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	LEA-VP-01	LEA-VP-02	LEA-VP-03	LEA-VP-04	LEA-VP-04	LEA-VP-05	LEA-VP-06
	Sample ID	1328353	1328354	1328355	1328356	1328356	1328357	1328358
	Sample Date	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014
	Sample Time	08:40	08:44	08:49	08:52	08:52	08:57	09:00
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0632-01	14F0632-02	14F0632-03	14F0632-04	14F0632-04RE1	14F0632-05	14F0632-06
Constituent	Units							
Vinyl Chloride	ug/m3	0.87	1.5	0.92	16	<100	<0.26	100
Tetrachloroethylene	ug/m3	2	3.3	2.6	<27	<270	0.79	<27
Bromodichloromethane	ug/m3	<1.3	<1.3	<0.67	<27	<270	<0.67	<27
Chloromethane	ug/m3	<0.83	<0.83	0.74	<17	<170	0.64	<17
Dibromochloromethane	ug/m3	<1.7	<1.7	<0.85	<34	<340	<0.85	<34
Methylene Chloride	ug/m3	<6.9	<6.9	<3.5	<140	<1400	66	<140
Bromoform	ug/m3	<2.1	<2.1	<1	<41	<410	<1	<41
Chloroform	ug/m3	<0.98	<0.98	0.81	<20	<200	3.1	<20
Trichlorofluoromethane	ug/m3	<1.1	<1.1	1.3	<22	<220	2.8	<22
Total Trihalomethanes (Calc.)	ug/m3	<2.1	<2.1	0.81	<41	<410	3.1	<41
Methyl Isobutyl ketone	ug/m3	<0.82	<0.82	<0.41	<16	<160	0.58	<16
1,3-Dichloropropane	ug/m3	<2.5	<2.5	<1.2	<50	<500	<1.2	<50
trans-1,3-Dichloropropene	ug/m3	<0.91	<0.91	<0.45	<18	<180	<0.45	<18
cis-1,3-Dichloropropene	ug/m3	<0.91	<0.91	<0.45	<18	<180	<0.45	<18
Styrene	ug/m3	0.95	1.5	0.94	<17	<170	0.76	<17
Toluene	ug/m3	10	28	30	40	<150	39	110
Trichloroethylene	ug/m3	<1.1	2.1	3.9	<21	<210	0.78	<21
o-Xylene	ug/m3	<0.87	12	8.2	<17	<170	2.8	620
Xylenes, Total (Calc.)	ug/m3	15	53	300	3400	2500	15	7700
Xylenes,m- & p-	ug/m3	15	41	290	3400	2500	12	7100
cis-1,2-Dichloroethylene	ug/m3	1.8	3.1	0.48	<16	<160	2.1	19
n-Butylbenzene	ug/m3	18	13	5.3	<63	<630	<1.6	280
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Table 4-8
ALL ANALYTICAL RESULTS FOR SOIL VAPOR
Town of Clinton Landfill, Clinton, Connecticut

Loureiro
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	Location ID	LEA-VP-06	LEA-VP-07	LEA-VP-07	LEA-VP-08	LEA-VP-08	LEA-VP-09	LEA-VP-09
	Sample ID	1328358	1328359	1328359	1328360	1328360	1328361	1328361
	Sample Date	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014
	Sample Time	09:00	09:05	09:05	09:08	09:08	09:11	09:11
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0632-06RE1	14F0632-07	14F0632-07RE1	14F0632-08	14F0632-08RE1	14F0632-09	14F0632-09RE1
Constituent	Units							
Date Organics Analyzed	-	06/24/2014	06/24/2014	06/21/2014	06/24/2014	06/24/2014	06/24/2014	06/24/2014
1,2-Dichloropropane	ug/m3	<180	<0.92	<18	<4.6	<18	<4.6	<18
Acetone	ug/m3	<3800	<19	990	<95	600	<95	540
Acrylonitrile	ug/m3	<500	<2.5	<50	<12	<50	<12	<50
Benzene	ug/m3	530	150	210	240	280	810	980
1,2,4-Trimethylbenzene	ug/m3	1300	440	610	1100	1400	2600	3100
1,2-Dichlorobenzene	ug/m3	<240	<1.2	<24	<6	<24	<6	<24
1,3,5-Trimethylbenzene	ug/m3	740	190	250	370	460	1100	1300
1,3-Dichlorobenzene	ug/m3	<240	<1.2	<24	<6	<24	<6	<24
1,4-Dichlorobenzene	ug/m3	<240	5.9	<24	250	300	16	<24
Chlorobenzene	ug/m3	3900	<0.92	<18	2000	2300	<4.6	<18
Ethylbenzene	ug/m3	<170	100	130	46	55	3800	5100
Isopropylbenzene (Cumene)	ug/m3	<500	160	230	480	<50	680	830
sec-Butylbenzene	ug/m3	<500	25	<50	160	<50	99	120
2-Butanone (MEK)	ug/m3	<4700	<24	<470	<120	<470	<120	<470
Carbon Tetrachloride	ug/m3	<250	<1.3	<25	<6.3	<25	<6.3	<25
4-Isopropyltoluene	ug/m3	<500	140 E	210	310	<50	1300 E	1600
Dichlorodifluoromethane	ug/m3	<200	8.6	50	130	<20	68	<20
1,1,1,2-Tetrachloroethane	ug/m3	<500	<2.5	<50	<12	<50	<12	<50
1,1,1-Trichloroethane	ug/m3	<220	<1.1	<22	<5.5	<22	<5.5	<22
1,1,2,2-Tetrachloroethane	ug/m3	<270	<1.4	<27	<6.9	<27	<6.9	<27
1,1,2-Trichloroethane	ug/m3	<220	30	<22	<5.5	<22	<5.5	<22
1,1-Dichloroethane	ug/m3	<160	6.6	<16	21	26	13	<16
Ethylene Dibromide	ug/m3	<310	<1.5	<31	<7.7	<31	<7.7	<31
1,2-Dichloroethane	ug/m3	<160	<0.81	<16	<4	<16	<4	<16
Chloroethane	ug/m3	48000	29	56	3000 E	3900	240	290
Methyl tert-Butyl ether	ug/m3	<140	<0.72	<14	<3.6	<14	<3.6	<14
1,1-Dichloroethylene	ug/m3	<160	8	<16	6.3	<16	<4	<16
trans-1,2-Dichloroethylene	ug/m3	<160	0.9	<16	<4	<16	<4	<16

Table 4-8
ALL ANALYTICAL RESULTS FOR SOIL VAPOR
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	LEA-VP-06	LEA-VP-07	LEA-VP-07	LEA-VP-08	LEA-VP-08	LEA-VP-09	LEA-VP-09
	Sample ID	1328358	1328359	1328359	1328360	1328360	1328361	1328361
	Sample Date	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014
	Sample Time	09:00	09:05	09:05	09:08	09:08	09:11	09:11
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0632-06RE1	14F0632-07	14F0632-07RE1	14F0632-08	14F0632-08RE1	14F0632-09	14F0632-09RE1
Constituent	Units							
Vinyl Chloride	ug/m3	<100	23	35	27	17	45	67
Tetrachloroethylene	ug/m3	4100	2.3	<27	<6.8	<27	13	<27
Bromodichloromethane	ug/m3	<270	<1.3	<27	<6.7	<27	<6.7	<27
Chloromethane	ug/m3	<170	<0.83	<17	<4.1	200	<4.1	<17
Dibromochloromethane	ug/m3	<340	<1.7	<34	<8.5	<34	<8.5	<34
Methylene Chloride	ug/m3	<1400	10	<140	<35	<140	<35	<140
Bromoform	ug/m3	<410	<2.1	<41	<10	<41	<10	<41
Chloroform	ug/m3	<200	<0.98	<20	<4.9	<20	<4.9	<20
Trichlorofluoromethane	ug/m3	<220	<1.1	<22	<5.6	<22	<5.6	<22
Total Trihalomethanes (Calc.)	ug/m3	<410	<2.1	<41	<10	<41	<10	<41
Methyl Isobutyl ketone	ug/m3	<160	<0.82	<16	<4.1	29	<4.1	17
1,3-Dichloropropane	ug/m3	<500	<2.5	<50	<12	<50	<12	<50
trans-1,3-Dichloropropene	ug/m3	<180	<0.91	<18	<4.5	<18	<4.5	<18
cis-1,3-Dichloropropene	ug/m3	<180	<0.91	<18	<4.5	<18	<4.5	<18
Styrene	ug/m3	<170	4.2	<17	31	39	36	44
Toluene	ug/m3	<150	110	150	73	89	740	900
Trichloroethylene	ug/m3	<210	3	<21	<5.4	<21	<5.4	<21
o-Xylene	ug/m3	350	220	260	280	330	1300	1600
Xylenes, Total (Calc.)	ug/m3	4600	1300	1800	1500	1600	5000	6200
Xylenes,m- & p-	ug/m3	4200	1100	1500	1200	1300	3700	4600
cis-1,2-Dichloroethylene	ug/m3	<160	5	<16	10	<16	23	27
n-Butylbenzene	ug/m3	<630	14	<63	130	<63	130	<63
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Table 4-8
ALL ANALYTICAL RESULTS FOR SOIL VAPOR
Town of Clinton Landfill, Clinton, Connecticut

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	Location ID	LEA-VP-10	LEA-VP-10	LEA-VP-11	LEA-VP-12	LEA-VP-12		
	Sample ID	1328362	1328362	1328363	1328364	1328364		
	Sample Date	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014		
	Sample Time	09:15	09:15	09:19	09:21	09:21		
	Laboratory	CONT	CONT	CONT	CONT	CONT		
	Lab. Number	14F0632-10	14F0632-10RE1	14F0632-11	14F0632-12	14F0632-12RE1		
Constituent	Units							
Date Organics Analyzed	-	06/24/2014	06/24/2014	06/24/2014	06/24/2014	06/21/2014		
1,2-Dichloropropane	ug/m3	1.2	<4.6	<0.92	<0.92	<18		
Acetone	ug/m3	1900	2500	100	54	<380		
Acrylonitrile	ug/m3	<2.5	<12	<2.5	<2.5	<50		
Benzene	ug/m3	180	190	0.69	0.86	<13		
1,2,4-Trimethylbenzene	ug/m3	21	26	5.9	7.1	<20		
1,2-Dichlorobenzene	ug/m3	<1.2	<6	<1.2	<1.2	<24		
1,3,5-Trimethylbenzene	ug/m3	16	19	2	2.5	<20		
1,3-Dichlorobenzene	ug/m3	<1.2	<6	<1.2	<1.2	<24		
1,4-Dichlorobenzene	ug/m3	<1.2	<6	<1.2	<1.2	<24		
Chlorobenzene	ug/m3	150	160	<0.92	2	<18		
Ethylbenzene	ug/m3	65	71	3.6	4.1	<17		
Isopropylbenzene (Cumene)	ug/m3	120	150	<2.5	<2.5	<50		
sec-Butylbenzene	ug/m3	38	48	<2.5	<2.5	<50		
2-Butanone (MEK)	ug/m3	<24	<120	<24	<24	<470		
Carbon Tetrachloride	ug/m3	<1.3	<6.3	<1.3	<1.3	<25		
4-Isopropyltoluene	ug/m3	23	30	<2.5	2.8	<50		
Dichlorodifluoromethane	ug/m3	72	110	63	7.6	<20		
1,1,1,2-Tetrachloroethane	ug/m3	<2.5	<12	<2.5	<2.5	<50		
1,1,1-Trichloroethane	ug/m3	<1.1	<5.5	<1.1	1300 E	850		
1,1,2,2-Tetrachloroethane	ug/m3	<1.4	<6.9	<1.4	<1.4	<27		
1,1,2-Trichloroethane	ug/m3	<1.1	<5.5	<1.1	<1.1	<22		
1,1-Dichloroethane	ug/m3	15	16	<0.81	23	<16		
Ethylene Dibromide	ug/m3	<1.5	<7.7	<1.5	<1.5	<31		
1,2-Dichloroethane	ug/m3	<0.81	<4	<0.81	<0.81	<16		
Chloroethane	ug/m3	83	91	34	3.9	<11		
Methyl tert-Butyl ether	ug/m3	<0.72	<3.6	<0.72	<0.72	<14		
1,1-Dichloroethylene	ug/m3	<0.79	<4	<0.79	1.4	<16		
trans-1,2-Dichloroethylene	ug/m3	1.3	<4	<0.79	<0.79	<16		

Table 4-8
ALL ANALYTICAL RESULTS FOR SOIL VAPOR
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	LEA-VP-10	LEA-VP-10	LEA-VP-11	LEA-VP-12	LEA-VP-12		
	Sample ID	1328362	1328362	1328363	1328364	1328364		
	Sample Date	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014		
	Sample Time	09:15	09:15	09:19	09:21	09:21		
	Laboratory	CONT	CONT	CONT	CONT	CONT		
	Lab. Number	14F0632-10	14F0632-10RE1	14F0632-11	14F0632-12	14F0632-12RE1		
Constituent	Units							
Vinyl Chloride	ug/m3	65	74	2.6	<0.51	<10		
Tetrachloroethylene	ug/m3	2.3	<6.8	<1.4	5.2	<27		
Bromodichloromethane	ug/m3	<1.3	<6.7	<1.3	<1.3	<27		
Chloromethane	ug/m3	<0.83	<4.1	<0.83	<0.83	20		
Dibromochloromethane	ug/m3	<1.7	<8.5	<1.7	<1.7	<34		
Methylene Chloride	ug/m3	<6.9	<35	<6.9	16	<140		
Bromoform	ug/m3	<2.1	<10	<2.1	<2.1	<41		
Chloroform	ug/m3	<0.98	<4.9	2.4	<0.98	<20		
Trichlorofluoromethane	ug/m3	1.7	<5.6	2.5	5.3	<22		
Total Trihalomethanes (Calc.)	ug/m3	<2.1	<10	2.4	<2.1	<41		
Methyl Isobutyl ketone	ug/m3	<0.82	12	1.1	1.3	<16		
1,3-Dichloropropane	ug/m3	<2.5	<12	<2.5	<2.5	<50		
trans-1,3-Dichloropropene	ug/m3	<0.91	<4.5	<0.91	<0.91	<18		
cis-1,3-Dichloropropene	ug/m3	<0.91	<4.5	<0.91	<0.91	<18		
Styrene	ug/m3	<0.85	<4.3	<0.85	<0.85	<17		
Toluene	ug/m3	140	150	1.9	2.9	<15		
Trichloroethylene	ug/m3	3.8	<5.4	<1.1	<1.1	<21		
o-Xylene	ug/m3	54	57	2	2.3	<17		
Xylenes, Total (Calc.)	ug/m3	490	550	8	10.1	<35		
Xylenes,m- & p-	ug/m3	440	490	6.3	7.8	<35		
cis-1,2-Dichloroethylene	ug/m3	14	14	<0.79	<0.79	<16		
n-Butylbenzene	ug/m3	6	<16	<3.2	<3.2	<63		
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Table 4-9
ALL ANALYTICAL RESULTS FOR GROUNDWATER AND SURFACE WATER SAMPLES
Town of Clinton Landfill, Clinton, Connecticut

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	Location ID	LEA-SW-01	LEA-SW-02	ME-BR2	ME-BR3	ME-BR4	ME-BR5	ME-BR6
	Sample ID	1328336	1328337	1328322	1328320	1328324	1328323	1328325
	Sample Date	06/11/2014	06/11/2014	06/11/2014	06/10/2014	06/11/2014	06/11/2014	06/11/2014
	Sample Time	10:10	14:10	13:40	12:05	15:50	11:35	14:00
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0541-06	14F0541-07	14F0541-08	14F0440-01	14F0541-05	14F0541-01	14F0541-02
Constituent	Units							
Depth of Well	Ft			26.50	30.01	33.21	24.85	
Depth to Water	Ft			13.58	3.52	1.34	14.40	4.37
Oxygen, Dissolved (field)	mg/L			5.32	0.0	5.38	0.17	0.0
Specific Conductivity (field)	uS/cm			1022	2568	1936	166.4	1326
Temperature	C			12.7	11.9	14.0	12.4	11.9
Turbidity (field)	NTU			71.09	1.33	4.91	4.68	5.76
pH (field measurement)	SU			6.88	8.21	6.43	5.29	7.67
Date Metals Analyzed	-	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/13/2014	06/17/2014	06/17/2014
Date Organics Analyzed	-	06/12/2014	06/12/2014	06/13/2014	06/11/2014	06/12/2014	06/12/2014	06/12/2014
Date Physical Analyzed	-	06/13/2014	06/13/2014	06/13/2014	06/11/2014	06/13/2014	06/12/2014	06/12/2014
Date Semivolatile Organics Analyzed	-	06/16/2014	06/17/2014	06/17/2014	06/13/2014	06/16/2014	06/16/2014	06/16/2014
Antimony	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Arsenic	mg/L	0.0025	<0.0020	<0.0020	0.0044	0.014	<0.0020	0.0029
Barium	mg/L	0.12	0.057	<0.05	0.14	0.22	<0.05	0.2
Beryllium	mg/L	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Cadmium	mg/L	<0.0025	<0.0025	<0.0025	<0.0025	0.0026	<0.0025	<0.0025
Chromium, Total	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Copper	mg/L	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Iron	mg/L	21	6.2	12	39	33	8.8	63
Lead	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Manganese	mg/L	1.5	1.1	3.5	0.70	0.87	1.4	0.92
Mercury	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Nickel	mg/L	<0.025	<0.025	<0.025	0.026	0.034	<0.025	<0.025
Selenium	mg/L	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Silver	mg/L	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
Thallium	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Vanadium	mg/L	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Zinc	mg/L	<0.05	<0.05	0.098	<0.05	<0.05	<0.05	<0.05
Ammonia	mg/L	16	4.0	0.80	48	32	0.53	26

Table 4-9
ALL ANALYTICAL RESULTS FOR GROUNDWATER AND SURFACE WATER SAMPLES
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	LEA-SW-01	LEA-SW-02	ME-BR2	ME-BR3	ME-BR4	ME-BR5	ME-BR6
	Sample ID	1328336	1328337	1328322	1328320	1328324	1328323	1328325
	Sample Date	06/11/2014	06/11/2014	06/11/2014	06/10/2014	06/11/2014	06/11/2014	06/11/2014
	Sample Time	10:10	14:10	13:40	12:05	15:50	11:35	14:00
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0541-06	14F0541-07	14F0541-08	14F0440-01	14F0541-05	14F0541-01	14F0541-02
Constituent	Units							
Carbonate	mg/L	730	260	140	1200	840	60	630
Cyanide	mg/L	0.013	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Oxidation-Reduction Potential	mV			-86.8	63.5	68.2	107.1	79.2
Total Petroleum Hydrocarbons (CT ETPH)	mg/L	0.49	0.26	0.38	1.5	0.96	0.14	1.2
Total Dissolved Solids	mg/L	840	270	150	1300	790	74	520
Total Suspended Solids	mg/L	70	30	32	820	77	7.0	40
Acenaphthylene	ug/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Benzo[a]anthracene	ug/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo[b]fluoranthene	ug/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzo(a)pyrene	ug/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Benzo(g,h,i)perylene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Benzo(k)fluoranthene	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Chrysene	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Dibenz(a,h)anthracene	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Fluoranthene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Fluorene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Indeno(1,2,3-c,d)pyrene	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Naphthalene	ug/L	<5.0	<5.0	<5.0	7.1	8.0	<5.0	10
Naphthalene	ug/L	<1.0	<1.0	<1.0	2.5	<1.0	<1.0	6.6
Phenanthrene	ug/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Pyrene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-Dichloropropane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Acenaphthene	ug/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Acetone	ug/L	9.0	6.3	160	<5.0	6.1	<5.0	7.1
Acrylonitrile	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Anthracene	ug/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Benzene	ug/L	1.9	<0.50	<0.50	12	11	<0.50	18
1,2,3-Trichlorobenzene	ug/L	<2.0	<2.0	<2.0	<0.50	<2.0	<2.0	<2.0
1,2,4-Trichlorobenzene	ug/L	<2.0	<2.0	<2.0	<0.50	<2.0	<2.0	<2.0

Table 4-9
ALL ANALYTICAL RESULTS FOR GROUNDWATER AND SURFACE WATER SAMPLES
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	LEA-SW-01	LEA-SW-02	ME-BR2	ME-BR3	ME-BR4	ME-BR5	ME-BR6
	Sample ID	1328336	1328337	1328322	1328320	1328324	1328323	1328325
	Sample Date	06/11/2014	06/11/2014	06/11/2014	06/10/2014	06/11/2014	06/11/2014	06/11/2014
	Sample Time	10:10	14:10	13:40	12:05	15:50	11:35	14:00
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0541-06	14F0541-07	14F0541-08	14F0440-01	14F0541-05	14F0541-01	14F0541-02
Constituent	Units							
1,2,4-Trimethylbenzene	ug/L	<0.50	<0.50	<0.50	1.3	4.3	<0.50	17
1,2-Dichlorobenzene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.65
1,3,5-Trimethylbenzene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	2.4
1,3-Dichlorobenzene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,4-Dichlorobenzene	ug/L	0.57	<0.50	<0.50	3.0	2.1	<0.50	5.2
Bromobenzene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Chlorobenzene	ug/L	2.1	<0.50	<0.50	8.4	3.8	0.77	9.5
Ethylbenzene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Isopropylbenzene (Cumene)	ug/L	<0.50	<0.50	<0.50	1.8	4.8	<0.50	4.3
n-Propylbenzene	ug/L	<1.0	<1.0	<1.0	1.0	2.8	<1.0	4.0
sec-Butylbenzene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
tert-Butylbenzene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Hexachlorobutadiene	ug/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
2-Butanone (MEK)	ug/L	<5.0	<5.0	6.9	<5.0	<5.0	<5.0	<5.0
trans-1,4-Dichloro-2-Butene	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Carbon Disulfide	ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Carbon Tetrachloride	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
4-Isopropyltoluene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Dichlorodifluoromethane	ug/L	<0.50	<0.50	1.7	<0.50	0.96	<0.50	2.3
1,1,1,2-Tetrachloroethane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,1-Trichloroethane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,2,2-Tetrachloroethane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,2-Trichloroethane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.73
Ethylene Dibromide	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,2-Dichloroethane	ug/L	<0.50	<0.50	<0.50	<5.0	<0.50	<0.50	<0.50
Chloroethane	ug/L	7.7	0.55	<0.50	16	51	7.8	130 E
Methyl tert-Butyl ether	ug/L	<0.50	<0.50	<0.50	0.64	<0.50	<0.50	<0.50

Table 4-9
ALL ANALYTICAL RESULTS FOR GROUNDWATER AND SURFACE WATER SAMPLES
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	LEA-SW-01	LEA-SW-02	ME-BR2	ME-BR3	ME-BR4	ME-BR5	ME-BR6
	Sample ID	1328336	1328337	1328322	1328320	1328324	1328323	1328325
	Sample Date	06/11/2014	06/11/2014	06/11/2014	06/10/2014	06/11/2014	06/11/2014	06/11/2014
	Sample Time	10:10	14:10	13:40	12:05	15:50	11:35	14:00
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0541-06	14F0541-07	14F0541-08	14F0440-01	14F0541-05	14F0541-01	14F0541-02
Constituent	Units							
1,1-Dichloroethylene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
trans-1,2-Dichloroethylene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Vinyl Chloride	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tetrahydrofuran	ug/L	49	<10	<10	56	180	36	500 E
Hexanone, 2-	ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromomethane	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Bromodichloromethane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Chloromethane	ug/L	<0.50	<0.50	<0.50	<5.0	<0.50	<0.50	<0.50
Dibromochloromethane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Methylene Dibromide	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Methylene Chloride	ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Bromoform	ug/L	<2.0	<2.0	<2.0	<0.50	<2.0	<2.0	<2.0
Chloroform	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Trichlorofluoromethane	ug/L	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
2-Methylnaphthalene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Methyl Isobutyl ketone	ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2,3-Trichloropropane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,2-Dibromo-3-Chloropropane	ug/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,3-Dichloropropane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
sec-Dichloropropane	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloropropene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
trans-1,3-Dichloropropene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
cis-1,3-Dichloropropene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Styrene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-Chlorotoluene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
4-Chlorotoluene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Trichloroethylene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

Table 4-9
ALL ANALYTICAL RESULTS FOR GROUNDWATER AND SURFACE WATER SAMPLES
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	LEA-SW-01	LEA-SW-02	ME-BR2	ME-BR3	ME-BR4	ME-BR5	ME-BR6
	Sample ID	1328336	1328337	1328322	1328320	1328324	1328323	1328325
	Sample Date	06/11/2014	06/11/2014	06/11/2014	06/10/2014	06/11/2014	06/11/2014	06/11/2014
	Sample Time	10:10	14:10	13:40	12:05	15:50	11:35	14:00
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0541-06	14F0541-07	14F0541-08	14F0440-01	14F0541-05	14F0541-01	14F0541-02
Constituent	Units							
o-Xylene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes,m- & p-	ug/L	<2.0	<2.0	<2.0	<2.0	14	<2.0	23
cis-1,2-Dichloroethylene	ug/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
n-Butylbenzene	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
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Table 4-9
ALL ANALYTICAL RESULTS FOR GROUNDWATER AND SURFACE WATER SAMPLES
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	ME-BR6	ME-BR6	ME-BR6	ME-BR7	ME-OB3B	ME-OB4	ME-OB4
	Sample ID	1328325	1328335	1328335	1328319	1328321	1328326	1328326
	Sample Date	06/11/2014	06/11/2014	06/11/2014	06/11/2014	06/10/2014	06/11/2014	06/11/2014
	Sample Time	14:00	14:00	14:00	12:51	12:15	14:20	14:20
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0541-02RE1	14F0541-03	14F0541-03RE1	14F0541-10	14F0440-02	14F0541-04	14F0541-04RE1
Constituent	Units							
Depth of Well	Ft				30.15	21.67	10.92	10.92
Depth to Water	Ft	4.37	4.37	4.37	5.72	2.01	0.91	0.91
Oxygen, Dissolved (field)	mg/L	0.0	0.0	0.0	0.36	0.0	6.24	6.24
Specific Conductivity (field)	uS/cm	1326	1326	1326	292.8	1011	1982	1982
Temperature	C	11.9	11.9	11.9	12.6	12.4	12.4	12.4
Turbidity (field)	NTU	5.76	5.76	5.76	4.76	1.29	4.88	4.88
pH (field measurement)	SU	7.67	7.67	7.67	5.31	8.44	6.79	6.79
Date Metals Analyzed	-		06/13/2014		06/13/2014	06/13/2014	06/13/2014	
Date Organics Analyzed	-	06/13/2014	06/12/2014	06/13/2014	06/13/2014	06/11/2014	06/12/2014	06/13/2014
Date Physical Analyzed	-		06/12/2014		06/13/2014	06/11/2014	06/12/2014	
Date Semivolatile Organics Analyzed	-		06/16/2014		06/17/2014	06/13/2014	06/16/2014	
Antimony	mg/L		<0.0050		<0.0050	<0.0050	<0.0050	
Arsenic	mg/L		0.0031		<0.0020	0.0032	0.012	
Barium	mg/L		0.19		<0.05	0.16	0.58	
Beryllium	mg/L		<0.0020		<0.0020	<0.0020	<0.0020	
Cadmium	mg/L		<0.0025		<0.0025	<0.0025	<0.0025	
Chromium, Total	mg/L		<0.0050		<0.0050	<0.0050	<0.0050	
Copper	mg/L		<0.025		<0.025	<0.025	<0.025	
Iron	mg/L		63		10	51	40	
Lead	mg/L		<0.0050		<0.0050	<0.0050	<0.0050	
Manganese	mg/L		0.92		1.5	2.5	1.3	
Mercury	mg/L		<0.00010		<0.00010	<0.00010	<0.00010	
Nickel	mg/L		<0.025		<0.025	<0.025	0.034	
Selenium	mg/L		<0.025		<0.025	<0.025	<0.025	
Silver	mg/L		<0.0025		<0.0025	<0.0025	<0.0025	
Thallium	mg/L		<0.0010		<0.0010	<0.0010	<0.0010	
Vanadium	mg/L		<0.025		<0.025	<0.025	<0.025	
Zinc	mg/L		<0.05		<0.05	<0.05	<0.05	
Ammonia	mg/L		26		0.80	16	41	

Table 4-9
ALL ANALYTICAL RESULTS FOR GROUNDWATER AND SURFACE WATER SAMPLES
Town of Clinton Landfill, Clinton, Connecticut

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	Location ID	ME-BR6	ME-BR6	ME-BR6	ME-BR7	ME-OB3B	ME-OB4	ME-OB4
	Sample ID	1328325	1328335	1328335	1328319	1328321	1328326	1328326
	Sample Date	06/11/2014	06/11/2014	06/11/2014	06/11/2014	06/10/2014	06/11/2014	06/11/2014
	Sample Time	14:00	14:00	14:00	12:51	12:15	14:20	14:20
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0541-02RE1	14F0541-03	14F0541-03RE1	14F0541-10	14F0440-02	14F0541-04	14F0541-04RE1
Constituent	Units							
Carbonate	mg/L		630		52	450	910	
Cyanide	mg/L		0.014		<0.010	0.011	0.019	
Oxidation-Reduction Potential	mV	79.2	79.2	79.2	26.7	9.7	64.4	64.4
Total Petroleum Hydrocarbons (CT ETPH)	mg/L		1.3		0.11	0.67	1.6	
Total Dissolved Solids	mg/L		480		52	520	780	
Total Suspended Solids	mg/L		40		<5.0	33	210	
Acenaphthylene	ug/L		<0.30		<0.30	<0.30	<0.30	
Benzo[a]anthracene	ug/L		<0.050		<0.050	<0.050	<0.050	
Benzo[b]fluoranthene	ug/L		<0.050		<0.050	<0.050	<0.050	
Benzo(a)pyrene	ug/L		<0.10		<0.10	<0.10	<0.10	
Benzo(g,h,i)perylene	ug/L		<0.50		<0.50	<0.50	<0.50	
Benzo(k)fluoranthene	ug/L		<0.20		<0.20	<0.20	<0.20	
Chrysene	ug/L		<0.20		<0.20	<0.20	<0.20	
Dibenz(a,h)anthracene	ug/L		<0.20		<0.20	<0.20	<0.20	
Fluoranthene	ug/L		<0.50		<0.50	<0.50	<0.50	
Fluorene	ug/L		<1.0		<1.0	<1.0	<1.0	
Indeno(1,2,3-c,d)pyrene	ug/L		<0.20		<0.20	<0.20	<0.20	
Naphthalene	ug/L	<100	10	<100	<5.0	4.6	9.8	<50
Naphthalene	ug/L		9.5		<1.0	1.5	4.7	
Phenanthrene	ug/L		<0.050		<0.050	<0.050	0.066	
Pyrene	ug/L		<1.0		<1.0	<1.0	<1.0	
1,2-Dichloropropane	ug/L	<10	<0.50	<10	<0.50	<0.50	<0.50	<5.0
Acenaphthene	ug/L		<0.30		<0.30	<0.30	<0.30	
Acetone	ug/L	<100	6.2	<100	<5.0	<5.0	9.7	<50
Acrylonitrile	ug/L	<40	<2.0	<40	<2.0	<2.0	<2.0	<20
Anthracene	ug/L		<0.20		<0.20	<0.20	<0.20	
Benzene	ug/L	22	17	22	<0.50	6.5	16	19
1,2,3-Trichlorobenzene	ug/L	<40	<2.0	<40	<2.0	<0.50	<2.0	<20
1,2,4-Trichlorobenzene	ug/L	<40	<2.0	<40	<2.0	<0.50	<2.0	<20

Table 4-9

ALL ANALYTICAL RESULTS FOR GROUNDWATER AND SURFACE WATER SAMPLES

Town of Clinton Landfill, Clinton, Connecticut

	Location ID	ME-BR6	ME-BR6	ME-BR6	ME-BR7	ME-OB3B	ME-OB4	ME-OB4
	Sample ID	1328325	1328335	1328335	1328319	1328321	1328326	1328326
	Sample Date	06/11/2014	06/11/2014	06/11/2014	06/11/2014	06/10/2014	06/11/2014	06/11/2014
	Sample Time	14:00	14:00	14:00	12:51	12:15	14:20	14:20
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0541-02RE1	14F0541-03	14F0541-03RE1	14F0541-10	14F0440-02	14F0541-04	14F0541-04RE1
Constituent	Units							
1,2,4-Trimethylbenzene	ug/L	16	16	16	<0.50	<0.50	3.4	<5.0
1,2-Dichlorobenzene	ug/L	<10	0.60	<10	<0.50	<0.50	<0.50	<5.0
1,3,5-Trimethylbenzene	ug/L	<10	2.4	<10	<0.50	<0.50	<0.50	<5.0
1,3-Dichlorobenzene	ug/L	<10	<0.50	<10	<0.50	<0.50	<0.50	<5.0
1,4-Dichlorobenzene	ug/L	<10	5.0	<10	<0.50	2.9	3.0	<5.0
Bromobenzene	ug/L	<10	<0.50	<10	<0.50	<0.50	<0.50	<5.0
Chlorobenzene	ug/L	12	9.3	12	<0.50	2.4	4.9	5.7
Ethylbenzene	ug/L	<10	<0.50	<10	<0.50	<0.50	<0.50	<5.0
Isopropylbenzene (Cumene)	ug/L	<10	4.3	<10	<0.50	1.0	9.1	8.3
n-Propylbenzene	ug/L	<20	3.8	<20	<1.0	<1.0	4.5	<10
sec-Butylbenzene	ug/L	<20	<1.0	<20	<1.0	<1.0	<1.0	<10
tert-Butylbenzene	ug/L	<20	<1.0	<20	<1.0	<1.0	<1.0	<10
Hexachlorobutadiene	ug/L	<8.0	<0.40	<8.0	<0.40	<0.40	<0.40	<4.0
2-Butanone (MEK)	ug/L	<100	<5.0	<100	<5.0	<5.0	<5.0	<50
trans-1,4-Dichloro-2-Butene	ug/L	<40	<2.0	<40	<2.0	<2.0	<2.0	<20
Carbon Disulfide	ug/L	<100	<5.0	<100	<5.0	<5.0	<5.0	<50
Carbon Tetrachloride	ug/L	<10	<0.50	<10	<0.50	<0.50	<0.50	<5.0
4-Isopropyltoluene	ug/L	<10	<0.50	<10	<0.50	<0.50	<0.50	<5.0
Dichlorodifluoromethane	ug/L	<10	2.3	<10	<0.50	<0.50	1.3	<5.0
1,1,1,2-Tetrachloroethane	ug/L	<10	<0.50	<10	<0.50	<0.50	<0.50	<5.0
1,1,1-Trichloroethane	ug/L	<10	<0.50	<10	<0.50	<0.50	<0.50	<5.0
1,1,2,2-Tetrachloroethane	ug/L	<10	<0.50	<10	<0.50	<0.50	<0.50	<5.0
1,1,2-Trichloroethane	ug/L	<10	<0.50	<10	<0.50	<0.50	<0.50	<5.0
1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/L	<10	<0.50	<10	<0.50	<0.50	<0.50	<5.0
1,1-Dichloroethane	ug/L	<10	0.73	<10	<0.50	0.56	<0.50	<5.0
Ethylene Dibromide	ug/L	<10	<0.50	<10	<0.50	<0.50	<0.50	<5.0
1,2-Dichloroethane	ug/L	<10	<0.50	<10	<0.50	<5.0	<0.50	<5.0
Chloroethane	ug/L	190	130 E	190	<0.50	20	77	99
Methyl tert-Butyl ether	ug/L	<10	<0.50	<10	<0.50	<0.50	<0.50	<5.0

Table 4-9
ALL ANALYTICAL RESULTS FOR GROUNDWATER AND SURFACE WATER SAMPLES
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	ME-BR6	ME-BR6	ME-BR6	ME-BR7	ME-OB3B	ME-OB4	ME-OB4
	Sample ID	1328325	1328335	1328335	1328319	1328321	1328326	1328326
	Sample Date	06/11/2014	06/11/2014	06/11/2014	06/11/2014	06/10/2014	06/11/2014	06/11/2014
	Sample Time	14:00	14:00	14:00	12:51	12:15	14:20	14:20
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0541-02RE1	14F0541-03	14F0541-03RE1	14F0541-10	14F0440-02	14F0541-04	14F0541-04RE1
Constituent	Units							
1,1-Dichloroethylene	ug/L	<10	<0.50	<10	<0.50	<0.50	<0.50	<5.0
trans-1,2-Dichloroethylene	ug/L	<20	<1.0	<20	<1.0	<1.0	<1.0	<10
Vinyl Chloride	ug/L	<20	<1.0	<20	<1.0	<1.0	<1.0	<10
Tetrachloroethylene	ug/L	<20	<1.0	<20	<1.0	<1.0	<1.0	<10
Tetrahydrofuran	ug/L	510	470 E	560	<10	18	250 E	250
Hexanone, 2-	ug/L	<100	<5.0	<100	<5.0	<5.0	<5.0	<50
Bromomethane	ug/L	<20	<1.0	<20	<1.0	<1.0	<1.0	<10
Bromodichloromethane	ug/L	<10	<0.50	<10	<0.50	<0.50	<0.50	<5.0
Chloromethane	ug/L	<10	<0.50	<10	<0.50	<5.0	<0.50	<5.0
Dibromochloromethane	ug/L	<10	<0.50	<10	<0.50	<0.50	<0.50	<5.0
Methylene Dibromide	ug/L	<10	<0.50	<10	<0.50	<0.50	<0.50	<5.0
Methylene Chloride	ug/L	<100	<5.0	<100	<5.0	<5.0	<5.0	<50
Bromoform	ug/L	<40	<2.0	<40	<2.0	<0.50	<2.0	<20
Chloroform	ug/L	<10	<0.50	<10	<0.50	<0.50	<0.50	<5.0
Trichlorofluoromethane	ug/L	<40	<2.0	<40	<2.0	<2.0	<2.0	<20
2-Methylnaphthalene	ug/L		<1.0		<1.0	<1.0	<1.0	
Methyl Isobutyl ketone	ug/L	<100	<5.0	<100	<5.0	<5.0	<5.0	<50
1,2,3-Trichloropropane	ug/L	<10	<0.50	<10	<0.50	<0.50	<0.50	<5.0
1,2-Dibromo-3-Chloropropane	ug/L	<100	<5.0	<100	<5.0	<5.0	<5.0	<50
1,3-Dichloropropane	ug/L	<10	<0.50	<10	<0.50	<0.50	<0.50	<5.0
sec-Dichloropropane	ug/L	<10	<0.50	<10	<0.50	<0.50	<0.50	<5.0
1,1-Dichloropropene	ug/L	<10	<0.50	<10	<0.50	<0.50	<0.50	<5.0
trans-1,3-Dichloropropene	ug/L	<10	<0.50	<10	<0.50	<0.50	<0.50	<5.0
cis-1,3-Dichloropropene	ug/L	<10	<0.50	<10	<0.50	<0.50	<0.50	<5.0
Styrene	ug/L	<20	<1.0	<20	<1.0	<1.0	<1.0	<10
Toluene	ug/L	<20	<1.0	<20	<1.0	<1.0	<1.0	<10
2-Chlorotoluene	ug/L	<10	<0.50	<10	<0.50	<0.50	<0.50	<5.0
4-Chlorotoluene	ug/L	<10	<0.50	<10	<0.50	<0.50	<0.50	<5.0
Trichloroethylene	ug/L	<20	<1.0	<20	<1.0	<1.0	<1.0	<10

Table 4-9
ALL ANALYTICAL RESULTS FOR GROUNDWATER AND SURFACE WATER SAMPLES
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	ME-BR6	ME-BR6	ME-BR6	ME-BR7	ME-OB3B	ME-OB4	ME-OB4
	Sample ID	1328325	1328335	1328335	1328319	1328321	1328326	1328326
	Sample Date	06/11/2014	06/11/2014	06/11/2014	06/11/2014	06/10/2014	06/11/2014	06/11/2014
	Sample Time	14:00	14:00	14:00	12:51	12:15	14:20	14:20
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0541-02RE1	14F0541-03	14F0541-03RE1	14F0541-10	14F0440-02	14F0541-04	14F0541-04RE1
Constituent	Units							
o-Xylene	ug/L	<20	<1.0	<20	<1.0	<1.0	<1.0	<10
Xylenes,m- & p-	ug/L	<40	22	<40	<2.0	<2.0	18	<20
cis-1,2-Dichloroethylene	ug/L	<10	<0.50	<10	<0.50	<0.50	<0.50	<5.0
n-Butylbenzene	ug/L	<20	<1.0	<20	<1.0	<1.0	<1.0	<10
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Table 4-9
ALL ANALYTICAL RESULTS FOR GROUNDWATER AND SURFACE WATER SAMPLES
Town of Clinton Landfill, Clinton, Connecticut

Loureiro
Engineering • Construction • EH&S • Energy • Waste

	Location ID	SW-2	SW-2					
	Sample ID	1328318	1328318					
	Sample Date	06/11/2014	06/11/2014					
	Sample Time	15:31	15:31					
	Laboratory	CONT	CONT					
	Lab. Number	14F0541-09	14F0541-09RE1					
Constituent	Units							
Depth of Well	Ft	14.85	14.85					
Depth to Water	Ft	5.18	5.18					
Oxygen, Dissolved (field)	mg/L	4.09	4.09					
Specific Conductivity (field)	uS/cm	1288	1288					
Temperature	C	13.5	13.5					
Turbidity (field)	NTU	5.99	5.99					
pH (field measurement)	SU	5.90	5.90					
Date Metals Analyzed	-	06/13/2014						
Date Organics Analyzed	-	06/12/2014	06/13/2014					
Date Physical Analyzed	-	06/13/2014						
Date Semivolatile Organics Analyzed	-	06/17/2014						
Antimony	mg/L	<0.0050						
Arsenic	mg/L	0.0032						
Barium	mg/L	<0.05						
Beryllium	mg/L	<0.0020						
Cadmium	mg/L	<0.0025						
Chromium, Total	mg/L	<0.0050						
Copper	mg/L	<0.025						
Iron	mg/L	81						
Lead	mg/L	<0.0050						
Manganese	mg/L	1.4						
Mercury	mg/L	<0.00010						
Nickel	mg/L	<0.025						
Selenium	mg/L	<0.025						
Silver	mg/L	<0.0025						
Thallium	mg/L	<0.0010						
Vanadium	mg/L	<0.025						
Zinc	mg/L	<0.05						
Ammonia	mg/L	20						

Table 4-9
ALL ANALYTICAL RESULTS FOR GROUNDWATER AND SURFACE WATER SAMPLES
Town of Clinton Landfill, Clinton, Connecticut

Loureiro
Engineering • Construction • EH&S • Energy • Waste

	Location ID	SW-2	SW-2					
	Sample ID	1328318	1328318					
	Sample Date	06/11/2014	06/11/2014					
	Sample Time	15:31	15:31					
	Laboratory	CONT	CONT					
	Lab. Number	14F0541-09	14F0541-09RE1					
Constituent	Units							
Carbonate	mg/L	560						
Cyanide	mg/L	<0.010						
Oxidation-Reduction Potential	mV	-42.1	-42.1					
Total Petroleum Hydrocarbons (CT ETPH)	mg/L	1.2						
Total Dissolved Solids	mg/L	550						
Total Suspended Solids	mg/L	110						
Acenaphthylene	ug/L	<0.30						
Benzo[a]anthracene	ug/L	<0.050						
Benzo[b]fluoranthene	ug/L	<0.050						
Benzo(a)pyrene	ug/L	<0.10						
Benzo(g,h,i)perylene	ug/L	<0.50						
Benzo(k)fluoranthene	ug/L	<0.20						
Chrysene	ug/L	<0.20						
Dibenz(a,h)anthracene	ug/L	<0.20						
Fluoranthene	ug/L	<0.50						
Fluorene	ug/L	<1.0						
Indeno(1,2,3-c,d)pyrene	ug/L	<0.20						
Naphthalene	ug/L	<5.0	<200					
Naphthalene	ug/L	2.3						
Phenanthrene	ug/L	<0.050						
Pyrene	ug/L	<1.0						
1,2-Dichloropropane	ug/L	<0.50	<20					
Acenaphthene	ug/L	<0.30						
Acetone	ug/L	9.5	<200					
Acrylonitrile	ug/L	<2.0	<80					
Anthracene	ug/L	<0.20						
Benzene	ug/L	19	23					
1,2,3-Trichlorobenzene	ug/L	<2.0	<80					
1,2,4-Trichlorobenzene	ug/L	<2.0	<80					

Table 4-9
ALL ANALYTICAL RESULTS FOR GROUNDWATER AND SURFACE WATER SAMPLES
Town of Clinton Landfill, Clinton, Connecticut

Engineering • Construction • EH&S • Energy • Waste

	Location ID	SW-2	SW-2					
	Sample ID	1328318	1328318					
	Sample Date	06/11/2014	06/11/2014					
	Sample Time	15:31	15:31					
	Laboratory	CONT	CONT					
	Lab. Number	14F0541-09	14F0541-09RE1					
Constituent	Units							
1,2,4-Trimethylbenzene	ug/L	3.5	<20					
1,2-Dichlorobenzene	ug/L	<0.50	<20					
1,3,5-Trimethylbenzene	ug/L	<0.50	<20					
1,3-Dichlorobenzene	ug/L	<0.50	<20					
1,4-Dichlorobenzene	ug/L	1.6	<20					
Bromobenzene	ug/L	<0.50	<20					
Chlorobenzene	ug/L	3.5	<20					
Ethylbenzene	ug/L	0.71	<20					
Isopropylbenzene (Cumene)	ug/L	4.4	<20					
n-Propylbenzene	ug/L	2.2	<40					
sec-Butylbenzene	ug/L	<1.0	<40					
tert-Butylbenzene	ug/L	<1.0	<40					
Hexachlorobutadiene	ug/L	<0.40	<16					
2-Butanone (MEK)	ug/L	<5.0	<200					
trans-1,4-Dichloro-2-Butene	ug/L	<2.0	<80					
Carbon Disulfide	ug/L	<5.0	<200					
Carbon Tetrachloride	ug/L	<0.50	<20					
4-Isopropyltoluene	ug/L	<0.50	<20					
Dichlorodifluoromethane	ug/L	1.5	<20					
1,1,1,2-Tetrachloroethane	ug/L	<0.50	<20					
1,1,1-Trichloroethane	ug/L	<0.50	<20					
1,1,2,2-Tetrachloroethane	ug/L	<0.50	<20					
1,1,2-Trichloroethane	ug/L	<0.50	<20					
1,1,2-Trichloro-1,2,2-Trifluoroethane	ug/L	<0.50	<20					
1,1-Dichloroethane	ug/L	1.0	<20					
Ethylene Dibromide	ug/L	<0.50	<20					
1,2-Dichloroethane	ug/L	<0.50	<20					
Chloroethane	ug/L	52	70					
Methyl tert-Butyl ether	ug/L	<0.50	<20					

Table 4-9

ALL ANALYTICAL RESULTS FOR GROUNDWATER AND SURFACE WATER SAMPLES

Town of Clinton Landfill, Clinton, Connecticut

	Location ID	SW-2	SW-2						
	Sample ID	1328318	1328318						
	Sample Date	06/11/2014	06/11/2014						
	Sample Time	15:31	15:31						
	Laboratory	CONT	CONT						
	Lab. Number	14F0541-09	14F0541-09RE1						
Constituent	Units								
1,1-Dichloroethylene	ug/L	<0.50	<20						
trans-1,2-Dichloroethylene	ug/L	<1.0	<40						
Vinyl Chloride	ug/L	<1.0	<40						
Tetrachloroethylene	ug/L	<1.0	<40						
Tetrahydrofuran	ug/L	720 E	790						
Hexanone, 2-	ug/L	<5.0	<200						
Bromomethane	ug/L	<1.0	<40						
Bromodichloromethane	ug/L	<0.50	<20						
Chloromethane	ug/L	<0.50	<20						
Dibromochloromethane	ug/L	<0.50	<20						
Methylene Dibromide	ug/L	<0.50	<20						
Methylene Chloride	ug/L	<5.0	<200						
Bromoform	ug/L	<2.0	<80						
Chloroform	ug/L	<0.50	<20						
Trichlorofluoromethane	ug/L	<2.0	<80						
2-Methylnaphthalene	ug/L	<1.0							
Methyl Isobutyl ketone	ug/L	6.1	<200						
1,2,3-Trichloropropane	ug/L	<0.50	<20						
1,2-Dibromo-3-Chloropropane	ug/L	<5.0	<200						
1,3-Dichloropropane	ug/L	<0.50	<20						
sec-Dichloropropane	ug/L	<0.50	<20						
1,1-Dichloropropene	ug/L	<0.50	<20						
trans-1,3-Dichloropropene	ug/L	<0.50	<20						
cis-1,3-Dichloropropene	ug/L	<0.50	<20						
Styrene	ug/L	<1.0	<40						
Toluene	ug/L	<1.0	<40						
2-Chlorotoluene	ug/L	<0.50	<20						
4-Chlorotoluene	ug/L	<0.50	<20						
Trichloroethylene	ug/L	<1.0	<40						

Table 4-9
ALL ANALYTICAL RESULTS FOR GROUNDWATER AND SURFACE WATER SAMPLES
Town of Clinton Landfill, Clinton, Connecticut

Loureiro
Engineering • Construction • EH&S • Energy • Waste

	Location ID	SW-2	SW-2					
	Sample ID	1328318	1328318					
	Sample Date	06/11/2014	06/11/2014					
	Sample Time	15:31	15:31					
	Laboratory	CONT	CONT					
	Lab. Number	14F0541-09	14F0541-09RE1					
Constituent	Units							
o-Xylene	ug/L	<1.0	<40					
Xylenes,m- & p-	ug/L	<2.0	<80					
cis-1,2-Dichloroethylene	ug/L	<0.50	<20					
n-Butylbenzene	ug/L	<1.0	<40					
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TABLE 4-10
GROUNDWATER ELEVATION SUMMARY
FORMER TOWN OF CLINTON LANDFILL
CLINTON, CONNECTICUT

Well ID	Gauging Date	Total Depth (ft)	Screen Length (ft)	Screened Section (ft - ft)	Elevation of Top of PVC (ft)	Depth to Ground Water (ft. below top of PVC)	Water Table Elevation (see notes)
ME-BR1	NA	22.75	10.0	12.75 - 22.75	PVC broken	PVC broken	NA
ME-BR2	6/11/2014	24.5	10.0	14.5 - 24.5	91.58	13.58	78.00
ME-BR3	6/10/2014	28.0	10.0	18.0 - 28.0	61.18	3.52	57.66
ME-OB3A	NA	11.0	5.5	6.0 - 11.0	60.7	Destroyed	Destroyed
ME-OB3B	6/10/2014	20.33	5.0	15.33 - 20.33	60.59	2.01	58.58
ME-BR4	6/11/2014	31.5	10.0	21.5 - 31.5	43.16	1.34	41.82
ME-OB4	6/11/2014	9.5	5.0	4.5 - 9.5	41.96	0.91	41.05
ME-BR5	6/11/2014	23.25	10.0	13.25 - 23.25	74.71	14.40	60.31
ME-BR6	6/11/2014	27.1	10.0	17.1 - 27.1	51.24	4.37	46.87
ME-BR7	6/11/2014	28.0	10.0	18.0 - 28.0	77.03	5.72	71.31
ME-OB7	NA	13.5	10.0	3.5 - 13.5	77.04	Not Located	NA
SW-2	6/11/2014	14.9	Unknown	Unknown	51.14	5.18	45.96

Notes:
- Gauging took place on June 10, 2014
- Ground water depths are relative to top of PVC casing (NGVD 1988 datum).
- Monitoring well, ME-OB7 could not be located and monitoring well, ME-OB3A was found to be destroyed.
- Monitoring well, ME-BR1 had a broken riser, thus the water level could not be accurately measured.

TABLE 4-11

EXCEEDANCES OF THE 2013 RESIDENTIAL DIRECT EXPOSURE CRITERIA

Town of Clinton Landfill, Clinton, Connecticut

Constituent	Units							
nothing found								
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TABLE 4-12

EXCEEDANCES OF THE 2013 INDUSTRIAL/COMMERCIAL DIRECT EXPOSURE CRITERIA

Town of Clinton Landfill, Clinton, Connecticut

Constituent	Units							
nothing found								
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TABLE 4-13
EXCEEDANCES OF THE 2013 GA POLLUTANT MOBILITY CRITERIA
Town of Clinton Landfill, Clinton, Connecticut

Constituent	Units							
nothing found								
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Printed on 06/24/2014

TABLE 4-14

EXCEEDANCES OF THE 2013 RESIDENTIAL VOLATILIZATION CRITERIA FOR SOIL VAPOR

Town of Clinton Landfill, Clinton, Connecticut

Loureiro

Engineering • Construction • EH&S • Energy • Waste

Constituent	Units							
nothing found								
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TABLE 4-15
EXCEEDANCES OF THE 2013 INDUSTRIAL/COMMERCIAL VOLATILIZATION CRITERIA FOR SOIL VAPOR
Town of Clinton Landfill, Clinton, Connecticut

Loureiro
Engineering • Construction • EH&S • Energy • Waste

Constituent	Units							
nothing found								
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TABLE 4-16

EXCEEDANCES OF THE 2013 GROUNDWATER PROTECTION CRITERIA

Town of Clinton Landfill, Clinton, Connecticut

	Location ID	ME-BR2	ME-BR3	ME-BR4	ME-BR6	ME-BR6	ME-BR6	ME-BR6
	Sample ID	1328322	1328320	1328324	1328325	1328325	1328335	1328335
	Sample Date	06/11/2014	06/10/2014	06/11/2014	06/11/2014	06/11/2014	06/11/2014	06/11/2014
	Sample Time	13:40	12:05	15:50	14:00	14:00	14:00	14:00
	Laboratory	CONT	CONT	CONT	CONT	CONT	CONT	CONT
	Lab. Number	14F0541-08	14F0440-01	14F0541-05	14F0541-02	14F0541-02RE1	14F0541-03	14F0541-03RE1
Constituent	Units							
Depth of Well	Ft	26.50	30.01	33.21				
Depth to Water	Ft	13.58	3.52	1.34	4.37	4.37	4.37	4.37
Date Organics Analyzed	-		06/11/2014	06/12/2014	06/12/2014	06/13/2014	06/12/2014	06/13/2014
Date Physical Analyzed	-	06/14/2014	06/13/2014	06/13/2014	06/13/2014		06/13/2014	
Total Petroleum Hydrocarbons (CT ETPH)	mg/L	0.38	1.5	0.96	1.2		1.3	
Benzene	ug/L		12	11	18	22	17	22
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Table 4-16
EXCEEDANCES OF THE 2013 GROUNDWATER PROTECTION CRITERIA
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	ME-OB3B	ME-OB4	ME-OB4	SW-2	SW-2		
	Sample ID	1328321	1328326	1328326	1328318	1328318		
	Sample Date	06/10/2014	06/11/2014	06/11/2014	06/11/2014	06/11/2014		
	Sample Time	12:15	14:20	14:20	15:31	15:31		
	Laboratory	CONT	CONT	CONT	CONT	CONT		
	Lab. Number	14F0440-02	14F0541-04	14F0541-04RE1	14F0541-09	14F0541-09RE1		
Constituent	Units							
Depth of Well	Ft	21.67	10.92	10.92	14.85	14.85		
Depth to Water	Ft	2.01	0.91	0.91	5.18	5.18		
Date Organics Analyzed	-	06/11/2014	06/12/2014	06/13/2014	06/12/2014	06/13/2014		
Date Physical Analyzed	-	06/13/2014	06/13/2014		06/14/2014			
Total Petroleum Hydrocarbons (CT ETPH)	mg/L	0.67	1.6		1.2			
Benzene	ug/L	6.5	16	19	19	23		
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TABLE 4-17
EXCEEDANCES OF THE 2013 SURFACE WATER PROTECTION CRITERIA
Town of Clinton Landfill, Clinton, Connecticut

	Location ID	ME-BR3	ME-BR4	ME-OB4				
	Sample ID	1328320	1328324	1328326				
	Sample Date	06/10/2014	06/11/2014	06/11/2014				
	Sample Time	12:05	15:50	14:20				
	Laboratory	CONT	CONT	CONT				
	Lab. Number	14F0440-01	14F0541-05	14F0541-04				
Constituent	Units							
Depth of Well	Ft	30.01	33.21	10.92				
Depth to Water	Ft	3.52	1.34	0.91				
Date Metals Analyzed	-	06/13/2014	06/13/2014	06/13/2014				
Arsenic	mg/L	0.0044	0.014	0.012				
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TABLE 4-18

EXCEEDANCES OF THE 2013 RESIDENTIAL VOLATILIZATION CRITERIA FOR GROUNDWATER

Town of Clinton Landfill, Clinton, Connecticut

Constituent	Units							
nothing found								
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TABLE 4-19

EXCEEDANCES OF THE INDUSTRIAL/COMMERCIAL VOLATILIZATION CRITERIA FOR GROUNDWATER

Town of Clinton Landfill, Clinton, Connecticut

Constituent	Units							
nothing found								
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TABLE 4-20
VAPOR PROBE MONITORING LOG
FORMER CLINTON LANDFILL

DATE: 6/13/2014 **LOCATION:** Former Clinton Landfill

INSTRUMENT: Landtec GEM 5000 s/n G500446 **PERSONNEL:** Neil Payne

Sample ID	Time	CH_4 (%)	$C0_2$ (%)	O_2 (%)	CO (ppm)	H_2S (ppm)	Balance (%)	NOTES
LEA-VP-001	0840	26.0	13.7	0.8	2	2	60.8	
LEA-VP-002	0844	8.5	1.6	3.4	22	12	87.`1	
LEA-VP-003	0849	1.9	4.8	16.1	29	5	77.3	
LEA-VP-004	0852	17.3	11.7	8.5	7	4	62.9	
LEA-VP-005	0857	0.1	10.9	8.0	1	2	81.5	
LEA-VP-006	0900	70.8	25.5	0.3	2	4	3.2	
LEA-VP-006	0902	69.1	24.8	0.9	2	5	5.1	Duplicate Reading
LEA-VP-006	0926	41.0	16.8	8.1	3	4	41.0	Duplicate Reading (probe left open from previous reading)
LEA-VP-007	0905	33.6	18.3	2.1	11	10	48.8	
LEA-VP-008	0908	54.2	31.3	0.5	0	6	14.6	
LEA-VP-009	0911	72.9	26.2	0.1	2	17	0.0	
LEA-VP-010	0915	69.0	30.1	0.4	1	6	0.0	
LEA-VP-011	0919	2.2	3.4	17.9	0	3	77.2	
LEA-VP-012	0921	0.0	8.0	13.1	0	3	79.0	
Ambient	0834	0.0	0.1	21.1	0	1	78.8	Outside air near LEA-VP-001
Ambient	0848	0.0	0.1	20.9	0	3	79.0	Outside air near LEA-VP-003
Ambient	0910	0.0	0.1	21.1	0	3	78.8	Outside air near LEA-VP-009
Ambient	0921	0.0	0.1	21.2	0	3	78.7	Outside air near LEA-VP-012

CH_4 - Methane

CO_2 - Carbon Dioxide

H_2S - Hydrogen Sulfide

CO - Carbon Monoxide

O_2 - Oxygen

Ambient Temperature - 67 °F

Barometric Pressure - 29.83 inches (1010.2 mb)

Table 7-1

Preliminary Landfill Closure Cost Estimates
Old Nod Road, Clinton, Connecticut
Option 1 - Landfill Closure with Redevelopment

Task	Unit Cost	Units	Number of Units	Extended Cost
Engineering/Design/Permitting/Construction Administration		%	15	$458,466
General Conditions (bid bond, bonding, project management)		%	6	$183,386
Subtotal				**$641,852**
Pre-Construction Site Preparation				
Surveying Layout	$25,000	lump sum	1	$25,000
Erosion Control	$2.50	per linear foot	3,000	$7,500
Clearing/Grubbing	$1,000	per acre	9.26	$9,260
Import	$2.50	per cubic yard	30000	$75,000
Cuts and Fill	$4.00	per cubic yard	10000	$40,000
Top Soil	$5	per cubic yard	2600	$13,000
Subtotal				**$169,760**
Building Foundation Work				
Pile Installation	$700,000	lump sum	1	$700,000
Pile Cap and Grade Beam Construction	$500	per cubic yard	600	$300,000
Structural Slab	$240	per cubic yard	1900	$456,000
Subtotal				**$1,456,000**
Site Redevelpment and Construction				
Site Drainage	$75,000	lump sum	1	$75,000
Building Excavation	$4.00	per cubic yard	880	$3,520
Cap Under Foundation (trenching and vapor mitigation system inc.)	$4.63	per square foot	60,000	$277,800
Cap Under Roads and Sidewalk	$2.56	per square foot	91,700	$234,752
Cap Under Landscaped Areas	$2.31	per square foot	245,500	$567,105
Paving (parking and roads)	$2.50	per square foot	85,000	$212,500
Concrete Sidewalks, Dumpster Pad, Curbs	$60,000	lump sum	1	$60,000
Subtotal				**$1,430,677**
Total Estimated Project Cost				$3,698,289
Contingency (10% of total)				$369,829
TOTAL ESTIMATED PROJECT COST				**$4,068,118**

Notes:

1. Cost estimates provided herein should be considered rough order of magnitude costs, and should be used for planning level purposes only. Formal written bids have not been obtained for the tasks presented.
2. Cost estimate presented herein assumes DEEP will approve proposed side slope grading conditions of 2 : 1.

Table 7-2

Preliminary Landfill Closure Cost Estimates
Old Nod Road, Clinton, Connecticut
Option 2 - Traditional Landfill Closure with No Development

Task	Unit Cost	Units	Number of Units	Extended Cost
Engineering/Permitting/Construction Administration		%	15	$296,670
General Conditions (bid bond, bonding, project management)		%	6	$118,668
Subtotal				**$415,338**
Site Construction				
Surveying Layout	$20,000	lump sum	1	$20,000
Erosion Control	$2.50	per linear foot	3,000	$7,500
Clearing/Grubbing	$5,000	per acre	9.26	$46,300
Mass Grading (top soil, cuts and fill, import)	$500,000	lump sum	1	$500,000
Cap Under Landscaped Areas	$3.51	per square foot	400,000	$1,404,000
Subtotal				**$1,977,800**
Total Estimated Project Cost				$2,393,138
Contingency (10% of total)				$239,314
TOTAL ESTIMATED PROJECT COST				**$2,632,452**

Notes:

1. Cost estimates provided herein should be considered rough order of magnitude costs, and should be used for planning level purposes only. Formal written bids have not been obtained for the tasks presented.
2. Cost estimate presented herein assumes landfill will be closed with tradition low-permeability soil, with no building construction or development.
3. Cost estimate presented herein assumes DEEP will approve existing side slope grading conditions.

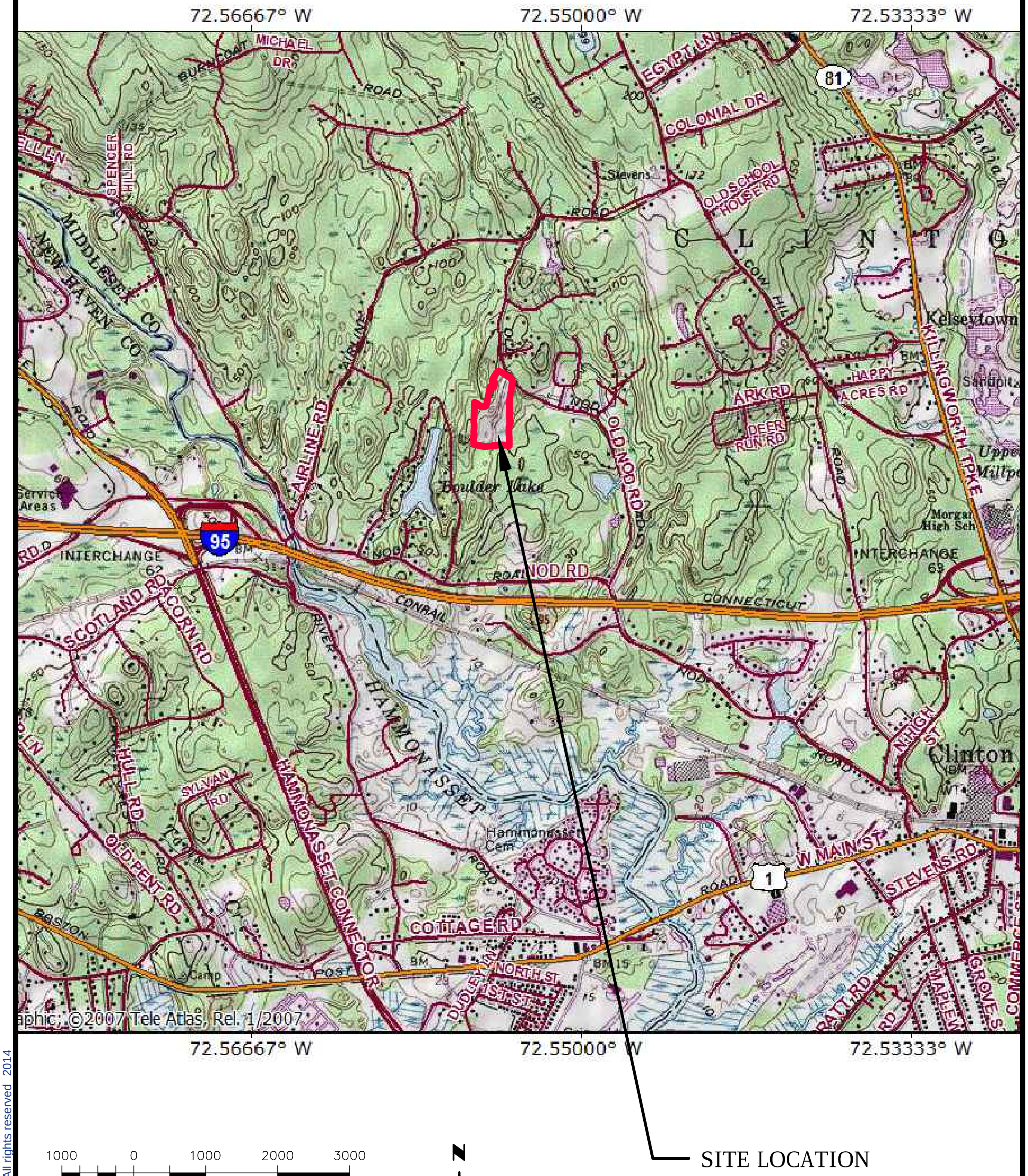
Table 7-3

Preliminary Landfill Closure Cost Estimates
Old Nod Road, Clinton, Connecticut
Option 3 - No Action

Task	**Unit Cost**	**Units**	**Number of Units**	**Extended Cost**
Leachate Monitoring	$10,000	per year	30	$300,000
Total Estimated Project Cost				$300,000
Contingency (10% of total)				$30,000
TOTAL ESTIMATED PROJECT COST				**$330,000**

Notes:

1. Cost estimates provided herein should be considered rough order of magnitude costs, and should be used for planning level purposes only. Formal written bids have not been obtained for the tasks presented.



1000 0 1000 2000 3000

APPROXIMATE SCALE IN FEET

N

MAP REFERENCE:

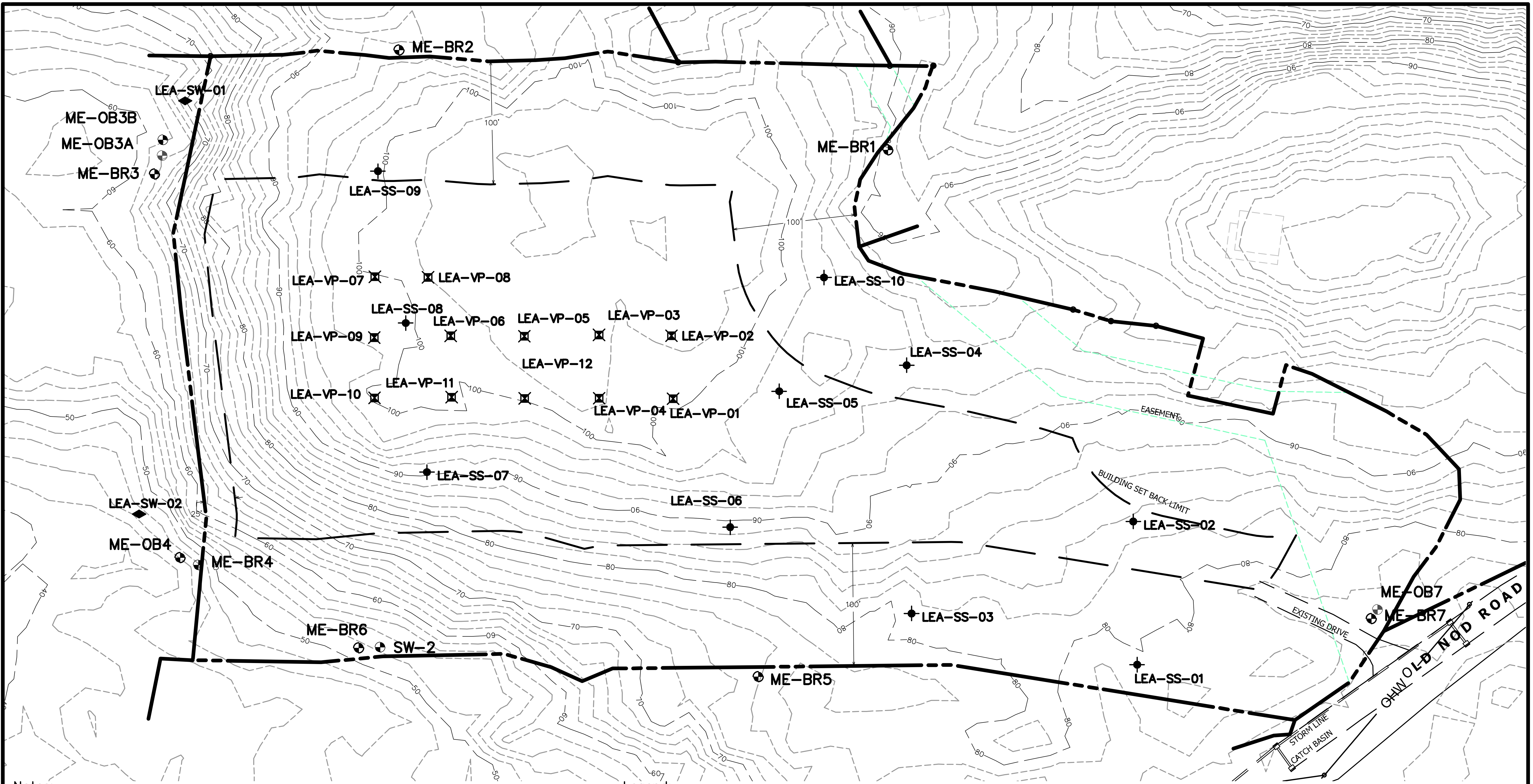
SECTION OF THE USGS 7.5 MINUTE SERIES TOPOGRAPHIC MAP FOR CLINTON, CONN. MAP VERSION DATE 1984, MAP CREATED WITH TOPO! © 2008 NATIONAL GEOGRAPHIC & © 2007 TELE ATLAS, NORTH AMERICA, INC., RELEASE 01/2007.

FEASIBILITY STUDY REPORT
Town of Clinton, Former Landfill, Old Nod Road, Clinton, CT

SITE LOCATION MAP

Comm.No.	FIGURE 1	Loureiro
65PE4.01		Engineering • Construction • EH&S • Energy • Waste

\\STORAGE01\PROJECTS\PROJECTS\AUTOCAD\PROJECTS\65PE401-CLINTON LANDFILL\SUBMISSION JUNE 2014\65PE401-FSREPORT-F01.DWG Tab:F01 Saved: 6/26/2014 2:31 PM Plotted: 6/30/2014 11:19 AM



Notes:

"PROPERTY SURVEY – LAND OF THE TOWN OF CLINTON, OLD NOD ROAD – ASR'S. MAP 14, BLOCK 3, LOT 18, CLINTON, CONNECTICUT, MAY 16, 2014, SCALE: 1 INCH = 40 FEET", by Barden Survey L.L.C.

"Improvement Location Survey – Proposed, Preliminary Ice Rink Prepared For Payne Environmental, Assessor's Map 14, Block 3, Lot 18, Old Nod Road, Clinton, Connecticut", Scale: 1"=40', dated June 16, 2014, by Thomas A. Stevens & Associates, Inc.

1. Topographic information depicted on the drawing is based on a aerial contours. All existing features and conditions are not necessarily depicted or noted hereon. Property line information shown on the drawing is approximate only and is provided for the contractor's general information.

2. All elevations are referenced to the North American Vertical Datum of 1988.

Legend:

Property / Right Of Way
Easement
Existing Elevation Contour
60 x104.2 Existing Spot Elevation
Fence (Barbed Wire)

✚ Shallow Soil Boring Location
☒ Vapor Probe Sample Location
◆ Surface Water Sample Location
● Monitoring Well Location – Overburden Well
● Monitoring Well Location – Bedrock Well
● Monitoring Well Location – Destroyed/Damaged

40 0 40 80 120
SCALE IN FEET (1"=80')

N

FEASIBILITY STUDY REPORT
Town of Clinton, Former Landfill, Old Nod Road, Clinton, CT

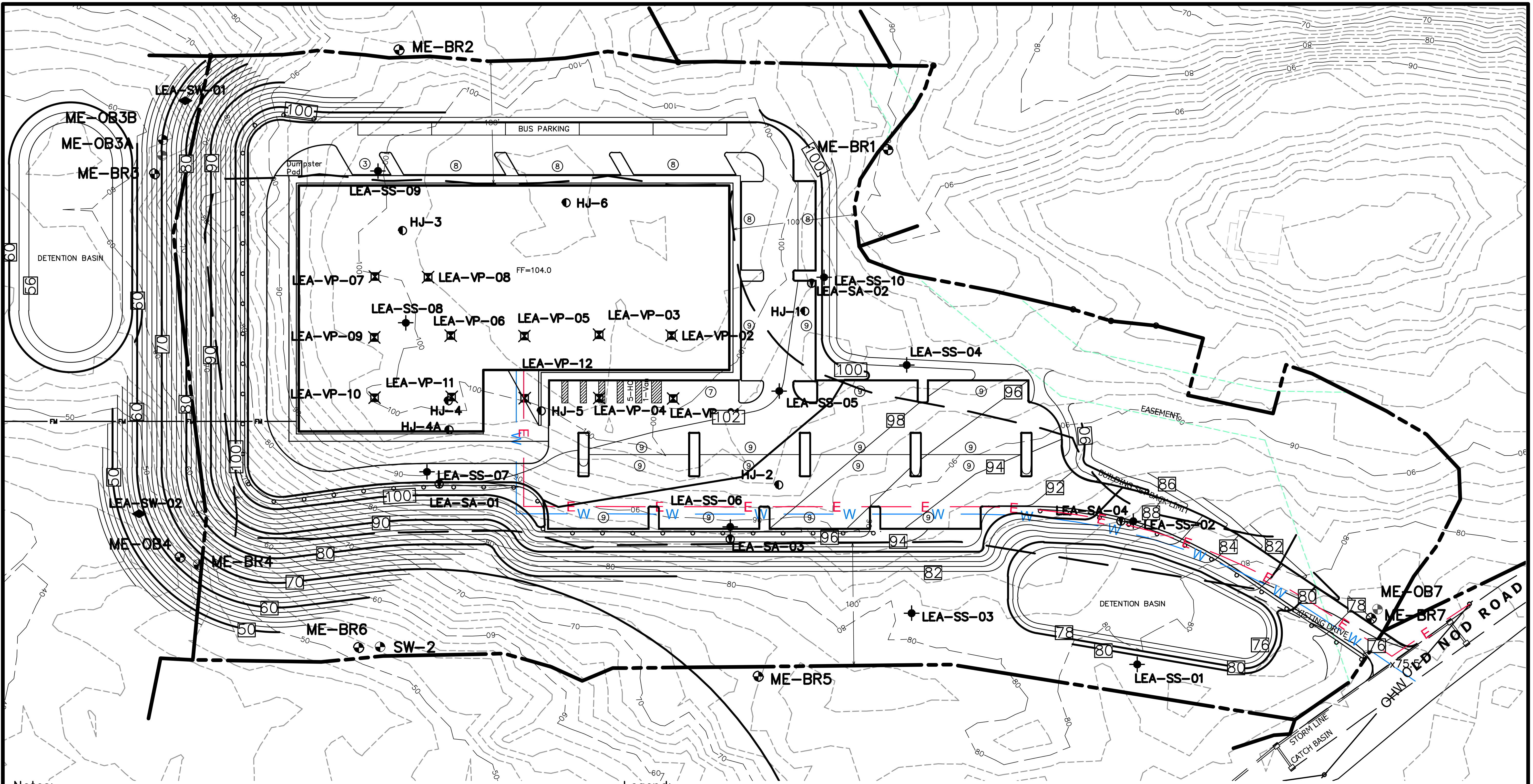
EXISTING CONDITIONS AND
SAMPLING LOCATIONS

Comm.No.
65PE4.01

FIGURE 2

Loureiro
Engineering • Construction • EH&S • Energy • Waste

\\STORAGE01\PROJECTS\AUTOCAD\PROJECTS\65PE401-CLINTON LANDFILL\SUBMISSION JUNE 2014\E-5472 06-16-14-LEA.DWG Tab: F02 Saved: 6/27/2014 10:31 AM Plotted: 6/30/2014 11:13 AM



Notes:

"PROPERTY SURVEY – LAND OF THE TOWN OF CLINTON, OLD NOD ROAD – ASR'S. MAP 14, BLOCK 3, LOT 18, CLINTON, CONNECTICUT, MAY 16, 2014, SCALE: 1 INCH = 40 FEET", by Barden Survey L.L.C.

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2. All elevations are referenced to the North American Vertical Datum of 1988.

Legend:

Property / Right Of Way
Easement
60 Existing Elevation Contour
x104.2 Existing Spot Elevation
Fence (Barbed Wire)
Proposed Building
Proposed Edge of Pavement
106 Proposed Elevation Contour
FM Proposed Sanitary Sewer Force Main
E Proposed Electrical/Communications
W Proposed Water/Fire Service

Shallow Soil Boring Location
Vapor Probe Sample Location
Surface Water Sample Location
Monitoring Well Location – Overburden Well
Monitoring Well Location – Bedrock Well
Geotechnical Boring Location
Sieve Analysis Location

40 0 40 80 120
SCALE IN FEET (1"=80')

N

FEASIBILITY STUDY REPORT
Town of Clinton, Former Landfill, Old Nod Road, Clinton, CT

PROPOSED REDEVELOPMENT,
GEOTECHNICAL AND SAMPLING LOCATIONS

Comm.No.
65PE4.01

FIGURE 3

Loureiro
Engineering • Construction • EH&S • Energy • Waste

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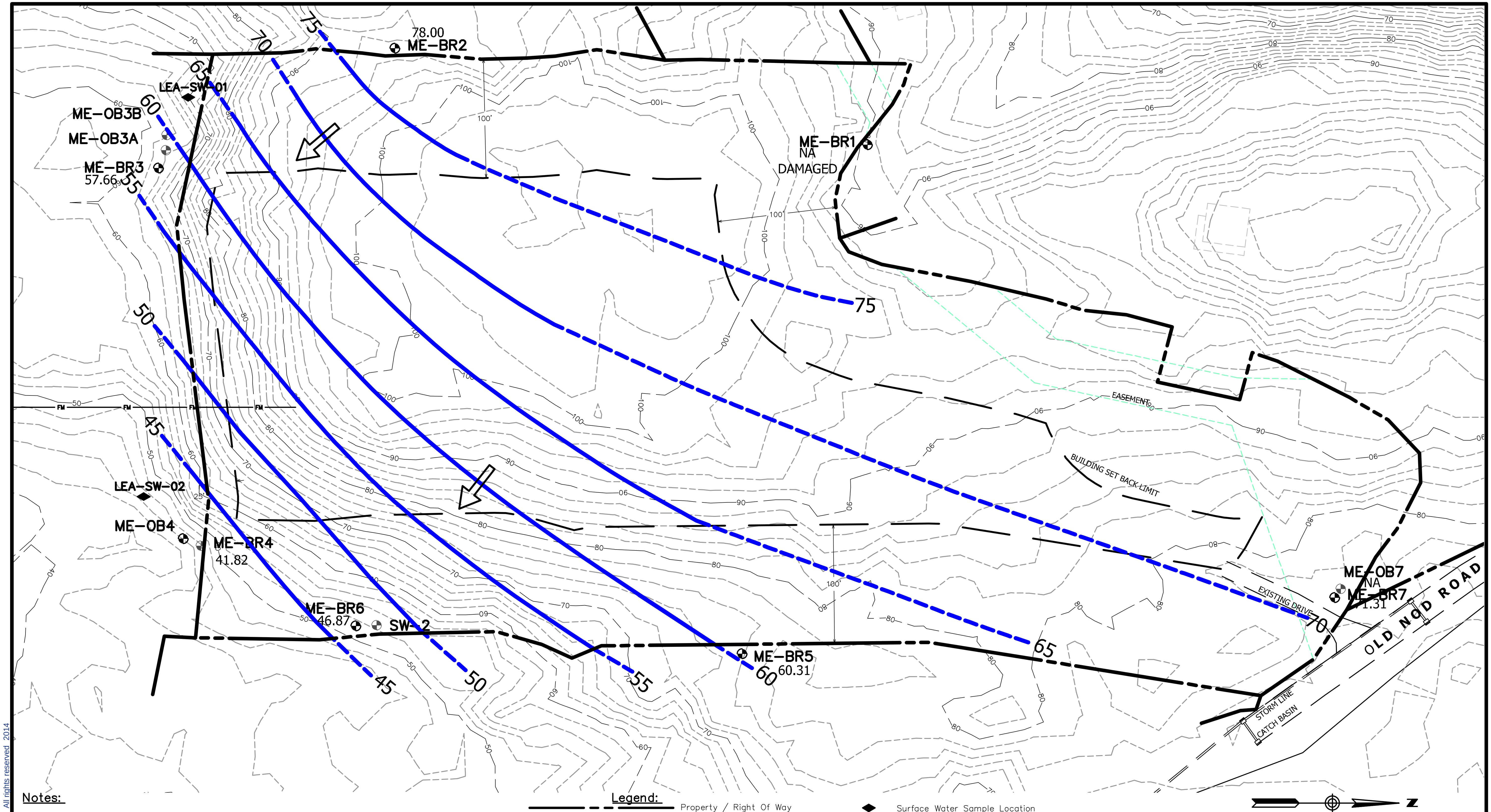

Notes:

"PROPERTY SURVEY – LAND OF THE TOWN OF CLINTON, OLD NOD ROAD – ASR'S. MAP 14, BLOCK 3, LOT 18, CLINTON, CONNECTICUT, MAY 16, 2014, SCALE: 1 INCH = 40 FEET", by Barden Survey L.L.C.

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2. All elevations are referenced to the North American Vertical Datum of 1988.

Legend:

Property / Right Of Way
Easement
60 Existing Elevation Contour
x104.2 Existing Spot Elevation
Fence (Barbed Wire)
Proposed Building
Proposed Edge of Pavement
106 Proposed Elevation Contour
FM Proposed Sanitary Sewer Force Main
E Proposed Electrical/Communications
W Proposed Water/Fire Service

◆ Surface Water Sample Location
Monitoring Well Location – Overburden Well
Monitoring Well Location – Bedrock Well
Groundwater Contour (Sample Date June , 2014)
(Dashed where inferred)
41.05 Groundwater Elevation (NGVD88)
⇦ Groundwater Flow Direction

40 0 40 80 120
SCALE IN FEET (1"=80')

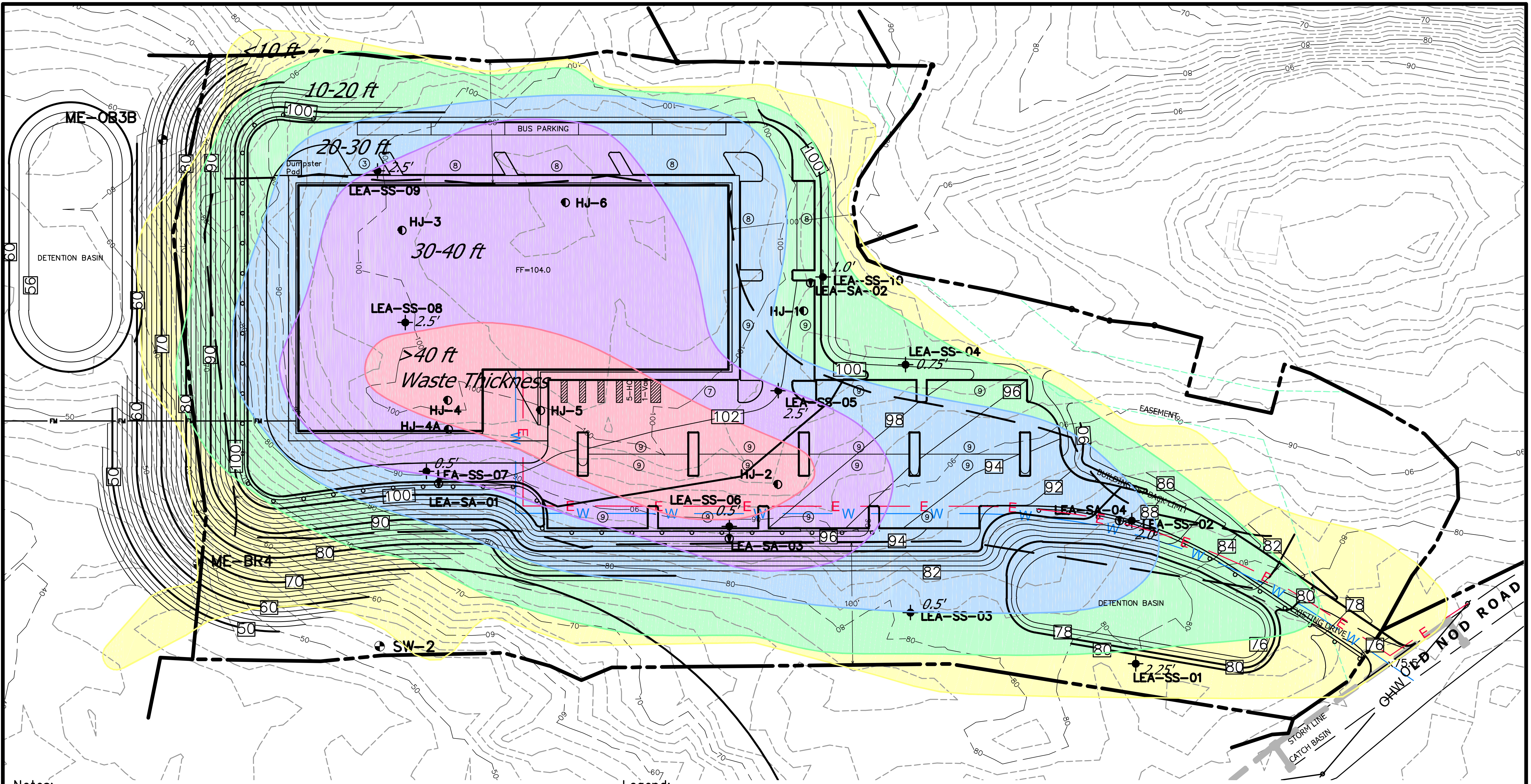
FEASIBILITY STUDY REPORT
Town of Clinton, Former Landfill, Old Nod Road, Clinton, CT

GROUNDWATER CONTOURS
IN BEDROCK

Comm.No.
65PE4.01

FIGURE 4

\\STORAGE01\PROJECTS\AUTOCAD\PROJECTS\65PE401-CLINTON LANDFILL\SUBMISSION JUNE 2014\E-5472 06-16-14-LEA.DWG Tab: F04 Saved: 6/27/2014 10:31 AM Plotted: 6/30/2014 11:15 AM



Notes:

"PROPERTY SURVEY – LAND OF THE TOWN OF CLINTON, OLD NOD ROAD – ASR'S. MAP 14, BLOCK 3, LOT 18, CLINTON, CONNECTICUT, MAY 16, 2014, SCALE: 1 INCH = 40 FEET", by Barden Survey L.L.C.

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1. Topographic information depicted on the drawing is based on a aerial contours. All existing features and conditions are not necessarily depicted or noted hereon. Property line information shown on the drawing is approximate only and is provided for the contractor's general information.
2. All elevations are referenced to the North American Vertical Datum of 1988.

Legend:

— — —	Property / Right Of Way
— — —	Easement
— 60 —	Existing Elevation Contour
x104.2	Existing Spot Elevation
—x—x—	Fence (Barbed Wire)
—	Proposed Building
—	Proposed Edge of Pavement
106	Proposed Elevation Contour
— FM — FM —	Proposed Sanitary Sewer Force Main
— E — E — E —	Proposed Electrical/Communications
— W — W — W —	Proposed Water/Fire Service
✦	Shallow Soil Boring Location
◐	Geotechnical Boring Location
◑	Sieve Analysis Location
0.5′	Depth Of Fill To Municipal Solid Waste

40 0 40 80 120

SCALE IN FEET (1"=80')

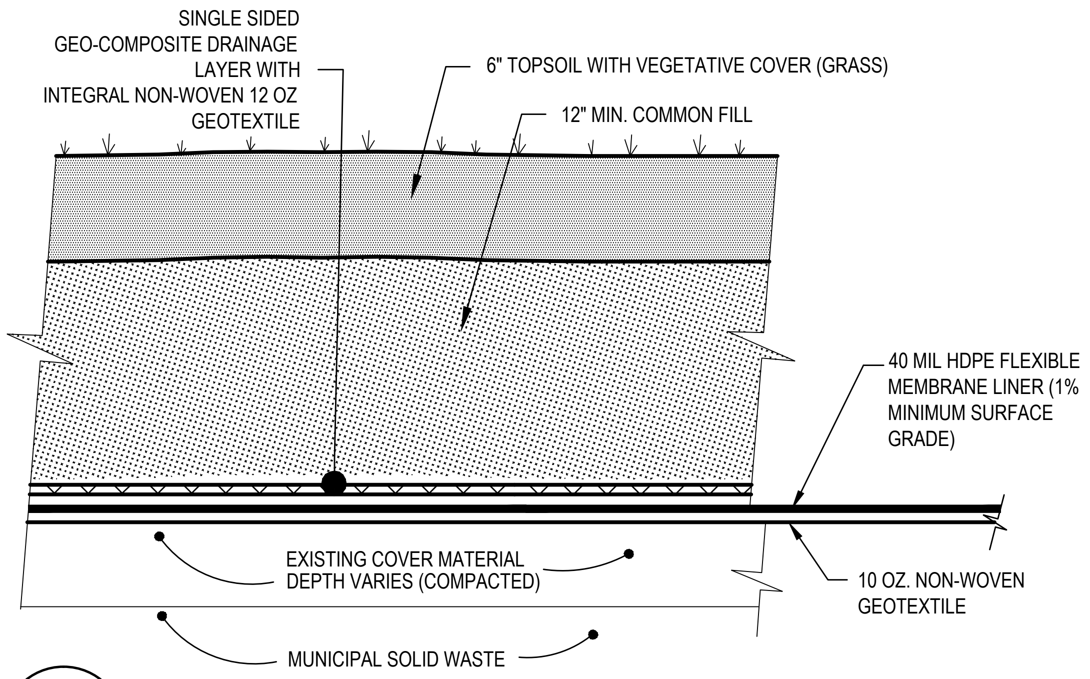
FEASIBILITY STUDY REPORT
Town of Clinton, Former Landfill, Old Nod Road, Clinton, CT

APPROXIMATE SOLID WASTE LIMITS
AND DEPTH

Comm.No.
65PE4.01

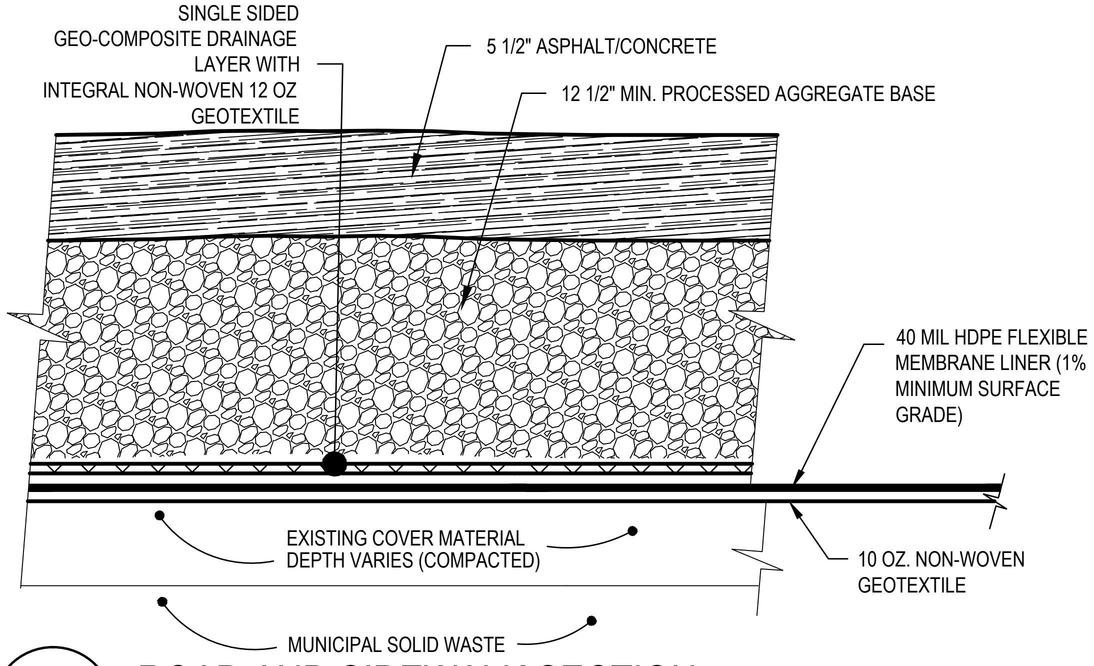
FIGURE 5

Loureiro



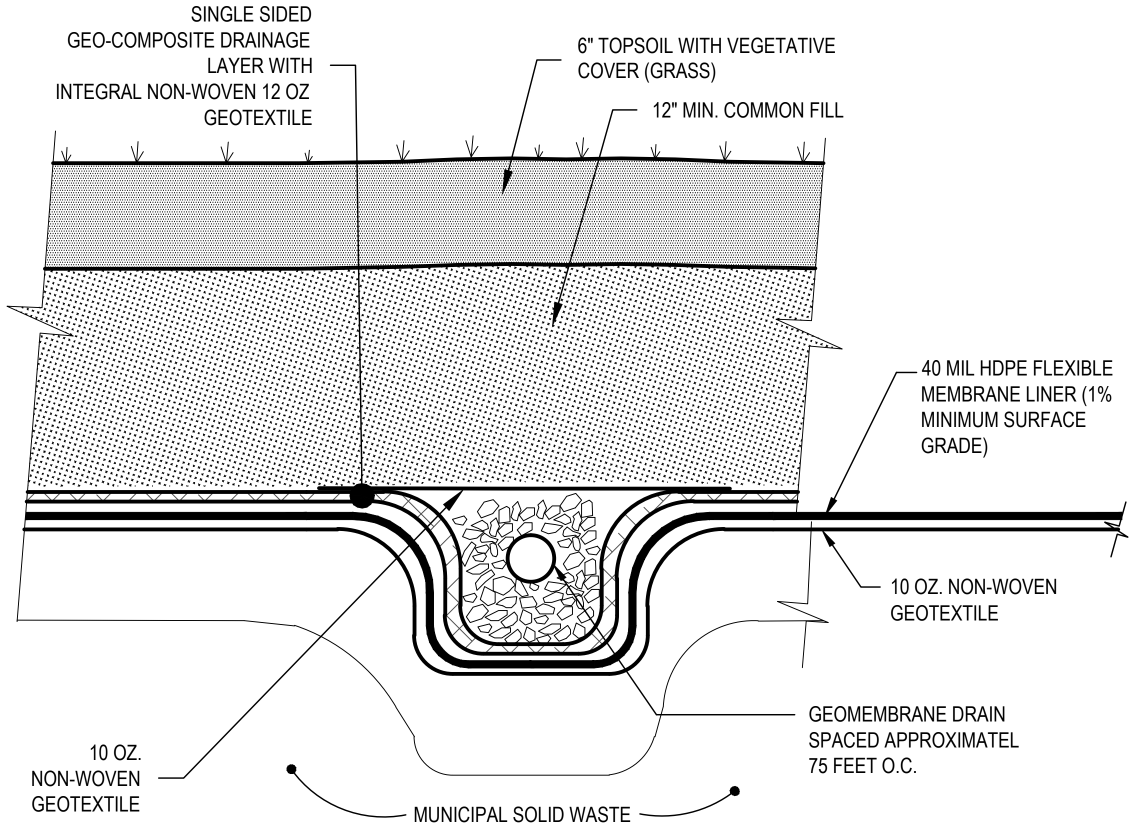
1 LANDSCAPED SECTION (GRASS)

NTS



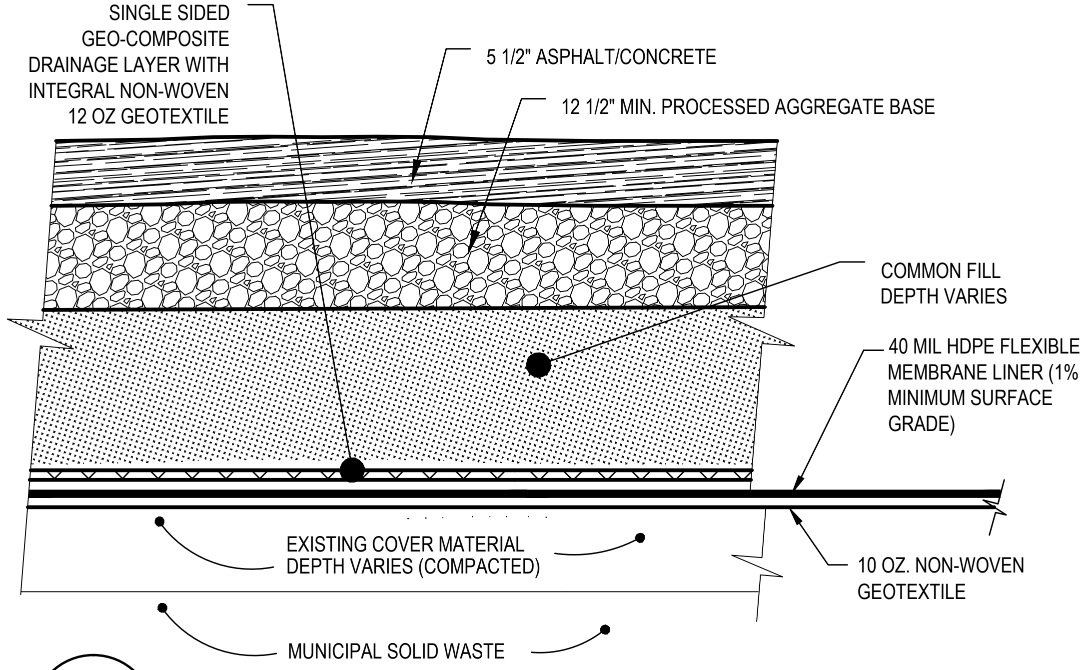
3 ROAD AND SIDEWALK SECTION

NTS



2 SECTION AT INTERMEDIATE LINER DRAIN

NTS



4 ROAD SECTION WITH UTILITIES

NTS

FEASIBILITY STUDY REPORT
Town of Clinton, Former Landfill, Old Nod Road, Clinton, CT

LANDFILL CAP DETAILS

Comm.No.
65PE4.01

FIGURE 6

Loureiro
Engineering • Construction • EH&S • Energy • Waste

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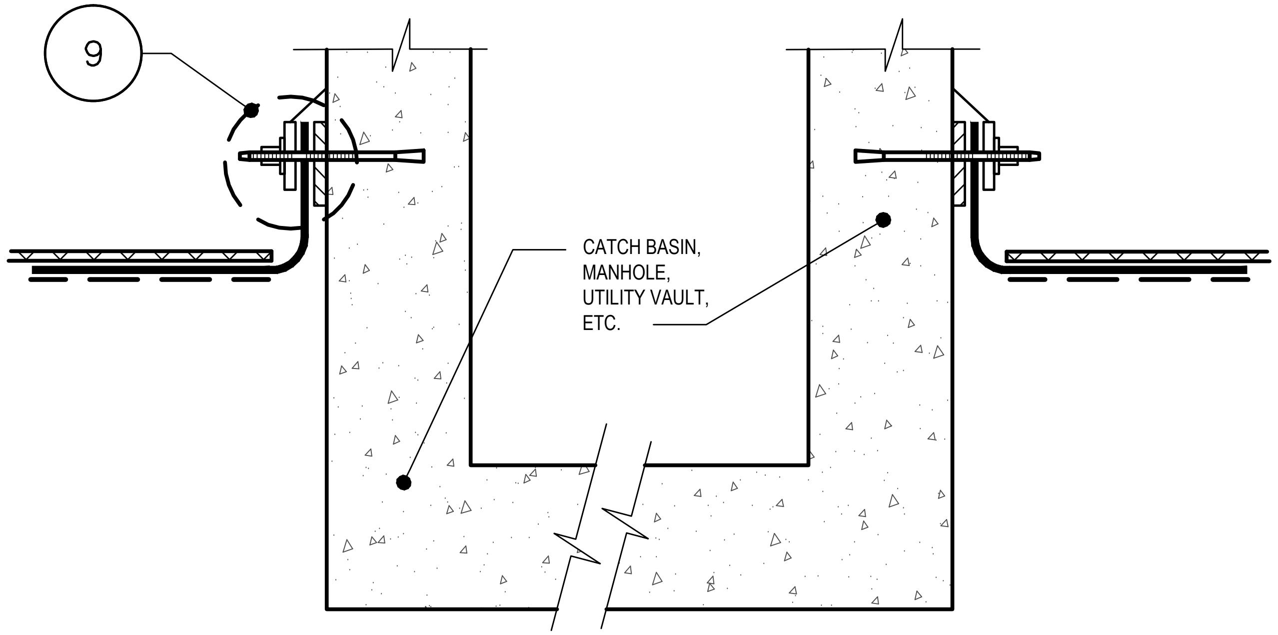
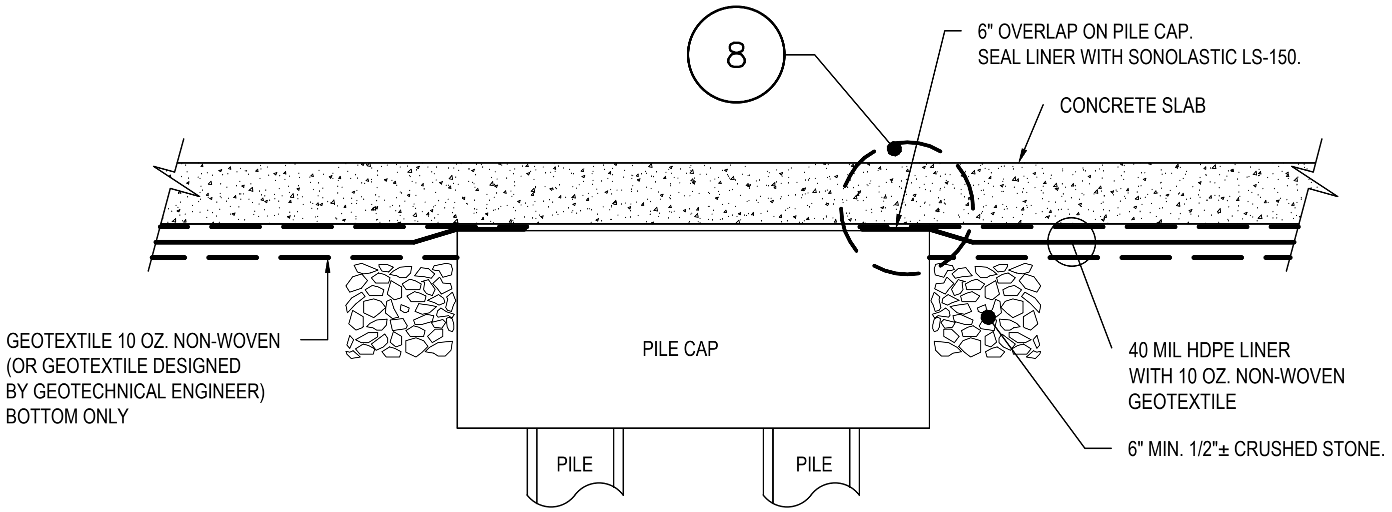


5 DETAIL - TYPICAL UTILITY PENETRATION

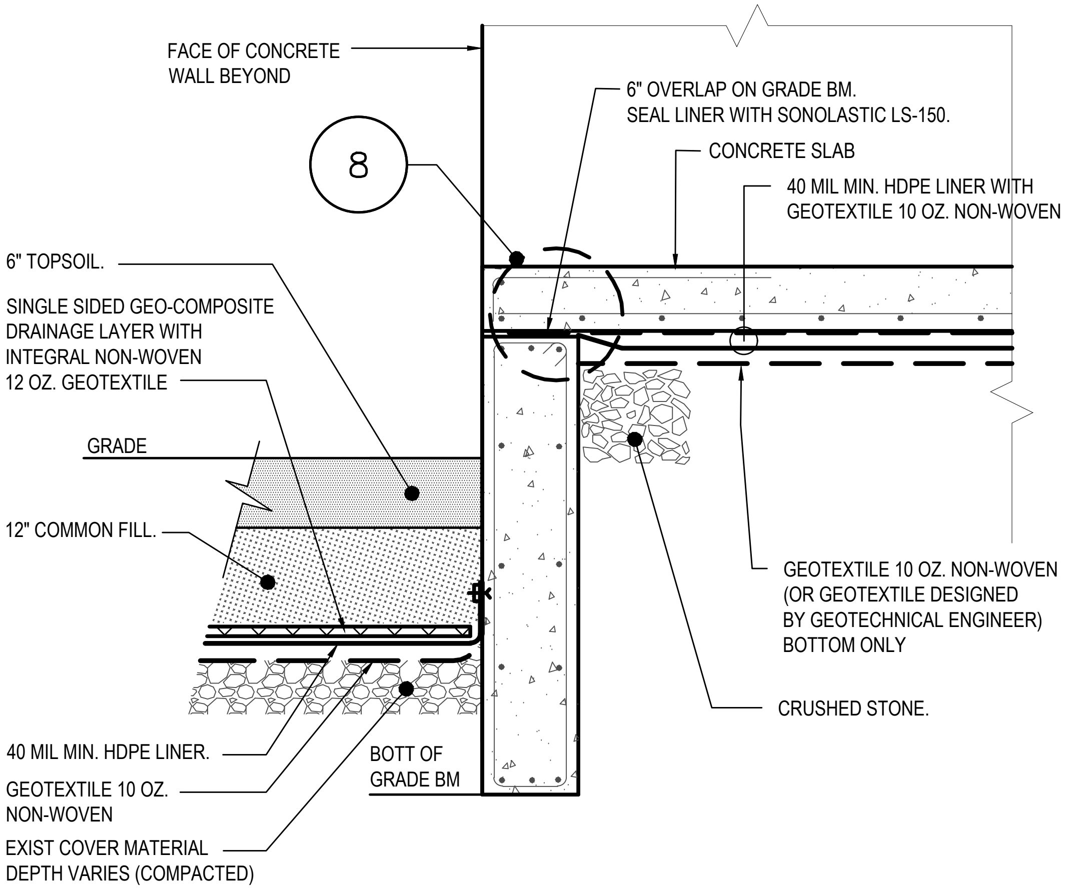
NTS



TYPICAL IN BUILDING

7 SECTION AT PILE CAP

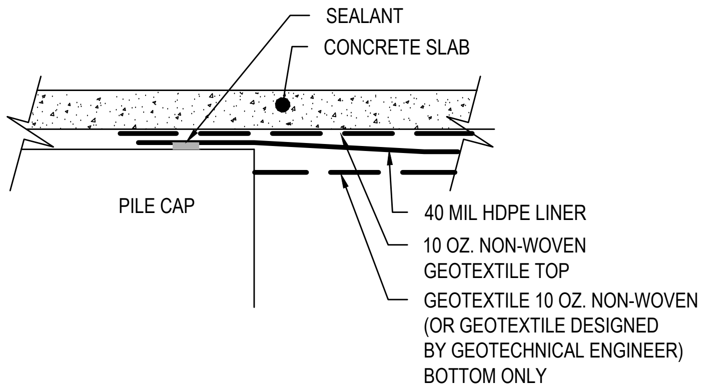
NTS



AT GROUND FLOOR & AT GRADE PARKING

6 DETAIL - SSVS LINER

NTS



8 DETAIL AT PILE CAP

NTS

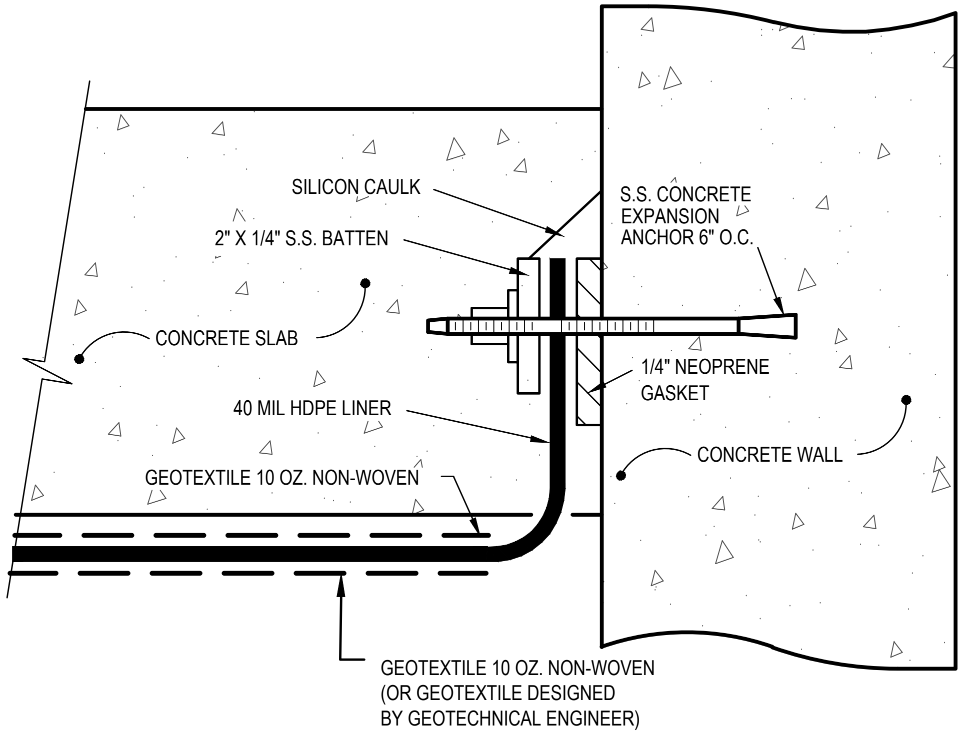
FEASIBILITY STUDY REPORT
Town of Clinton, Former Landfill, Old Nod Road, Clinton, CT

LANDFILL CAP DETAILS

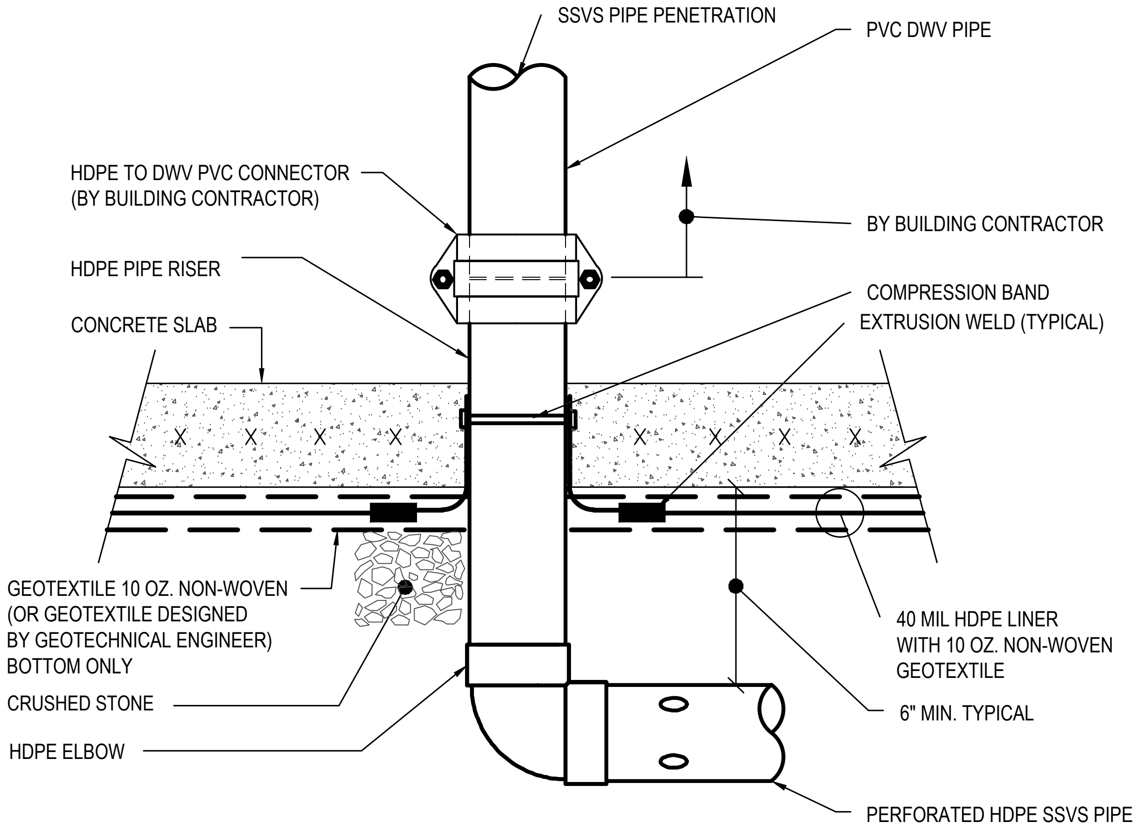
Comm.No.
65PE4.01

FIGURE 7

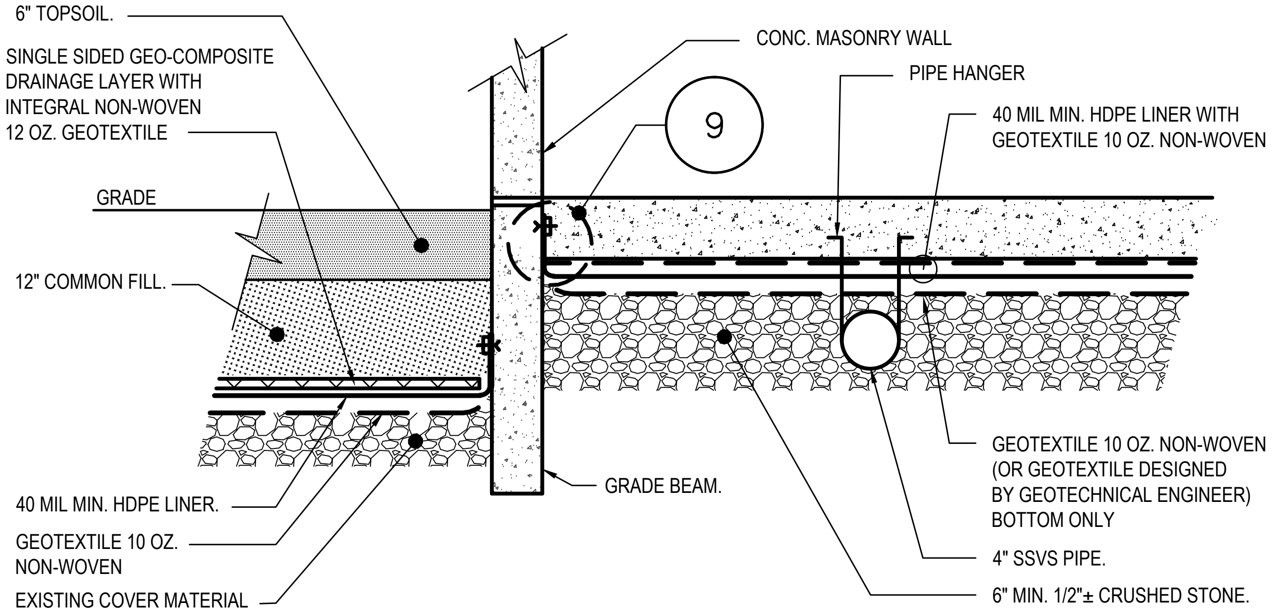
Loureiro
Engineering • Construction • EH&S • Energy • Waste



9 DETAIL - HDPE LINER ATTACHMENT
NTS



11 SECTION AT PIPE PENETRATION
NTS



AT GROUND FLOOR BUILDINGS & AT GRADE PARKING

10 DETAIL - SSVS PIPE SECTION
NTS

FEASIBILITY STUDY REPORT
Town of Clinton, Former Landfill, Old Nod Road, Clinton, CT

LANDFILL CAP DETAILS

Comm.No.
65PE4.01

FIGURE 8

Loureiro

\\STORAGE01\PROJECTS\AUTOCAD\PROJECTS\65PE401-CLINTON LANDFILL\SUBMISSION JUNE 2014\E-5472 06-16-14-LEA.DWG Tab: F08 Saved: 6/30/2014 11:18 AM Plotted: 6/30/2014 11:18 AM

Submitted to:
Town of Clinton, Connecticut

OLD NOD ROAD LANDFILL REMEDIAL ALTERNATIVES ASSESSMENT REPORT

January 1993

Prepared by:
Metcalf & Eddy, Inc.
One Research Parkway
Meriden, CT 06450

METCALF & EDDY, INC.

M&E Metcalf & Eddy
An Air & Water Technologies Company

January 27, 1993

Mr. Paul Austin
First Selectman
Town of Clinton
54 East Main Street
Clinton, CT 06413

Dear Mr. Austin:

Enclosed please find nine copies of the Draft Old Nod Road Landfill Remedial Alternatives Assessment Report for your review and comment. This report has been prepared in accordance with our scope of work authorization dated May 26, 1992.

Following your comments, the report will be finalized for submittal to the Connecticut Department of Environmental Protection.

We look forward to discussing this work with the board of Selectmen on January 27, 1992. Please do not hesitate to contact us if we can provide any additional information.

Very truly yours,

METCALF & EDDY, INC.

John J Cardoni

John J. Cardoni, P.E.
Associate

JJC:alg
Enclosures

One Research Parkway, Meriden, CT 06450

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SECTION ONE
INTRODUCTION

Connecticut Department of Environmental Protection (ConnDEP) Consent Order WC 4956 dated June 29, 1990 requires that the Town of Clinton take action to characterize the extent of contamination at the Old Nod Road landfill, and to prepare and implement a remedial action plan to abate pollution at the site. In accordance with the Consent Order, a report entitled *Old Nod Road Landfill Assessment* was submitted to ConnDEP on September 3, 1991. This report presented data and evaluated the extent and degree of contamination at the landfill in accordance with an investigation plan pre-approved by ConnDEP. The report also included a proposed scope of work for the evaluation of remedial alternatives at the landfill site. This scope of work was subsequently approved by ConnDEP, and is the basis for the work presented in this report.

The scope of work tasks include: collection of limited field data to augment previously collected data; a technical and cost evaluation of landfill remedial alternatives; the preparation of a remedial action monitoring program; and the submittal of a recommended remedial action plan to ConnDEP.

This report is organized into four subsequent sections for which a brief description follows:

Section Two - Existing Conditions Summary. In this section, information regarding the physical surroundings, geology and hydrogeology, water quality, existing topography and cover is summarized. The information summarized is drawn from past reports, existing maps or from field observations.

Section Three - Field Data Collection. Previous investigations have evaluated the degree of groundwater contamination around the landfill perimeter. As part of the remedial alternatives assessment, data collection activities consisted of attempted leachate seep sampling on the landfill side slopes, hydraulic conductivity testing in existing wells, existing landfill cover measurements and a landfill perimeter soil gas survey.

Section Four - Remedial Alternatives Analysis. Section four evaluates remedial alternatives which specifically address the production of leachate. Alternatives include landfill covers and leachate collection and treatment systems. Adherence to current regulations and outstanding regulatory orders are discussed for each alternative. Additionally, performance appraisals and estimated construction costs are presented.

Section Five - Recommended Remedial Plan. Based on the alternatives evaluation, a recommended remedial plan which addresses the production of leachate is presented in this final section. A discussion of the recommended plan, future uses of the landfill, estimated costs, and a conceptual plan are also included.

SECTION TWO
EXISTING CONDITIONS SUMMARY

The Old Nod Road landfill was operated from the early 1960's through 1979. The landfill accepted both municipal and locally generated industrial wastes during 15 years of operation. This section of the report provides a brief discussion of the physical surroundings, geology and hydrogeology, water quality conditions, topography and cover of the landfill. More detailed information on the landfill wastes, landfill surroundings and water quality conditions is presented in a previous report entitled "Old Nod Road Landfill Assessment, Final Report" (M&E, September 1991).

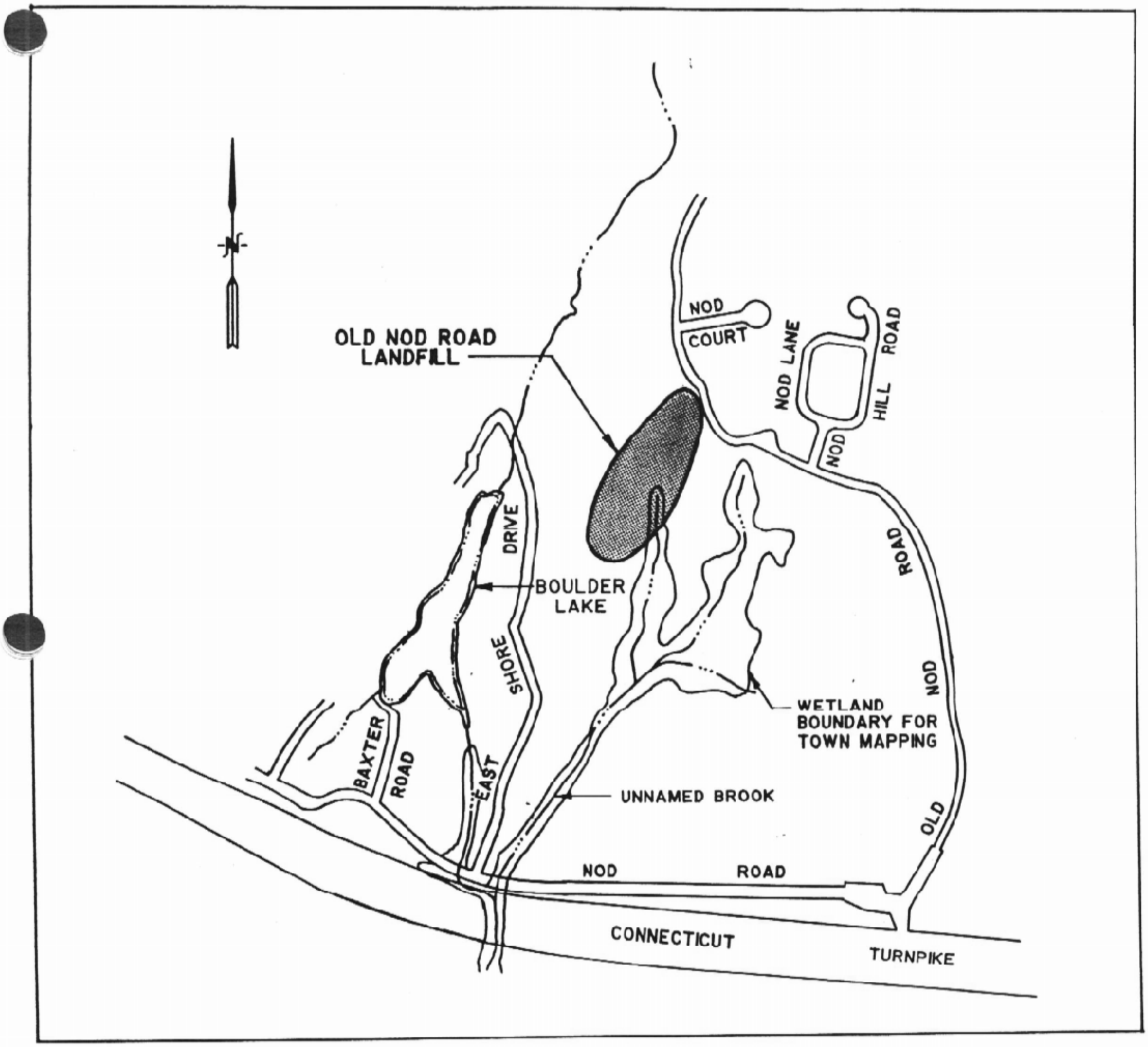
2.1 PHYSICAL SURROUNDINGS

The Old Nod Road Landfill is located south and west of Old Nod Road, between Nod Hill Road and Nod Court (See Figure 2-1). East Shore Drive and Nod Road are located approximately 300 feet west and 1,800 feet south, respectively. The westerly, northerly, and easterly perimeter of the landfill are bordered by rural, single-family residential properties. The southerly perimeter is bordered by a wooded wetland owned in part by the town of Clinton. Most of the land surrounding the landfill is currently wooded.

2.2 GEOLOGY AND HYDROGEOLOGY

Soils

According to the Soil Survey of Middlesex County, Connecticut (U.S. Department of Agriculture, Soil Conservation Service, 1976) the original soils at the landfill were identified as the Hollis-Rock outcrop complex; the Leicester, Ridgebury, and Whitman extremely stony fine sandy loams; and the Charlton-Hollis very stony fine sandy loams. These soils are described briefly as they apply to subsurface conditions at the landfill.



SCALE: l" = 800'
SOURCE: OFFICIAL INLAND WETLANDS AND WATER COURSES MAP; TOWN OF CLINTON - MIDDLESEX CO. - CT.
REVISED JANUARY 1, 1989

FIGURE 2-1 SITE LOCATION PLAN, OLD NOD ROAD LANDFILL, CLINTON, CT

The Hollis-Rock outcrop complex is described as sloping, somewhat excessively drained soils and areas of bedrock outcrop, present on uplands where the relief is affected by underlying bedrock. The soil is described as a fine sandy loam. The soil, where present, extends to a depth of approximately fourteen inches and is underlain by hard, unweathered bedrock. Small areas with a greater depth to bedrock may be present. The permeability of the soil is moderate to rapid above the bedrock.

The Leicester, Ridgebury, and Whitman extremely stony fine sandy loams are described as nearly level, poorly drained soils in drainage ways of glacial till uplands. The three soil units are similar. They differ slightly in color and texture, and are therefore mapped together. They are composed of fine sandy loam extending to a depth of 60 inches or more. Greater than three percent of the surface is covered with stones and boulders. The permeability of these soils ranges from very slow to moderately rapid.

The Charlton-Hollis very stony fine sandy loams are described as gently sloping and sloping, well drained and somewhat excessively drained soils on ridges. The relief is affected by underlying bedrock. The soils are both composed of fine sandy loams. The substratum of the Charlton soil extends to a depth of over 60 inches, but the Hollis soil is underlain by bedrock at a depth of fourteen inches. The permeability of the soils is moderate.

The west half of the landfill is underlain by the Hollis-Rock outcrop complex, and the east half is underlain by Charlton-Hollis soils. A small area at the southeastern part of the landfill is underlain by Leicester, Ridgebury, and Whitman soils.

Surficial Geology

The surficial geology of the site is mapped as bedrock outcrops and glacial till (Flint, 1971). The outcrop area is characterized by thin discontinuous patches of till separated by bedrock outcrops. This is a compact, nonsorted sediment composed of sand, silt, gravel, cobbles, boulders, and clay, deposited by a glacier. The north and west parts of the landfill are underlain by outcrops and thin till.

Bedrock Geology

The bedrock underlying the site is mapped as Monson Gneiss (Lundgren and Thurell, 1973). The rock is described as dark gray hornblendic plagioclase-quartz rock. Gneiss is generally a very hard, crystalline rock that is resistant to decomposition by weathering. It is characterized by light and dark bands resulting from parallel alignments of light and dark minerals. Groundwater movement through gneiss is restricted mainly to flow through rock fractures. The bedrock below the Clinton landfill can be described as moderately fractured.

Hydrogeology

The groundwater in the vicinity of the landfill is classified as GB/GA. The GB/GA classification indicates that the groundwater quality is degraded (GB) but it is DEP's goal to improve the water to drinking water quality (GA).

Groundwater flow through the bedrock aquifer in the vicinity of the landfill has been estimated to flow in a southeasterly direction. This flow direction is based on groundwater contours developed using water level data collected in January and June 1991 from bedrock wells. The flow direction beneath the landfill is inferred to be the same but has not been accurately determined due to a lack of data. There is potential for radial flow in the immediate vicinity of the landfill due to groundwater mounding effects caused by the landfill itself.

An estimate of groundwater flow in the overburden aquifer has not been prepared because of the discontinuity of the overburden. The overburden exists as isolated deposits found in bedrock depressions. This characteristic does not allow for an accurate interpretation of groundwater flow. However, results of field testing performed for the Old Nod Road Landfill Assessment; Final Report (M&E, September 1991) did provide information regarding the overburden aquifer.

Based on field testing data, wells in the southeasterly corner of the landfill indicate an upward gradient of groundwater from the bedrock to the overburden aquifer. Wells along the north of the landfill showed both downward gradient and no gradient in January and June 1991, respectively. Lastly, wells in the southwest corner of the landfill showed both upward and downward gradients during the same time period.

2.3 WATER QUALITY CONDITIONS

Based on data collected in November 1990 and June 1991, landfill leachate is present in groundwater at the perimeter of the landfill. Volatile aromatics, volatile organics and chlorinated organics have been detected in groundwater samples collected at the perimeter of the landfill. The concentrations of the contaminants are generally not high. The contaminant most prominently detected above the primary drinking water standards is benzene. Early sampling results also detected vinyl chloride and 1,2-dichloroethane above their respective primary drinking water standards.

Other parameters which are commonly found in leachate such as iron, manganese and total dissolved solids were also detected. The concentrations of these parameters exceeded the secondary drinking water standards. However, secondary drinking water standards are established for aesthetic rather than health based purposes. Sodium, chloride and nitrate were also detected at concentrations which exceed Connecticut drinking water limits or action levels.

A full description of water quality conditions at the landfill is presented in the *Old Nod Road Landfill Assessment Report* (September, 1991).

2.4 EXISTING LANDFILL TOPOGRAPHY AND COVER

Two-thirds of the Clinton landfill slopes gradually toward the north and Old Nod Road. The southeasterly and southerly side slopes of the landfill are approximately 2:1 with flatter slopes found on the remaining sides. The top of the landfill is graded relatively flat with slopes less than four percent. The apparent height of the landfill varies from side to side with the greatest height perspective (approximately 45 feet) visible from the southerly aspects. An access road from Old Nod Road extends almost to the top of the landfill along the northerly face.

The existing cover of the landfill appears to consist of sandy, granular soil similar to the stone-washing materials found stockpiled near Old Nod Road. Depth of cover over solid waste varies from greater than two feet on the top of the landfill to one foot or less on the steeper side slopes. Depths of cover of six inches or less are evident on the side slopes by the lack of vegetative growth. Section Three provides additional information on the existing landfill cover.

Vegetation such as grass, small trees and bushes are common on most faces of the landfill. Evidence of vegetation typically associated with wetlands grows along the easterly and southeasterly slopes of the landfill.

SECTION THREE
FIELD DATA COLLECTION

Several field data collection activities were performed as part of the landfill remedial alternatives evaluation. The activities conducted were as follows:

- Attempted landfill leachate seep sampling;
- Hydraulic conductivity tests of existing monitoring wells;
- Depth and permeability assessment of existing landfill cover materials;
- Landfill gas survey.

The information obtained from each of these activities is described in this section.

3.1 LEACHATE SEEP SAMPLING

Three potential leachate seep areas were identified in the Landfill Assessment Report dated September, 1991. These locations are shown in Figure 3-1.

Walk-over surveys were conducted on July 8 and September 17, 1992 in an attempt to find and sample active leachate seeps on the landfill side slopes. None were found on either date. However, evidence of leachate seepage was observed at two of the three locations identified previously. At ME-LS1, iron staining was observed in an intermittent drainage way. At ME-LS3, a wet, black area measuring approximately one foot wide by ten feet long was observed.

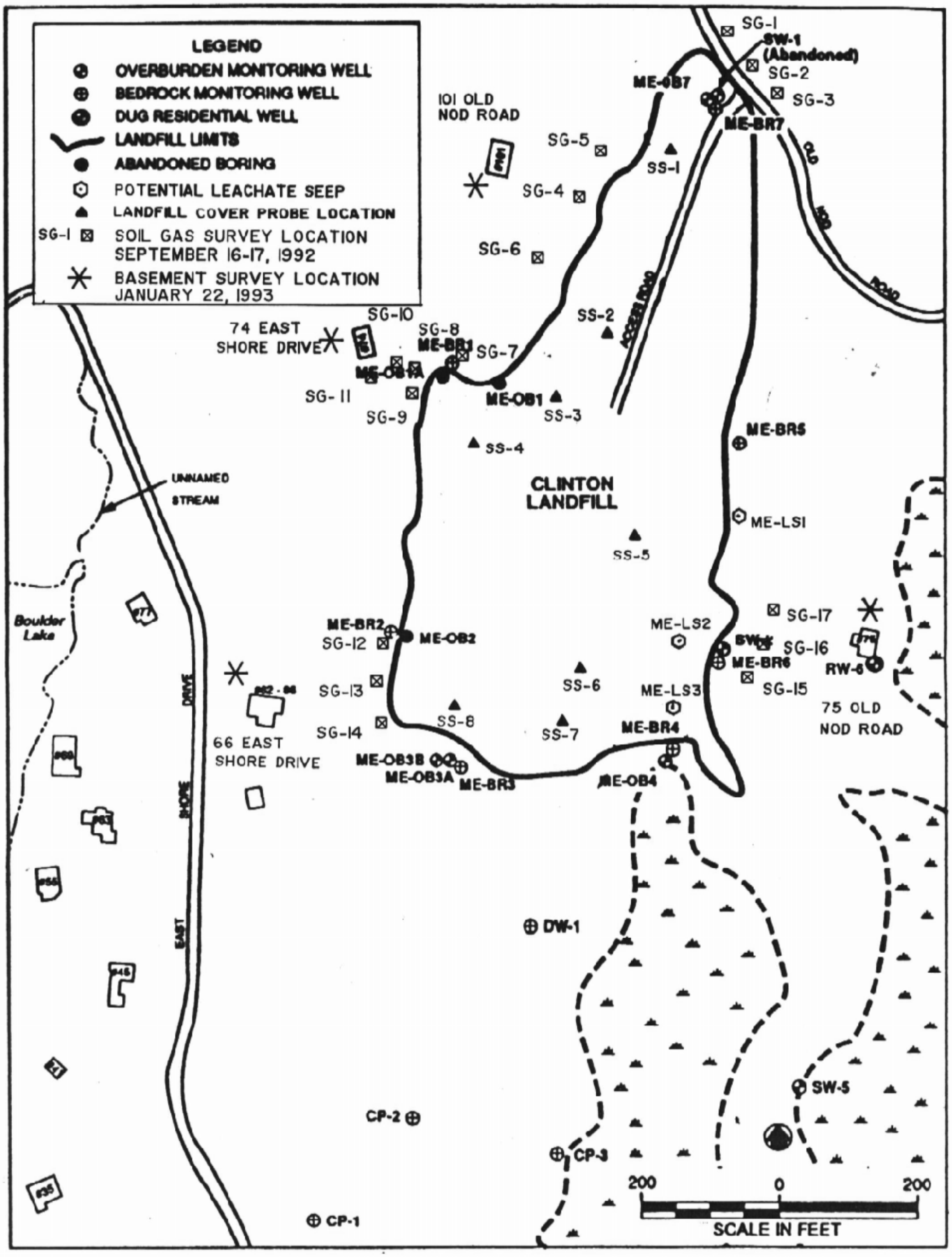


Figure 3-1 Investigation Summary Plan

3.2 HYDRAULIC CONDUCTIVITY TESTING

Hydraulic conductivity tests (slug tests) were conducted in eight of the wells around the perimeter of the landfill. The tests were conducted by rapidly removing a bailer full of water, thereby lowering the water level in the well, and then monitoring the water level recovery in the well using a Hermit 1000 data logger with a pressure transducer. Data from the slug tests were analyzed using the method of Bouwer and Rice (1976). The results of the slug tests are summarized in Table 3-1.

TABLE 3-1. SUMMARY OF SLUG TESTS CONDUCTED OLD NOD ROAD LANDFILL, SEPTEMBER 16 AND 17, 1992

Well No.	Location	Well Type	Calculated Hydraulic Conductivity, feet per day
ME-0B3B	Southwest corner of landfill	overburden	1.07
ME-BR3	Southwest corner of landfill	bedrock	0.74
ME-0B4	Southeast corner of landfill	overburden	0.23
ME-BR4	Southeast corner of landfill	bedrock	0.27
SW-2	Southeast corner of landfill	overburden	0.10
ME-BR6	Southeast corner of landfill	bedrock	1.70
ME-0B7	North end of landfill	overburden	2.38
ME-BR7	North end of landfill	bedrock	5.29

The estimated hydraulic conductivity values are in the low to moderate range, and are typical values for fractured metamorphic rock and fine silty sand overburden (Freeze and Cherry, 1979). The range of hydraulic conductivity values for bedrock wells (0.27-5.29 feet per day) was similar to the range for overburden wells (0.1-2.38 feet per day). The data suggests that overall, groundwater flows through the bedrock with the same degree of difficulty that it flows through the overburden.

3.3 EXISTING LANDFILL COVER SURVEY

The depth of existing cover over the landfill was evaluated on July 8 and 9, 1992 by probing the cover materials with a post hole digger and measuring the depth to refuse. In general, the depth of cover ranged from 0.5 ft. to greater than 4 ft. At selected locations, soil samples were collected for grain size distribution analysis. The soil cover probing and sampling locations are shown in Figure 3-1.

Appendix A includes the grain size distribution for the samples collected. The permeability of these samples was estimated using Hazen's approximation (Freeze & Cherry, 1979). A summary of the estimated permeability of these samples is summarized below:

Sample No.	Location	Estimated Permeability, cm/s
SS-1	North End of Landfill	3.8×10^{-3}
SS-3	Center of Landfill	3.2×10^{-3}
SS-6	Southeast Portion of Landfill	1.2×10^{-2}
SS-8	Southwest Portion of Landfill	1.2×10^{-2}

3.4 LANDFILL GAS SURVEY

A soil gas survey was conducted at the site to evaluate the potential for off-site migration of methane gas. The survey focused on the perimeter of the landfill in locations where there are nearby buildings. The survey was conducted by installing a hollow probe approximately 3 feet below the ground surface and measuring soil gas concentrations below grade. Gas measurements were obtained using the following instruments:

- Foxboro Organic Vapor Analyzer (OVA) flame ionization detector calibrated to a methane standard;

- Industrial Scientific Corp. (ISC) MX251 combustible gas/oxygen meter.

The OVA measures low concentrations of methane and VOCs in air. It has a measurement range of 1 part per million (ppm) to 1,000 ppm, expressed as ppm total volatiles detected. The OVA has different sensitivity to different compounds. However, for methane, it is a direct-reading instrument. Because methane was expected to be the main constituent detected, the OVA readings should correspond to methane concentrations in the soil gas.

Due to the OVA's detection method, it yields inaccurate results for air samples with either reduced oxygen levels or high methane concentrations. Under these conditions, the instrument reading is lower than the actual methane concentration. The oxygen concentration in ambient air is approximately 20.8% by volume. As sample oxygen levels decrease, the instrument reading error increases. At oxygen levels below 13.5%, the instrument flame goes out and yields no reading.

The ISC MX251 measures both combustible gases (such as methane) and oxygen. It measures concentrations of combustible gases relative to the lower explosive limit (LEL). The LEL is the minimum concentration of a gas in air which will support combustion. For example, a reading of 100 represents 100% of the LEL, and is the threshold for a combustible mixture. The LEL for methane in air is approximately 5.5% by volume, or 55,000 ppm.

The ISC MX251 also measures the oxygen content of a sample. For the soil gas survey, oxygen levels were a measure of the reliability of OVA readings as well as an indicator of proximity to decomposing solid waste. Oxygen levels near 20.8% support reliable OVA operation, but levels below 13.5% preclude OVA use. Oxygen deficiency is associated with decomposition of organic material (solid waste) and production of methane.

Figure 3-1 shows the locations sampled. Table 3-2 summarizes the measurements obtained at these locations.

The soil gas results indicate the presence of combustible levels of gas at sample locations SG-7, SG-8, and SG-9, located along the west edge of the landfill. The results suggest that the soil

TABLE 3-2. SUMMARY OF SOIL GAS MEASUREMENTS AT OLD NOD ROAD LANDFILL, SEPTEMBER 16-17, 1992

Location	OVA Reading	$\%O_2$	%LEL
SG-1	F0	11.8	0
SG-2	F0	6.5	1
SG-3	F0	9.6	1
SG-4	0	20.1	0
SG-5	0	20.5	0
SG-6	0	17.0	0
SG-7	>1,000/F0	4.0	730
SG-8	>1,000/F0	4.9	567
SG-9	F0	8.9	706
SG-10	0	18.7	0
SG-11	0	11.4	9
SG-12	30	17.1	13
SG-13	0	19.7	11
SG-14	0	20.3	10
SG-15	7.4	19.5	2
SG-16	3.2	19.1	2
SG-17	150	18.7	4

NOTE: FO indicates instrument flame-out due to insufficient oxygen in sample.

gas at the edge of the landfill in this area was composed of approximately 30% to 50% methane. Oxygen levels were correspondingly low.

Methane was detected at lower levels, well below the LEL, at SG-11, located farther away from the landfill. No methane was detected at SG-10, in the same area.

Lower levels of methane were also detected at SG-12, SG-13, and SG-14 at the southwest corner of the landfill, and in SG-15, SG-16 and SG-17 near the southeast corner of the landfill.

At the north end of the landfill, only traces of methane were detected.
U.S. EPA Solid Waste Disposal Facility Criteria (40 CFR 258.23) require that the concentration of methane gas not exceed 25 percent of the LEL in facility structures, and not exceed the LEL itself at the facility property boundary. Although 40 CFR 258.23 apparently does not apply to the Old Nod Road landfill since it was not in operation at the time of promulgation of these regulations, it nonetheless provides criteria by which to evaluate the site. There are no on-site structures in the immediate vicinity of the landfill, however, samples collected at SG-7, SG-8 and SG-9 are near the property line and exceed the LEL.

Subsequent to the soil gas survey, a survey was conducted in basements of selected buildings in the proximity of the landfill where soil gas measurements indicated the presence of methane. The same instrumentation described previously was used for the basement survey. Air measurements were taken throughout the basements and, in particular, at foundation cracks, holes, and sumps. The basement survey was conducted on January 22, 1992, which corresponded to a period of decreasing atmospheric pressure due to a low pressure front. This type of weather condition is expected to provide higher methane gas concentrations at the ground surface.

Basements at the following residences were surveyed:

- 74 East Shore Drive

- 66 East Shore Drive
- 75 Old Nod Road
- 101 Old Nod Road

The location of these residences are shown on Figure 3-1.

No methane/VOCs, explosive gases, or oxygen deficiencies were detected in any of the four basements surveyed. However, an LEL reading of 25% was obtained outside at ground level in the vicinity of soil gas location SG-8.

Landfill gas management is considered as part of the landfill remediation alternatives assessment. Further discussions of this issue are presented in Section Four and Section Five.

SECTION FOUR
REMEDIAL ALTERNATIVES ANALYSIS

4.1 SUMMARY OF ALTERNATIVES EVALUATED

Groundwater quality in the vicinity of the Old Nod Road landfill has been affected by the leachate produced by the landfill. Efforts to mitigate the effects of landfill leachate typically focus either on reducing leachate production or on controlling the leachate produced. These approaches to leachate management can be effectively used independently or together for landfills. A general discussion of each of these two leachate management approaches is provided below. Examination of the effectiveness of these approaches with respect to the Old Nod Road landfill follows. But first, a general discussion of each of these two leachate management approaches is provided.

Leachate is produced when precipitation passes through a landfill and mixes with waste disposed of in the landfill. Alternative cover options (caps) can be used to limit leachate production. Cover systems which use low permeable soils (clay) and/or geosynthetic liners act as barriers and can significantly reduce the volume of leachate produced. However, with the reduction of leachate production an increase in surface runoff occurs. The increased runoff requires engineered systems which manage the runoff and convey the water away from the landfill.

The collection of leachate through the use of underground collection systems is also an effective leachate management option. Leachate collection is most effective for landfills constructed with low permeability bottom liners to prevent leachate releases to groundwater. For unlined landfills, leachate collection systems typically include the placement of underground piping systems beneath or immediately adjacent to the landfill and/or wells from which leachate and groundwater are pumped. In either case, the leachate collected must be treated prior to disposal.

The use of a landfill leachate collection system is site specific, and may not be a cost effective approach for existing landfills such as Clinton's. A more detailed discussion of leachate collection for the Old Nod Road landfill is provided in Section 4.5 of this report.

4.2 REGULATORY REQUIREMENTS AND PERFORMANCE STANDARDS

The Old Nod Road landfill in Clinton was formerly a permitted municipal solid waste landfill. Based on available records, the landfill stopped receiving municipal solid waste in 1980. The landfill was graded around the time of its closing and the existing topography appears to be a result of that work.

This report is prepared to address groundwater remediation alternatives. As part of the alternatives evaluation, an assessment of current regulatory requirements for municipal solid waste landfills is considered. In the discussions of alternatives for the Clinton landfill, an evaluation of the performance of the alternatives with respect to these regulatory requirements is presented.

RCSA Section 22a-209-71(4)

Connecticut DEP regulations for final cover design are described in Section 22a-209-7 of the Regulations of Connecticut State Agencies (RCSA). The regulation describes a final cover system consisting of a uniform layer of final cover material compacted to a minimum depth of two (2) feet over the entire surface of the landfill area to be closed. There is no specific permeability standard specified for the final cover material. The area should be graded to prevent erosion and minimize infiltration with a minimum top slope of 4 percent and a maximum side slope of 3 to 1, unless otherwise authorized by DEP. A vegetative cover must be planted following closure and must be maintained continuously.

However, the DEP *Landfill Assessment and Closure Guidance Manual* recommends a minimum landfill cover consisting of a 6-inch vegetative layer capable of supporting vegetation which helps to limit erosion, and an 18-inch low-permeable infiltration layer with a hydraulic conductivity equal to the landfill liner or 1 x 10^{-5} cm/sec, whichever is less. Hydraulic conductivity is defined as the rate at which a porous medium (soil) transmits water.

Additionally, the manual suggests that the landfill cover include a subgrade layer immediately over the refuse , a gas venting layer just beneath the low permeability layer to help convey landfill gasses to collection points, and a 6-inch drainage layer with a hydraulic conductivity of 1 x 10^{-3} cm/sec just above the low permeability layer. This landfill cover is a ConnDEP recommended cap, although it is noted that alternative designs providing equivalent protection are acceptable.

RCRA Subtitle D - 40 CFR 258

In September 1991, the Environmental Protection Agency signed the Solid Waste Disposal Facility criteria into regulation (40 CFR Part 258), also referred to as RCRA Subtitle D. These actions provide closure criteria and post-closure requirements for solid waste disposal facilities. However, these regulations do not apply to the Old Nod Road landfill. The Subtitle D regulations contain a provision that landfills which did not receive wastes after October 8, 1991 do not fall under the regulations. Because the Clinton landfill closed in 1980, the landfill does not fall under the Subtitle D regulations. It should be noted though, the final cover requirements under Subtitle D are similar to the cover as outlined in the ConnDEP *Landfill Assessment and Closure Guidance Manual.*

ConnDEP Consent Order

On June 29, 1990, the town of Clinton was issued Consent Order WC 4956 from the DEP due in part to current and past activities at the Old Nod Road landfill. Specifically, item 7 of the Consent Order requires Clinton to "take remedial actions to prevent and abate such groundwater, surface water and soil pollution to the satisfaction of the Commissioner (DEP)."

It can be inferred from Consent Order WC 4956 that the mitigation of leachate production is a major issue in Clinton's compliance with that order. The State of Connecticut is committed to protecting the waters of the State. As such, the volume of leachate produced will directly affect the groundwater in the vicinity of the landfill. To this end, an aggressive leachate management system will best help Clinton meet the objectives of the ConnDEP consent order.

Summary

The evaluation of remedial alternatives for the Old Nod Road landfill must consider the regulations, guidelines and consent order described above. In general, a remedial alternative which reduces the volume of leachate will be most effective in mitigating groundwater contamination resulting from landfill leachate. An examination of various alternatives for the Old Nod Road landfill are discussed in the following sections.

4.3 LANDFILL CAPPING ALTERNATIVES EVALUATION

The landfill capping alternatives considered for the Old Nod Road Landfill are as follows:

- No Action
- Alternative Cap 1: On-site material;
- Alternative Cap 2: Geosynthetic membrane;
- Alternative Cap 3: Bentonite augmented soil;
- Alternative Cap 4: Geocomposite membrane (e.g. CLAYMAX);

Each of these alternatives have been evaluated on the basis of their performance, their compliance with regulatory requirements and their estimated costs. Cap performance in terms of leachate generation reduction was evaluated using the U.S. EPA Hydrogeologic Evaluation of Landfill Performance (HELP) model. Costs have been estimated based on unit costs for similar types of work and information provided by vendors. The evaluation of each of the capping alternatives is presented in the following sections.

It should be noted that the evaluation of capping alternatives and associated cost estimates include passive gas venting beneath the landfill cap, but does not address perimeter landfill gas migration management controls. This issue is addressed separately in Section 4.6 of this report.

4.3.1 No Action Alternative

The no action alternative is considered here as a base-case from which to compare other alternatives. The landfill, with existing cover, slopes and vegetation, would remain as is. However, the "no action" alternative is not a satisfactory response to DEP Consent Order WC 4956. By taking no action on the landfill, leachate production and the degradation of groundwater go unabated. The landfill will continue to be a source of contamination to groundwater near the landfill. This alternative and inaction will most likely be unacceptable to the State.

Additionally, the "no-action" alternative leaves the landfill in a condition which does not meet the minimum standards set forth under RCSA Section 22a-209-71(4). Based on observations made in July 1992, areas of the landfill have less than 24-inches of final cover over waste. Also, existing slopes of the landfill do not meet the minimum slopes called for in the regulations. The slopes on top of the landfill are less than four percent, and the slopes along the southerly and southeasterly sides of the landfill are steeper than 3:1.

Although the cost and effort of implementing the "no-action" alternative are minimal (monitoring costs only), the "no-action" alternative is not considered to be a viable remediation approach for the reasons stated above.

4.3.2 Alternative Cap 1: On-Site Material

One alternative cap for the Clinton landfill involves the use of the materials currently stockpiled at the landfill. With this alternative, the landfill would be cleared of all existing vegetation.

Locally available materials (washings from a stone crushing operation) stockpiled on site would be used to regrade the landfill slopes and to provide a minimum of 24-inches of cover over the solid waste. A protective cover of vegetation would be established on top of the graded slopes to minimize erosion. A typical cross section of this alternative cap is provided below as Figure 4-1.

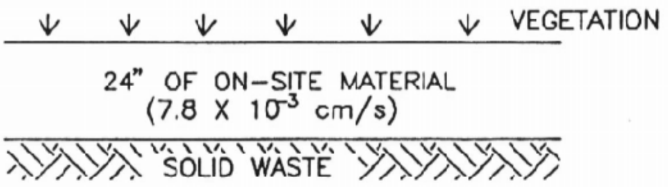


FIGURE 4-1. ALTERNATIVE CAP 1: ON-SITE MATERIAL

With proper grading, this landfill cap meets the minimum requirements set forth under RCSA Section 22a-290, however, it does not meet the requirements of the DEP *Landfill Assessment and Closure Guidance Manual* due to the high permeability of the on-site materials. The ability of this cap to reduce the infiltration of precipitation, and thus the production of leachate, is limited. The performance of the cap was evaluated using the U.S. EPA Hydrologic Evaluation of Landfill Performance (HELP) Model, Version 2.05. The HELP program models the effects of hydrologic processes on landfill caps. The results of the model provide an estimation of the amount of surface runoff, subsurface drainage and leachate that may be expected to result with the cap. The results of the HELP evaluation in this study are useful for comparison purposes but are not intended for design. Based on the results of the HELP model, it is estimated that approximately 5 million gallons of leachate would be produced annually. The results of the HELP model are included in Appendix B.

The construction of this cap could be readily accomplished. The use of stockpiled material and, based on discussions with town officials, the low cost and abundant availability of similar material locally would help minimize costs. A breakdown of the estimated construction costs for this alternative is provided in Table 4-1.

4.3.3 Alternative Cap 2: Geosynthetic Membrane

A second alternative cap evaluated for the Old Nod Road landfill consists of a cover which uses a barrier layer consisting of a geosynthetic membrane. As with each alternative, this alternative cap will involve the clearing of all vegetation from the existing landfill slopes and the rough grading of the landfill. Use of the existing, stockpiled materials for rough grading is recommended. The purpose of the rough grading is to construct a base for the cap which has the minimum required slopes. Additionally, the rough grading will provide a depth of cover over the existing waste which will protect the cap.

Once the rough grading is complete, the cap can be constructed on the landfill. This alternative cap consists of a 6-inch gas ventilation layer, constructed most likely of gravel or coarse sand, placed upon the rough graded surface. The purpose of the gas ventilation layer is to intercept and collect landfill gases. On top of the ventilation layer will be a very low-permeable, geosynthetic liner which has minimal thickness (60 mils) compared to other caps. For the purpose of this alternative comparison, a 60 mil very low density polyethylene (VLDPE) liner has been assumed. The geosynthetic liner, acting as the barrier layer, will significantly reduce the infiltration of water into the landfill. Placed upon the geosynthetic liner will be a 12-inch drainage layer, a filter fabric and a minimum 6-inch topsoil layer on which a good stand of grass is to be grown. A drainage layer is required to provide an avenue for water, which infiltrates through the top soil, to be carried off the landfill and away from the barrier layer. This alternative cap is shown on Figure 4-2.

TABLE 4.1 ALTERNATIVE CAP 1 - 24" OF EXISTING ON-SITE MATERIAL
OLD NOD ROAD LANDFILL - CLINTON, CONNECTICUT
LANDFILL CAP COST ESTIMATE (JANUARY 1993)

FINAL CLOSURE CONSTRUCTION COST SUMMARY

	UNIT	QTY	UNIT COST	TOTAL COST
FINAL COVER				
CLEARING & GRUBBING	ACRES	8.63	$2,000.00	$17,260
LEVELING LAYER (1)	CY	9,762	$4.00	$39,048
HYDROSEEDING	SF	375,600	$0.15	$56,340
EROSION CONTROL				
SILT FENCE/HAYBALES	LS	1	$16,000.00	$16,000
ROCK EXCAVATION	CY	0	$40.00	$0
STORMWATER CONTROL				
ALLOWANCE	LS	1	$50,000.00	$50,000
ACCESS ROADWAY				
10' GRAVEL ROAD	CY	260	$15.00	$3,900
AS-BUILT DRAWINGS	LS	1	$4,000.00	$4,000
SUBTOTAL No. 1				$186,548
ENGINEERING @ 13% (2)				$24,251
SUBTOTAL No. 2				$210,799
CONTINGENCIES @ 25%				$52,700
		TOTAL:		$263,499

NOTES:

(1) USE ON-SITE MATERIAL TO AUGMENT EXISTING COVER TO 24-INCHES. ASSUME MATERIAL IS AVAILABLE TO TOWN AT NO COST

(2) ENGINEERING COSTS REFLECT 8% OF CONSTRUCTION COST FOR DESIGN PLUS 5% OF CONSTRUCTION COST FOR PART-TIME CONSTRUCTION SUPERVISION SERVICES

(3) CONSTRUCTION COSTS DO NOT INCLUDE COSTS ASSOCIATED WITH: LANDFILL GAS MIGRATION MANAGEMENT; LEACHATE COLLECTION AND TREATMENT; PROPERTY ACQUISITION; PERMITTING; AND PRELIMINARY LANDFILL SURVEY

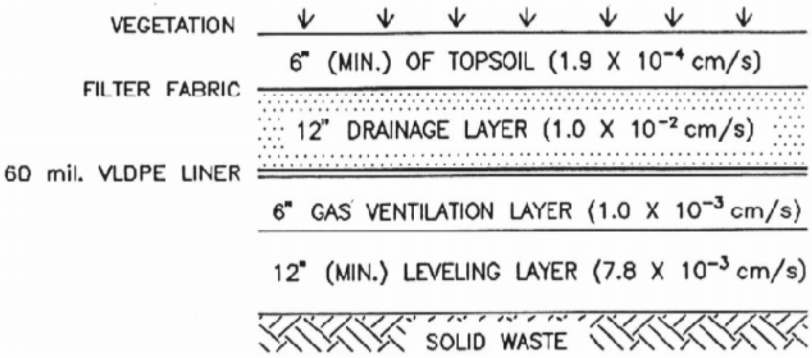


FIGURE 4-2. ALTERNATE CAP 2: GEOSYNTHETIC MEMBRANE

This alternative cap meets current State regulations governing the closure of non-operating landfills. Also, this alternative addresses DEP Consent Order WC 4956 by reducing leachate production, thereby mitigating groundwater contamination in the vicinity of the landfill. The performance evaluation of this cap using the HELP model yields a wide range of estimated annual leachate production. This wide range is due to the fact that the HELP model is very sensitive to the leakage rate of the synthetic liner. The leakage rate is a value put into the model and slight changes in the value affect leachate estimates significantly. The leakage rate is largely determined by the quality of the liner installation. With good quality control during installation, the HELP model evaluation indicates an annual leachate production rate on the order of 30,000 gallons is not an unreasonable estimate.

As noted above, strict controls during construction can enhance the cap performance and should be emphasized. Table 4-2 provides a detailed summary of the estimated construction costs for this alternative.

TABLE 4.2 ALTERNATIVE CAP 2 - GEOSYNTHETIC MEMBRANE
OLD NOD ROAD LANDFILL - CLINTON, CONNECTICUT
LANDFILL CAP COST ESTIMATE (JANUARY 1993)

FINAL CLOSURE CONSTRUCTION COST SUMMARY

	UNIT	QTY	UNIT COST	TOTAL COST
FINAL COVER				
CLEARING & GRUBBING	ACRES	8.63	$2,000.00	$17,260
LEVELING LAYER(1)	CY	10,994	$4.00	$43,976
GAS VENT LAYER (6")	CY	7,676	$9.00	$69,084
60 mil VLDPE LINER (NON-TEXTURED)	SF	263,300	$0.60	$157,980
60 mil VLDPE LINER (TEXTURED)	SF	112,300	$0.65	$72,995
DRAINAGE LAYER (12")	CY	15,352	$9.00	$138,168
FILTER FABRIC	SF	375,600	$0.15	$56,340
TOPSOIL LAYER (6")	CY	7,676	$13.00	$99,788
HYDROSEEDING	SF	394,380	$0.15	$59,157
EROSION CONTROL				
SILT FENCE/HAYBALES	LF	3,200	$5.00	$16,000
ROCK EXCAVATION	CY	1500	$40.00	$60,000
STORMWATER CONTROL				
ALLOWANCE	LS	1	$75,000.00	$75,000
ACCESS ROADWAY				
10' GRAVEL ROAD	CY	1,200	$15.00	$18,000
GAS VENTING SYSTEM				
4" PERF. PE PIPE	LF	3,000	$15.00	$45,000
4" VENT RISERS	LF	150	$30.00	$4,500
AS-BUILT DRAWINGS	LS	1	$6,000.00	$6,000
SUBTOTAL No. 1				$939,248
ENGINEERING @ 13%(2)				$122,102
SUBTOTAL No. 2				$1,061,350
CONTINGENCIES @ 25%				$265,338
		TOTAL:		$1,326,688

NOTES:

(1) USE ON-SITE MATERIAL TO MEET SLOPE REQUIREMENTS. ASSUME MATERIAL IS AVAILABLE TO TOWN AT NO COST

(2) ENGINEERING COSTS REFLECT 8% OF CONSTRUCTION COST FOR DESIGN PLUS 5% OF CONSTRUCTION COST FOR PART-TIME CONSTRUCTION SUPERVISION SERVICES

(3) CONSTRUCTION COSTS DO NOT INCLUDE COSTS ASSOCIATED WITH: LANDFILL GAS MIGRATION MANAGEMENT; LEACHATE COLLECTION AND TREATMENT; PROPERTY ACQUISITION; PERMITTING; AND PRELIMINARY LANDFILL SURVEY

4.3.4 Alternative Cap 3: Bentonite Augmented Soil

The use of naturally existing clay as a barrier layer within a cap is a commonly used landfill cover. However, because of the large volume of clay required to construct the Clinton landfill cap, no single source of clay has been identified in Connecticut by M&E or Clinton town staff. However, an alternative to using natural clay for the barrier layer is to use a layer which is comprised of bentonite (a processed clay mineral) mixed with soil. This option, the mixing of bentonite with the stone washing material stockpiled at the Old Nod Road landfill, is an alternative cap evaluated for the Clinton landfill.

This alternative is identical to the cap discussed in Section 4.3.3 except that 18-inches of bentonite and soil mixture replace the geosynthetic liner. The 18-inches of bentonite and soil mixture provide a barrier layer which has a low permeability, thereby helping to reduce the production of leachate. A typical section of this alternative cap is provided below in Figure 4-3.

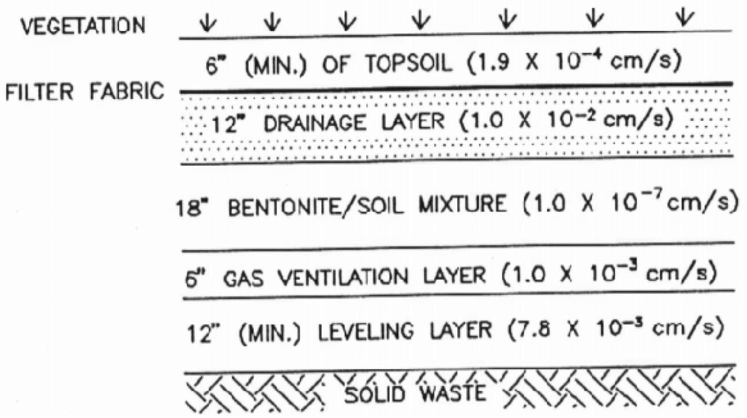


FIGURE 4-3. ALTERNATIVE CAP 3: BENTONITE AUGMENTED SOIL

With rough grading to provide minimum slopes, this alternative cap meets the requirements of RCSA Section 22a-209. This cap also addresses the issues covered by DEP Consent Order WC 4956 by reducing leachate production and thereby mitigating the effect the leachate has to groundwater. Based on an analysis of this landfill cap with the HELP model, approximately 1.4 million gallons of leachate can be expected to be produced.

As part of this study, Metcalf & Eddy sampled and analyzed the existing on-site material to determine its permeability (see Section 3 and Appendix A). Based on the results of the soil analysis, an evaluation of mixing bentonite with the soil was completed. Discussions were held with a bentonite vendor regarding the mixing of bentonite with on-site material at the landfill. A combination of the materials to produce a low permeable barrier layer can be achieved. However, due to the nature of the available stone washing materials, a significant volume of bentonite would need to be added to achieve the desired permeability. The mixing of bentonite and soil would require the use of a pug mill and contractor specializing in this work. Also, a large volume of water for the mixing process is necessary.

Due to the fact that the on-site material is not ideal for bentonite mixing, the estimated construction cost for this cap exceeds $1.8 million. The estimated cost of construction for this cap is influenced primarily by the quantity of bentonite and labor effort needed to make the barrier layer. A detailed summary of the estimated construction costs is provided in Table 4-3.

4.3.5 Alternative Cap 4: Geocomposite Membrane (e.g. CLAYMAX)

A fourth alternative cap evaluated for the Old Nod Road landfill is similar to the alternatives discussed in Sections 4.3.3 and 4.3.4. This alternative cap consists of a 6-inch gas ventilation layer, the barrier layer, a 12-inch drainage layer, filter fabric, and 6-inches (minimum) of topsoil with vegetation. The difference with this alternative is that the barrier layer is comprised of a geocomposite material consisting of a thin layer (typically 1/4-inch) of bentonite clay sandwiched between geotextiles. This barrier layer is commercially manufactured by several companies, the most widely known being CLAYMAX. The material is rolled out onto a prepared rough-graded

TABLE 4.3 ALTERNATIVE CAP 3 - BENTONITE AUGMENTED SOIL
OLD NOD ROAD LANDFILL - CLINTON, CONNECTICUT
LANDFILL CAP COST ESTIMATE (JANUARY 1993)

FINAL CLOSURE CONSTRUCTION COST SUMMARY

	UNIT	QTY	UNIT COST	TOTAL COST
FINAL COVER				
CLEARING & GRUBBING	ACRES	8.80	$2,000.00	$17,600
LEVELING LAYER(1)	CY	10,994	$4.00	$43,976
GAS VENT LAYER (6")	CY	7,676	$9.00	$69,084
FILTER FABRIC	SF	375,600	$0.15	$56,340
BARRIER LAYER (18")(2)	CY	24,179	$25.00	$604,475
DRAINAGE LAYER (12")	CY	15,660	$9.00	$140,940
FILTER FABRIC	SF	375,600	$0.15	$56,340
TOPSOIL LAYER (6")	CY	7,830	$13.00	$101,790
HYDROSEEDING	SF	402,268	$0.15	$60,340
EROSION CONTROL				
SILT FENCE/HAYBALES	LF	3,200	$5.00	$16,000
ROCK EXCAVATION	CY	1,500	$40.00	$60,000
STORMWATER CONTROL				
ALLOWANCE	LS	1	$25,000.00	$25,000
ACCESS ROADWAY				
10' GRAVEL ROAD	CY	1,200	$15.00	$18,000
GAS VENTING SYSTEM				
4" PERF. PE PIPE	LF	3,000	$15.00	$45,000
4" VENT RISERS	LF	150	$30.00	$4,500
AS-BUILT DRAWINGS	LS	1	$6,000.00	$6,000
SUBTOTAL No. 1				$1,325,385
ENGINEERING @ 13%(3)				$172,300
SUBTOTAL No. 2				$1,497,685
CONTINGENCIES @ 25%				$374,421
		TOTAL:		$1,872,107

NOTES:

(1) USE ON-SITE MATERIAL TO MEET SLOPE REQUIREMENTS. ASSUME MATERIAL IS AVAILABLE TO TOWN AT NO COST.

(2) BASED ON WYO-BEN TELECON (12/16/92)

(3) ENGINEERING COSTS REFLECT 8% OF CONSTRUCTION COST FOR DESIGN PLUS 5% OF CONSTRUCTION COST FOR PART TIME CONSTRUCTION SUPERVISION SERVICES

(4) CONSTRUCTION COSTS DO NOT INCLUDE COSTS ASSOCIATED WITH: LANDFILL GAS MIGRATION MANAGEMENT; LEACHATE COLLECTION AND TREATMENT; PROPERTY ACQUISITION; PERMITTING; AND PRELIMINARY LANDFILL SURVEY

landfill cover. The barrier layer can provide a level of performance which can exceed a barrier layer consisting of 18-inches of clay. Figure 4-4 shows a typical section of this alternative cap.

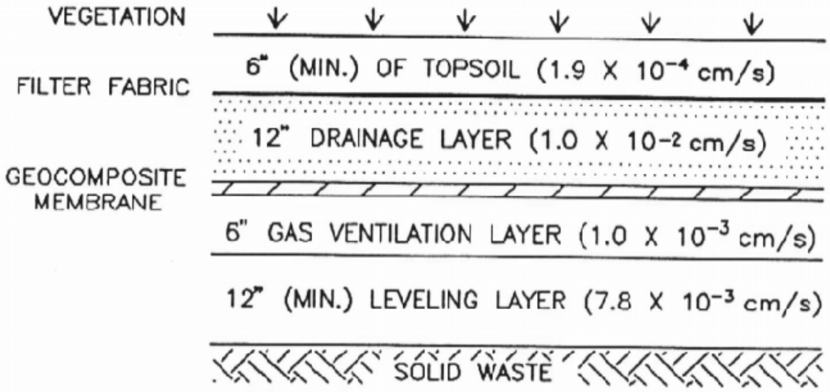


FIGURE 4-4. ALTERNATIVE CAP 4: GEOCOMPOSITE MEMBRANE (e.g. CLAYMAX)

The use of this type of geocomposite layer on the steeper side slopes is not highly desirable because of the potential for the bentonite to slide downhill. An alternative for the side slopes involves the use of a VLDPE liner like the one discussed in Section 4.3.3. Commercially manufactured liners with modified (textured) surfaces which are designed to hold cover soils are useful on steep slopes.

Based on the HELP model evaluation of this cap, approximately 30,000 gallons of leachate is estimated to be produced annually.

As with all of these alternatives, grading of the landfill to provide for minimum slopes is required. With regraded slopes and this alternative cap, compliance with RCSA 22a-209 is attained. This alternative also addresses DEP Consent Order WC 4956 by limiting leachate production.

A detailed breakdown of the estimated construction costs is provided in Table 4-4.

TABLE 4.4 ALTERNATIVE CAP 4 - GEOCOMPOSITE MEMBRANE (CLAYMAX)
OLD NOD ROAD LANDFILL - CLINTON, CONNECTICUT
LANDFILL CAP COST ESTIMATE (JANUARY 1993)

FINAL CLOSURE CONSTRUCTION COST SUMMARY

	UNIT	QTY	UNIT COST	TOTAL COST
FINAL COVER				
CLEARING & GRUBBING	ACRES	8.63	$2,000.00	$17,260
LEVELING LAYER (1)	CY	10,994	$4.00	$43,976
GAS VENT LAYER (6")	CY	7,676	$9.00	$69,084
GEOCOMPOSITE MEMBRANE	SF	263,300	$0.75	$197,475
60 mil VLDPE	SF	112,300	$0.65	$72,995
DRAINAGE LAYER (12")	CY	15,352	$9.00	$138,168
FILTER FABRIC	SF	375,600	$0.15	$56,340
TOPSOIL LAYER (6")	CY	7,676	$13.00	$99,788
HYDROSEEDING	SF	394,380	$0.15	$59,157
EROSION CONTROL				
SILT FENCE/HAYBALES	LF	3,200	$5.00	$16,000
ROCK EXCAVATION	CY	1,500	$40.00	$60,000
STORMWATER CONTROL				
ALLOWANCE	LS	1	$75,000.00	$75,000
ACCESS ROADWAY				
10' GRAVEL ROAD	CY	1,200	$15.00	$18,000
GAS VENTING SYSTEM				
4" PERF. PE PIPE	LF	3,000	$15.00	$45,000
4" VENT RISERS	LF	150	$30.00	$4,500
AS-BUILT DRAWINGS	LS	1	$6,000.00	$6,000
SUBTOTAL No. 1				$978,743
ENGINEERING @ 13% (2)				$127,237
SUBTOTAL No. 2				$1,105,980
CONTINGENCIES @ 25%				$276,495
		TOTAL:		$1,382,474

NOTES:

(1) USE ON-SITE MATERIAL TO MEET SLOPE REQUIREMENTS. ASSUME MATERIAL IS AVAILABLE TO TOWN AT NO COST

(2) ENGINEERING COSTS REFLECT 8% OF CONSTRUCTION COST FOR DESIGN PLUS 5% OF CONSTRUCTION COST FOR PART-TIME CONSTRUCTION SUPERVISION SERVICES

(3) CONSTRUCTION COSTS DO NOT INCLUDE COSTS ASSOCIATED WITH: LANDFILL GAS MIGRATION MANAGEMENT; LEACHATE COLLECTION AND TREATMENT; PROPERTY ACQUISITION; PERMITTING; AND PRELIMINARY LANDFILL SURVEY

4.4 CAPPING ALTERNATIVES COMPARISON SUMMARY

A tabulated summary of the alternative caps is provided in Table 4-5. The leachate volumes shown are based on an analysis of the cap with the U.S. EPA HELP model. The volumes are a rough estimate and provide an indication of the relative level of performance of the caps. The estimated volume should be used for comparative purposes as actual leachate volumes will most likely differ.

The estimated construction costs are for landfill caps only and do not include costs associated with: landfill perimeter gas migration management; leachate collection and treatment; property acquisition; permitting; and preliminary landfill surveys.

All of the caps meet the requirements of RCSA 22a-209. However, based on the HELP model evaluations, Alternative Cap 1 does not significantly address the reduction of leachate and Alternative Caps 2 and 4 more aggressively reduce leachate production. This is a significant issue as ConnDEP Consent Order WC 4956 requires the town of Clinton to address ongoing groundwater contamination.

Based on the criteria listed in Table 4-5, Alternative Caps 2 and 4 are the most effective in limiting leachate production. Both alternatives meet the requirements of RCSA 22a-209 and directly address Consent Order WC 4956.

4.5 LEACHATE COLLECTION EVALUATION

The primary goal of the Old Nod Road landfill remedial action program is to reduce contamination of groundwater due to landfill leachate. This is best accomplished by reducing the production of leachate, therefore reducing the need for leachate collection. As noted in previous sections, a low permeability landfill cap can be an effective means of reducing leachate production. This section considers the need for additional measures, beyond a cap, for leachate management at the Old Nod Road landfill.

TABLE 4-5. SUMMARY COMPARISON OF ALTERNATIVE CAPS EVALUATED FOR THE OLD NOD ROAD LANDFILL

Alternative	Description	Estimated Annual Leachate Production (x 1,000 gallons)	Compliance With RCSA Section 22a-209-71(4)	Compliance With Consent Order WC 4956	Estimated Construction Cost
Cap 1	On-site material	5,000	Marginal	Marginal	$ 263,000
Cap 2	Geosynthetic membrane	30	Yes	Yes	1,326,000
Cap 3	Bentonite augmented soil	1,400	Yes	Yes	1,872,000
Cap 4	Geocomposite Membrane (e.g.CLAYMAX)	30	Yes	Yes	1,382,000

REMARKS:

Alt. 1:	Minimal mitigation in leachate production; Meets basic requirements of RCSA, but does not meet requirements of ConnDEP guidance document. Perimeter gas migration plan may be required.
Alt. 2:	Significant leachate reduction; good quality control during installation required; implementation of perimeter gas migration system required.
Alt. 3:	Construction cost possibly higher depending on actual bentonite mixing requirements; requires significant volume of water for construction; perimeter gas migration system required.
Alt. 4:	Significant leachate reduction; use of VLDPE of 3:1 slopes for cover soil stability recommended; requires water during construction; cap is flexible and resilient; implementation of perimeter gas migration system required.

A landfill cap can be very effective in reducing leachate production caused by infiltration of precipitation through the landfill. However, if there is a significant volume of solid waste below the water table, some leachate production may occur due to groundwater passing through the fill. To evaluate leachate collection/migration management at the Old Nod Road landfill, the following issues have been considered:

- Potential for leachate production due to solid waste below the water table.
- Methods for collecting leachate/groundwater at the landfill toe.
- Methods for treating collected leachate/groundwater

4.5.1 Water Table Assessment

Information collected as part of the *Old Nod Road Landfill Assessment Report* (September 1991) indicates that the original ground surface beneath the landfill was a small valley. The lowest part of the valley was below the eastern central portion of the landfill. The maximum depth of landfilling is approximately 40 feet. These data are shown on Figure 4-5, a map of existing and original surface topography. Groundwater elevation measurements in the perimeter wells, combined with the original ground surface contour data, appear to indicate that the deepest part of the landfill may currently be submerged below the water table. The apparently submerged area is located in the lowest part of the filled valley. The depth of submerged fill is estimated to be from one to fifteen feet. This estimate is uncertain due to a lack of water level data within the landfill itself, and also to the small scale at which the original ground surface topography was mapped. It is expected that the presence of submerged fill in the landfill is due to the limited hydraulic conductivity of the fill and the resultant "mounding" effect of precipitation infiltrating into the fill.

With installation of a low permeability landfill cap and surface run-on/run-off controls, infiltration and groundwater mounding effects will be reduced, and the water table elevation within the landfill should decline. Additional measures that could be used to reduce groundwater

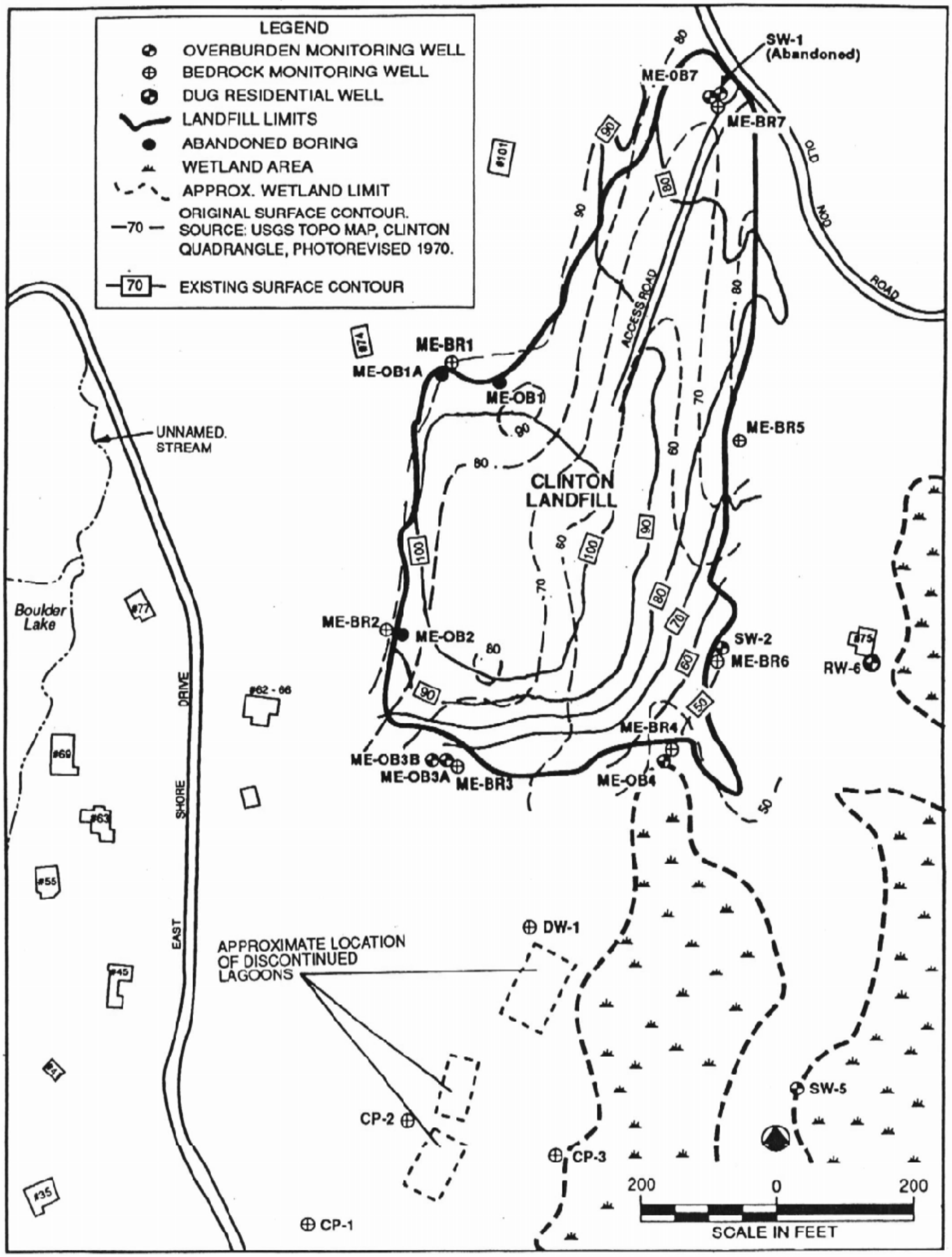


Figure 4-5 Approximate Contours of the Original and Existing Ground Surface

flow through the landfill include upgradient vertical barriers (i.e. grout curtain) to direct groundwater flow around the landfill and upgradient groundwater pumping to lower the water table elevation. However, with a landfill cap, these measures may not be warranted.

4.5.2 Leachate Collection Methods

A variety of methods can be used to collect landfill leachate. The most effective methods are employed when landfills are constructed with a base liner, thus containing the leachate and minimizing the volume of leachate collection required. The Old Nod Road landfill does not have a base liner, therefore leachate collection would consist of collection of groundwater contaminated with leachate.

The purpose of a leachate collection system is to minimize the migration of leachate away from the landfill. The most commonly used leachate collection systems are subsurface drainage trenches or vertical extraction wells. Due to the shallow depth to bedrock at the Old Nod Road Landfill and the fact that the bedrock aquifer at the toe of the landfill appears to be impacted by landfill leachate, construction of subsurface trenches around the landfill would require rock excavation and would be difficult.

It appears that vertical or horizontal wells would be more appropriate than a trench design for this site. The wells would be installed either within the landfill or along the toe of the landfill to collect the most contaminated groundwater. Well locations would be determined during design. Preliminary calculations indicate that the groundwater pumping rate would most likely be in the 10 to 50 gallon per minute range. Water level impacts on the abutting wetland due to pumping would also be of concern, and a discharge location for the treated water would need to be determined with ConnDEP. Additional information from aquifer pumping tests and further clarification of the objectives of leachate collection would be needed to refine this estimate.

4.5.3 Leachate Treatment Methods

Considerations evaluated in leachate treatment include the volume of leachate requiring treatment, the level of treatment necessary, the availability of a suitable receptor for treated leachate, space availability and cost. Treatment can be achieved through the collection and hauling of leachate to approved wastewater treatment facilities or through the construction of an on-site treatment plant. With any alternative, the total volume of leachate requiring treatment significantly affects the overall cost.

Since there are no sanitary sewers or a municipal wastewater treatment plant in Clinton, on-site treatment and discharge appears to be the most cost effective option. Based on available data from perimeter monitoring wells, the leachate/groundwater requiring treatment would be relatively dilute. With installation of a low permeability cap, further reduction in contaminant concentrations is expected. Treatment technologies that may be appropriate for the organic compounds detected include air stripping, physical/chemical oxidation, biological treatment and granular activated carbon.

If on-site treatment were to occur, a discharge permit would be required for the treatment system, and effluent limitations would be established. Year-round operation and maintenance of the leachate/groundwater collection system and treatment system would be required.

Based on the assumptions presented herein, capital costs for a leachate/groundwater collection and treatment system for this site is estimated to be on the order of $1.0 million. These costs are preliminary estimates only, and could vary significantly. Additional design details would need to be developed to refine this cost estimate.

4.5.4 Conclusion

It is expected that a low permeability landfill cap will significantly reduce leachate production and will preclude the need for leachate/groundwater collection and treatment at the Old Nod

Road landfill. Leachate collection would be difficult at this site due to the shallow bedrock aquifer and the fact that there is no municipal sewer system or treatment plant to accept the leachate/groundwater. The Town has implemented a program of connecting all residences in the vicinity of the landfill with contaminated wells to public water. Therefore, potential exposure to groundwater contamination from the landfill has been significantly reduced.

Following capping of the landfill, a monitoring program should be implemented to assess the effectiveness of the cap in reducing groundwater contamination. If necessary, the issue of leachate collection can be re-evaluated at that time.

4.6 LANDFILL GAS MIGRATION MANAGEMENT

Landfill gas control systems can be either passive or active. Passive systems rely on differential pressure and convection to release landfill gases to the atmosphere. Active systems use a blower to induce gas flow from a series of gas recovery wells or trenches.

With the installation of a low permeability cap over the Old Nod Road landfill, gas released through the landfill surface may be reduced and lateral migration of gases could increase. A passive system would consist of landfill gas vents over the surface of the landfill as part of the cap installation. The gas venting system would include a network of subsurface gas collection pipes and risers through the landfill surface. This type of gas ventilation system was included in the evaluation of capping systems presented in Section 4.3.

Based on the gas survey measurements presented in Section 3.4, and concern of potential for landfill gas migration beyond the landfill property line, perimeter gas controls appear warranted in selected areas. Most notably, gas extraction wells would be required on the west-central side of the landfill, where soil gas measurements indicated gas levels above the lower explosive limit. The most effective means of controlling gas emissions in this area would be through an active venting system. With an active gas venting system the passive surface vents would be replaced with a series of gas extraction wells from within the landfill. Gas from these gas extraction wells would be combined with gas from the perimeter wells. This type of system will avoid drawing air into the landfill from the passive vents and thereby reduce potential for combustion within the landfill. Also, by augmenting the perimeter gas with gas from within the landfill, it will be easier to maintain a flare if the gas is to be combusted before release.

Currently, there are no regulations that require flaring or treatment of vented landfill gases. However, proposed regulations under the Clean Air Act would require landfills emitting over 167 tons per year of non-methane organic compounds to install gas collection systems and combust captured landfill gases. No site specific non-methane organic vapor data is available for the Old Nod Road landfill, however, if an active gas venting system were employed, flaring of landfill gas would likely be required due to the point source nature of the air discharge.

In addition to the gas venting controls discussed above, a landfill gas monitoring system should be installed around the landfill perimeter. If gas migration problems are found, additional controls may be required.

Additional details on the gas migration control system at the Old Nod Road landfill should be developed during design stages. A preliminary, rough cost estimate for an active perimeter gas collection system in selected areas of the landfill is on the order of $400,000.

SECTION FIVE
RECOMMENDED REMEDIAL ACTION PLAN

This section presents a recommended remedial action plan for the Old Nod Road landfill. Included in this section is a final grading conceptual plan; a discussion of the recommended landfill capping system, gas migration plan, and future landfill uses; a remedial action monitoring plan; a cost estimate; and a preliminary schedule for the implementation of the recommended plan.

5.1 Final Grading Conceptual Plan

The recommended conceptual grading plan for the Old Nod Road landfill requires the existing landfill to be rough graded to create slopes which meet minimum slopes called for under RCSA 22a-209. This involves the raising of the top of the landfill to create slopes steeper than four percent. Also, the flattening of the southerly and easterly slopes to create grades flatter than 3:1 is necessary.

With the conceptual grading plan, the extension of the toe of the landfill is necessary. Clearing and grubbing of areas adjacent to the landfill must be conducted to allow for the flattened side slopes and proposed cap. Clearing and grubbing of existing landfill slopes is also necessary to prepare the site for the final cover.

Surface runoff control is proposed with a series of rip rap channels. A reverse bench midway down the steepest slopes will interrupt runoff and convey the water to channels which can bring the storm water to the base of the landfill where it is proposed to be discharged into the adjacent wetlands. A channel along the easterly side of the landfill will also collect and convey runoff to the wetlands. No sedimentation basin prior to the discharge of runoff to the wetlands is proposed due to limited available space and potential negative impacts to the wetlands. The use of rip rap diffuser pads and temporary check dams in the channels during the establishment of

TABLE 5.1 RECOMMENDED REMEDIAL ALTERNATIVE
OLD NOD ROAD LANDFILL – CLINTON, CONNECTICUT
COST ESTIMATE (JANUARY 1993)

FINAL CLOSURE CONSTRUCTION COST SUMMARY

	UNIT	QTY	UNIT COST	TOTAL COST
FINAL COVER				
CLEARING & GRUBBING	ACRES	8.63	$2,000.00	$17,260
LEVELING LAYER (1)	CY	10,994	$4.00	$43,976
BEDDING LAYER (6")	CY	7,676	$10.00	$76,760
60 mil VLDPE LINER (NON–TEXTURED)	SF	263,300	$0.60	$157,980
60 mil VLDPE LINER (TEXTURED)	SF	112,300	$0.65	$72,995
DRAINAGE LAYER (12")	CY	15,352	$9.00	$138,168
FILTER FABRIC	SF	375,600	$0.15	$56,340
TOPSOIL LAYER (6")	CY	7,676	$13.00	$99,788
HYDROSEEDING	SF	394,380	$0.15	$59,157
EROSION CONTROL				
SILT FENCE/HAYBALES	LF	3,200	$5.00	$16,000
ROCK EXCAVATION	CY	1500	$40.00	$60,000
STORMWATER CONTROL				
ALLOWANCE	LS	1	$75,000.00	$75,000
ACCESS ROADWAY				
10' GRAVEL ROAD	CY	1,200	$15.00	$18,000
GAS MIGRATION SYSTEM (2)	LS	1	$400,000.00	$400,000
AS–BUILT DRAWINGS	LS	1	$10,000.00	$10,000
SUBTOTAL No. 1				$1,301,424
ENGINEERING @ 13% (3)				$169,185
SUBTOTAL No. 2				$1,470,609
CONTINGENCIES @ 25%				$367,652
		TOTAL:		$1,838,261

NOTES:

(1) USE ON–SITE MATERIAL TO MEET SLOPE REQUIREMENTS. ASSUME MATERIAL IS AVAILABLE TO TOWN AT NO COST

(2) PRELIMINARY ESTIMATE FOR PLANNING PURPOSES. ESTIMATE SHOULD BE REVISED DURING PRELIMINARY DESIGN

(3) ENGINEERING COSTS REFLECT 8% OF CONSTRUCTION COST FOR DESIGN PLUS 5% OF CONSTRUCTION COST FOR PART–TIME CONSTRUCTION SUPERVISION SERVICES

(4) CONSTRUCTION COSTS DO NOT INCLUDE COSTS ASSOCIATED WITH: LEACHATE COLLECTION AND TREATMENT; PROPERTY ACQUISITION; PERMITTING; AND PRELIMINARY LANDFILL SURVEY

cover vegetation should help to limit the introduction of sediment into the wetlands. After a vegetative cover is established, the check dams can be removed.

A gravel access road from Old Nod Road to the top of the landfill is proposed. Also, an access road along the easterly side of the landfill is proposed to allow for inspection and maintenance of the drainage channel. Due to the location of the wetlands, this easterly access road dead terminates at the end of the drainage channel. A paved driveway apron at Old Nod Road is proposed to help keep from tracking dust onto the public road.

To construct the proposed improvements, the acquisition of easements and/or property is most likely required. The purchase of the property immediately adjacent to the eastern boundary of the current landfill is necessary for the construction of the improvements recommended herein. Purchase and/or easements for the construction of the cover and gas migration system will most likely be necessary along the westerly side of the landfill.

The conceptual final grading plan is provided in Appendix C. The final cover system recommended for the landfill is discussed in the following section.

5.2 Landfill Cover System

The recommended cover for the Old Nod Road landfill includes the use of both textured and non-textured geosynthetic membranes. A textured geosynthetic membrane is recommended on the steeper slopes found along the southerly and easterly slopes due to the ability of the textured liner to hold cover soils on these slopes.

The complete recommended cover includes the placement of a 6-inch bedding layer on the rough graded landfill surfaces. On top of the gas layer a geosynthetic membrane will be placed, followed by a 12-inch drainage layer, filter fabric, and a minimum of 6-inches of topsoil. The establishment of vegetation on the surface of the topsoil is the final ingredient in the cover system. The final grading conceptual plan provides details and locations for the two cover systems recommended for Clinton's landfill.

5.3 Gas Migration Plan

At this time, it is anticipated that an active gas venting system would be needed to control perimeter gas migration on the west side of the landfill. Gas migration controls will consist of gas extraction wells within the landfill and a perimeter gas collection system, in selected areas, to control off-site migration.

Further evaluation of perimeter gas control alternatives is necessary prior to design of a control system. The following steps should be taken to further define gas control needs:

- Conduct compound specific sampling of both methane and non-methane organic compounds along the west perimeter of the landfill;
- Conduct longer term monitoring of landfill gas levels in nearby structures;
- Assess alternative methods for collecting landfill gases along the west perimeter (i.e. evaluate vertical barriers and vertical extraction wells);
- Prepare a preliminary design of a perimeter landfill gas control system. Include identification of landfill gas combustion requirements.

It is recommended that these steps be undertaken immediately rather than waiting for ConnDEP approval of this Remedial Alternatives Assessment Report.

5.4 Future Landfill Uses

Following closure, the use of the landfill must be restricted to passive or active recreation that will not threaten the public health, the environment, or the integrity of the closure methods employed. Any development should have no negative effect on the final cover or storm water runoff. Also, any vegetative species having long roots which could potentially disturb the impermeable layer should not be planted. No construction activity should occur due to the instability of the waste material, regulatory requirements, and potential damage to the environment.

5.5 Monitoring Program

In preparation. To be included in final report.

5.6 Cost Estimate

Table 5-1 presents a preliminary cost estimate for the recommended remedial action plan. This estimate represents a planning level cost estimate based on a number of assumptions. Notably, the cost estimate for perimeter gas migration control is a rough estimate at this time. Revised cost estimates should be provided during design stages as additional detail is developed.

5.7 Schedule

Figure 5-1 presents the estimated schedule for implementation of the recommended remedial action plan. This schedule assumes that property acquisition and easement issues can be resolved in an expedited manner.

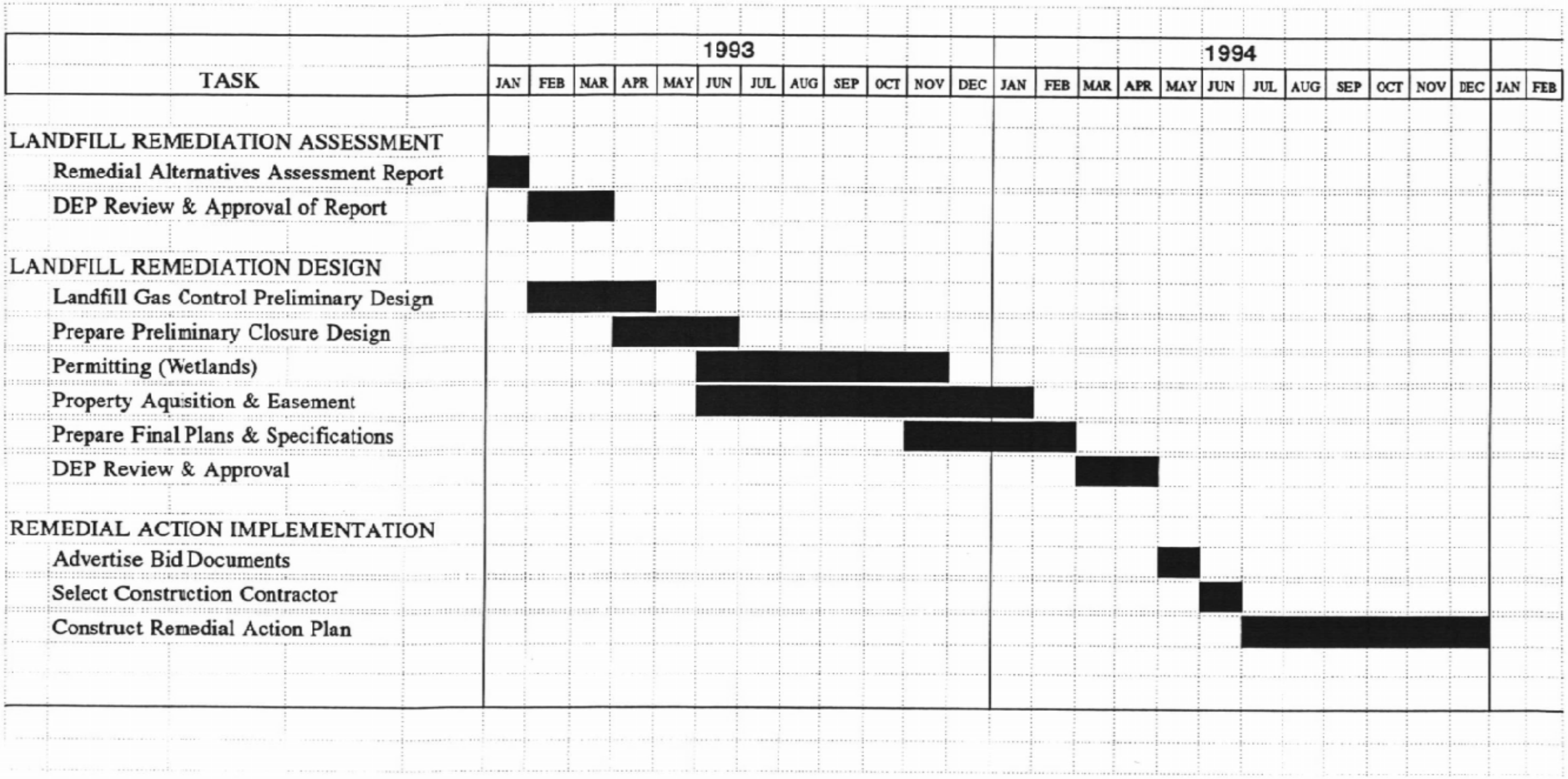


Figure 5-1 Estimated Implementation Schedule - Old Nod Road Landfill Remedial Action Recommendations

REFERENCES

Bouwer H., and R.C. Rice, 1976. A Slug Test for Determining the Hydraulic Conductivity of Unconfirmed Aquifers With Completely or Partially Penetrating Wells. Water Resources Research, Vol 12, No. 3, pp. 423-428.

Connecticut Department of Environmental Protection in cooperation with Massachusetts Executive Office of Environmental Affairs.Landfill Assessment and Closure Guidance Manual, November 1992.

Freeze, R.A. and J.A. Cherry, 1979. Groundwater. Prentice-Hall, Inc., Englewood Cliffs, N.J.

Metcalf & Eddy, Inc., September 1991, Old Nod Road Landfill Assessment Final Report, Prepared for the Town of Clinton, Connecticut.

APPENDIX A

EXISTING LANDFILL COVER MATERIAL GRAIN SIZE DISTRIBUTION

ENVIRONMENTAL SCIENCE CORPORATION
362 Industrial Park Rd.
Middletown, CT 06457
(203) 632-0600, FAX (203) 632-7743

LABORATORY REPORT

LAB. REPORT NO.
C-12532

State Certification No. PH-0476
EPA Number CT013

CLIENT

Mr. John Cardoni
Metcalf & Eddy, Inc.
One Research Parkway
Meriden, CT 06450

DATE RECEIVED	07/23/92
PURCHASE ORDER NO.	30339
CLIENT I.D.	MET & EDDY
CLIENT PROJECT NO.	010031-0004
TELEPHONE NO.	630-1735

CLINTON LF

TEST : Grain Size-Sieve Analysis
PARAMETER: Grain Size - Sieve Analysis
UNITS :

SAMPLE ID	LOCATION	TYPE	DATE	RESULT	ANALYSIS DATE & TIME
SS-1 (0-2)	EAST SHORE DRIVE	SOIL/SOLID	07/08/92	^	07/28/92 10:00
SS-3 (0-2)	EAST SHORE DRIVE	SOIL/SOLID	07/09/92	^	07/28/92 10:00
SS-6 (0-3.5)	EAST SHORE DRIVE	SOIL/SOLID	07/09/92	^	07/28/92 10:00
SS-8 (0-1.5)	EAST SHORE DRIVE	SOIL/SOLID	07/09/92	^	07/28/92 10:00

^See attached sheet

07/29/92
DATE REPORTED

Thomas F McGlone
LABORATORY DIRECTOR

ENVIRONMENTAL
SCIENCE
CORPORATION

Laboratory, Field, and Consulting Services

Mr. John Cardoni
Metcalf and Eddy - Clinton LF
Lab Report C-12532
Date Received: 7/23/92

			% Retained			
Sieve #	Millimeters	Inches	SS-1 0-2	SS-3 0-2	SS-6 0-3.5	SS-8 0-1.5
2 in.	50.8	2.0	0	0	0	0
1.5 in.	38.1	1.5	0	0	0	0
1 in.	25.4	1.0	0	0	0	0
3/4 in.	19.0	0.750	0	0	0	0
3/8 in.	9.5	0.375	10.5	4.7	3.8	11.5
#4	4.75	0.187	2.9	0.8	4.3	5.8
#10	2.00	0.0787	5.2	3.8	4.0	5.8
	Micrometers	Inches				
#20	850	0.0331	11.4	11.8	13.8	14.6
#40	425	0.0165	18.5	26.8	21.3	18.4
#60	250	0.0098	17.9	28.9	23.2	16.6
#140	106	0.0041	16.2	4.1	20.0	18.1
#200	75	0.0029	4.4	5.1	4.8	3.4
Bottom Pan	< 75	< 0.0029	12.9	14.0	4.9	5.8

Thomas F. McGlone

Project CLINTON LANDFILL Acct. No. ______ Page ____ of ____

Subject EVALUATION OF REMEDIAL ALT. Comptd. By DJF Date 8/7/92

Detail SOIL COVER PERMEABILITY Ck'd. By ______ Date ______

Estimate soil hydraulic conductivity from grain-size analyses.

Use Hazen's approximation (Freeze & Cherry, 1979)

$K = A d_{10}^2$ where K = hydraulic conductivity, cm/s

$A = 1.0$

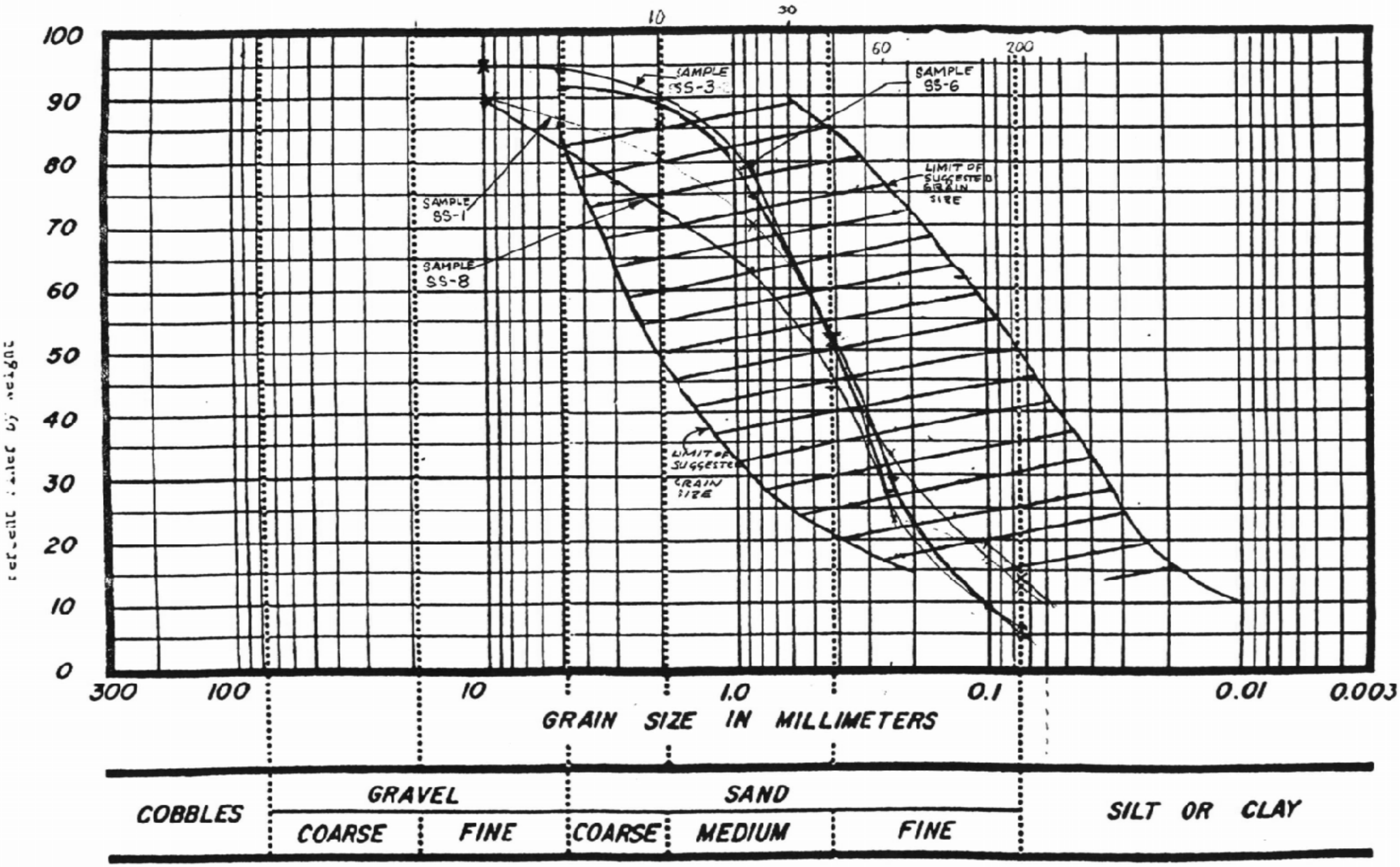
d_{10} = grain size diameter, in mm, coarser than 10% of sample by weight, from grain size curve

sample ID	d_{10}	K, cm/s	K, ft/day
SS-1 (0-2)	0.062 ~~0.62~~	~~3.8×10^{-3}~~ ok	10.9
SS-3 (0-2)	0.057	3.2×10^{-3}	9.2
SS-6 (0-3.5)	0.11	1.2×10^{-2}	34.3
SS-8 (0-1.5)	0.11	1.2×10^{-2}	34.3

NONREPRODUCIBLE GRID FORM 145

METCALF & EDDY, ENGINEERS

FIGURE 1. SUGGESTED GRAIN SIZE RANGE FOR LANDFILL COVER SOILS



Kozeny - Carmen

APPENDIX B

HELP MODEL RESULTS

Appendix B is not included in this copy to reduce bulk. The official report copy includes Appendix B.

APPENDIX C

FINAL LANDFILL GRADING PLAN

SUBMITTED TO:
TOWN OF CLINTON
CONNECTICUT

OLD NOD ROAD LANDFILL ASSESSMENT

FINAL REPORT

SEPTEMBER, 1991

M&E

Metcalf & Eddy

September 3, 1991

Ms. Virginia D. Zawoy
First Selectman
Town of Clinton
54 East Main Street
Clinton, CT 06413

Dear Ms. Zawoy:

We are pleased to submit this Final Report on the Old Nod Road Landfill Assessment. This report has been prepared in accordance with our agreement dated September 6, 1990. This report is being submitted concurrently to Mr. Eric Jorgensen of the Connecticut DEP.

To assist in the town's and DEP's review of this report, the following summary has been prepared to address issues raised in the DEP memorandum entitled "Clinton Landfill Report Requirements Summary" and issues discussed during the August 7, 1991 meeting between the town, DEP and State Representative Holbrook.

GENERAL

Work on this project has been conducted in accordance with the project Scope of Study dated July 19, 1990 and approved by Connecticut DEP on October 1, 1990. The Scope of Study was prepared in consultation with DEP staff, and was designed to provide a focused assessment of the nature of contamination at the landfill. Monitor wells were installed and sampled at the toe of the landfill, nearby surface waters were sampled and attempts were made to sample leachate seeps (none active). Evaluation of other potential contaminant sources in the area (ie. transfer station, town garage, bulky waste site and lagoons) is not included in this report.

This report includes results from two separate rounds of sampling conducted in November 1990 and June 1991.

EVALUATION OF DATA

The data collected as part of this work plan are presented in tables and maps along with textual interpretation of the data. This information is presented in Section Three of this report, and is briefly summarized in the Conclusions section of this letter. In addition, historic groundwater monitoring data in the vicinity of the landfill are summarized in Section Two of this report.

One Research Parkway
Meriden, CT 06450
(203) 630-1735 — FAX: (203) 630-1135

AWT Affiliates of Air & Water Technologies Corporation

The primary routes of potential exposure to landfill contamination are groundwater consumption, nearby surface water contact, and direct contact with the landfill itself. The town of Clinton is in the process of extending public water lines to all contaminated well users in the area of the landfill, thereby reducing or eliminating ingestion as a potential exposure pathway. In addition, the town maintains a private well monitoring program to assure that if any wells become contaminated due to the landfill, they can be connected to the public water system. The limited available surface water sampling data in the immediate vicinity of the landfill indicate the presence of leachate contaminants in the surface water, however, the data do not indicate the presence of organic contaminants. The landfill currently has soil cover over its entire surface, thereby reducing the risk of direct contact exposure. The town is also in the process of eliminating leachate seeps on the landfill slopes. These measures serve to reduce potential direct contact exposure at the landfill.

DATA PRESENTATION

A map illustrating the analytical results for organics is presented in Plate 2 of Appendix A. The study focused on water quality at the toe of the landfill, rather than regional groundwater quality in the area around the landfill. Leachate parameters were detected in all of the wells sampled. Water quality data are presented in Tables 3-8, 3-9, 3-10 and 3-11. Well construction details are presented in Table 3-4. In general, concentrations of leachate parameters were lowest at the north end of the landfill and highest at the south end.

Groundwater contour maps for the bedrock aquifer are presented in Figures 3-1 and 3-2. As shown, the hydraulic gradient of the bedrock aquifer is toward the southeast. Groundwater contour maps could not be prepared for the overburden aquifer because it is discontinuous in the area around the landfill.

A sample location map is shown on Plate 1 in Appendix A.

The town of Clinton has been conducting a monitoring program to identify residential water wells which are impacted by the landfill. The town has nearly completed the installation of water mains throughout the affected area.

OTHER ISSUES

During the August 7, 1991 meeting, questions were raised regarding the perfume-like odors noticed during monitoring well installation and sampling. These observations are summarized on page 3-29 of this report. Also, the issue of the presence of chloromethane was discussed at this meeting, and is addressed on pages 3-26 to 3-28 of this report. In summary, it appears that chloromethane is present in the groundwater at the landfill, however, this could not be confirmed by a second laboratory.

CONCLUSIONS

The results of the water quality data analyses are presented in pages 3-22 through 3-31 of this report. No clear data trends can be established from the two sampling rounds. Benzene was present at fairly consistent concentrations on both sampling dates. However, the concentrations of other parameters varied in a non-systematic manner among adjacent wells, between bedrock and overburden wells, and between the two sampling events. The variations are graphically illustrated in Plate 2 of Appendix A.

In general, the results of this investigation indicate that landfill leachate is present in groundwater at the toe of the landfill, however, gross levels of organic contamination were not detected. Benzene was the most prevalent contaminant detected above primary drinking water standards, with levels in all wells at the toe of the landfill exceeding the Connecticut drinking water standard of 1 ppb (part per billion). Inorganic compounds such as iron, manganese and total dissolved solids were detected at levels exceeding secondary drinking water standards, however, they are within the typical range for landfill leachate.

Additional data collection needs include leachate seep sampling, surface water sampling and hydraulic conductivity testing as discussed in Section Four.

An assessment of landfill remediation alternatives is recommended in Section Four. Alternatives include no action, landfill capping, and leachate collection and treatment.

A surface water and groundwater monitoring program is recommended in Section Four. The purpose of the plan will be to evaluate the effectiveness of the selected remedial action.

If there are any further questions on the results of this investigation, please do not hesitate to contact us.

Very truly yours,

John J. Cardoni

John J. Cardoni, P.E.
Project Manager

JJC/alg
cc: J. Cissell
L. Munro
E. Jorgensen, Connecticut DEP

CONTENTS

TABLE OF CONTENTS

LIST OF TABLES

SECTION 1

SECTION ONE
INTRODUCTION

The Old Nod Road Landfill was operated from the early 1960s through 1979. The landfill accepted both municipal and local industrial wastes during its period of operation. In addition, there are three former sludge lagoons near the landfill that accepted industrial wastes. Other potential contamination sources in the landfill area are the town transfer station, bulky waste landfill, salt storage area, and former underground fuel tanks at the town garage. Figure 1-1 shows the project location.

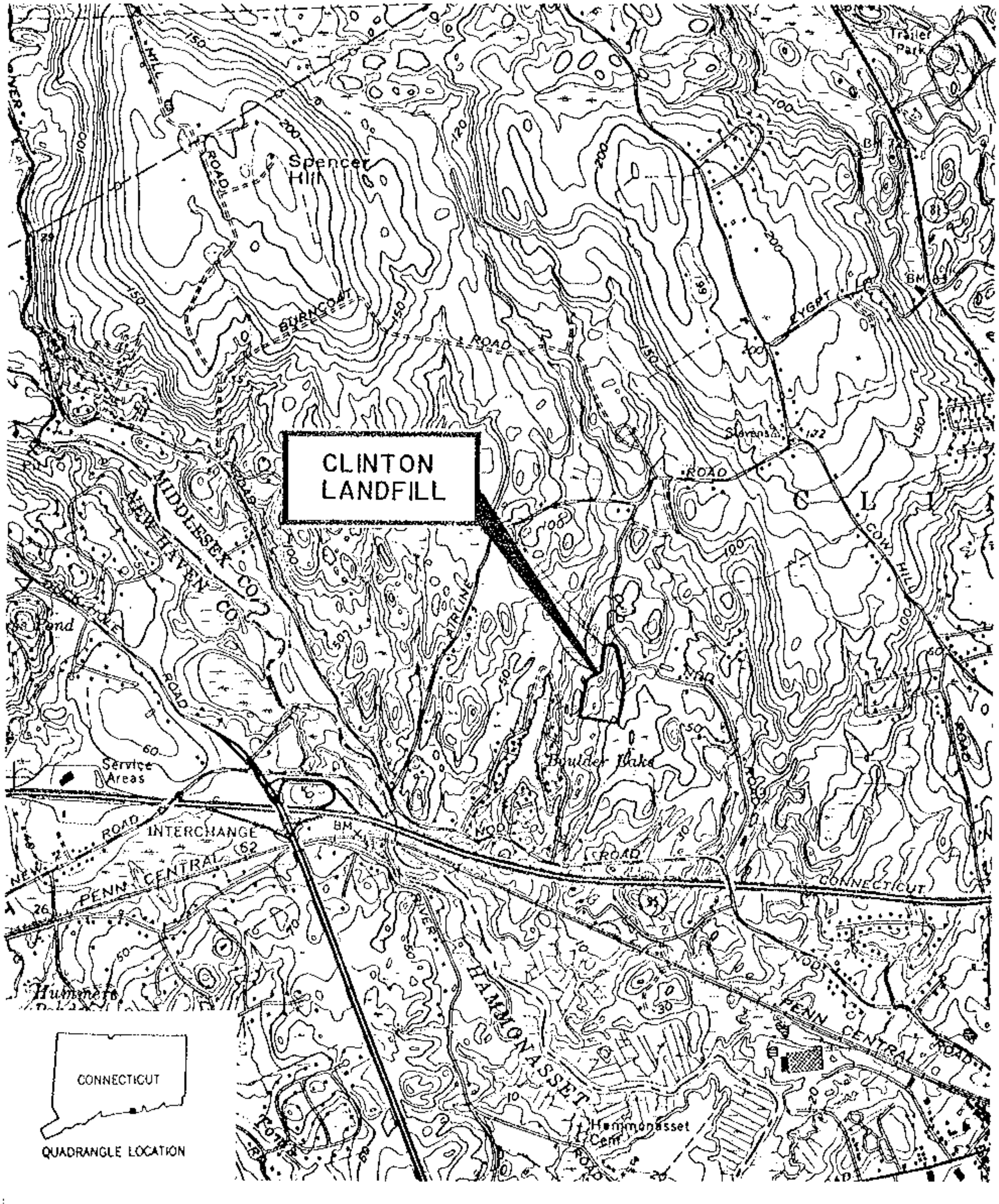
Past studies have indicated that the landfill is a source of pollution to surrounding groundwater and surface water. The town is in the process of extending public water to affected users in the area, and has already completed much of this work. Connecticut Department of Environmental Protection (ConnDEP) Consent Order WC 4956 dated June 29, 1990, requires that the town take actions to further characterize the extent of contamination at the site, and to remediate this pollution.

SCOPE OF STUDY

The scope of study for this site assessment was developed through consultation with both the town and ConnDEP, and was subsequently approved by ConnDEP. Work conducted under the assessment provides a focused evaluation of the nature of contamination at the landfill. Data collection efforts were designed to characterize groundwater quality at the toe of the landfill and to assess the need for further remedial action at the site.

This landfill assessment consisted of the following tasks:

- Review of applicable information from past studies and groundwater monitoring conducted at the landfill.



SOURCE: USGS TOPOGRAPHIC MAP OF THE CLINTON QUADRANGLE, CONNECTICUT, PHOTO REVISED 1970.

FIGURE I-I. PROJECT LOCATION MAP.

- Installation of 7 bedrock and 4 overburden monitoring wells around the perimeter of the landfill.

- Two rounds of sampling of newly installed wells and one existing well for volatile organic compounds, cyanide and other leachate indicator parameters. Samples collected during the first round were also analyzed for metals.

- Sampling at one surface water station during the first round of sampling. During the second round, no surface water was present. Sampling of leachate seeps was attempted; however, no active seeps were found during either the first or second rounds of sampling.

- Analysis of site hydrogeology and water quality based on data collected during the site assessment.

- Development of recommendations for additional field investigations and a plan for the evaluation of remediation alternatives at the landfill.

The findings of the landfill assessment are presented herein. This report has been prepared in accordance with the project Scope of Study approved by DEP on October 1, 1990.

REPORT FORMAT

The information from this investigation is presented in four basic sections:

Section One - Introduction

Section Two - Existing Information Review Relevant information from past reports is summarized and historic groundwater quality data from off-site wells is presented.

Section Three - Data Collection and Analysis The data collection program and field procedures used to conduct borings, install wells and collect samples are described in detail. Data collected is presented and analyzed, including both a hydrogeologic assessment of the landfill and an evaluation of water quality data collected.

Section Four - Recommendations for Additional Work Recommendations for additional field investigation needed for the evaluation of remediation alternatives are presented. In addition, a preliminary discussion of remediation alternatives is presented along with a plan for evaluation of these alternatives.

The draft report was submitted for review to both the town and ConnDEP. Comments received were incorporated into the final report.

SECTION 2

SECTION TWO

EXISTING INFORMATION REVIEW

Existing information pertaining to the landfill was reviewed to gain familiarity with site conditions and augment data collection efforts. The review included the following sources: published maps of soils, surficial geology and bedrock geology; aerial photographs; water quality analyses for wells in the area; reports prepared for the Town of Clinton by Flaherty-Giavara Associates, Heynen Engineers, Nathan Jacobson & Associates, and Enviro-Audit Ltd; the Clinton Landfill Preliminary Assessment prepared by ConnDEP; and a report prepared for Chesebrough-Ponds, Inc. by Industrial Pollution Control, Inc.

SOILS AND GEOLOGY

Soils

According to the Soil Survey of Middlesex County, Connecticut (U.S. Department of Agriculture, Soil Conservation Service, 1976) the original soils at the landfill were identified as the Hollis-Rock outcrop complex; the Leicester, Ridgebury, and Whitman extremely stony fine sandy loams; and the Charlton-Hollis very stony fine sandy loams. These soils are described briefly as they apply to subsurface conditions at the landfill.

The Hollis-Rock outcrop complex is described as sloping, somewhat excessively drained soils and areas of bedrock outcrop, present on uplands where the relief is affected by underlying bedrock. The soil is described as a fine sandy loam. The soil, where present, extends to a depth of approximately fourteen inches and is underlain by hard, unweathered bedrock. Small areas with a greater depth to bedrock may be present. The permeability of the soil is moderate to rapid above the bedrock.

The Leicester, Ridgebury, and Whitman extremely stony fine sandy loams are described as nearly level, poorly drained soils in drainage ways of glacial till uplands. The three soil units are similar. They differ slightly in color and texture, and are therefore mapped together. They are composed of fine sandy loam extending to a depth of 60 inches or more. Greater than three percent of the surface is covered with stones and boulders. The permeability of these soils ranges from very slow to moderately rapid.

The Charlton-Hollis very stony fine sandy loams are described as gently sloping and sloping, well drained and somewhat excessively drained soils on ridges. The relief is affected by underlying bedrock. The soils are both composed of fine sandy loams. The substratum of the Charlton soil extends to a depth of over 60 inches, but the Hollis soil is underlain by bedrock at a depth of fourteen inches. The permeability of the soils is moderate.

The distribution of these soils is shown in Figure 2-1. The west half of the landfill is underlain by the Hollis-Rock outcrop complex, and the east half is underlain by Charlton-Hollis soils. A small area at the southeastern part of the landfill is underlain by Leicester, Ridgebury, and Whitman soils.

Surficial Geology

The surficial geology of the site is mapped as bedrock outcrops and glacial till (Flint, 1971). The outcrop area is characterized by thin discontinuous patches of till separated by bedrock outcrops. Till is a compact, nonsorted sediment composed of sand, silt, gravel, cobbles, boulders, and clay, deposited by a glacier. The north and west parts of the landfill are underlain by outcrops and thin till. The southeast portion of the landfill around ME-BR4 and ME-BR6 is underlain by deeper till deposits.

Bedrock Geology

The bedrock underlying the site is mapped as Monson Gneiss (Lundgren and Thurell, 1973). The rock is described as dark gray hornblendic plagioclase-quartz rock. Gneiss is generally a very hard, crystalline rock that is resistant to decomposition by weathering. It is characterized

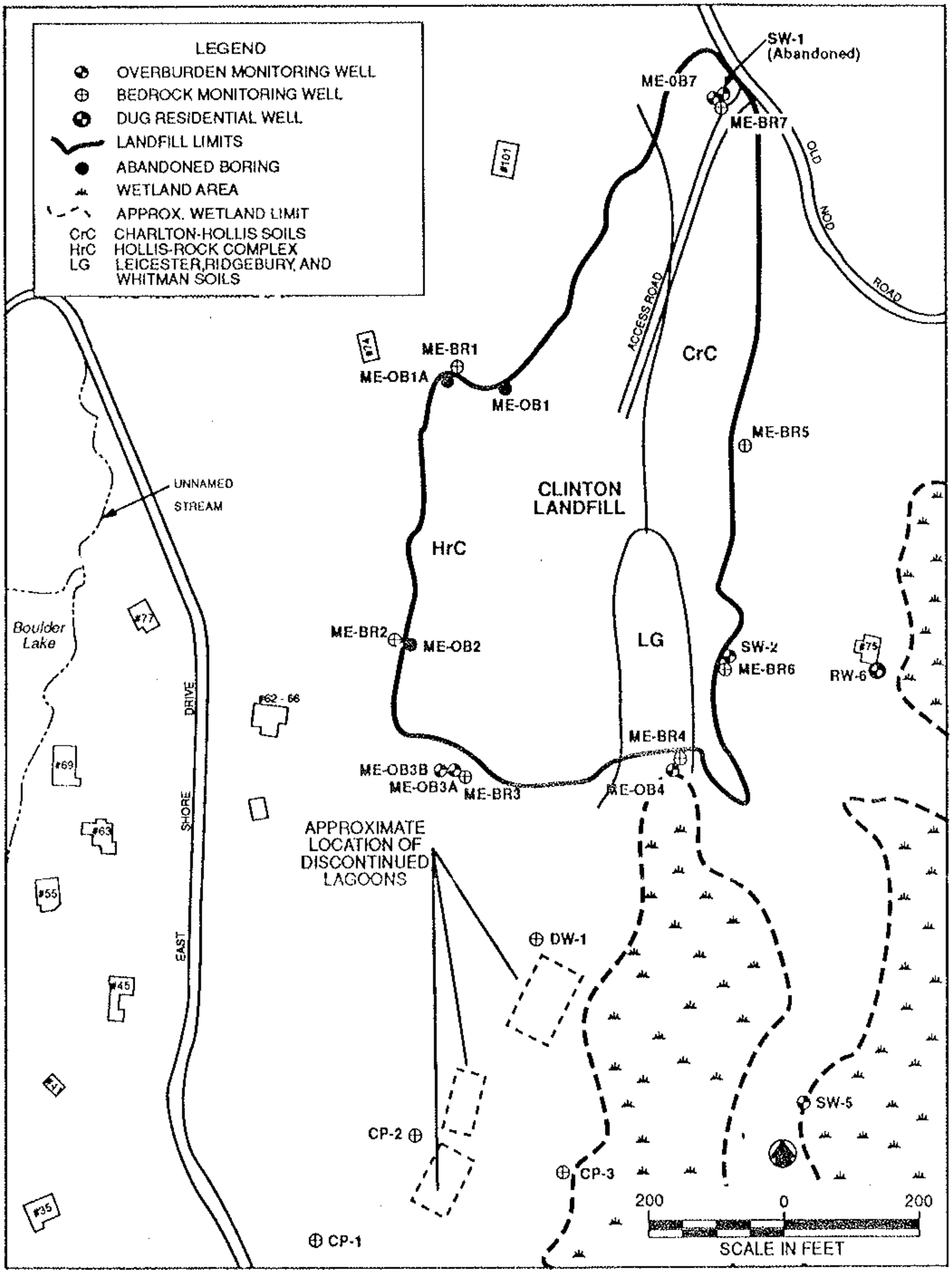


FIGURE 2-1. APPROXIMATE DISTRIBUTION OF ORGINAL SOILS.

by light and dark bands resulting from parallel alignments of light and dark minerals. Groundwater movement through gneiss is restricted mainly to flow through fractures in the rock.

AERIAL PHOTOGRAPHS

Historical aerial photographs of the area were reviewed to identify the original conditions prior to landfilling, as well as conditions during landfill construction. Photographs reviewed were taken in 1965, 1970, 1975, 1980, 1986 and 1990.

In 1965, the area now occupied by the landfill was a wooded ravine. A stream was visible flowing southward from Old Nod Road down the middle of the ravine. No evidence of landfilling was observed.

The 1970 photographs showed a large cleared area at the existing landfill location. The ground surface of the cleared area was generally smooth, with a gentle southward facing slope. At the toe of the slope at the south end of the landfill, approximately five to ten feet of fill material was present. A large pile of material inferred to be scrap metal and/or bulky wastes was present along the west edge of the landfill near the current location of ME-BR1. The pile was estimated to be 180 feet in diameter. No buildings were evident at the landfill.

In 1975, the landfill appeared higher and wider (east to west) than in 1970. The areal extent of the landfill appeared similar to the existing landfill limits. The landfill sloped gently upward from Old Nod Road. The southern portion of the landfill was lower than the existing final grade. South of the landfill, two lagoons were observed. Although the location of the lagoons was the same as that identified previously by the Town of Clinton, the configuration of the lagoons was different. The approximate locations of the lagoons as sketched from the aerial photos are shown in Plate 1 in Appendix A.

In the 1980 photographs, the landfill appeared similar to the existing topography. The landfill surface was smooth and rounded as if recently graded. A third lagoon was present adjacent to the south of the two original lagoons, as shown in Plate 1.

The landfill changed little between 1980 and 1986. By 1986, a few small gullies and some vegetation were apparent on the landfill. At the lagoon area, only the middle lagoon appeared to be in operation. The two lagoons on either side of the middle lagoon appeared to have been filled in. Two new cleared areas were apparent; one was located north of the lagoons, and one was to the west. These areas are shown on Plate 1. The nature and origin of the two cleared areas could not be discerned from the photographs. Subsequent review of a 1980 report prepared for Chesebrough-Ponds by Industrial Pollution Control (IPC) indicates that the northern cleared area was proposed for use as a disposal area for sludge to be excavated from the lagoons.

The 1990 photos were similar to those from 1986. Several truck load sized piles of material were present at the north end and central portion of the landfill. During site visits, piles of wood chips were observed in these areas. The middle lagoon appeared to have been filled in. The limits of the former lagoons and cleared areas could no longer be distinguished.

PREVIOUS INVESTIGATIONS

In 1974, Flaherty-Giavara Associates (FGA) conducted an investigation at the landfill to evaluate landfill leachate impacts on the surrounding area. The work included 16 borings through the landfill, collection of soil and rock core samples, installation of 16 monitoring wells, and collection and analysis of groundwater and surface water samples. Groundwater elevation data were mapped to identify the groundwater flow direction, as well as portions of the landfill submerged below the water table. Groundwater flow was identified as moving southward. An area beneath the center of the landfill was found to be partially submerged. Soil samples were sieved to determine the grain size distribution. The grain size distribution was used to calculate a hydraulic conductivities ranging from 0.002 to 0.02 cm/sec for the surficial aquifer materials beneath the landfill. Groundwater and surface water samples were analyzed for several leachate indicator parameters, but not for VOCs. Water quality results indicated the presence of leachate parameters in groundwater and surface water.

The report also identified waste sources. Universal Wire reportedly disposed of cardboard boxes, industrial soap, and partially burned coal in 1973 and 1974. Chesebrough-Ponds reportedly disposed of barrels of raw materials such as wax, petroleum products, and surplus final product.

In 1975, FGA prepared a second report containing recommendations for reducing leachate generation and treating leachate.

In 1980, Industrial Pollution Control, Inc. (IPC) prepared a report for Chesebrough-Ponds describing a proposed plan to dispose of sludge from one of the lagoons. The report referred to "Lagoon #1", and identified the northernmost of the three lagoons located south of the Clinton Landfill. The volume of sludge to be removed from the lagoon was estimated to be 585 cubic yards. The composition of the sludge was described as primarily aluminum hydroxide, non-petroleum based oil and grease, waste activated sludge, and a small amount of zinc hydroxide. The plan called for disposing of the sludge by burying it in the nearby vicinity. An area located approximately 150 feet north of the northernmost lagoon was identified as a suitable location for sludge disposal. The proposed disposal area shown in the report coincided with the cleared area apparent north of the lagoons in the 1986 aerial photos.

Heynen Engineers conducted a second hydrogeologic investigation of the landfill in 1986. This investigation took a broad, general approach, and considered the landfill, lagoons, bulky waste site, town garage, and private residences. The work included installation and sampling of two surficial wells at the landfill (identified as SW-1 and SW-2) and a deep bedrock well (DW-1) between the landfill and sludge lagoons. Other wells were installed at greater distances from the landfill. Groundwater samples were collected from the monitoring wells and several residential wells. The samples were analyzed for VOCs and leachate indicator parameters.

Several VOCs were detected in SW-1, SW-2, DW-1 and many of the residential wells.

Concurrent with the investigation by Heynen Engineers, Nathan Jacobson and Associates prepared an engineering report containing best management practices. Recommendations for the landfill were to regrade the top of the landfill to a minimum four percent slope, and

evaluate the cover material. If the cover was too coarse-grained to meet ConnDEP criteria, the report recommended adding more acceptable cover material to reduce infiltration.

Enviro-Audit Ltd prepared an environmental audit of the landfill in 1989. The audit presented a summary of geologic, water quality, and environmental data for the landfill and surrounding area. The report cited the following companies as having disposed of wastes at the landfill: Chesebrough-Ponds Inc., Stanley Bostich, Burns and Lee Tool Company, National Sintered Alloys, and New England Barrel Company.

A Preliminary Assessment Report for the landfill was prepared by ConnDEP in 1989. The report summarized landfill history and existing data. Four companies were identified as disposing of wastes at the landfill. Chesebrough-Ponds, Inc. reportedly discharged 30 cubic yards per day of solid waste (from offices, cafeteria, and macerated return products) and 300 gallons per day of chemical wastes (remainders, off spec materials, and scrapings from mixing tanks) in 55 gallon drums at the landfill. Liquid wastes were also disposed of, presumably at the lagoons. Burns and Lee Tool Company reportedly discharged five gallons per year of Blaco-Tri solvent mixed with trash and water soluble oil. National Sintered Alloys reportedly discharged 1/2 drum of tumbling waste per month to the landfill. Universal wire was reported to have discharged cardboard boxes and industrial soap. The report concluded that groundwater, surface streams, and wetlands were contaminated by the landfill. The report recommended an inspection to determine whether or not all potentially affected parties are being supplied an alternative source of potable water.

HISTORICAL WATER QUALITY DATA

Selected water quality data collected by the Town of Clinton were reviewed to evaluate water quality trends. The data reviewed were from samples collected at monitoring wells and residential wells in the vicinity of the landfill. The maximum concentrations of volatile organic compounds (VOCs) detected at each location were summarized and are presented in Table 2-1. Three groups of VOCs were identified: aromatic compounds, halogenated aromatic compounds, and halogenated aliphatic compounds. The data presented were compiled from three sources: Heynen Engineers' 1986 report, Enviro-Audit Ltd's 1989 report, and water quality analyses provided by the Town of Clinton.

The most commonly observed group of VOCs was the aromatics. Benzene was the most commonly detected aromatic, detected in 10 wells. The highest benzene concentration was detected in SW-2 at the southeast corner of the landfill. Benzene concentrations were much lower in samples from residential wells. Three other aromatics, toluene, xylenes, and ethylbenzene, were also detected in several wells. As a group, the maximum concentrations of aromatics detected was split between monitoring wells and residential wells.

Three halogenated aromatics, chlorobenzene, 1,2-dichlorobenzene and 1,4-dichlorobenzene were detected at low concentrations in monitoring wells at the landfill and lagoons.

A total of eight halogenated aliphatics were detected. The most commonly detected halogenated aliphatic was 1,1,-dichloroethane, which was present in ten wells. The compound with the greatest concentration was trichlorofluoromethane, present at 381 ppb at 66 East Shore Drive. The greatest concentrations of three other compounds, 1,1,-dichloroethane, 1,1,1-trichloroethane, and trans-1,2-dichloroethene, also occurred at 66 East Shore Drive. As a group, halogenated aliphatics were detected more frequently and at greater concentrations in residential wells than in monitoring wells. Four of the halogenated aliphatics (1,1,1-trichloroethane, trans-1,2-dichloroethene, trichloroethene, and 1,1-dichloroethane) were detected in residential wells, but not in monitoring wells.

TABLE 2-1. SUMMARY OF WATER QUALITY DATA, ORGANIC COMPOUNDS

LOCATION	BENZENE CONCENTRATION				OTHER COMPOUNDS DETECTED		
	DATES	AVE.	MAX.	MOST RECENT	COMPOUND	MAX. CONC.	DATE
MONITORING WELLS							
CP-1	6/3/86	ND	ND	ND	ND	-	-
CP-2	6/3/86-10/23/87	2.2	4.4	4.4	Ethylbenzene	3.1	6/3/86
					Toluene	2.3	6/3/86
					Xylenes	6.3	6/3/86
					1,2-Dichlorobenzene	2.7	10/23/87
					1,4-Dichlorobenzene	1.8	10/23/87
CP-3/MW-3	3/10/86-10/25/90	2.6	4.6	1.4	Ethylbenzene	7.7	6/3/86
					Methylene Chloride	4.3	6/3/86
					Toluene	4.9	6/3/86
					Xylenes	16.8	6/3/86
					1,1-Dichloroethane	2.6	10/23/87
					1,2-Dichlorobenzene	2.7	10/23/87
					1,4-Dichlorobenzene	1.8	10/23/87
DW1	3/10/86	3.5	3.5	3.5	Ethylbenzene	1.3	3/10/86
					Toluene	2.8	3/10/86
					Xylenes	6.8	3/10/86
SW1	3/10/86-5/29/86	1.1	2.2	2.2	Ethylbenzene	8.9	5/29/86
					Methylene Chloride	2.1	3/10/86
					Toluene	14.8	5/29/86
					Tetrachloroethene	1.8	3/10/86
					Xylenes	23.6	5/29/86
SW2	3/10/86-10/23/87	34.7	49.9	49.9	Chlorobenzene	15.0	10/23/87
					Ethylbenzene	36.8	5/29/86
					Methylene Chloride	2.1	3/10/86
					Toluene	12.1	5/29/86
					Trichlorofluoromethane	9.7	10/23/87
					Xylenes	63.5	5/29/86
					1,1-Dichloroethane	3.8	10/23/87
					1,4-Dichlorobenzene	4.3	10/23/87
RESIDENTIAL WELLS							
East Shore Drive (ESD): 27 ESD	5/29/86-1/20/89	0.7	2.8	ND	Ethylbenzene	5.1	5/29/86
					Toluene	14.8	5/29/86
					Xylenes	23.6	5/29/86

NOTES: 1. ALL CONCENTRATIONS ARE IN ug/L.
2. ND - COMPOUND NOT DETECTED (LESS THAN 1 ug/L).

TABLE 2-1(continued). SUMMARY OF WATER QUALITY DATA, ORGANIC COMPOUNDS

LOCATION	BENZENE CONCENTRATION				OTHER COMPOUNDS DETECTED		
	DATES	AVE.	MAX.	MOST RECENT	COMPOUND	MAX. CONC.	DATE
45 ESD	3/10/86-1/20/89	ND	ND	ND	1,1-Dichloroethane	12.0	3/10/86
55 ESD	10/23/87-1/20/89	ND	ND	ND	1,1-Dichloroethane	7.2	10/23/87
66 ESD	3/10/86-2/22/89	2.3	6.6	2.0	Ethylbenzene	3.0	5/29/86
					Toluene	12.7	5/29/86
					Trichlorofluoromethane	381.0	2/22/89
					Xylenes	19.9	5/29/86
					1,1-Dichloroethane	148.0	10/23/87
					1,1,1-Trichloroethane	2.0	2/22/89
					T-1,2-Dichloroethylene	12.0	1/20/89
74 ESD	10/23/87-2/7/89	0.7	2.0	ND	Toluene	6.0	12/7/88
					Trichloroethene	3.0	2/7/89
					Trichlorofluoromethane	45.0	12/7/88
					1,1-Dichloroethane	25.6	10/23/87
76 ESD	10/23/87-1/20/89	ND	ND	ND	1,1-Dichloroethane	45.4	10/23/87
77 ESD	10/23/87-3/14/88	ND	ND	ND	1,1-Dichloroethane	38.0	10/23/87
Old Nod Road (ONR):							
101 ONR	12/30/87-10/24/90	0.5	1.5	ND	Trichlorofluoromethane	70.0	2/22/89
					O-Xylene	11.0	1/20/89
					1,1-Dichloroethane	14.0	12/7/88
103 ONR	10/23/87-10/24/90	1.0	3.0	ND	Trichlorofluoromethane	10.0	2/22/89
					O-Xylene	139.0	3/14/88
					1,1-Dichloroethane	15.9	7/26/90
					1,1-Dichloroethene	11.6	10/23/87
Nod Hill Apts.	10/23/87-10/24/90	ND	ND	ND	ND	-	-

NOTES: 1. ALL CONCENTRATIONS ARE IN ug/L.
2. ND - COMPOUND NOT DETECTED (LESS THAN 1 ug/L).

SECTION 3

SECTION THREE
DATA COLLECTION AND ANALYSIS

To evaluate groundwater impacts near the landfill, M&E prepared and executed a ConnDEP-approved plan to install monitoring wells, collect water samples from monitoring wells, leachate seeps, and surface waters, and analyze the data collected. Data collection was aimed at defining groundwater movement and determining whether the landfill is releasing organic solvents or metals. The data were analyzed in the context of groundwater flow, contaminant transport, and groundwater contamination.

SUBSURFACE FIELD INVESTIGATION

The subsurface field investigation was designed to assess groundwater movement, identify geologic materials, and provide a monitoring network for characterizing groundwater quality at the toe of the landfill. Two factors were considered in assessing groundwater flow. The first was to evaluate whether groundwater flows radially outward from the landfill, or only in one or two principal directions. The second was the interaction of the surficial and bedrock aquifers. A single ring of wells around the landfill was selected for an initial assessment of groundwater movement and quality at the toe of the landfill.

Evaluation of groundwater movement between the surficial and bedrock aquifers required the installation of wells screened in the surficial aquifer and wells screened in the bedrock aquifer. To accomplish this, the plan called for installing pairs of surficial and bedrock wells. Water level differences within each pair of wells indicate whether groundwater is flowing from the surficial aquifer into the bedrock aquifer, or vice versa. Sites for installing wells were selected using the following criteria:

- the likelihood of encountering a sufficient thickness of overburden materials to install an overburden well;

- evaluating whether leachate is flowing radially from the landfill or in only one or two directions;

- identifying the distribution of overburden materials and bedrock around the landfill;

- the regional groundwater flow pattern;

- pairing existing overburden wells with bedrock wells.

One or more of these criteria were applied in selecting the monitoring well locations. Further explanation of these criteria and their application to the proposed well locations is discussed below.

In general, topographic high points in the area are mapped as bedrock outcrops or shallow bedrock, which precluded the installation of overburden wells. Additionally, groundwater tends to collect in topographic depressions. The likelihood of encountering saturated overburden materials should therefore be greatest in topographic low areas. This criterion was used in siting all of the overburden wells by avoiding local topographic highs and favoring topographic lows.

One of the objectives of the investigation was to determine whether landfill leachate is migrating radially outward from the landfill, and to assess variations in leachate quality at different locations around the landfill perimeter. Monitoring well locations were selected to encircle the landfill, so that this assessment could be made.

Geologic maps of the area indicate that the west and east edges of the landfill are underlain by shallow bedrock, and that the southeast corner of the landfill is underlain by till. Because the till is likely to have a greater hydraulic conductivity than the bedrock, leachate flow from the landfill may be greater in the southeast corner of the landfill. Wells ME-OB3 and ME-OB4 were intended to evaluate this possibility.

Regional topography suggests that groundwater flow in the area around the landfill is generally southward toward Long Island Sound. Wells located at the south end of the landfill will presumably be downgradient of the landfill with respect to regional groundwater flow, and should contain the greatest leachate concentrations. Wells ME-BR2, ME-BR3, ME-OB3A,

ME-OB3B, ME-OB4, ME-BR4 and ME-BR6 were installed at the inferred downgradient end of the landfill. Wells ME-BR7 and ME-OB7 were installed at the north end of the landfill near former well SW-1.

The final criterion in siting monitoring wells is pairing the two existing wells SW-2 and SW-1 with new bedrock wells, ME-BR6 and ME-BR7. Upon inspection, well SW-1 was found to be damaged, and was abandoned and replaced with well ME-OB7.

Drilling Methods

Boreholes for well installation were advanced using three drilling methods: hollow stem augers, driving casing, and rock coring. Hollow stem augers with a 4-1/4 inch inside diameter were generally used to advance boreholes for overburden wells. At locations where coarse grained deposits washed in through the bottom of the augers, the augers were removed and 4-1/4 inch steel casing was used to advance the borehole. The casing was driven with a 300 pound hammer, and then cleaned out with water. Boreholes were advanced through bedrock by rock coring using a three inch outside diameter core barrel. Either augers or casing were advanced to bedrock. The core barrel was inserted through them. Rock coring was continued in five foot increments until the final depth was reached. The boreholes were then enlarged by reaming with a 3-7/8 inch tricone roller bit. The purpose of reaming the boreholes was to allow sufficient room for placing an effective seal above the screened interval of the monitoring well. The bottom ten feet of each borehole, where the well screen would be installed, was left unreamed.

Drilling water, used for washing out the steel casing and as a drilling fluid for the core barrel, was obtained from a spigot at the Clinton Dog Pound, located adjacent to the town garage. The water supply for the spigot was the Connecticut Water Company.

To prevent cross contamination, all drilling equipment which entered the boreholes was decontaminated prior to beginning each new boring. Decontamination was done by steam cleaning each piece of equipment until all visible dirt was removed. Steam cleaning was done on wooden pallets over the gravel-covered driveway adjacent to the dog pound.

As an added precaution to prevent introducing contaminants, no petroleum-based lubricants were used on drilling equipment which entered the borehole. When necessary, vegetable shortening was used as a lubricant.

Soil and Rock Sample Collection

During drilling, samples of surficial materials and bedrock were collected to identify the geologic materials present. A two foot long by two inch diameter split spoon sampler was used to collect samples of surficial materials. Samples were collected continuously in two foot increments from the ground surface to refusal on bedrock. The samples were field classified according to a modified version of the Wentworth Particle Size Classification System as outlined in Tables 3-1 and 3-2, and placed in glass jars for storage. Soil sampling was conducted for one boring at each well pair, except at ME-BR6, where no soil samples were collected. Soils in this area were described in the boring log for SW-2, installed previously by others. Descriptions of soil samples are given in the boring logs in Appendix B. The soils varied in texture, but were generally composed of sand with small to moderate amounts of silt and gravel. Landfill material containing soil and solid waste was encountered in borings ME-OB1, ME-OB1A, ME-BR6, ME-BR7, and ME-OB7. Bedrock was present at shallow depths (within four feet of the surface) in borings ME-BR1, ME-BR2, ME-OB2, and ME-BR5.

Samples of the bedrock were collected during rock coring. Continuous rock cores were collected in approximately five-foot lengths and placed in wooden core boxes for storage.

The following information was recorded for each sample: description of the rock, percent recovery, and rock quality designation (RQD). Two rock types were identified. The predominant rock at the landfill is gray, coarse grained, moderately foliated gneiss composed of quartz, calcium/sodium feldspar, and unidentified ferromagnesian minerals (amphibole, pyroxene, hornblende, and/or biotite). Due to its high quartz content, the gneiss is extremely hard and resistant to weathering. The other, less common rock type identified at the site was a pink, white and gray very coarsely crystalline pegmatite. The pegmatite was present as veins in the gneiss, ranging in thickness from six inches to over three feet . The pegmatite was composed of potassium feldspar, calcium/sodium feldspar, quartz and ferromagnesian minerals. Although the pegmatite is a hard rock, it is softer and more susceptible to weathering than the

TABLE 3-1 MODIFIED WENTWORTH PARTICLE SIZE CLASSIFICATION SYSTEM

	Diameter	
Classification	Millimeter	Inches
Boulder	> 256	>10.1
Cobble	255-64	10.1-2.5
Coarse Gravel	64-32	2.5-1.3
Medium Gravel	32-8	1.3-0.3
Fine Gravel	8-2	0.3-0.08
Very Coarse Sand	2-1	0.08-0.04
Coarse Sand	1-0.5	0.04-0.02
Medium Sand	0.5-0.125	0.02-0.005
Very Fine Sand	0.125-0.0625	0.005-0.0025
Silt	0.0625-0.0039	0.0025-0.0015

TABLE 3-2 RELATIVE ABUNDANCES OF GRAIN SIZES IN SOILS

Descriptive Adjective	Percentage Required
trace	1-10%
little	10-20%
some	20-35%
and	35-50%

gneiss. Pegmatite veins were present in wells along the east and south edges of the landfill (borings ME-BR3, ME-BR4, ME-BR5, ME-BR6, and ME-BR7). Several marble sized garnets were identified in the samples from ME-BR6. The uppermost core sample from ME-BR5 contained several small voids which appeared to be the result of dissolution of the rock. Small amounts of a soft red substance, similar to lipstick in appearance, were present in some of the rock voids.

The length of rock core recovered was compared to the length drilled for each core run. Incomplete recovery generally indicates open rock fractures or weathered rock which disintegrated during the drilling process. Recovery of rock cores at the site was high as shown in Table 3-3, indicating that the rock has few large fractures and is mostly unweathered.

The RQD of each core run was calculated as the total length of core fragments greater than four inches, compared to the total length drilled for that core run. RQD is an indication of the degree of close fracturing of the rock. Rock cores from the site had high RQD values as shown in Table 3-3, which further show that the rock generally has a low degree of fracturing.

TABLE 3-3 SUMMARY OF ROCK CORE DATA

BORING NUMBER	CORE NUMBER	CORE DEPTH INTERVAL, FT.	RECOVERY, %	RQD, %
ME-BR1	CR-1	4.25- 9.25	96	94
	CR-2	9.25-14.25	100	93
	CR-3	14.25-18.58	98	-
	CR-4	18.58-23.25	89	-
ME-BR2	CR-1	4.50- 9.50	95	68
	CR-2	9.50-14.50	93	87
	CR-3	14.50-19.50	100	100
	CR-4	19.50-24.50	100	96
ME-BR3	CR-1	12.00-17.33	100	100
	CR-2	17.33-22.33	100	88
	CR-3	22.33-28.00	100	99
ME-BR4	CR-1	18.00-23.00	98	50
	CR-2	23.00-28.00	97	91
	CR-3	28.00-31.75	100	88
ME-BR5	CR-1	5.17-10.17	98	74
	CR-2	10.17-15.17	100	91
	CR-3	15.17-19.63	100	76
	CR-4	19.63-23.33	100	84
ME-BR6	CR-1	13.00-17.83	82	-
	CR-2	17.83-22.83	92	-
	CR-3	22.83-27.08	100	-
ME-BR7	CR-1	15.00-20.00	98	93
	CR-2	20.00-25.00	100	100
	CR-3	25.00-30.00	99	88

Monitoring Well Installation

A monitoring well was constructed in each of the completed borings using two inch diameter flush joint threaded, PVC screen and riser pipe. A five or ten foot length of slotted screen with 0.01 inch wide slots was installed at the bottom of the borehole, with a solid riser pipe to the surface. Silica sand was poured into the annular space around the well screen. The sand created a filter pack around the overburden wells, minimizing the amount of fine-grained sediment pumped from them. In the bedrock wells, the sand pack provided support for the annular seal material, thereby preventing it from clogging the well screen. The wells were sealed with bentonite clay, placed in the form of pellets, granules, or grout. The annular seal was placed directly on top of the sand pack. Grout was placed using the tremie tube method. Pellets or granules were placed by pouring them down the annular space around the monitoring well.

Prior to placing pellets or granules, the annular space was dewatered by pumping as a precaution to prevent bridging which would leave voids in the seal. Annular seals were continued to within four feet of the ground surface. Wells were finished with locking protective casings cemented in place. Construction details for the monitoring wells are shown in Table 3-4.

TABLE 3-4 MONITORING WELL CONSTRUCTION DETAILS

ELL UMBER	GROUND SURFACE ELEV.	DEPTH TO BEDROCK (FT)	SCREENED INTERVAL (FT)	SAND PACK INTERVAL BELOW GRADE (FT)	SEAL TYPE	SEAL INTERVAL BELOW GRADE (FT)
ME-BR1	85.5	3.67	12.75-22.75	11.00-22.75	Granules	4.0-11.0
ME-BR2	90.6	2.0	14.50-24.50	9.17-24.50	Granules	1.5-9.17
ME-BR3	59.9	11.17	18.00-28.00	16.00-28.00	Pellets	2.5-16.0
ME-OB3A	60.0	-	6.00-11.00	4.00-11.00	Granules	0.0- 4.0
ME-OB3B	59.9	20.17	15.33-20.33	13.33-20.33	Granules	4.0-13.33
ME-BR4	41.3	17.0	21.50-31.50	20.00-31.50	Grout	0.0-20.0
ME-OB4	41.3	-	4.50- 9.50	3.50- 9.50	Pellets	1.0- 3.5
ME-BR5	73.8	4.5	13.25-23.25	11.00-23.25	Granules	4.0-11.00
ME-BR6	50.3	12.1	17.10-27.10	15.00-27.10	Granules	4.0-15.0
ME-BR7	75.9	15.0	18.00-28.00	16.50-28.00	Grout	0.0-16.5
ME-OB7	76.1	13.5	3.50-13.50	3.00-13.50	Pellets	2.0- 3.0

NOTE: Ground surface elevation in feet above National Geodetic Vertical Datum of 1929. Surveyed by Arthur E. Barden, Registered Land Surveyor, 12/8/90.

Along the east and west edges of the landfill (borings ME-BR1, ME-BR2 and ME-BR5), bedrock was present at shallow depths which precluded the installation of overburden wells. After installing the bedrock wells, additional borings were conducted near ME-BR1 and ME-BR2 in an effort to install overburden wells. Two boring attempts near ME-BR1 were unsuccessful; rock was present at depths of seven and eight feet, and only a few inches of saturated overburden were present. At ME-BR2, one additional boring was conducted. Rock was present at a depth of four feet. At ME-BR5, a long, continuous outcrop was present immediately to the east, and the edge of the landfill was adjacent to the west. Because there did not appear to be any locations in the vicinity of ME-BR5 where a surficial well could be installed, no additional borings were conducted in this area.

WATER QUALITY SAMPLE COLLECTION

To assess impacts on water quality in the vicinity of the landfill, groundwater and surface water samples were collected and analyzed. The samples collected were analyzed for the parameters listed in Table 3-5.

Groundwater Sampling

The Scope of Study indicated that samples would be collected from up to fourteen wells. Shallow bedrock limited the number of wells to twelve. Groundwater samples were collected from existing well SW-2 and the eleven new monitoring wells installed around the landfill. Before the samples were taken, the groundwater level in each well was measured using a decontaminated measuring tape. To assure that representative samples were taken, a minimum of three well volumes was removed from each well prior to sample collection. All data and analytical measurements made during well purging were recorded in field notebooks. All metals samples were field filtered using a 0.45um membrane filter. All materials used to purge the wells or collect samples were decontaminated prior to starting and between wells to prevent cross contamination. During the first round of sampling, one metal (selenium) was detected in one of the samples at a concentration below drinking water standards. Because metals do not appear to be present in the groundwater near the landfill, metals were dropped from the list of analytical parameters for the second round of sampling.

TABLE 3-5 SAMPLING PROGRAM - PARAMETERS FOR ANALYSIS

Sample Matrix	Parameters for Analysis
Groundwater	. HSL Volatile Organics (U.S. EPA Method 8240) . Metals (dissolved fraction)(1) . Conductivity and pH (field measurements) . Cyanide . Other leachate parameters(2)
Surface Water	. HSL Volatile Organics (U.S. EPA Method 8240) . Metals (total)(1) . Conductivity and pH (field measurements) . Cyanide . Other leachate parameters(2)
Leachate Seeps	. Same as surface water samples

1. Metals to include arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver.
2. Alkalinity, ammonia, chloride, nitrate, sodium, total dissolved solids, iron and manganese.

Surface Water Sampling

Due to dry weather conditions preceding sample collection, only one surface water sampling point was flowing during the first sampling event. A surface water sample was collected at ME-SW3 as indicated on Plate 1. In an effort to overcome the lack of surface water flow, two additional sampling locations, both located in wetland areas, were proposed for sampling during the second round. These locations are identified as ME-SW2 and ME-SW3 on Plate 1. However, during the second sampling event, no surface water was present at any of the surface water sampling locations. The wetland areas contained wet, spongy soil, but no standing water.

Leachate Seep Sampling

None of the leachate seeps identified at the landfill were active at the time of either sampling event. Therefore, no leachate samples were collected.

HYDROGEOLOGIC DATA ANALYSIS

Groundwater flow through the bedrock aquifer in the vicinity of the landfill and lagoons was estimated by contouring water level data for the bedrock wells. Groundwater elevations measured in the monitoring wells are shown in Table 3-6. Groundwater contour maps for January and June are shown in Figures 3-1 and 3-2. Because no data was available to indicate the position of the contours beneath the landfill, the contour lines are dashed. The contours shown represent the best available estimate but actual groundwater elevations beneath the landfill may be different. Based on the contours, groundwater flow is inferred to be southeastward. Groundwater levels along the west edge of the landfill were roughly five feet higher in January than in June. This fluctuation was the result of a dry period preceding the June sampling. Groundwater levels along the southeastern edge of the landfill showed little change.

A similar contour map for the surficial wells was not prepared because the overburden is discontinuous. The overburden exists as isolated deposits which fill depressions in the bedrock surface. The paired wells near the southeast corner of the of the landfill (ME-BR4/ME-OB4,

TABLE 3-6 GROUNDWATER ELEVATIONS IN MONITORING WELLS

Well Number	Top of Casing Elevation	Groundwater Elevations		
		11/19-20/90	1/11/91	6/11-12/90
ME-BR1	87.48	78.10	79.30	74.29
ME-BR2	92.58	75.34	76.60	70.10
ME-BR3	62.18	58.52	58.49	57.70
ME-OB3A	61.70	59.16	58.96	58.41
ME-OB3B	61.59	59.62	59.54	58.75
ME-BR4	44.16	43.17	42.94	43.04
ME-OB4	42.96	41.68	41.33	41.85
ME-BR5	75.71	62.46	63.06	60.98
ME-BR6	52.24	47.59	47.66	46.89
ME-BR7	78.03	72.43	73.30	71.86
ME-OB7	78.04	72.50	73.41	71.87
SW-2	52.14	45.69	45.90	45.21
CP-1	63.26	ND	57.92	55.33
CP-2	59.52	ND	57.88	ND
CP-3	40.85	ND	39.43	37.92
Krny Well	45.22	ND	41.20	40.07

NOTES: 1. TOC elevations relative to NGVD 1929 datum
2. ND = Not determined

ME-BR6/SW-2) showed an upward vertical gradient from the bedrock to the overburden. The paired wells at the north end of the landfill (ME-BR7/ME-OB7) showed a slight downward vertical gradient from the overburden to the bedrock during the November and January measurements, and no significant gradient during the June measurements. The three clustered wells at the southwest corner of the landfill (ME-BR3, ME-OB3A, and ME-OB3B) showed the presence of both upward and downward vertical gradients. The deeper overburden well had the highest head value, followed by the shallow overburden well and the bedrock well. Vertical hydraulic gradients are directed from the deeper overburden both upward toward the surface and downward toward the bedrock.

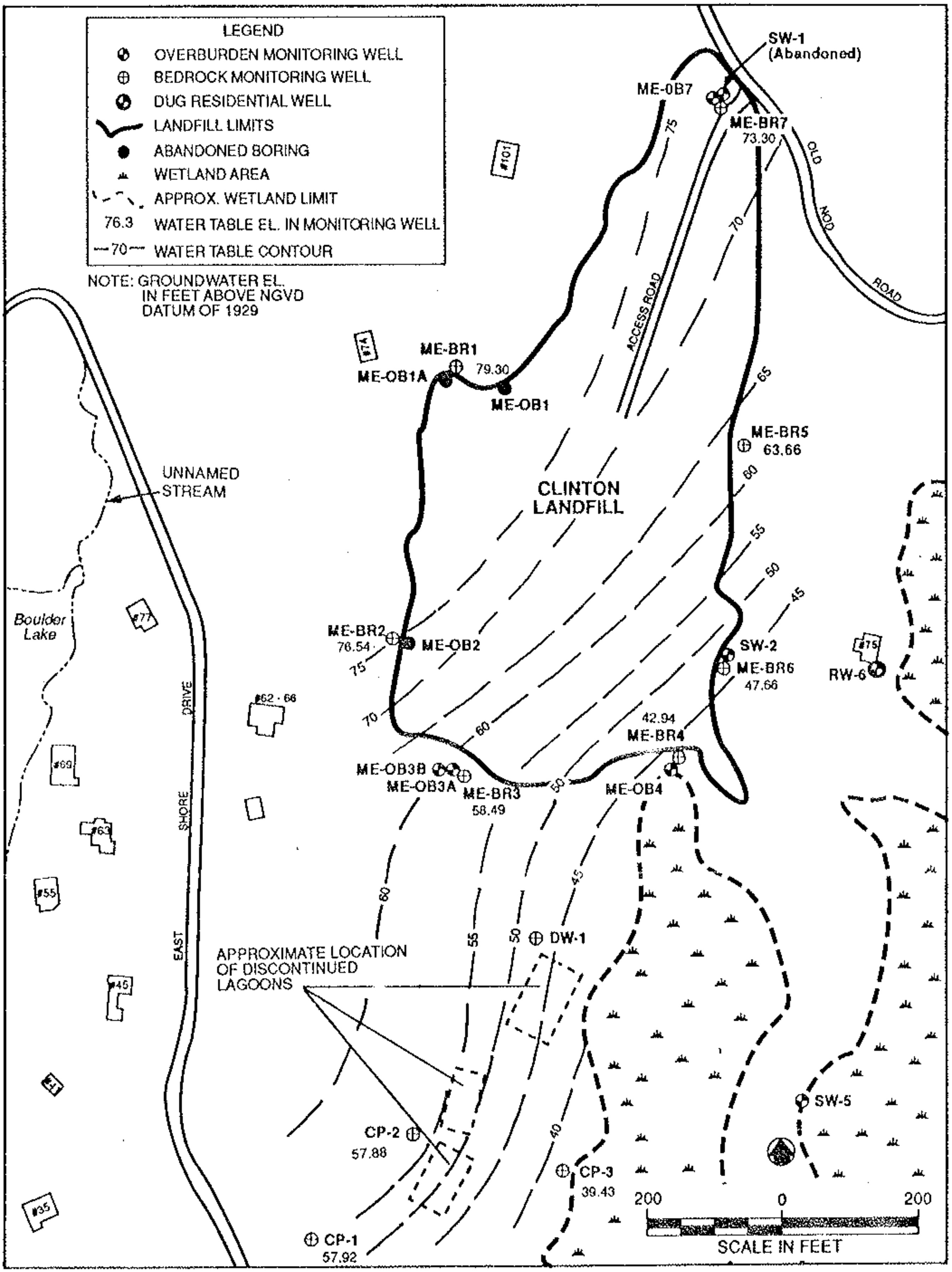


FIGURE 3-1. APPROXIMATE WATER TABLE / PIEZOMETRIC SURFACE CONTOURS FOR THE BEDROCK AQUIFER, JANUARY 11, 1991.

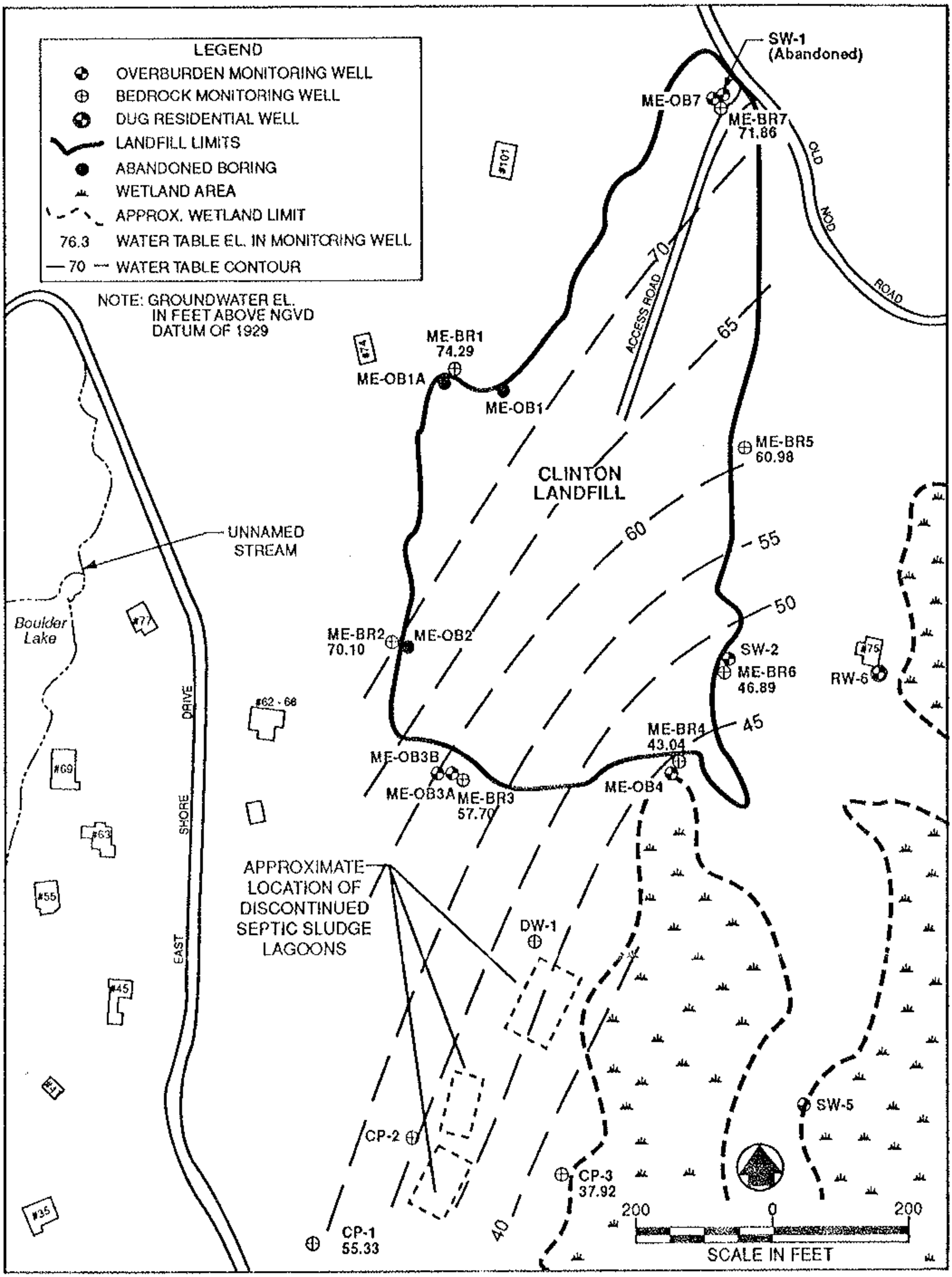


FIGURE 3-2. APPROXIMATE WATER TABLE/PIEZOMETRIC SURFACE CONTOURS FOR THE BEDROCK AQUIFER, JUNE 11-12, 1991.

Surface water elevations were surveyed at several points in the wetland areas south and east of the landfill. These data are summarized in Table 3-7. Surface water elevations are generally representative of shallow overburden aquifer piezometric surface elevations, provided no vertical gradients or confining layers are present.

Geologic sampling data identified surficial aquifer deposits as being composed mostly of sand with various amounts of silt and gravel. No significant fine-grained deposits were identified which would strongly inhibit groundwater movement between the surficial and bedrock aquifers. In general, the overburden deposits are likely to have a greater hydraulic conductivity than the bedrock. Groundwater is likely to move between the overburden and bedrock aquifers with little difficulty.

Groundwater flowing beneath the landfill appears to discharge to the south and east of the landfill in the vicinity of the wetland areas. Upward vertical gradients measured in paired monitoring wells, as well as seeps present at the south and east edges of the landfill confirm that groundwater discharge is occurring in these areas.

TABLE 3-7 SURFACE WATER ELEVATIONS
JANUARY 11, 1991

Shot No.	Location	Elevation
1	Swale by ME-BR6	43.4
3	Wetlands by Krny house	40.8
5	Surface water by ME-BR4	40.9
6	55' south of ME-BR4	39.1
7	100' south of ME-BR4	38.59
8	Stream at south edge landfill	54.3
9	Wetlands 140' NE DW1	55.4
10	Wetlands by ME-OB3	58.5
11	Wetlands by ME-OB3	57.7
12	Wetlands by ME-OB3	57.0

NOTES: 1. Refer to Plate 1 for locations
2. All elevations relative to NGVD, 1929

As shown in Figures 3-1 and 3-2, groundwater flow in the bedrock aquifer is toward the southeast. However, water quality data for the shallow well at the Krny residence, located 200 feet from the southeast corner of the landfill, show that no VOCs or leachate parameters have been detected there. The data suggest there is a barrier to shallow eastward groundwater flow between the landfill and the Krny residence.

Several geologic cross sections through the landfill were developed to depict vertical spatial relationships among the geologic features. The locations of the cross sections are shown in Figure 3-3. Figure 3-4 shows the north/south view of subsurface conditions. Figures 3-5 and 3-6 show east/west views through the landfill. The original ground surface beneath the landfill was a small valley. The lowest part of the valley was below the eastern central portion of the landfill. The maximum depth of landfilling is approximately 40 feet. These data are shown on Figure 3-7, a map of existing and original surface topography. The groundwater contours, combined with the original surface contour data, appear to indicate that the deepest part of the landfill may be submerged below the water table. The apparently submerged area is located in the lowest part of the filled valley. The depth of submerged fill is estimated to be from one to fifteen feet. This estimate is uncertain due to a lack of water level data within the landfill itself, and also to the small scale at which the original ground surface topography was mapped. It is expected that the presence of submerged fill in the landfill is due to the limited hydraulic conductivity of the fill and the resultant "mounding" effect of precipitation infiltrating into the fill.

A surface water drainage divide is located near the west edge of the landfill, between the landfill and East Shore drive. The natural surface water divide is approximately 100 feet west of the landfill, but filling has raised the ground surface and shifted a segment of the drainage divide between ME-BR2 and ME-BR1 eastward onto the landfill itself. The natural and existing surface divides are shown on Plate 1. West of the divide, drainage is to Boulder Lake, approximately 500 feet west of the landfill. East of the divide, drainage is to the wetland areas located south and east of the landfill. A groundwater flow divide is inferred to be present near

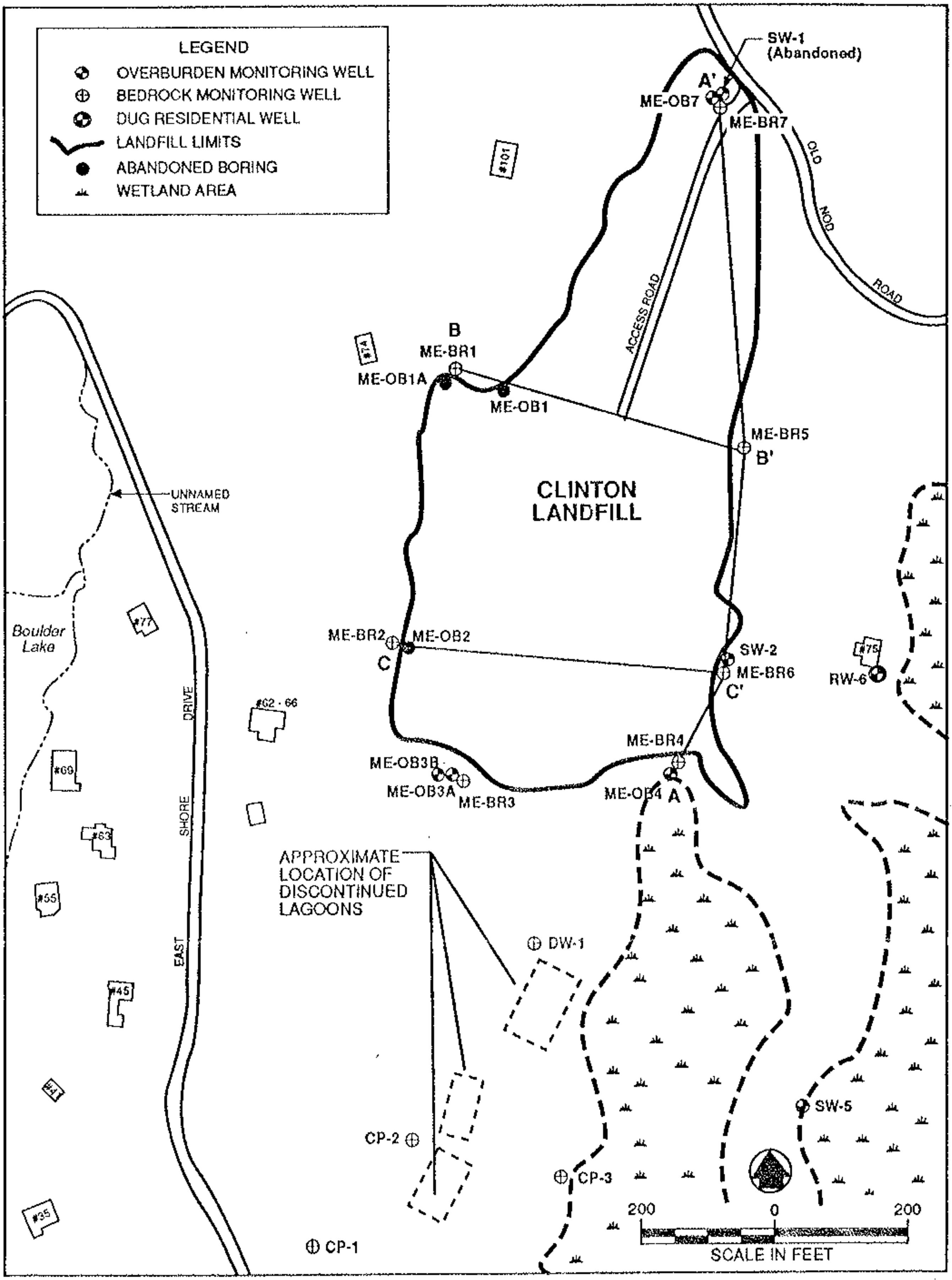


FIGURE 3-3. LOCATION OF GEOLOGIC CROSS-SECTIONS.

NOTE: ORIGINAL GROUND SURFACE INFERRED FROM USGS
CLINTON, CONN. 7.5 MINUTE TOPOGRAPHIC QUADRANGLE,
PHOTOREVISED 1970

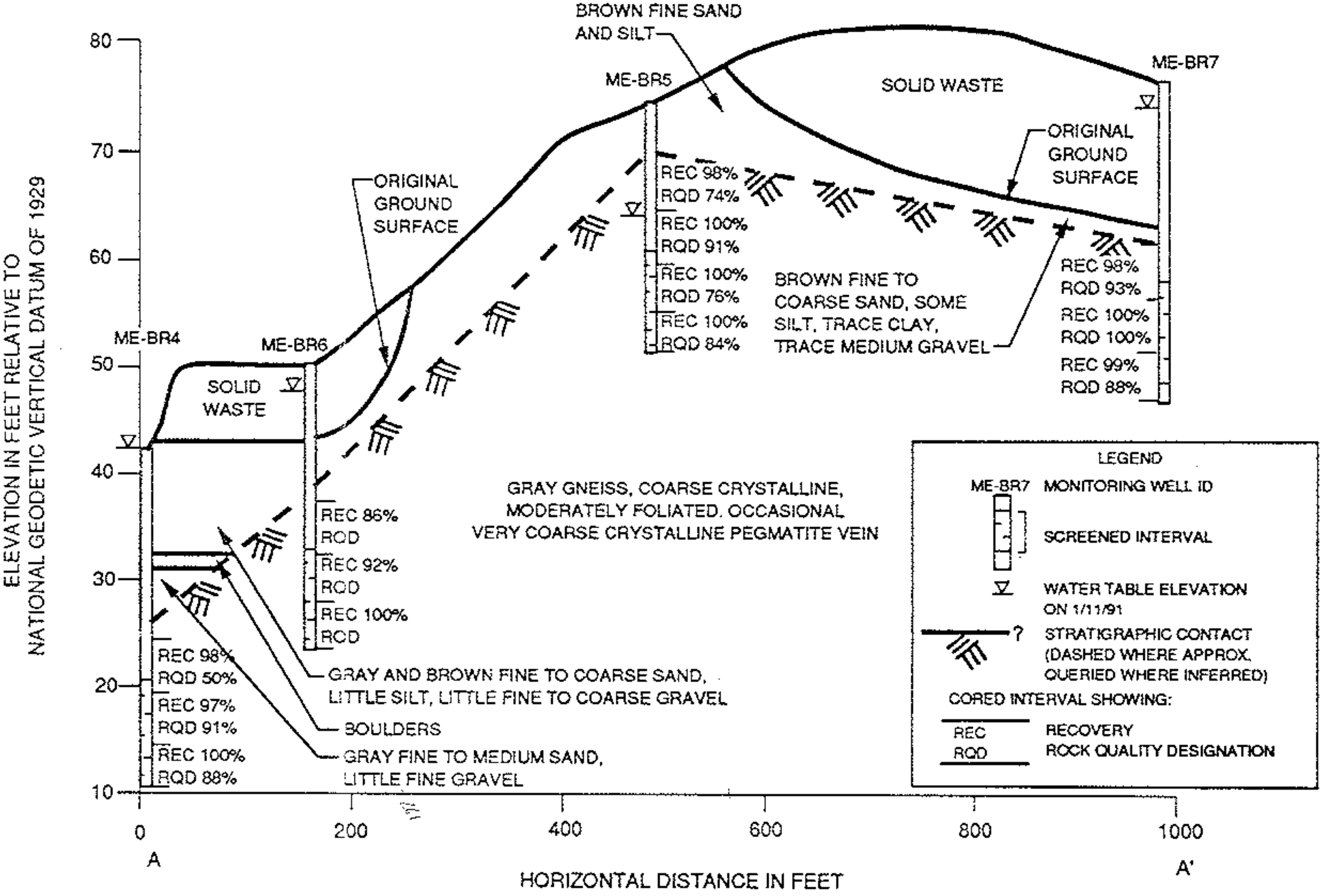
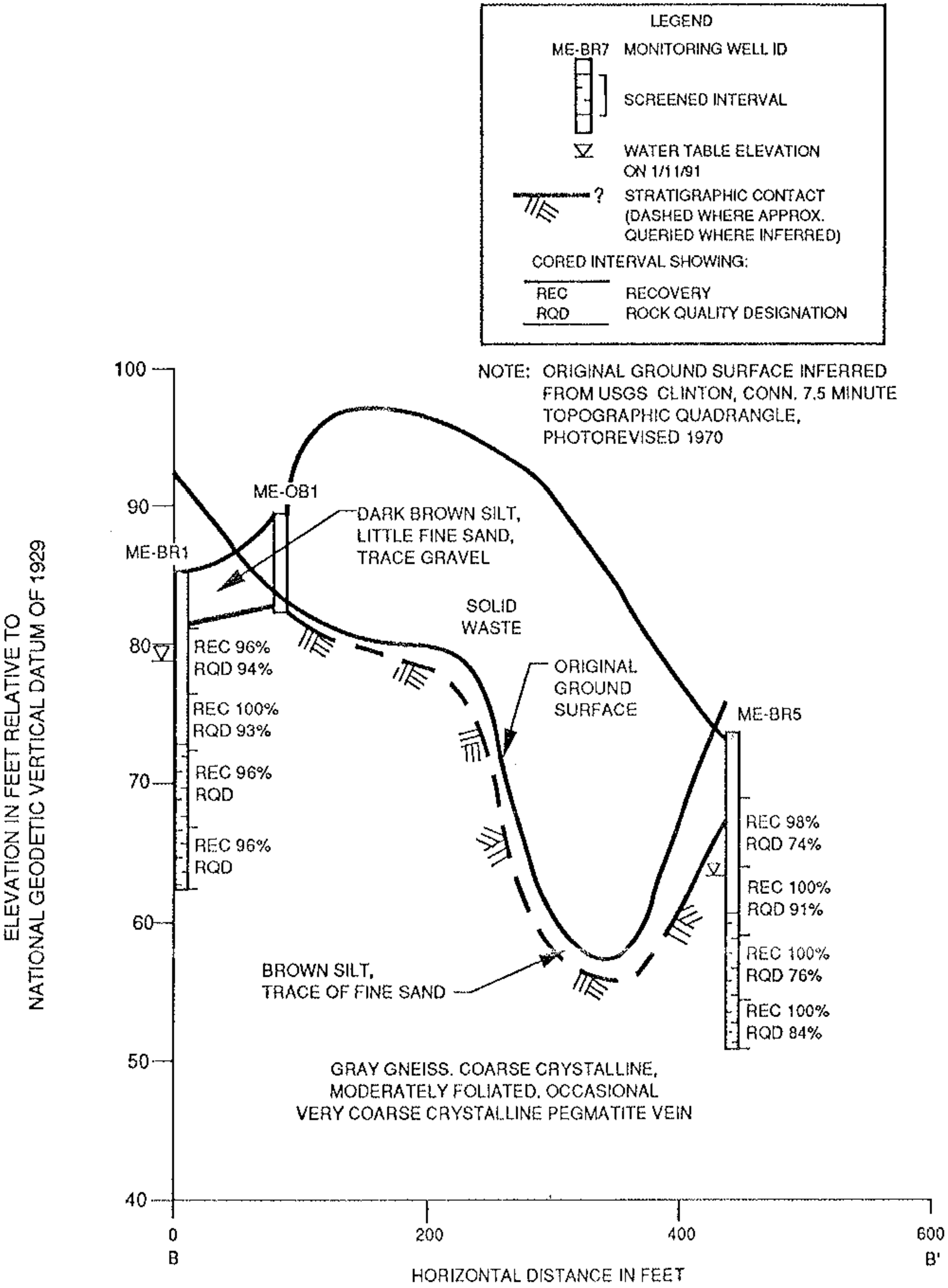
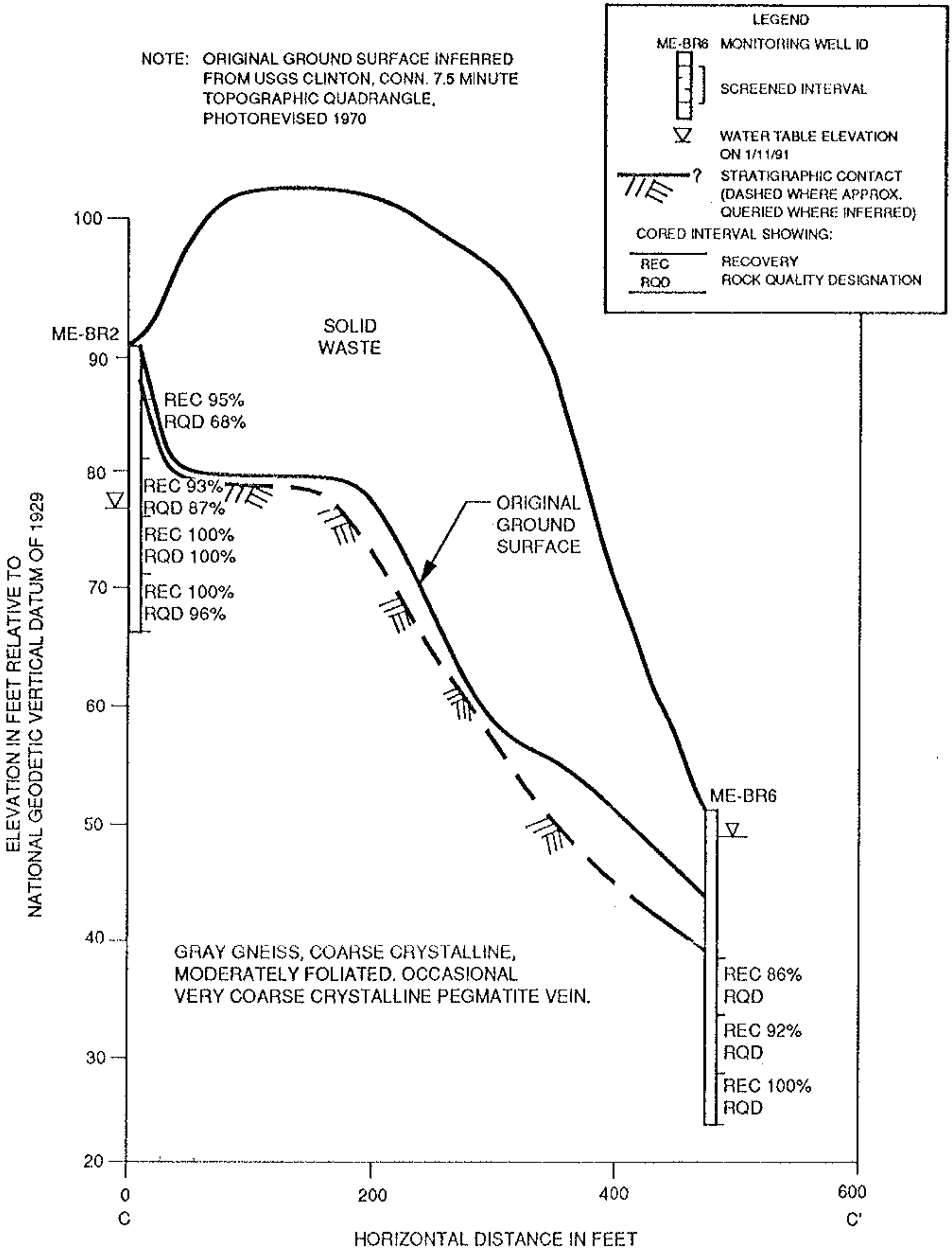


FIGURE 3-4. GEOLOGIC CROSS SECTION A-A'.



NOTE: ORIGINAL GROUND SURFACE INFERRED FROM USGS CLINTON, CONN. 7.5 MINUTE TOPOGRAPHIC QUADRANGLE, PHOTOREVISED 1970

FIGURE 3-5. GEOLOGIC CROSS SECTION B-B'.



NOTE: ORIGINAL GROUND SURFACE INFERRED FROM USGS CLINTON, CONN. 7.5 MINUTE TOPOGRAPHIC QUADRANGLE, PHOTOREVISED 1970

FIGURE 3-6. GEOLOGIC CROSS SECTION C-C'

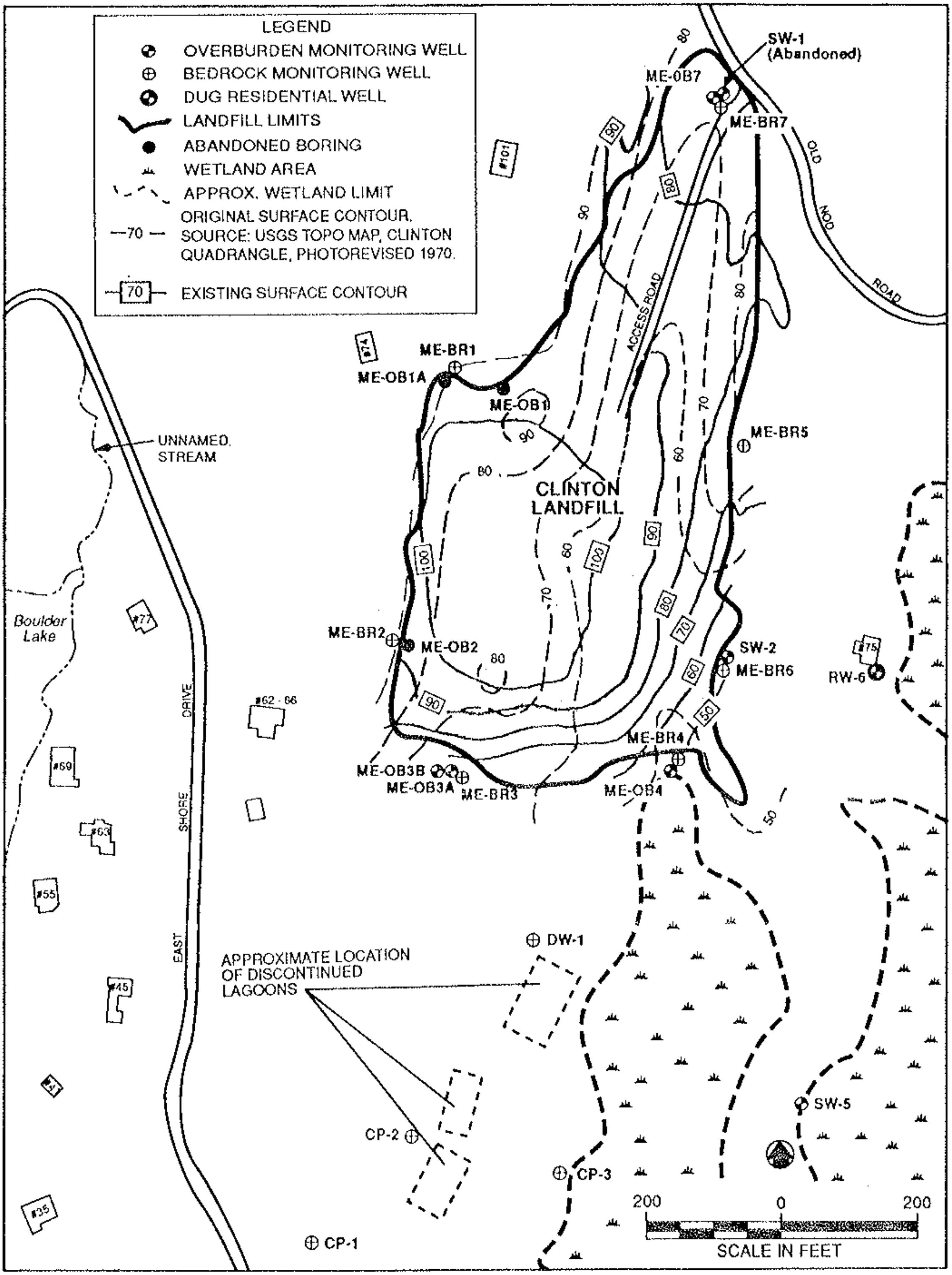


FIGURE 3-7. APPROXIMATE CONTOURS OF THE ORIGINAL AND EXISTING GROUND SURFACE.

the surface water divide. The actual location of the groundwater divide cannot be determined from the existing information. Nonetheless, the close proximity of the groundwater divide to the landfill suggests that some landfill leachate may possibly flow westward toward Boulder Lake. This possibility is supported by water quality data for residential wells along East Shore Drive. Several laboratory analyses have indicated the presence of VOCs and/or leachate parameters in these wells.

WATER QUALITY DATA ANALYSIS

Analytical Data

Analytical data for organic and inorganic constituents detected in monitoring well samples during the November, 1990 and June, 1991 sampling events are presented in Tables 3-8 and 3-9. The analytical results for the surface water sample collected in November, 1990 near the southern end of the landfill are presented in Table 3-10. Where applicable, the drinking water limits or other criteria have been included with groundwater data as a basis of comparison. The water quality data for organics are summarized on Plate 2 in Appendix A for convenience.

The monitor wells installed as part of this site assessment were located at the toe of the landfill, and were intended to detect maximum leachate contaminant levels in groundwater being transported from the site. Several contaminants have been detected in groundwater at levels exceeding drinking water standards, while other contaminants are present, but at levels below drinking water standards. Drinking water standards have been developed by state and federal agencies assuming that the water source is used for direct consumption, cooking and cleaning over an extended period of time. However, there are no known contaminated water supply wells active in the area of the landfill, and the town has a program in place to monitor and connect any contaminated well users to public water. Therefore, although groundwater sampling results are compared to drinking water standards in Tables 3-8 and 3-9, groundwater affected by the landfill is not currently used as a drinking water source.

TABLE 3-8. PARAMETERS DETECTED IN GROUNDWATER SAMPLES AT CLINTON LANDFILL, NOVEMBER 1990

PARAMETERS	DETECTION LIMIT	DRINKING WATER LIMIT	MEBR1	MEBR2	MEBR3	MEOB3A	MEOB3B	MEBR4	MEOB4	MEBR5	MEBR6	SW-2	MEBR7	MEOB7	MEBR8 TRIP BLANK	MEBR9 EQUIP. BLANK	MEBR10 DUPL. ME-BR7	MEBR11 TRIP BLANK
VOLATILE ORGANICS (ug/l)																		
Chloromethane	10	-	57.4	260	216	488	857	646	456	587	525	315	ND	ND	ND	ND	56	ND
Vinyl Chloride	1	2*#	ND	20.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	1	25*	ND	ND	1.4	ND	2.5	2.4	ND	1.4	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	1	7*#	2.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	1	-	14.9	99.5	ND	ND	1.7	1.2	ND	5	4.3	ND	3.9	ND	ND	ND	13	ND
Trans-1,2-Dichloroethene	1	100#	ND	1.6	ND	ND	2.2	ND	ND	ND	ND	2.2	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	1	1*	1.6	ND	2.8	3.2	5.3	ND	1.2	ND	ND	2.3	ND	ND	ND	ND	ND	ND
Chloroform	1	100*	ND	2.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	1	200*#	2.3	1.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	1	5*#	2.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	1	5*#	4.5	2.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	1	1*	12	9.7	29.2	29	33.7	28.7	19.2	5.5	5	40	ND	ND	ND	ND	1.9	ND
Toluene	1	1000*	54.3	ND	5.7	ND	ND	1.2	1.1	ND	1.6	2.2	ND	ND	ND	ND	ND	ND
Chlorobenzene	1	100#	ND	11.4	2.3	ND	ND	2.3	1.3	2.3	2.3	4.7	ND	ND	ND	ND	ND	ND
Ethylbenzene	1	700#	3.3	3.6	2.1	ND	10.7	7.1	1.2	11.5	10.3	1.2	ND	1.5	ND	ND	ND	ND
Styrene	1	100#	ND	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	1	10,000#	6.9	4.8	33	30	21.7	340	207	17.4	16.6	30.7	ND	6.3	ND	ND	ND	ND
METALS (mg/l)																		
Selenium	0.01	0.01*#	ND	ND	ND	ND	ND	ND	0.015	ND	ND	ND	ND	ND	NT	ND	ND	NT
LEACHATE PARAMETERS (mg/l)																		
Iron	0.05	0.3@	49.6	18.6	36.5	48.8	65.1	43.2	58.7	45	56	45.8	28.8	74.9	NT	ND	28.9	NT
Manganese	0.015	5* 0.05@	2.4	7.49	1.32	0.737	3.27	9.24	5.55	2.63	1.85	1.07	2.91	1.21	NT	ND	3.03	NT
Sodium	1	28!	16.8	9.72	41.9	44.2	180	46	223	10.3	85.2	288	9.08	7.6	NT	ND	9.67	NT
Alkalinity	1	-	102	100	2340	1410	710	1290	1320	140	980	1460	60	90	NT	ND	72	NT
Ammonia	0.03	-	1.72	0.07	8.3	7.5	2.8	2.3	3	4.4	63	34	0.67	6.3	NT	ND	0.97	NT
Chloride	1	250@+	2.0	ND	314	319	109	314	334	6	124	99	9	5	NT	ND	5	NT
Nitrate	1	10#+	0.21	ND	12	ND	ND	ND	ND	ND	ND	0.6	ND	ND	NT	ND	ND	NT
Total Dissolved Solids	1	500@	56	240	2936	1852	934	1888	1910	240	1162	1730	154	218	NT	ND	166	NT
Conductivity (um/cm)	-	-	NT	190	3300	2400	1200	2350	2300	2560	1650	2000	160	300	NT	NT	NT	NT
Temperature (deg. C)	-	-	12	11	9	10	10	13	12	11	12	12	12	12	NT	NT	NT	NT
pH	-	-	5.85	NT	6.35	6.20	5.85	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

NOTES:
1. NT denotes sample not tested for the parameters indicated.
2. ND denotes parameter not detected.
3. Samples collected on November 19, 20, and 21, 1990.
4. Conductivity, temperature, and pH were measured in the field by M&E personnel.
5. Drinking water limits cited were obtained from four sources as defined below:
   - * Connecticut Department of Health Services Action Level.
   - \+ Connecticut Standard for Quality of Public Drinking Water.
   - # National Primary Drinking Water Standard.
   - @ National Secondary Drinking Water Standard.
   - ! Connecticut Department of Health Services Notification Level.

TABLE 3-9. PARAMETERS DETECTED IN GROUNDWATER SAMPLES AT CLINTON LANDFILL, JUNE 1991

PARAMETERS	DETECTION LIMIT	DRINKING WATER LIMIT	MEBR1	MEBR2	MEBR3	MEOB3A	MEOB3B	MEBR4	MEOB4	MEBR5	MEBR6	SW-2	MEBR7	MEOB7	MEBR8 TRIP BLANK	MEBR9 TRIP BLANK
VOLATILE ORGANICS (ug/l)																
Chloromethane	10	-	ND	ND	ND	ND	ND	ND	ND	ND	129	ND	ND	ND	ND	ND
Chloroethane	10	-	15.1	ND	88.0	67.0	92.4	130	136	177	192	123	ND	ND	ND	ND
Methylene Chloride	1	25*	ND	ND	1.3	1.1	1.1	2.9	1.4	2.1	2.0	ND	ND	ND	ND	ND
1,1-Dichloroethane	1	-	5.2	7.6	ND	ND	2.3	1.1	ND	7.8	5.5	2.3	12.2	ND	ND	ND
Trans-1,2-Dichloroethene	1	100#	ND	ND	ND	ND	1.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	1	1* 5#	14.3	2.0	26.1	28.7	28.7	30.3	28.0	8.6	29.0	38.0	3.2	1.7	ND	ND
1,1,2,2-Tetrachloroethane	1	-	ND	ND	1.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	1	1000*	227	6.2	1.7	ND	1.7	2.1	1.5	2.2	2.0	2.6	1.9	32.1	ND	ND
Chlorobenzene	1	100#	ND	ND	2.2	1.1	1.1	3.1	2.2	3.1	12.1	7.5	2.0	2.1	ND	ND
Ethylbenzene	1	700#	1.8	ND	2.3	ND	7.1	5.8	1.1	14.0	6.5	80.1	ND	ND	ND	ND
Total Xylenes	10	10,000#	14.0	ND	47.0	54.9	55.0	150	116	42.4	168	95.9	ND	ND	ND	ND
LEACHATE PARAMETERS (mg/l)																
Iron	0.05	0.3@	56.8	5.52	48.8	51.4	68.8	48.7	64.1	75.8	65.0	38.6	27.6	69.9	NT	NT
Manganese	0.015	5* 0.05@	1.70	2.15	1.31	0.729	3.24	6.78	6.12	3.49	1.88	1.01	3.14	1.08	NT	NT
Sodium	1	28!	ND	ND	4.87	3.18	1.22	2.26	4.30	ND	1.58	2.75	ND	ND	NT	NT
Alkalinity	1	-	100	30	2180	1700	750	1450	1390	160	1200	1700	62	72	NT	NT
Ammonia	0.03	-	2.35	ND	79.9	84.1	31.2	37.2	20.3	3.05	73.3	69.5	1.68	6.23	NT	NT
Chloride	1	250@+	7.0	2.0	360	330	126	295	325	16	142	128	6.0	4.0	NT	NT
Nitrate	1	10#+	ND	ND	5.96	6.20	2.55	8.49	2.49	ND	5.99	6.34	ND	ND	NT	NT
Total Dissolved Solids	1	500@	120	64	2758	2198	904	1972	1944	250	1264	1982	136	108	NT	NT
Conductivity (um/cm)	-	-	370	105	NT	NT	NT	NT	NT	NT	NT	NT	225	325	NT	NT
Temperature (deg. C)	-	-	11.5	16	12	15	14	16	15	13	14	13	13	14	NT	NT
pH	-	-	6.15	5.89	6.80	6.70	6.48	6.53	6.49	6.42	6.39	6.10	6.05	6.42	NT	NT

NOTES:
1. NT denotes sample not tested for the parameters indicated.
2. ND denotes parameter not detected.
3. Samples collected on June 11 and 12, 1991.
4. Conductivity, temperature, and pH were measured in the field by M&E personnel.
5. Drinking water limits cited were obtained from four sources as defined below:
   - * Connecticut Department of Health Services Action Level.
   - \+ Connecticut Standard for Quality of Public Drinking Water.
   - \# National Primary Drinking Water Standard.
   - @ National Secondary Drinking Water Standard.
   - ! Connecticut Department of Health Services Notification Level.

TABLE 3-10. PARAMETERS DETECTED IN SURFACE WATER SAMPLES AT CLINTON LANDFILL, NOVEMBER 1990.

PARAMETERS	DETECTION LIMIT	MESW3	MESW4 DUPL. MESW3
VOLATILE ORGANICS (ug/l)			
Chloromethane	10	19.6	18.1
Vinyl Chloride	1	ND	ND
Methylene Chloride	1	ND	ND
1,1-Dichloroethene	1	ND	ND
1,1-Dichloroethane	1	ND	ND
Trans-1,2-Dichloroethene	1	ND	ND
1,2-Dichloroethane	1	ND	ND
Chloroform	1	ND	ND
1,1,1-Trichloroethane	1	ND	ND
Carbon Tetrachloride	1	ND	ND
Trichloroethene	1	ND	ND
Benzene	1	ND	ND
Toluene	1	ND	ND
Chlorobenzene	1	ND	ND
Ethylbenzene	1	ND	ND
Styrene	1	ND	ND
Total Xylenes	1	ND	ND
METALS (mg/l)			
Selenium	0.01	ND	ND
LEACHATE PARAMETERS (mg/l)			
Iron	0.05	16.3	19.7
Manganese	0.015	1.31	1.91
Sodium	1	103	109
Alkalinity	1	400	600
Ammonia	0.03	7.6	7.7
Chloride	1	86	72
Nitrate	1	ND	ND
Total Dissolved Solids	0.02	620	760
Conductivity, um/cm	-	600	NM
Temperature, deg. C	-	6	NM
pH	-	NM	NM

NOTES:
1. ND denotes parameter not detected.
2. NM denotes parameter not measured.
3. Conductivity and temperature were measured in the field by M&E personnel.
4. Samples collected on November 21, 1990.

The primary volatile organics detected in groundwater samples include aromatics (benzene, toluene, chlorobenzene, ethyl benzene and xylene) and chlorinated organics (chloromethane and dichloroethane). In addition to the dichloroethane, several other chlorinated organics associated with the chlorinated ethene and ethane degradation series (ie. trichloroethylene, vinyl chloride, 1,1-dichloroethene, trans-1,2-dichloroethene, chloroethane, methylene chloride, chloroform and chloromethane), were also detected in groundwater samples at low levels. The only volatile organic detected in the surface water sample was chloromethane. Landfill leachate parameters were detected in all groundwater and surface water samples.

During the first round of sampling, chloromethane, an organic compound which had not previously been detected in the area, was present in several of the samples. To address concerns over potential laboratory errors or cross contamination, split samples were collected from three wells during the second round of sampling and submitted to both the original laboratory (Environmental Consulting Laboratories, Inc. - ECLI) and to a second laboratory (Environmental Science Corporation - ESC). Analytical results for the three split samples are summarized in Table 3-11. In general, the analytical results from the two labs are similar with respect to the compounds detected and the concentrations reported. ESC used slightly higher detection limits than ECLI, ranging from 2 to 10 ppb for most compounds. ESC also reported a longer list of compounds analyzed. The discrepancy in the number of compounds reported occurred because ECLI reports the Target Compound List of 35 compounds, and ESC reports the complete Method 8240 list of 45 compounds. Significant discrepancies between the two sets of results occurred for samples from ME-BR4 and ME-BR6. For ME-BR4 ECLI reported xylenes at 150 ppb, while ESC reported xylenes at 410 ppb. For ME-BR6, ECLI reported chloromethane at 129 ppb and chloroethane at 192 ppb. ESC reported chloromethane as <50 ppb (not detected), chloroethane at 420 ppb, and carbon disulfide at 25 ppb. The cause of these discrepancies is unknown, but may be the result of sample variation, slight differences in laboratory procedures, or misinterpretation of analytical results.

Split sampling did not confirm the presence of chloromethane as intended. Chloromethane was initially detected in several samples collected in November 1990. However, during the second

TABLE 3-11. COMPARISON OF ANALYTICAL RESULTS FOR GROUNDWATER SPLIT SAMPLES AT CLINTON LANDFILL, JUNE 1991

PARAMETERS	DRINKING WATER LIMIT	MEOB3B		MEBR4		MEBR6	
		ECLI	ESC	ECLI	ESC	ECLI	ESC
VOLATILE ORGANICS (ug/l)							
Chloromethane	-	<10	<10	<10	<50	129	<50
Chloroethane	-	92.4	84	130	150	192	420
Methylene Chloride	25*	1.1	2.8	2.9	10	2.0	<10
1,1-Dichloroethane	-	2.3	<2.0	1.1	<10	5.5	<10
Trans-1,2-Dichloroethene	100#	1.3	<2.0	<1.0	<10	<1.0	<10
Benzene	1* 5#	28.7	20	30.3	26	29.0	22
Toluene	1000*	1.7	<2.0	2.1	<10	2.0	<10
Chlorobenzene	100#	1.1	<2.0	3.1	<10	12.1	11
Ethylbenzene	700#	7.1	5.5	5.8	<10	6.5	<10
Total Xylenes	10,000#	55.0	23	150	410	168	130
Carbon Disulfide	-	<10	<2.0	<10	<10	<10	25

NOTES:
1. NR denotes parameter not reported.
2. ND denotes parameter not detected.
3. Samples collected on June 11 and 12, 1991.
4. ECLI: Environmental Consulting Laboratories, Inc.
   ESC: Environmental Science Corp.
5. Drinking water limits cited were obtained from four sources as defined below:
   * Connecticut Department of Health Services Action Level.
   + Connecticut Standard for Quality of Public Drinking Water.
   # National Primary Drinking Water Standard.
   @ National Secondary Drinking Water Standard.
   ! Connecticut Department of Health Services Notification Level.

round of sampling in June, chloromethane was detected in only one sample. Although chloromethane was reported by ECLI in the sample from ME-BR6, no chloromethane was detected by ESC. In response to questions regarding the presence of chloromethane and chloroethane, both laboratories rechecked their analytical results. ECLI prepared a letter confirming that chloromethane was detected in the December 1990 samples and that chloroethane was detected in the June 1991 samples. A copy of the letter is included with the analytical results in Appendix C. ESC reported verbally that chloroethane was present in all three split samples and that chloromethane was not detected. Although the presence of chloromethane could not be confirmed by a second laboratory, the split sampling did confirm the presence of chloroethane, which had not been detected prior to the June 1991 sampling. Both labs detected chloroethane in all three split samples. No drinking water standards have been established for chloroethane.

In general, the results of this site assessment indicate that landfill leachate is present in groundwater at the toe of the landfill, however, gross levels of contaminants were generally not detected. Benzene was the most prevalent contaminant detected above primary drinking water standards, with levels in all wells exceeding the standard of 1.0 ug/l (U.S.EPA standard for benzene is 5 ug/l). During the first round of sampling, vinyl chloride and 1,2-dichloroethane were also detected above primary drinking water standards. Vinyl Chloride was only detected in one well, ME-BR2, along the southwest border of the landfill. The concentration of 1,2-dichloroethane ranged from ND to 5.3 ug/l, with the highest concentration detected in well ME-OB3B located on the southern border of the landfill. In the second round of sampling, only benzene was detected at levels exceeding drinking water standards. Benzene was present in all twelve samples.

Leachate indicator parameters such as iron, manganese, and total dissolved solids were detected at levels far in excess of secondary drinking water standards; however, secondary standards are established on the basis of aesthetic impacts rather than health based impacts. Sodium, chloride and nitrate were also found, in several locations, to exceed Connecticut drinking water limits or action levels. For purposes of comparison, a summary of typical ranges for inorganic constituents in sanitary landfill leachate (Freeze & Cherry, 1979) is given in Table 3-12. In general, the concentrations of leachate parameters at the landfill fall within or just below the representative ranges.

In addition to the quantative analytical data described above, it should be noted that during drilling activities along the south end of the landfill, a peculiar odor was detected in the air. The odor is described as a chemical smell with perfume-like overtones. The odor was detected prior to initiating work, and was present near minor seeps at the toe of the landfill. The odor did not produce a reading on field air monitoring equipment (Thermo Environmental Instruments Model 580A PID). During the subsequent groundwater sampling, the seeps were inactive. Groundwater purged from wells in this area (ME-BR3, ME-OB3A, ME-0B3B, ME-BR4, ME-0B4, and ME-BR6) contained the same odor.

Contaminant Distribution

Overall, the groundwater data indicate that contamination is present along the western, southern and eastern boundaries of the landfill. Data from wells ME-BR7 and ME-OB7, located in the northern extent of the fill area, had low to non-detectable levels of similar contaminants found in other areas of the landfill. Although contaminants have been detected along the western border of the landfill (ME-BR1 and ME-BR2), concentrations of contaminants in groundwater generally increase along the south and southeastern borders of the landfill. This distribution of contaminants corresponds with the general southeast bedrock groundwater flow pattern at the site.

Of the organic contaminants detected, aromatic organics (ie. benzene) were prevalent in the groundwater samples. The occurrence of chlorinated organics in the samples was sporadic. Various chlorinated organics were detected in most of the samples from both samplings. Eight of the compounds detected in the first round of sampling (vinyl chloride, 1,1-dichloroethene, 1,2-dichloroethane, chloroform, 1,1,1-trichloroethane, carbon tetrachloride, trichloroethene, and styrene) were not present in the second round. Two compounds were detected in the second

TABLE 3-12 REPRESENTATIVE RANGES FOR VARIOUS INORGANIC CONSTITUENTS IN LEACHATE FROM SANITARY LANDFILLS

Parameter	Representative Range(1) (mg/l)	Range Measured at(2) Clinton Landfill
Na^+	200-1200	<1.0-288
Cl^-	300-3000	<1.0-360
SO_4^{2-}	10-1000	NM
Alkalinity	500-10,000	30-2340
Fe (total)	1-1000	18.6-75.8
Mn	0.01-100	0.729-9.24
Cu	<10	NM
Zn	0.1-100	NM
Pb	<5	<0.05
Hg	<0.2	<0.002
NO_{3-}	0.1-10	<1.0-12
P as PO_4^{2-}	1-100	NM
COD (chemical oxygen demand)	1000-90,000	NM
Total dissolved solids	5000-40,000	56-2936
pH	4-8	5.85-6.80

NOTES:
1. Source: Freeze and Cherry, 1979.
2. Data from sampling conducted November 19, 20 and 21, 1990 and June 11 and 12, 1991
3. NM indicates parameter not measured

round (chloroethane and 1,1,2,2-tetrachloroethane) which were not detected in the first round. In comparison with past water quality data from previously existing wells (see Table 2-1, Section Two) the presence of chlorinated organics and aromatics is consistent with the specific compounds detected along the toe of the landfill. Benzene and 1,1-dichloroethane are the most prevalent organics detected in area wells. Chloromethane and chloroethane are not directly associated with the other organics detected in the groundwater. Both are used as refrigerants and topical anesthetics. Also, chloromethane and chloroethane could be formed in the landfill through either chemical or biological processes. Methane or ethane gas could react with either chlorine gas or chlorine bleach to form chloromethane or chloroethane. Biodegradation of chlorinated organics could also form chloromethane or chloroethane.

With the exception of chloromethane, the analytical results for sample ME-SW3 do not indicate that volatile organic contamination has impacted the surface water just south of the landfill. Landfill leachate parameters were detected in the surface water at lower concentrations than found in the monitoring wells.

Quality Assurance/Quality Control Data

Field quality assurance/quality control (QA/QC) samples collected during the monitor well and surface water sampling included trip blanks, an equipment blank and field duplicates. The analytical results for the QA/QC samples are tabulated in Tables 3-8, 3-9 and 3-10, presented previously. The laboratory reports for the QA/QC samples have been included in Appendix C. Trip blanks were collected to monitor potential contamination during sample transport or storage. Equipment blanks were collected to verify if effective decontamination procedures were used during field activities. The absence of any organics or inorganics in these samples indicates that there was not any contamination of samples through transport or field collection activities.

Field duplicates were collected to measure variability in sample collection procedures and laboratory analyses. The duplicate analyses for leachate parameters on both groundwater sample ME-BR7 and surface water sample ME-SW3 were fairly consistent. The volatile organics duplicate analyses for the groundwater sample did not correlate as well as the leachate parameters. In particular, chloromethane was not detected in ME-BR7 but was detected at 56 ug/l in ME-BR10 (duplicate of ME-BR7). The variability in the results for benzene and 1,1-dichloroethane was relatively low and could be attributed to sampling and/or analytical variability.

The laboratory QA/QC samples included method blanks, laboratory replicates, spikes and surrogate recoveries. No volatile organics were detected in the method blanks. For the laboratory replicate performed as sample ME-BR1, the relative percent difference for several of the chlorinated organics was higher than 20% specified in the QA plan, however the detectable concentrations in the original sample were low. The relative percent difference does not therefore appear to be significant.

Surrogate recovery data fell within the laboratory's acceptable accuracy range of 60-120% recovery. Although this range was lower than the 75%-125% accuracy range specified in the QA plan, the majority of samples also fell within the QA plan accuracy range. The laboratory stated that the few low recoveries were due to sample foaming during analytical procedures.

Potential Waste Origin

Based on information collected by ConnDEP during the Preliminary Assessment (ConnDEP, 1989) the landfill had accepted industrial waste during its operation. Chesebrough-Ponds, Inc. reportedly deposited approximately 30 cubic yards per day of general solid waste (office waste, cafeteria waste, macerated return products) approximately 5 to 6,000 gallons per week of chemically and biologically treated wastes and approximately 300 gallons per day of remainders, off spec materials and scrapings from mixing tanks in sealed 55 gallon drums. The 1974 report by FGA referenced disposal of raw materials such as wax, petroleum products, and surplus final product.

In addition to industrial wastes generated from Chesebrough- Ponds, the Preliminary Assessment also noted additional industrial wastes deposited at the landfill. These wastes include: 5 gallons per year of Blaco-Tri solvent mixed with trash and unknown quantities of water soluble oil from Burns and Lee Tool, Co; 1/2 drum per month of "tumbling" sludge from National Sintered Alloys; and cardboard boxes and industrial soap from Universal Wire. The 1989 report by Enviro-Audit identified two additional sources, Stanley Bostich and New England Barrel Company.

The chlorinated solvents detected in groundwater at the toe of the landfill are typically related with industrial uses such as dry cleaning, degreasing and parts cleaning operations. Information from the Preliminary Assessment does indicate that solvents had been deposited in the landfill.

The scattered distribution of chlorinated ethenes and ethanes is a possible indication that a solvent source is being degraded in the landfill.

The aromatic organics, such as benzene, toluene and xylene can be associated with gasoline, petroleum naphtha, fuel oil, paint thinners and other compounds. The water soluble oil indicated in the Preliminary Assessment report is a potential source of these compounds. Benzene has been used in the manufacture of medicinal chemicals, dyes, other organic compounds, linoleum, oil cloth, varnishes, lacquers, and as a solvent for waxes, resins, and oils. Benzene could be formed in the landfill through biological decomposition of toluene and/or xylene. More specific information is needed on the wastes disposed of at the landfill to evaluate if they are a potential source of the chlorinated and/or aromatic organics.

SECTION 4

SECTION FOUR
RECOMMENDATIONS FOR ADDITIONAL WORK

This site assessment report is in response to the requirements of Item 7g of Connecticut DEP Consent Order WC 4956 regarding the Old Nod Road Landfill. The Consent Order requires that a supplemental investigation plan be prepared if the DEP deems that additional investigations are necessary. The Order further requires that a proposed plan be developed for the evaluation of remedial actions to abate pollution at the site.

Recommendations for additional work put forth in this report focus on obtaining additional data to support a remedial action plan and conducting the feasibility assessment and design of remediation measures. These recommendations are described in the following paragraphs. It is assumed that these recommendations will be discussed with the Connecticut DEP and DEP comments will be addressed prior to initiation of additional investigations.

ADDITIONAL FIELD INVESTIGATIONS

No active leachate seeps were observed during either of the two rounds of sampling, and no leachate samples were obtained. The town is planning to implement measures to reduce or eliminate leachate seeps. If these seeps become active in the future, leachate samples should be collected to augment the existing water quality data and to evaluate potential landfill impacts.

One surface water sample was collected during the first round of sampling. No surface waters were observed during the second round. Another attempt should be made to sample surface waters during Spring, 1992 to evaluate potential surface water impacts.

Conducting slug tests on the bedrock and overburden wells around the landfill is recommended to obtain estimates of hydraulic conductivity, groundwater flow rates, and leachate generation rates. The slug tests will consist of instantaneously removing a known volume of water from a well, and observing water level recovery in that well with time. The data obtained will be used to calculate preliminary estimates of hydraulic conductivity for the bedrock and overburden aquifers. This method of analysis is a cost effective way to obtain a preliminary estimate of the bedrock hydraulic conductivity. The hydraulic conductivity values will be used in estimating groundwater flow rates and leachate generation from the landfill.

LANDFILL REMEDIATION ASSESSMENT

The selection of a remedial action plan for the Old Nod Road Landfill is dependent on state regulatory requirements and the risk posed by the landfill to human health and the environment.

The groundwater classification in the vicinity of the landfill is GB/GA, indicating that groundwater quality is currently degraded (GB) however, the goal is to reach drinking water quality (GA). One of ConnDEP's goals in managing groundwater is to maintain or improve the existing groundwater quality. Lowering the groundwater quality designation at the landfill from GB/GA to GB would be contradictory to this goal. In the past ConnDEP has not granted requests to lower groundwater quality designations.

The primary routes of potential human exposure to landfill contamination are groundwater consumption, nearby surface water contact, and direct contact with the landfill itself. The town of Clinton is in the process of extending public water lines to all contaminated well users in the area of the landfill, thereby reducing or eliminating ingestion as a potential exposure pathway. The limited available surface water sampling data in the immediate vicinity of the landfill indicate the presence of leachate contaminants in the surface water, however, the data do not indicate the presence of organic contaminants. The landfill currently has soil cover over its entire surface, thereby reducing the risk of direct contact exposure. The town is also in the process of eliminating leachate seeps on the landfill slopes. These measures serve to reduce potential direct contact exposure at the landfill.

Based on data presented in this site assessment report and the fact that groundwater ingestion has been reduced or eliminated as a potential exposure pathway, it is proposed to evaluate alternatives for controlling landfill contaminant migration at the source. No detailed evaluation of remediation of off-site groundwater contamination is proposed.

Existing data and data to be collected as part of the proposed additional field investigations will be used to develop a remedial action plan for the Old Nod Road Landfill. The following remediation alternatives will be evaluated:

- No Action
- Landfill Capping
- Leachate Collection/Treatment

Landfill capping is a means of reducing leachate generation by reducing infiltration of precipitation through the fill material. Caps can consist of low permeability natural materials, augmented soils (ie. soil bentonite mixtures) and synthetic membranes. The lower the overall permeability of the cap, the greater its effectiveness in reducing leachate generation. Although a landfill cap will reduce infiltration, it may not entirely eliminate leachate generation due to groundwater flow through the landfill. Past borings through the landfill have indicated that there is fill beneath the water table in the landfill, however, installation of a low permeability cap is likely to lower the water table in the landfill. Pre-landfill topography indicates that the natural water table at the site is below the fill area.

Leachate collection and treatment would consist of installing a series of groundwater pumping wells or groundwater collection trenches to collect and treat leachate contaminated groundwater, thus minimizing off-site migration. Leachate collection requires more operation and maintenance than a cap alone, however, it would be more effective than a cap if significant leachate generation is due to groundwater flow through fill. In cases where leachate collection is required it is generally done in conjunction with a landfill cap. It should be noted that Clinton does not currently have sewers or a municipal wastewater treatment system, therefore, leachate collection would necessitate construction and operation of a leachate treatment system. This would significantly increase the cost of this alternative.

The effectiveness of each alternative in abating pollution at the site will be evaluated and a recommended plan will be developed.

Alternatives Evaluation

The analyses to be conducted for each alternative are described in the following paragraphs.

No Action Under this alternative, no further remedial action would be taken at the landfill, and it is assumed that the landfill would act as a continuing source of contamination. It is assumed that the existing groundwater monitoring program and water main extension program would continue. The no action alternative will be included as a basis of comparison with other alternatives.

Landfill Capping Various landfill capping alternatives will be evaluated on the basis of performance and cost. Alternatives will include both synthetic and natural material caps. The nearby availability of satisfactory natural capping materials will be evaluated through consultation with town personnel. The Hydrologic Evaluation of Landfill Parameters (HELP) model will be used to estimate changes in leachate generation under different capping scenarios. The results of this analysis will be used in choosing the most appropriate capping system. Other issues to be addressed as part of the landfill capping analysis are as follows:

- Existing Landfill Cover - the depth and permeability of the existing soil cover on the landfill is unknown. The depth of landfill cover will be field checked at approximately ten locations, and selected samples will be analyzed for grain size distribution. The permeability will be estimated from the grain size distribution using empirical relationships.

- Grading - Existing top and side slopes at the landfill will be reviewed based on town survey information. A grading plan will be developed for the final landfill cap to assure proper runoff and slope stabilization.

- Water Table Assessment - The potential impact of a landfill cap on lowering the water table within the fill will be evaluated. In addition, upgradient vertical barriers (ie. grout curtain) will be evaluated as a potential means of directing groundwater flow around the landfill if it is thought that the fill may be below the water table after a cap has been constructed.

- Gas Venting - The need for gas venting will be evaluated and alternative gas venting systems will be described. Due to the proximity of surrounding buildings, the need for perimeter gas collection will be assessed. New federal landfill regulations may require controls on vented gas, and this will also be evaluated.

- Future Land Use - Potential future land use of the landfill will be discussed with the town. Based on those discussions, recommendations for future land use options will be made. These options will be taken into consideration in the assessment of the landfill cap.

A recommended capping system will be described at the conclusion of this assessment, including a preliminary cost estimate.

Leachate Collection/Treatment

Collection of leachate contaminated groundwater at the toe of the landfill will be evaluated as a means of controlling contaminant migration from the site. This evaluation will consist of the following:

- Evaluation of alternative leachate collection systems (ie. pumping wells vs. collection trenches). The estimated volume of leachate contaminated groundwater requiring treatment will be evaluated based on groundwater flow patterns and hydraulic conductivity tests being conducted as part of the additional field investigations.

- Conduct a preliminary evaluation of alternative leachate treatment systems. Collected leachate would either need to be contained and disposed of off-site, or an on-site treatment system would need to be installed. Currently there are no sewers or municipal wastewater treatment systems in Clinton.

The need for a leachate collection system will be evaluated relative to the expected performance of a landfill cap alone. A planning level cost estimate will be prepared for a leachate collection and treatment system. If this alternative is determined to be necessary, further investigation would be necessary prior to design. These investigations may include a pumping test to obtain information for layout of recovery wells or trenches and possible pilot testing of leachate treatment systems.

Remedial Action Monitoring Program

A surface water and groundwater monitoring program will be developed for the purpose of evaluating the performance of the recommended remediation plan. This monitoring program will include well and surface water monitoring locations, parameters to be analyzed, monitoring frequency and quality assurance/ quality control measures.

Recommended Plan Report

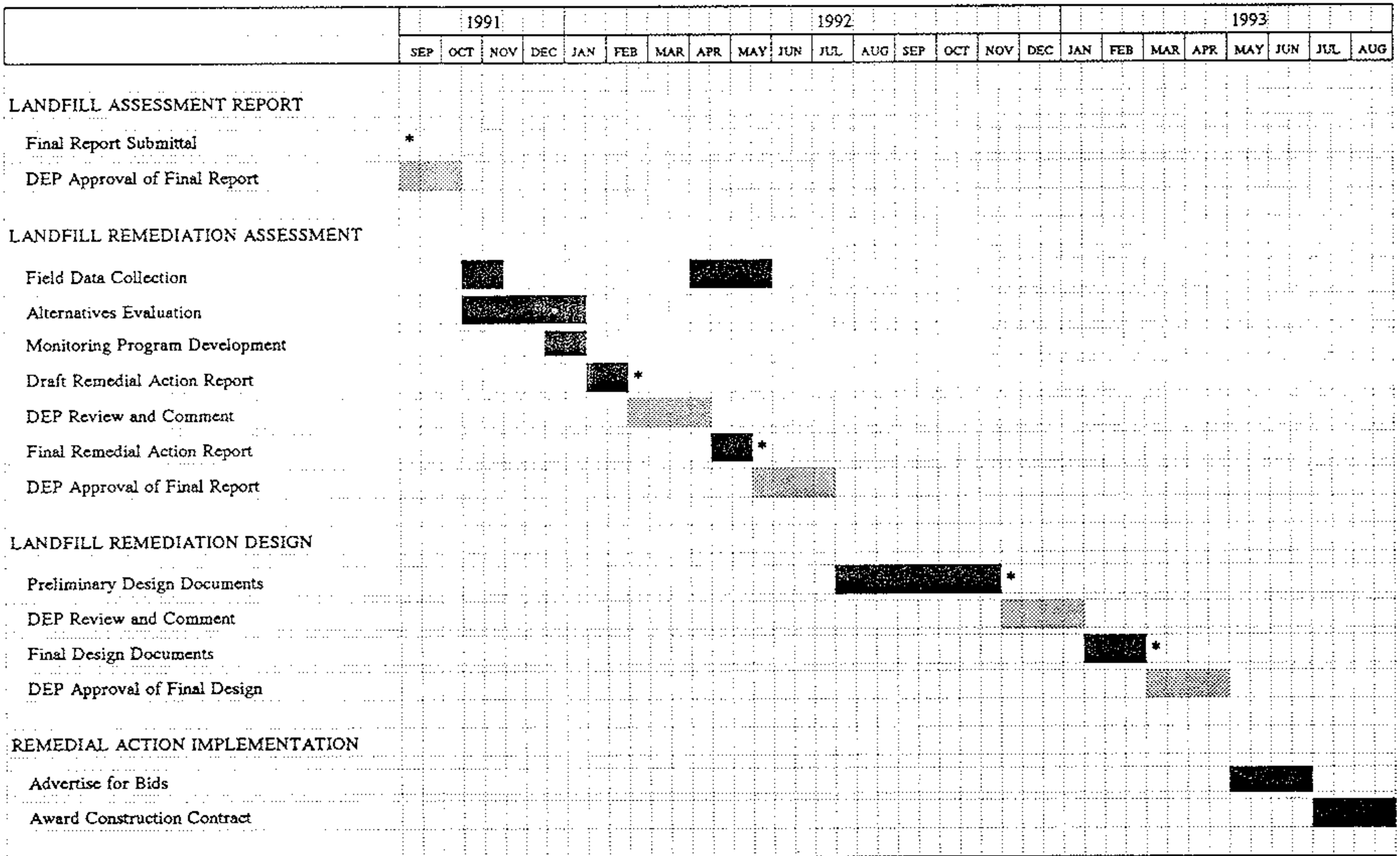
A report will be prepared summarizing the results of the landfill remediation assessment. A draft report will be submitted to the town and DEP for review and comment. Following receipt of comments, a final report will be prepared.

LANDFILL REMEDIATION DESIGN

The DEP Consent Order requires that the assessment of remediation alternatives and recommended plan be submitted to ConnDEP for review and approval. Subsequent to this approval, final design of the recommended plan would commence. The final design will include required contract plans and specifications and application for required permits. The exact scope of the final design effort is dependent on the nature of the approved remedial action plan.

SCHEDULE

The estimated schedule for the recommendations outlined in this section is presented in Figure 4-1. This schedule is preliminary, and is subject to change based on potential changes in the scope of the project and changes in the assumed review and approval periods.



1. Draft and final submittals noted by asterisk (*).

FIGURE 4-1. ESTIMATED IMPLEMENTATION SCHEDULE – OLD NOD ROAD LANDFILL RECOMMENDATIONS

REFERENCES

Aerial Data Reduction Associates Inc. 1987. Topographic Survey of the Town of Clinton, Sheet C-10. Map prepared for the Town of Clinton. Revised 6/18/90 to show lagoon locations, revised 12/8/90 to show M&E wells.

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Flint, R.F. 1971. The Surficial Geology of the Guilford and Clinton Quadrangles. State Geological and Natural History Survey of Connecticut, Quadrangle Report No. 28.

Heynen Engineers. 1986. Hydrological Study, Clinton Landfill Report prepared for the Town of Clinton, Connecticut.

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Nathan L. Jacobson & Associates, Inc. 1987. Engineering Report-Best Management Practices Plan. Report prepared for the Town of Clinton, Connecticut.

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APPENDIX

APPENDIX A

Plate 1. Landfill Vicinity and Sampling Location Map

Plate 2. Summary of Landfill Assessment Water Quality Data

APPENDIX B

Old Nod Road Landfill
Boring Logs

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
GLASTONBURY, CT 06033
(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy

PROJECT NAME Landfill

LOCATION Clinton, CT

BORING NUMBER ME-BR-1

SHEET No. 1 of 1

DRILLER W. Burns

INSPECTOR J. Fitting

DATE START 10-4-90

DATE FINISH 10-5-90

ARCHITECT ENGINEER

FILE NO.

SURFACE ELEV.

LINE & STATION

OFFSET

	Casing	Sampler	Core Barrel
TYPE	HW	SS	NX
SIZE I.D.	4"	1-3/8"	2"
HAMMER WT.	300	140	
HAMMER FALL	24	30	

DEPTH	SAMPLE NO.	SAMPLE DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	S-1	0-2.0	2	6					.2 Topsoil Dark Brown Silt, Little Fine Sand, Trace of Gravel.
				6	6	15"			
	S-2	2.0-2.9	3	120					
5'	R-1	4.2-9.2	Cored			60"	13	4.2	
							10		Run 1 Cored Gneiss Rock from 4.2-9.2' Rec. 60".
							9		
							13		
							14		
10'	R-2	9.2-14.2	Cored			60"	11		
							13		Run 2 Cored Gneiss Rock from 9.2-14.2' Rec. 60".
							15		
							25		
							18		
	R-3	14.2-18.7	Cored			53"	18		
							27		Run 3 Cored Gneiss Rock from 14.2-18.7' Rec. 53".
							27		
							40		
							42		
20'	R-4	18.7-23.2	Cored			55"	11		Run 4 Cored Gneiss Rock from 18.7-23.2' Rec. 55".
							12		
							13		
							17	23.2	
25'									End of Boring @ 23.2' Water @ 14.7'. Reamed Hole to 4" Dia. to 11.7' Installed: 10'-2" PVC Screen 14.5'-2" PVC Riser Sand to 10.9' Seal to 4.0' 1 Locking Protector Pipe.
30'									
35'									

S: 1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:
.5 Hrs. Well Devp't
.25 Hrs. DCON

COL. A Coring Times/FT.

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
GLASTONBURY, CT 06033
(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy

PROJECT NAME Landfill

LOCATION Clinton, CT

BORING NUMBER ME-BR-2

SHEET No. 1 of 1

DRILLER K. Regan

INSPECTOR J. Fitting

DATE START 10-23-90

DATE FINISH 10-25-90

ARCHITECT ENGINEER

	Casing	Sampler	Core Barrel
TYPE	HW		NX
SIZE I.D.	4"		2-7/8"
HAMMER WT.	300		
HAMMER FALL	24/ SPIN		

FILE NO.

SURFACE ELEV.

LINE & STATION

OFFSET

DEPTH	SAMPLE NO.	SAMPLE DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
								2.1	Top of Rock.
5'	R-1	4.5-9.5	Cored			57"	22	4.5	Roller Bit to 4.5'.
							9		Run 1
							3		Cored Gneiss Rock
							5		from 4.5-9.5'
							11		Rec. 57".
10'	R-2	9.5-14.5	Cored			56"	8		Run 2
							7		from 9.5-14.5'
							4		Rec. 56".
							8		
							11		Run 3
'	R-3	14.5-19.5	Cored			60"	14		from 14.5-19.5'
							11		Rec. 60".
							13		
							13		
							12		
20'	R-4	19.5-24.5	Cored			60"	9		Run 4
							8		from 19.5-24.5'
							8		Rec. 60".
							9		
							9	24.5	
25'									
									End of Boring @ 24.5' Water @ 10.2'.
30'									
									Reamed Hole to 4" Dia. to 14.5' Installed: 10'-2" PVC Screen 17'-2" PVC Riser Sand to 11.1' Seal to 2.6' 1-LPP
35'									

S: 1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:
.3 Hrs. Well Devp.
1 Hr. DCON

COL. A Coring Times/Ft.

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
GLASTONBURY, CT 06033
(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy
PROJECT NAME Landfill
LOCATION Clinton, CT

BORING NUMBER ME-BR-3
SHEET No. 1 of 1

DRILLER K. Regan
INSPECTOR J. Fitting
DATE START 10-19-90
DATE FINISH 10-23-90

ARCHITECT ENGINEER
FILE NO.
SURFACE ELEV.
LINE & STATION
OFFSET

	Casing	Sampler	Core Barrel
TYPE	HW		NX
SIZE I.D.	4"		2"
HAMMER WT.	300		
HAMMER FALL	24		

DEPTH	SAMPLE NO.	DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
		No Samples Required							
5'									
10'									
								11.1	Top of Rock.
	R-1	12.0-17.3	Cored			64"	17	12.0	Roller Bit to 12.0'.
							21		Run 1
							12		Cored Gneiss Rock
							15		from 12.0-17.3'
							18		Rec. 64".
							9		
	R-2	17.3-22.3	Cored			60"	10		Run 2
							12		from 17.3-22.3'
20'							15		Rec. 60".
							14		
							16		
	R-3	22.3-28.0	Cored			68"	17		Run 3
							19		from 22.3-28.0'
25'							24		Rec. 68".
							29		
							4/8"		
								28.0	
30'									End of Boring @ 28.0'
									Water @ 0.5'.
									Reamed Hole to 4" Dia. 11.1-17.0'
									Installed: 10'-2" PVC Screen
35'									20'-2" PVC Riser
									Sand to 16.0'
									Seal to 2.0'
									1-LPP

1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:
1 Hr. Well Devp.

COL. A Coring Times/ Ft.

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
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(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy
PROJECT NAME Landfill
LOCATION Clinton, CT

BORING NUMBER ME-BR-4
SHEET No. 1 of 1

DRILLER W. Burns
INSPECTOR J. Fitting
DATE START 10-11-90
DATE FINISH 10-12-90

ARCHITECT ENGINEER
FILE NO.

	Casing	Sampler	Core Barrel
TYPE	HW		NX
SIZE I.D.	4"		2"
HAMMER WT.	300		
HAMMER FALL	24		

SURFACE ELEV.
LINE & STATION
OFFSET

DEPTH	SAMPLE NO.	SAMPLE DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
5'									
10'									
								17.0	Top of Rock.
								18.0	Roller Bit Rock 17-18.0'.
	R-1	18.0-23.0	Cored			59"	9		Run 1
20'							7		from 18.0-23.0'
							6		Rec. 59".
							8		
							9		
	R-2	23.0-28.0	Cored			58"	8		Run 2
25'							10		from 23.0-28.0'
							10		Rec. 58".
							10		
							11		
	R-3	28.0-31.5	Cored			47"	12		Run 3
30'							17		from 28.0-31.5'
							35	31.5	Rec. 47".
							75/6"		
									End of Boring @ 31.5'
35'									Water @ Ground Level.

Reamed Rock to 4" Dia. 17-22.0'
Installed: 10'-2" PVC Screen
23'-2" PVC Riser
Sand to 20'. Seal to Ground Level.

NOTES: 1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:
.25 Well Devp.

COL. A Coring Times/Ft.

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
GLASTONBURY, CT 06033
(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy
PROJECT NAME Landfill
LOCATION Clinton, CT

BORING NUMBER ME-BR-5
SHEET No. 1 of 1

DRILLER W. Burns
INSPECTOR J. Fitting
DATE START 10-9-90
DATE FINISH 10-10-90

ARCHITECT ENGINEER

	Casing	Sampler	Core Barrel
TYPE	HW	SS	NX
SIZE I.D.	4"	1-3/8"	2"
HAMMER WT.	300	140	
HAMMER FALL	24	30"	

FILE NO.
SURFACE ELEV.
LINE & STATION
OFFSET

DEPTH	SAMPLE NO.	SAMPLE DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	S-1	0-2.0	1	1				.6	Fine-Crs. Sand.
				1	2	13"			Brown Silt, Trace of Fine Sand, Roots.
	S-2	2.0-3.0	8	17		6"			
5'	S-3	3.0-4.5	5	14	35	10"		5.1	
	R-1	5.1-10.1	Cored			58"	5		Run 1
							5		Cored Gneiss Rock
							4		from 5.1-10.1'
							2		Rec. 58".
10'							3		
	R-2	10.1-15.1	Cored			50"	4		Run 2
							5		from 10.1-15.1'
							6		Rec. 50".
'							6		
							9		
	R-3	15.1-19.7	Cored			63"	8		Run 3
							8		from 15.1-19.7'
							9		Rec. 63".
20'							12		
							15		
	R-4	19.7-23.3	Cored			45"	9		Run 4
							8		from 19.7-23.3'
							12	23.3	Rec. 45".
25'							8		
									End of Boring @ 23.3'
									Water @ 14.0'.
30'									Reamed Hole to 4" Dia. to 13.0'.
									Installed: 10'-2" PVC Screen
									15'-2" PVC Riser
									Sand pack to 11.0'
									Seal to 4.0'
35'									1-LPP

ES: 1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:
40 min. Devp. Time

COL. A Coring Times/Ft.

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
GLASTONBURY, CT 06033
(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy
PROJECT NAME Landfill
LOCATION Clinton, CT

BORING NUMBER ME-BR-6
SHEET No. 1 of 1

DRILLER K. Regan
INSPECTOR J. Fitting
DATE START 10-15-90
DATE FINISH 10-16-90

ARCHITECT ENGINEER

	Casing	Sampler	Core Barrel
TYPE	HW		NX
SIZE I.D.	4"		2"
HAMMER WT.	300		
HAMMER FALL	24		

FILE NO.
SURFACE ELEV.
LINE & STATION
OFFSET

DEPTH	SAMPLE NO.	SAMPLE DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
		~~No Samples Required~~							
5'									
10'									
								12.0	Top of Rock.
	R-1	13.0-18.0	Cored			48"	10		Run 1
							10		Cored Gneiss Rock
'							10		from 13.0-18.0'
							6		Rec. 48".
							5		
	R-2	18.0-23.0	Cored			55"	7		Run 2
20'							11		from 18.0-23.0'
							12		Rec. 55".
							11		
							11		
	R-3	23.0-28.0	Cored			54"	10		Run 3
25'							10		from 23.0-28.0'
							13		Rec. 54".
							15		
							15		
								28.0	
30'									End of Boring @ 28.0' Water @ 6.0'.
35'									Reamed Hole to 4" Dia. 12-18.0' Installed: 10'-2" PVC Screen 17'-2" PVC Riser Seal 15'-4" Sand 27.1'-15' Sand above Seal 1-LPP

NOTES: 1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:
50 min. DCON
.75 Hr. Well Devp.

COL. A Coring Times/Ft.

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
GLASTONBURY, CT 06033
(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy
PROJECT NAME Landfill
LOCATION Clinton, CT

BORING NUMBER ME-BR-7
SHEET No. 1 of 1

DRILLER C. Reil
INSPECTOR J. Fitting
DATE START 10-1-90
DATE FINISH 10-3-90

ARCHITECT ENGINEER

	Casing	Sampler	Core Barrel
TYPE	HW	SS	NX
SIZE I.D.	4"	1-3/8"	2"
HAMMER WT.	300	140	
HAMMER FALL	24	30"	

FILE NO.
SURFACE ELEV.
LINE & STATION
OFFSET

DEPTH	SAMPLE NO.	DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	S-1	0-2.0	10	12					
				15	21	17"			Brown Fine-Med. Sand, Little Silt and Gravel.
	S-2	2.0-4.0	13	18					
				13	10	10"			
5'	S-3	4.0-6.0	8	9					
				6	5	8"		6.0	
	S-4	6.0-8.0	1	1					Brown Silt, Trace of Fine Sand.
				1	0	6"		8.0	
	S-5	8.0-10.0	0	0					Fine-Crs. Sand, Silt and Garbage, Fill.
10'				1	9	2"			
	S-6	10.0-12.0	13	35					
				36	32	19"		12.0	
	S-7	12.0-14.0	0	30					Brown Fine-Crs. Sand, Some Silt, Trace of Clay, Gravel.
				33	25	24"			
'	S-8	14.0-15.0	7	15	61/0"	9"		15.0	
									Run 1
	R-1	15.0-20.0	Cored			60"			Cored Black & White Gneiss Rock from 15.0-20.0' Rec. 60".
20'									
	R-2	20.0-25.0	Cored			60"			Run 2 from 20.0-25.0' Rec. 60".
25'									
	R-3	25.0-30.0	Cored			60"			Run 3 from 25.0-30.0' Rec. 60".
30'								30.0	
									End of Boring @ 30.0' Water @ 6.0'. Reamed Hole to 4" Dia. to 15.0'. Installed: 10'-2" PVC Screen 20'-2" PVC Riser 1-LPP
35'									
1									

ES: 1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:
1 Hr. DCON
1.16 Well Devp.

COL. A

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
GLASTONBURY, CT 06033
(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy

PROJECT NAME Landfill

LOCATION Clinton, CT

BORING NUMBER ME-OB-1

SHEET No. 1 of 1

DRILLER W. Burns

INSPECTOR J. Fitting

DATE START 10-9-90

DATE FINISH 10-9-90

ARCHITECT ENGINEER

FILE NO.

SURFACE ELEV.

LINE & STATION

OFFSET

	Casing	Sampler	Core Barrel
TYPE	HSA		
SIZE I.D.	4-1/4"		
HAMMER WT.			
HAMMER FALL			

DEPTH	SAMPLE NO.	SAMPLE DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
		No Samples Required							
5'									
								8.0	
10'									Auger Refusal @ 8.0' No Well.
'									

S: 1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:

COL. A

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
GLASTONBURY, CT 06033
(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy
PROJECT NAME Landfill
LOCATION Clinton, CT

BORING NUMBER ME-OB-1A
SHEET No. 1 of 1

ILLER W. Burns
INSPECTOR J. Fitting
DATE START 10-9-90
DATE FINISH 10-9-90

ARCHITECT ENGINEER

FILE NO.
SURFACE ELEV.
LINE & STATION
OFFSET

	Casing	Sampler	Core Barrel
TYPE	HSA		
SIZE I.D.	4-1/4"		
HAMMER WT.			
HAMMER FALL			

DEPTH	SAMPLE NO.	SAMPLE DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
		No Samples Required							
5'									
								7.0	
10'									Auger Refusal @ 7.0' No Well.

1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:

COL. A

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
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(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy
PROJECT NAME Landfill
LOCATION Clinton, CT

BORING NUMBER ME-OB-2
SHEET No. 1 of 1

DRILLER K. Regan
INSPECTOR J. Fitting
DATE START 10-23-90
DATE FINISH 10-23-90

ARCHITECT ENGINEER

	Casing	Sampler	Core Barrel
TYPE	HSA		
SIZE I.D.	4-1/4"		
HAMMER WT.			
HAMMER FALL			

FILE NO.
SURFACE ELEV.
LINE & STATION
OFFSET

DEPTH	SAMPLE					COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	NO.	DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	REC.		
		No Samples Required						
							4.0	
5'								
								Auger Refusal @ 4.0'.
10'								

S: 1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:

COL. A

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
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(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy

PROJECT NAME Landfill

LOCATION Clinton, CT

BORING NUMBER ME-OB-3

SHEET No. 1 of 1

DRILLER K. Regan

INSPECTOR J. Fitting

DATE START 10-17-90

DATE FINISH 10-18-90

ARCHITECT ENGINEER

	Casing	Sampler	Core Barrel
TYPE	HSA	SS	
SIZE I.D.	4-1/4"	1-3/8"	
HAMMER WT.		140	
HAMMER FALL		30"	

FILE NO.

SURFACE ELEV.

LINE & STATION

OFFSET

DEPTH	SAMPLE NO.	SAMPLE DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	S-1	0-2.0	2	12					Brown Silt, Little Fine-Med. Sand, Trace of Wood, .1 Peat and Wood.
				11	7	9"		2.0	
	S-2	2.0-4.0	1	5					Gray Fine-Med. Sand, Little Silt.
				7	3	15"			
5'	S-3	4.0-6.0	3	2				5.0	
				4	5	22"		6.0	Gray Silt, Little Fine-Med. Sand, Trace of Clay.
	S-4	6.0-8.0	13	15					
				15	18	14"		8.0	Gray Brown Fine-Med. Sand, Trace of Silt, Black Fine Sand Layer.
	S-5	8.0-10.0	13	17					
10'				20	24	24"			
	S-6	10.0-12.0	17	18					Brown Fine-Med. Sand, Trace of Gravel, Silt.
				18	19	17"		12.0	
	S-7	12.0-14.0	22	18					Brown Fine-Crs. Sand, Trace of Gravel, Brown Fine Sand, Little Silt
				27	21	24"		14.0	
	S-8	14.0-16.0	3	7				15.0	Brown Fine-Med. Sand, Trace of Gravel, Little Silt.
				13	6	24"		16.0	
	S-9	16.0-18.0	7	11					Brown Fine-Crs. Sand, Some Gravel, Trace of Silt.
				13	9	12"			
	S-10	18.0-20.0	20	11					Gray Brown Fine-Crs. Sand and Gravel, Trace of Silt.
20'				7	12	5"			
	S-11	20.0-22.0	32	44					
				103	200	24"		22.0	
	S-12	22.0-22.3	200/4"					22.3	Gray Silt, Trace of Fine-Crs. Sand, Gravel, Clay.
25'									Auger Refusal @ 22.6' Water @ Ground Level.
30'									
35'									

1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:

COL. A

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
GLASTONBURY, CT 06033
(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy
PROJECT NAME Landfill
LOCATION Clinton, CT

BORING NUMBER ME-OB-3A
SHEET No. 1 of 1

DRILLER K. Regan
INSPECTOR J. Fitting
DATE START 10-19-90
DATE FINISH 10-19-90

ARCHITECT ENGINEER

FILE NO.
SURFACE ELEV.
LINE & STATION
OFFSET

	Casing	Sampler	Core Barrel
TYPE	HW		
SIZE I.D.	4"		
HAMMER WT.	300		
HAMMER FALL	24		

DEPTH	SAMPLE NO.	SAMPLE DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
		No Samples Required							
5'									
10'									
								11.0	
									End of Boring @ 11.0' Water @ Ground Level. Installed: 5'-2" PVC Screen 8'-2" PVC Riser Sand to 4.0' Seal to Surface 1-LPP
'									
20'									
25'									
30'									
35'									
'									

ES: 1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:

COL. A

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
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(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy
PROJECT NAME Landfill
LOCATION Clinton, CT

BORING NUMBER ME-OB-3B
SHEET No. 1 of 1

DRILLER K. Regan
INSPECTOR J. Fitting
DATE START 10-18-90
DATE FINISH 10-18-90

ARCHITECT ENGINEER

	Casing	Sampler	Core Barrel
TYPE	HW		
SIZE I.D.	4"		
HAMMER WT.	300		
HAMMER FALL	24		

FILE NO.
SURFACE ELEV.
LINE & STATION
OFFSET

DEPTH	SAMPLE NO.	SAMPLE DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
		No Samples Required							
5'									
10'									
'									
20'								20.3	
									End of Boring @ 20.3' Water @ Ground Level. Installed: 5'-2" PVC Screen 17'-2" PVC Riser Sand to 13.0' Seal to 4.0' Sand to Surface 1-LPP
25'									
30'									
35'									
'									

S: 1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS: .25 Hr. Well Devp.

COL. A

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
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(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy
PROJECT NAME Landfill
LOCATION Clinton, CT

BORING NUMBER ME-OB-4
SHEET No. 1 of 1

DRILLER W. Burns
INSPECTOR J. Fitting
DATE START 10-10-90
DATE FINISH 10-11-90

ARCHITECT ENGINEER

	Casing	Sampler	Core Barrel
TYPE	HSA	SS	
SIZE I.D.	4-1/4"	1-3/8"	
HAMMER WT.		140	
HAMMER FALL		30"	

FILE NO.
SURFACE ELEV.
LINE & STATION
OFFSET

DEPTH	SAMPLE NO.	DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	S-1	0-2.0	1	1					Brown Fine-Crs. Sand, Trace of Gravel, Wood, Plastic, Black Fine-Med. Sand, Trace of Silt.
				1	2	14"			
	S-2	2.0-4.0	1	1					
				2	5	24"		3.5	
5'	S-3	4.0-6.0	1	5					Brown Gray Silt and Clay.
				10	13	17"		5.7	
	S-4	6.0-8.0	4	5				6.0	Gray Fine-Crs. Sand, Trace of Gravel, Silt.
				9	4			8.0	Gray Silt, Trace of Fine-Crs. Sand, Little Gravel, Trace of Silt.
	S-5	8.0-9.6	43	41					
10'				47	100/2"			9.6	Red Brown Fine-Crs. Sand and Gravel, Little Silt.
20'									
25'									

Auger Refusal @ 9.6'
Water @ Ground Level.

Installed: 5'-2" PVC Screen
6.5'-2" PVC Riser
Sand to 3.5'
Seal to 1.0'
1-LPP

1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:
1 Hr. DCON

COL. A

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
GLASTONBURY, CT 06033
(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy

PROJECT NAME Landfill

LOCATION Clinton, CT

BORING NUMBER ME-OB-7

SHEET No. 1 of 1

DRILLER C. Reil

INSPECTOR J. Fitting

DATE START 10-3-90

DATE FINISH 10-3-90

ARCHITECT ENGINEER

	Casing	Sampler	Core Barrel
TYPE	HSA		
SIZE I.D.	4-1/4"		
HAMMER WT.			
HAMMER FALL			

FILE NO.

SURFACE ELEV.

LINE & STATION

OFFSET

DEPTH	SAMPLE NO.	SAMPLE DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
		No Samples Required							
5'									
10'									
								13.5	
'									End of Boring @ 13.5' Water @ 6.0'. Installed: 10'-2" PVC Screen 4'-2" PVC Riser 1-LPP
20'									
25'									
30'									
35'									
'									

S: 1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.

2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

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140 lb. Wt. falling 30" on 2" O.D. Sampler

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10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:

COL. A

APPENDIX C

Old Nod Road Landfill
Laboratory Reports

COLLEGE PLAZA
51 COLLEGE STREET
NEW HAVEN, CT 06510
TELEPHONE 203/776-9624

ENVIRONMENTAL
CONSULTING LABORATORIES, INC.

CONNECTICUT TOLL-FREE
1-800-343-4569
Connecticut Certification PH-0535

REPORT PREPARED FOR

Metcalf & Eddy, Inc.
One Research Parkway, Suite 2
Meriden, CT 06450

ATTENTION Mr. Jim Fitting

Sample Type: Water
Collected By: Client

Report Date:	December 13, 1990
Report No.:	M90-2657
Subcontractor No.:	90-005936-02
Date Received:	
90-5936 - 90-5943:	November 20, 1990
90-5944 - 90-5946:	November 21, 1990
90-5955 - 90-5961:	NOvember 21, 1990

Project: Clinton Landfill

REPORT PREPARED BY:

for
Nancy R. Ballou
Laboratory Supervisor

REPORT CERTIFIED BY:

David C. Barris
Laboratory Director

Client I.D.: 005936

(Units in mg/L)

Sample No.:	MEBRI-GW 90-5936	MEBR3-GW 90-5937	MEOB3A-GW 90-5938	MEOB3B-GW 90-5939
Parameter				
Metals:				
Arsenic	<0.05	<0.05	<0.05	<0.05
Barium	<1.0	<1.0	<1.0	<1.0
Cadmium	<0.01	<0.01	<0.01	<0.01
Chromium	<0.050	<0.050	<0.050	<0.050
Lead	<0.05	<0.05	<0.05	<0.05
Mercury	<0.0020	<0.0020	<0.0020	<0.0020
Selenium	<0.01	<0.01	<0.01	<0.01
Silver	<0.050	<0.050	<0.050	<0.050
Iron	49.6	36.5	48.8	65.1
Manganese	2.40	1.32	0.737	3.27
Sodium	16.8	41.9	44.2	180
Alkalinity	*	2340	1410	710
Ammonia	*	8.3	7.5	2.8
Chloride	*	314	319	109
Nitrate	*	12.0	<1.0	<1.0
Total Dissolved Solids	*	2936	1852	934
Total Cyanide	<0.02	<0.02	<0.02	<0.02

*Sample not received.

Client I.D.: 005936

Sample No.:	MEBR4-GW 90-5940	MEOB4-GW 90-5941	MEBR6-GW 90-5942	SW2-GW 90-5943
		(Units in mg/L)		
Parameter				
Metals:				
Arsenic	<0.05	<0.05	<0.05	<0.05
Barium	<1.0	<1.0	<1.0	<1.0
Cadmium	<0.01	<0.01	<0.01	<0.01
Chromium	<0.050	<0.050	<0.050	<0.050
Lead	<0.05	<0.05	<0.05	<0.05
Mercury	<0.0020	<0.0020	<0.0020	<0.0020
Selenium	<0.01	0.015	<0.01	<0.01
Silver	<0.050	<0.050	<0.050	<0.050
Iron	43.2	58.7	56.0	45.8
Manganese	9.24	5.55	1.85	1.07
Sodium	46.0	223	85.2	288
Alkalinity	1290	1320	980	1460
Ammonia	2.3	3.0	63	34
Chloride	314	334	124	99
Nitrate	<1.0	<1.0	<1.0	0.60
Total Dissolved Solids	1888	1910	1162	1730
Total Cyanide	<0.02	<0.02	<0.02	<0.02

Client I.D.: 005936

Sample No.:	MEBR5-GW 90-5944	MEBR9-GW 90-5946	MEBR2-GW 90-5955	MEBR7-GW 90-5956
		(Units in mg/L)		
Parameter				
Metals:				
Arsenic	<0.05	<0.05	<0.05	<0.05
Barium	<1.0	<1.0	<1.0	<1.0
Cadmium	<0.01	<0.01	<0.01	<0.01
Chromium	<0.050	<0.050	<0.050	<0.050
Lead	<0.05	<0.05	<0.05	<0.05
Mercury	<0.0020	<0.0020	<0.0020	<0.0020
Selenium	<0.01	<0.01	<0.01	<0.01
Silver	<0.050	<0.050	<0.050	<0.050
Iron	45.0	<0.050	18.6	28.8
Manganese	2.63	<0.015	7.49	2.91
Sodium	10.3	<1.0	9.72	9.08
Alkalinity	140	<1.0	100	60
Ammonia	4.4	<0.03	0.07	0.67
Chloride	6.0	<1.0	<1.0	9.0
Nitrate	<1.0	<1.0	<1.0	<1.0
Total Dissolved Solids	240	<1.0	240	154
Total Cyanide	<0.02	NR	<0.02	<0.02

NR = Not Requested

Client I.D.: 005936

Sample No.:	MEOB7-GW 90-5957	MEBR10-GW 90-5958	MESW3 90-5960	MESW4 90-5961
		(Units in mg/L)		
Parameter				
Metals:				
Arsenic	<0.05	<0.05	<0.05	<0.05
Barium	<1.0	<1.0	<1.0	<1.0
Cadmium	<0.01	<0.01	<0.01	<0.01
Chromium	<0.050	<0.050	<0.050	<0.050
Lead	<0.05	<0.05	<0.05	<0.05
Mercury	<0.0020	<0.0020	<0.0020	<0.0020
Selenium	<0.01	<0.01	<0.01	<0.01
Silver	<0.050	<0.050	<0.050	<0.050
Iron	74.9	28.9	16.3	19.7
Manganese	1.21	3.03	1.31	1.91
Sodium	7.60	9.67	103	109
Alkalinity	90	72	400	600
Ammonia	6.3	0.97	7.6	7.7
Chloride	5.0	5.0	86	72
Nitrate	<1.0	<1.0	<1.0	<1.0
Total Dissolved Solids	218	166	620	760
Total Cyanide	<0.02	<0.02	<0.02	<0.02

Client I.D.: 005936

Sample No.:	MEBRI-GW 90-5936	MEBR3-GW 90-5937	MEOB3A-GW 90-5938	MEOB3B-GW 90-5939
		(Units in ppb)		
Parameter				
EPA Method 8240				
Chloromethane	57.4	216	488	857
Bromomethane	<10.0	<10.0	<10.0	<10.0
Vinyl Chloride	<1.0	<1.0	<1.0	<1.0
Chloroethane	<10.0	<10.0	<10.0	<10.0
Methylene Chloride	<1.0	1.4	<1.0	2.5
Acetone	<10.0	<10.0	<10.0	<10.0
Carbon Disulfide	<10.0	<10.0	<10.0	<10.0
1, 1-Dichloroethene	2.4	<1.0	<1.0	<1.0
1, 1-Dichloroethane	14.9	<1.0	<1.0	1.7
Trans-1, 2-Dichloroethene	<1.0	<1.0	<1.0	2.2
Chloroform	<1.0	<1.0	<1.0	<1.0
1, 2-Dichloroethane	1.6	2.8	3.2	5.3
2-Butanone	<10.0	<10.0	<10.0	<10.0
1, 1, 1-Trichloroethane	2.3	<1.0	<1.0	<1.0
Carbon Tetrachloride	2.1	<1.0	<1.0	<1.0
Vinyl Acetate	<10.0	<10.0	<10.0	<10.0
Bromodichloromethane	<1.0	<1.0	<1.0	<1.0
1, 2-Dichloropropane	<1.0	<1.0	<1.0	<1.0
Trans-1, 3-Dichloropropene	<1.0	<1.0	<1.0	<1.0
Trichloroethene	4.5	<1.0	<1.0	<1.0
Dibromochloromethane	<1.0	<1.0	<1.0	<1.0
1, 1, 2 - Trichloroethane	<1.0	<1.0	<1.0	<1.0
Benzene	12.0	29.2	29.0	33.7
cis-1, 3-Dichloropropene	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinylether	<1.0	<1.0	<1.0	<1.0
Bromoform	<1.0	<1.0	<1.0	<1.0
4-Methyl-2-Pentanone	<10.0	<10.0	<10.0	<10.0
2-Hexanone	<10.0	<10.0	<10.0	<10.0
Tetrachloroethene	<1.0	<1.0	<1.0	<1.0
1, 1, 2, 2-Tetrachloroethane	<1.0	<1.0	<1.0	<1.0
Toluene	54.3	5.7	<1.0	<1.0
Chlorobenzene	<1.0	2.3	<1.0	<1.0
Ethylbenzene	3.3	2.1	<1.0	10.7
Styrene	<1.0	<1.0	<1.0	<1.0
Total Xylenes	6.9	33.0	30.0	21.7

Client I.D.: 005936

(Units in ppb)

Sample No.:	MEBR4-GW 90-5940	MEOB4-GW 90-5941	MEBR6-GW 90-5942	SW2-GW 90-5943
Parameter				
EPA Method 8240				
Chloromethane	646	456	525	315
Bromomethane	<10.0	<10.0	<10.0	<10.0
Vinyl Chloride	<1.0	<1.0	<1.0	<1.0
Chloroethane	<10.0	<10.0	<10.0	<10.0
Methylene Chloride	2.4	<1.0	<1.0	<1.0
Acetone	<10.0	<10.0	<10.0	<10.0
Carbon Disulfide	<10.0	<10.0	<10.0	<10.0
1, 1-Dichloroethene	<1.0	<1.0	<1.0	<1.0
1, 1-Dichloroethane	1.2	<1.0	4.3	<1.0
Trans-1, 2-Dichloroethene	<1.0	<1.0	<1.0	2.2
Chloroform	<1.0	<1.0	<1.0	<1.0
1, 2-Dichloroethane	<1.0	1.2	<1.0	2.3
2-Butanone	<10.0	<10.0	<10.0	<10.0
1, 1, 1-Trichloroethane	<1.0	<1.0	<1.0	<1.0
Carbon Tetrachloride	<1.0	<1.0	<1.0	<1.0
Vinyl Acetate	<10.0	<10.0	<10.0	<10.0
Bromodichloromethane	<1.0	<1.0	<1.0	<1.0
1, 2-Dichloropropane	<1.0	<1.0	<1.0	<1.0
Trans-1, 3-Dichloropropene	<1.0	<1.0	<1.0	<1.0
Trichloroethene	<1.0	<1.0	<1.0	<1.0
Dibromochloromethane	<1.0	<1.0	<1.0	<1.0
1, 1, 2 - Trichloroethane	<1.0	<1.0	<1.0	<1.0
Benzene	28.7	19.2	5.0	40.0
cis-1, 3-Dichloropropene	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinylether	<1.0	<1.0	<1.0	<1.0
Bromoform	<1.0	<1.0	<1.0	<1.0
4-Methyl-2-Pentanone	<10.0	<10.0	<10.0	<10.0
2-Hexanone	<10.0	<10.0	<10.0	<10.0
Tetrachloroethene	<1.0	<1.0	<1.0	<1.0
1, 1, 2, 2-Tetrachloroethane	<1.0	<1.0	<1.0	<1.0
Toluene	1.2	1.1	1.6	2.2
Chlorobenzene	2.3	1.3	2.3	4.7
Ethylbenzene	7.1	1.2	10.3	1.2
Styrene	<1.0	<1.0	<1.0	<1.0
Total Xylenes	340	207	16.6	30.7

Client I.D.: 005936

Sample No.:	MEBR5-GW 90-5944	MEBR8-GW 90-5945	MEBR9-GW 90-5946	MEBR2-GW 90-5955
		(Units in ppb)		
Parameter				
EPA Method 8240				
Chloromethane	587	<10.0	<10.0	260
Bromomethane	<10.0	<10.0	<10.0	<10.0
Vinyl Chloride	<1.0	<1.0	<1.0	20.3
Chloroethane	<10.0	<10.0	<10.0	<10.0
Methylene Chloride	1.4	<1.0	<1.0	<1.0
Acetone	<10.0	<10.0	<10.0	<10.0
Carbon Disulfide	<10.0	<10.0	<10.0	<10.0
1, 1-Dichloroethene	<1.0	<1.0	<1.0	<1.0
1, 1-Dichloroethane	5.0	<1.0	<1.0	99.5
Trans-1, 2-Dichloroethene	<1.0	<1.0	<1.0	1.6
Chloroform	<1.0	<1.0	<1.0	2.1
1, 2-Dichloroethane	<1.0	<1.0	<1.0	<1.0
2-Butanone	<10.0	<10.0	<10.0	<10.0
1, 1, 1-Trichloroethane	<1.0	<1.0	<1.0	1.7
Carbon Tetrachloride	<1.0	<1.0	<1.0	<1.0
Vinyl Acetate	<10.0	<10.0	<10.0	<10.0
Bromodichloromethane	<1.0	<1.0	<1.0	<1.0
1, 2-Dichloropropane	<1.0	<1.0	<1.0	<1.0
Trans-1, 3-Dichloropropene	<1.0	<1.0	<1.0	<1.0
Trichloroethene	<1.0	<1.0	<1.0	2.7
Dibromochloromethane	<1.0	<1.0	<1.0	<1.0
1, 1, 2 - Trichloroethane	<1.0	<1.0	<1.0	<1.0
Benzene	5.5	<1.0	<1.0	9.7
cis-1, 3-Dichloropropene	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinylether	<1.0	<1.0	<1.0	<1.0
Bromoform	<1.0	<1.0	<1.0	<1.0
4-Methyl-2-Pentanone	<10.0	<10.0	<10.0	<10.0
2-Hexanone	<10.0	<10.0	<10.0	<10.0
Tetrachloroethene	<1.0	<1.0	<1.0	<1.0
1, 1, 2, 2-Tetrachloroethane	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	<1.0	11.4
Chlorobenzene	2.3	<1.0	<1.0	<1.0
Ethylbenzene	11.5	<1.0	<1.0	3.6
Styrene	<1.0	<1.0	<1.0	1.0
Total Xylenes	17.4	<1.0	<1.0	4.8

Client I.D.: 005936

Sample No.:	MEBR7-GW 90-5956	MEBO7-GW 90-5957	MEBR10-GW 90-5958	MEBR11-GW 90-5959
		(Units in ppb)		
Parameter				
EPA Method 8240				
Chloromethane	<10.0	<10.0	56	<10.0
Bromomethane	<10.0	<10.0	<10.0	<10.0
Vinyl Chloride	<1.0	<1.0	<1.0	<10.0
Chloroethane	<10.0	<10.0	<10.0	<10.0
Methylene Chloride	<1.0	<1.0	<1.0	<1.0
Acetone	<10.0	<10.0	<10.0	<10.0
Carbon Disulfide	<10.0	<10.0	<10.0	<10.0
1, 1-Dichloroethene	<1.0	<1.0	<1.0	<1.0
1, 1-Dichloroethane	3.9	<1.0	13.0	<1.0
Trans-1, 2-Dichloroethene	<1.0	<1.0	<1.0	<1.0
Chloroform	<1.0	<1.0	<1.0	<1.0
1, 2-Dichloroethane	<1.0	<1.0	<1.0	<1.0
2-Butanone	<10.0	<10.0	<10.0	<10.0
1, 1, 1-Trichloroethane	<1.0	<1.0	<1.0	<1.0
Carbon Tetrachloride	<1.0	<1.0	<1.0	<1.0
Vinyl Acetate	<10.0	<10.0	<10.0	<10.0
Bromodichloromethane	<1.0	<1.0	<1.0	<1.0
1, 2-Dichloropropane	<1.0	<1.0	<1.0	<1.0
Trans-1, 3-Dichloropropene	<1.0	<1.0	<1.0	<1.0
Trichloroethene	<1.0	<1.0	<1.0	<1.0
Dibromochloromethane	<1.0	<1.0	<1.0	<1.0
1, 1, 2 - Trichloroethane	<1.0	<1.0	<1.0	<1.0
Benzene	<1.0	<1.0	1.9	<1.0
cis-1, 3-Dichloropropene	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinylether	<1.0	<1.0	<1.0	<1.0
Bromoform	<1.0	<1.0	<1.0	<1.0
4-Methyl-2-Pentanone	<10.0	<10.0	<10.0	<10.0
2-Hexanone	<10.0	<10.0	<10.0	<10.0
Tetrachloroethene	<1.0	<1.0	<1.0	<1.0
1, 1, 2, 2-Tetrachloroethane	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	<1.0	1.5	<1.0	<1.0
Styrene	<1.0	<1.0	<1.0	<1.0
Total Xylenes	<1.0	6.3	<1.0	<1.0

Client I.D.: 005936

Sample No.:	MESW3 90-5960	MESW4 90-5961
	(Units in ppb)	
Parameter		
EPA Method 8240		
Chloromethane	19.6	18.1
Bromomethane	<10.0	<10.0
Vinyl Chloride	<1.0	<1.0
Chloroethane	<10.0	<10.0
Methylene Chloride	<1.0	<1.0
Acetone	<10.0	<10.0
Carbon Disulfide	<10.0	<10.0
1, 1-Dichloroethene	<1.0	<1.0
1, 1-Dichloroethane	<1.0	<1.0
Trans-1, 2-Dichloroethene	<1.0	<1.0
Chloroform	<1.0	<1.0
1, 2-Dichloroethane	<1.0	<1.0
2-Butanone	<10.0	<10.0
1, 1, 1-Trichloroethane	<1.0	<1.0
Carbon Tetrachloride	<1.0	<1.0
Vinyl Acetate	<10.0	<10.0
Bromodichloromethane	<1.0	<1.0
1, 2-Dichloropropane	<1.0	<1.0
Trans-1, 3-Dichloropropene	<1.0	<1.0
Trichloroethene	<1.0	<1.0
Dibromochloromethane	<1.0	<1.0
1, 1, 2 - Trichloroethane	<1.0	<1.0
Benzene	<1.0	<1.0
cis-1, 3-Dichloropropene	<1.0	<1.0
2-Chloroethylvinylether	<1.0	<1.0
Bromoform	<1.0	<1.0
4-Methyl-2-Pentanone	<10.0	<10.0
2-Hexanone	<10.0	<10.0
Tetrachloroethene	<1.0	<1.0
1, 1, 2, 2-Tetrachloroethane	<1.0	<1.0
Toluene	<1.0	<1.0
Chlorobenzene	<1.0	<1.0
Ethylbenzene	<1.0	<1.0
Styrene	<1.0	<1.0
Total Xylenes	<1.0	<1.0

ENVIRONMENTAL CONSULTING LABORATORIES, INC.

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Page 1 of __

CHAIN OF CUSTODY RECORD

Client: Metcalf & Eddy
(Note: Complete reverse side if new client only.)

Project No./Name Clinton Landfill

Samplers: D. J. Fritting, M. R. Lewis

Sample Location	Date	Time	Sample Type				No. of Containers	Analysis Required
			Water	Solid	Comp	Grab		
005936-MEBR1-GW	11/19/90		X			X	6 (5)	8240, total RCRA metals*, iron, manganese, alkalinity, ammonia, chloride, nitrate, sodium, TDS, total cyanide
005936-MEBR3-GW	11/19/90		X			X	6	"
005936-MEOB3A-GW	11/19/90		X			X	6	"
005936-MEOB3B-GW	11/19/90		X			✓	6	"
005936-MEBR4-GW	11/20/90		X			X	6	"
005936-MEOB4-GW	11/20/90		X			X	6	"
005936-MEBR6-GW	11/20/90		X			X	6	"
005936-SW2-GW	11/20/90		X			X	6	"
005936-MEBR5-GW	11/20/90		X			X	6	"
005936-MEBR8-GW	11/19/90		X			X	3	8240
005936-MEBR8-GW (BR9)	11/19/90		X			X	5 (4)	all of above except cyanide

Relinquished by: Signature	Date/Time	Received by: Signature	Date/Time
D. James Fritting		Carl Bude	11/21/90
Relinquished by: Signature	Date/Time	Received by: Signature	Date/Time
Relinquished by: Signature	Date/Time	Received by: Signature	Date/Time

Lab Remarks:

Turn-Around Time: Normal X → 14 calendar days (12/4/90) Rush ______

* RCRA metals: arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver

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Page 1 of 1

CHAIN OF CUSTODY RECORD

Client: Metcalf & Eddy
(Note: Complete reverse side if new client only.)

Project No./Name Clinton Landfill

Samplers: D.J. Fitting, M.R Lewis

Sample Location	Date	Time	Sample Type: Water	Solid	Comp	Grab	No. of Containers	Analysis Required
								dissolvd
005936-MEBR2-GW	11/21/90	12:30	X				6	8240, ~~total~~ RCRA metals, i manganese, alkalinity, ammoni
005936-MEBR7-GW	11/21/90	10:45	X				6	chloride, nitrate, sodium, TDS, total cyanide
005936-MEOB7-GW	11/21/90	09:00	X				6	"
005936-MEBR10-GW	11/21/90	11:00	X				6	"
005936-MEBR11-GW	11/21/90	14:35	X				3	8240 — total
005936-MESW3	11/21/90	13:10	X				6 total — total	~~dissolved~~ RCRA metals, ~~dissolved~~ iro ~~dissolved~~ Mn & 8240, alkalinity
5936-MESW4	11/21/90	13:20	X				6	ammonia, TDS, sodium, Chloride, total cyanide, nitrate

Relinquished by: Signature	Date/Time	Received by: Signature	Date/Time
D. James Fitting	11/21/90 15:47	Receipt of Samples J. Yon	11/21/90 3:45 pm
Relinquished by: Signature	Date/Time	Received by: Signature	Date/Time
Relinquished by: Signature	Date/Time	Received by: Signature	Date/Time

Lab Remarks: → 14 calendar days (12/5/90)

Turn-Around Time: Normal X Rush ____

* RCRA metals: arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver

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ENVIRONMENTAL
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Connecticut Certification PH-0535

December 19, 1990

Mr. Jim Fitting
Metcalf & Eddy, Inc.
One Research Parkway
Suite 2
Meriden, CT 06450

Dear Mr. Fitting:

Enclosed is an Addendum corresponding to Report No. M90-2657 for the Quality Assurance/Quality Control Data.

Should you have any questions, please feel free to contact me.

Sincerely,

David C. Barris
Laboratory Directory

/ed

Enclosure

Metcalf & Eddy, Inc.
December 19, 1990
Report No.: M90-2657

ADDENDUM

Quality Assurance/Quality Control Data

Sample No.:	90-5936	90-5937	90-5938	90-5939
		(% Error)		
Parameter				
Metals:				
Arsenic	0	-	0	-
Barium	0	-	0	-
Cadmium	0	-	0	-
Chromium	0	-	0	-
Lead	0	-	-	-
Mercury	0	-	-	-
Selenium	0	-	-	-
Silver	0	-	-	-
Iron	1.0	-	-	-
Manganese	1.2	-	-	-
Sodium	3.0	-	-	-
Alkalinity	-	-	-	-
Chloride	-	0.64	-	-
Ammonia	-	-	-	7.4
Nitrate	-	-	-	-
Total Dissolved Solids	-	-	-	-
Total Cyanide	0	-	-	-

ADDENDUM

Quality Assurance/Quality Control Data

Sample No.:	90-5941	90-5943	90-5946	90-5955
		(% Error)		
Parameter				
Metals:				
Arsenic	-	-	-	-
Barium	-	-	-	-
Cadmium	-	-	-	-
Chromium	-	-	-	-
Lead	-	-	-	0
Mercury	-	-	-	0
Selenium	-	-	-	0
Silver	-	-	-	0
Iron	-	-	-	3.3
Manganese	-	-	-	1.5
Sodium	-	-	-	3.8
Alkalinity	-	0.69	-	-
Chloride	-	-	-	0
Ammonia	-	-	-	13.3
Nitrate	-	-	0	0
Total Dissolved Solids	0.79	-	-	-
Total Cyanide	-	-	-	0

ADDENDUM

Quality Assurance/Quality Control Data

Sample No.:	90-5960
Parameter	
Metals:	
Arsenic	-
Barium	-
Cadmium	-
Chromium	-
Lead	-
Mercury	-
Selenium	-
Silver	-
Iron	-
Manganese	-
Sodium	-
Alkalinity	2.5
Chloride	-
Ammonia	-
Nitrate	-
Total Dissolved Solids	1.6
Total Cyanide	-

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Connecticut Certification PH-0535

January 16, 1991

Mr. Jim Fitting
Metcalf & Eddy, Inc.
One Research Parkway
Suite 2
Meriden, CT 06450

Dear Mr. Fitting:

Enclosed is Addendum II corresponding to Report No. M90-2657 for the Quality Assurance/Quality Control Data.

Should you have any questions, please feel free to contact me.

Sincerely,

David C. Barris
Laboratory Directory

/ed

Enclosure

ADDENDUM II

Metcalf & Eddy, Inc. Report No.: M90-2657

Quality Assurance/Quality Control Data
GC/MS Volatile Organics

EPA Method 8240

Sample Number	Range of Surrogate Recovery (%)
90-5936	95-102
90-5937	98-120
90-5938	94-111
90-5939	107-111
90-5940	99-107
90-5941	102-104
90-5942	91-119
90-5943	91-95
90-5944	104-112
90-5945	107-120
90-5946	96-106
90-5955	68-74
90-5956	101-106
90-5957	60-66
90-5958	101-110
90-5959	63-85
90-5960	98-103
90-5961	101-109

Surrogates spiked at 10 ppb level.
Surrogate Recovery dependent on sample matrix.

Quality Assurance/Quality Control Data
GC/MS Volatile Organics

	Method Blank	
	Start Run	End Run
Sample No.:	BLK 121S	BLK 121E
	(Units in ppb)	
Parameter		
EPA Method 8240		
Chloromethane	<10	<10
Bromomethane	<10	<10
Vinyl Chloride	<1.0	<1.0
Chloroethane	<10	<10
Methylene Chloride	<1.0	<1.0
Acetone	<10	<10
Carbon Disulfide	<10	<10
1, 1-Dichloroethene	<1.0	<1.0
1, 1-Dichloroethane	<1.0	<1.0
Trans-1, 2-Dichloroethene	<1.0	<1.0
Chloroform	<1.0	<1.0
1, 2-Dichloroethane	<1.0	<1.0
2-Butanone	<10	<10
1, 1, 1-Trichloroethane	<1.0	<1.0
Carbon Tetrachloride	<1.0	<1.0
Vinyl Acetate	<10	<10
Bromodichloromethane	<1.0	<1.0
1, 2-Dichloropropane	<1.0	<1.0
Trans-1, 3-Dichloropropene	<1.0	<1.0
Trichloroethene	<1.0	<1.0
Dibromochloromethane	<1.0	<1.0
1, 1, 2 - Trichloroethane	<1.0	<1.0
Benzene	<1.0	<1.0
cis-1, 3-Dichloropropene	<1.0	<1.0
2-Chloroethylvinylether	<1.0	<1.0
Bromoform	<1.0	<1.0
4-Methyl-2-Pentanone	<10	<10
2-Hexanone	<10	<10
Tetrachloroethene	<1.0	<1.0
1, 1, 2, 2-Tetrachloroethane	<1.0	<1.0
Toluene	<1.0	<1.0
Chlorobenzene	<1.0	<1.0
Ethylbenzene	<1.0	<1.0
Styrene	<1.0	<1.0
Total Xylenes	<1.0	<1.0

Quality Assurance/Quality Control Data
GC/MS Volatile Organics

Spike Recovery CLP Spike Mix at 25 ppb

Client I.D.:	Initial	Spiked	%
Sample No.:	90-5959	90-5959S	Recovery
	(Units in ppb)		
Parameter			
EPA Method 8240			
Chloromethane	<1.0	<1.0	
Bromomethane	<1.0	<1.0	
Vinyl Chloride	<1.0	<1.0	
Chloroethane	<1.0	<1.0	
Methylene Chloride	<1.0	<1.0	
Acetone	<1.0	<1.0	
Carbon Disulfide	<1.0	<1.0	
1, 1-Dichloroethene	<1.0	27.5	110
1, 1-Dichloroethane	<1.0	<1.0	
Trans-1, 2-Dichloroethene	<1.0	<1.0	
Chloroform	<1.0	<1.0	
1, 2-Dichloroethane	<1.0	<1.0	
2-Butanone	<1.0	<1.0	
1, 1, 1-Trichloroethane	<1.0	<1.0	
Carbon Tetrachloride	<1.0	<1.0	
Vinyl Acetate	<1.0	<1.0	
Bromodichloromethane	<1.0	<1.0	
1, 2-Dichloropropane	<1.0	<1.0	
Trans-1, 3-Dichloropropene	<1.0	<1.0	
Trichloroethene	<1.0	23.2	92.8
Dibromochloromethane	<1.0	<1.0	
1, 1, 2 - Trichloroethane	<1.0	<1.0	
Benzene	<1.0	28.2	113
cis-1, 3-Dichloropropene	<1.0	<1.0	
2-Chloroethylvinylether	<1.0	<1.0	
Bromoform	<1.0	<1.0	
4-Methyl-2-Pentanone	<1.0	<1.0	
2-Hexanone	<1.0	<1.0	
Tetrachloroethene	<1.0	<1.0	
1, 1, 2, 2-Tetrachloroethane	<1.0	<1.0	
Toluene	<1.0	26.7	107
Chlorobenzene	<1.0	24.9	99.6
Ethylbenzene	<1.0	<1.0	
Styrene	<1.0	<1.0	

Quality Assurance/Quality Control Data
GC/MS Volatile Organics
Duplicates

Client I.D.: Sample No.: Parameter	Initial 90-5959	Duplicate 90-5959D	% Difference
	(Units in ppb)		
EPA Method 8240			
Chloromethane	<1.0	<1.0	0
Bromomethane	<1.0	<1.0	0
Vinyl Chloride	<1.0	<1.0	0
Chloroethane	<1.0	<1.0	0
Methylene Chloride	<1.0	<1.0	0
Acetone	<1.0	<1.0	0
Carbon Disulfide	<1.0	<1.0	0
1, 1-Dichloroethene	<1.0	<1.0	0
1, 1-Dichloroethane	<1.0	<1.0	0
Trans-1, 2-Dichloroethene	<1.0	<1.0	0
Chloroform	<1.0	<1.0	0
1, 2-Dichloroethane	<1.0	<1.0	0
2-Butanone	<1.0	<1.0	0
1, 1, 1-Trichloroethane	<1.0	<1.0	0
Carbon Tetrachloride	<1.0	<1.0	0
Vinyl Acetate	<1.0	<1.0	0
Bromodichloromethane	<1.0	<1.0	0
1, 2-Dichloropropane	<1.0	<1.0	0
Trans-1, 3-Dichloropropene	<1.0	<1.0	0
Trichloroethene	<1.0	<1.0	0
Dibromochloromethane	<1.0	<1.0	0
1, 1, 2 - Trichloroethane	<1.0	<1.0	0
Benzene	<1.0	<1.0	0
cis-1, 3-Dichloropropene	<1.0	<1.0	0
2-Chloroethylvinylether	<1.0	<1.0	0
Bromoform	<1.0	<1.0	0
4-Methyl-2-Pentanone	<1.0	<1.0	0
2-Hexanone	<1.0	<1.0	0
Tetrachloroethene	<1.0	<1.0	0
1, 1, 2, 2-Tetrachloroethane	<1.0	<1.0	0
Toluene	<1.0	<1.0	0
Chlorobenzene	<1.0	<1.0	0
Ethylbenzene	<1.0	<1.0	0
Styrene	<1.0	<1.0	0
Total Xylenes	<1.0	<1.0	0

Quality Assurance/Quality Control Data
GC/MS Volatile Organics

Duplicates

Client I.D.: Sample No.:	Initial 90-5936	Duplicate 90-5936D	% Difference
	(Units in ppb)		
Parameter			
EPA Method 8240			
Chloromethane	57.4	56.2	2.1
Bromomethane	<1.0	<1.0	
Vinyl Chloride	<1.0	<1.0	
Chloroethane	<1.0	<1.0	
Methylene Chloride	<1.0	<1.0	
Acetone	<1.0	<1.0	
Carbon Disulfide	<1.0	<1.0	
1, 1-Dichloroethene	2.4	<1.0	8.0
1, 1-Dichloroethane	14.9	13.7	
Trans-1, 2-Dichloroethene	<1.0	<1.0	
Chloroform	<1.0	<1.0	
1, 2-Dichloroethane	1.6	<1.0	37.5
2-Butanone	<1.0	<1.0	
1, 1, 1-Trichloroethane	2.3	<1.0	56.5
Carbon Tetrachloride	2.1	<1.0	52.4
Vinyl Acetate	<1.0	<1.0	
Bromodichloromethane	<1.0	<1.0	
1, 2-Dichloropropane	<1.0	<1.0	
Trans-1, 3-Dichloropropene	<1.0	<1.0	
Trichloroethene	4.5	2.3	48.9
Dibromochloromethane	<1.0	<1.0	
1, 1, 2 - Trichloroethane	<1.0	<1.0	
Benzene	12.0	10.2	15
cis-1, 3-Dichloropropene	<1.0	<1.0	
2-Chloroethylvinylether	<1.0	<1.0	
Bromoform	<1.0	<1.0	
4-Methyl-2-Pentanone	<1.0	<1.0	
2-Hexanone	<1.0	<1.0	
Tetrachloroethene	<1.0	<1.0	
1, 1, 2, 2-Tetrachloroethane	<1.0	<1.0	
Toluene	54.3	54.3	0
Chlorobenzene	<1.0	<1.0	
Ethylbenzene	3.3	2.7	18
Styrene	<1.0	<1.0	
Total Xylenes	6.9	5.8	15.9

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REPORT PREPARED FOR

Metcalf & Eddy, Inc.
One Research Parkway, Suite 2
Meriden, CT 06450

ATTENTION Mr. D. James Fitting

Sample Type: Water
Collected By: Client

Report Date: July 2, 1991
Report No.: M91-1592
Revision A
P.O. No.: 7966

Date Received: June 12, 1991

Project: Clinton Landfill

Page 1 of 9

REPORT PREPARED BY:	REPORT CERTIFIED BY:
Nancy R Ballou	
Nancy R. Ballou Laboratory Supervisor	David C. Barris Laboratory Director

ADMINISTRATION: 149 DURHAM ROAD • OAK PARK • MADISON, CT 06443

Client I.D.:	ME-BR1-GW	ME-BR2-GW	ME-BR3-GW	ME-OB3A-GW
Sample No.:	91-2892	91-2893	91-2894	91-2895
		(Units in mg/L)		
Parameter				
Total Iron	56.8	5.52	48.8	51.4
Total Manganese	1.70	2.15	1.31	0.729
Total Sodium	<1.0	<1.0	4.87	3.18
Alkalinity	100	30	2180	1700
Ammonia	2.35	<0.03	79.9	84.1
Chloride	7.0	2.0	360	330
Nitrate	<1.0	<1.0	5.96	6.20
Total Dissolved Solids	120	64	2758	2198
Total Cyanide	<0.02	<0.02	<0.02	<0.02

Client I.D.:	ME-BR1-GW	ME-BR2-GW	ME-BR3-GW	ME-OB3A-GW
Sample No.:	91-2892	91-2893	91-2894	91-2895
		(Units in ppb)		
Parameter				
EPA Method 8240				
Chloromethane	<10.0	<10.0	<10.0	<10.0
Bromomethane	<10.0	<10.0	<10.0	<10.0
Vinyl Chloride	<10.0	<10.0	<10.0	<10.0
Chloroethane	**15.1**	<10.0	**88.0**	**67.0**
Methylene Chloride	<1.0	<1.0	**1.3**	**1.1**
Acetone	<10.0	<10.0	<10.0	<10.0
Carbon Disulfide	<10.0	<10.0	<10.0	<10.0
1, 1-Dichloroethene	<1.0	<1.0	<1.0	<1.0
1, 1-Dichloroethane	**5.2**	**7.6**	<1.0	<1.0
Trans-1, 2-Dichloroethene	<1.0	<1.0	<1.0	<1.0
Chloroform	<1.0	<1.0	<1.0	<1.0
1, 2-Dichloroethane	<1.0	<1.0	<1.0	<1.0
2-Butanone	<50.0	<50.0	<50.0	<50.0
1, 1, 1-Trichloroethane	<1.0	<1.0	<1.0	<1.0
Carbon Tetrachloride	<1.0	<1.0	<1.0	<1.0
Vinyl Acetate	<50.0	<50.0	<50.0	<50.0
Bromodichloromethane	<1.0	<1.0	<1.0	<1.0
1, 2-Dichloropropane	<1.0	<1.0	<1.0	<1.0
Trans-1, 3-Dichloropropene	<1.0	<1.0	<1.0	<1.0
Trichloroethene	<1.0	<1.0	<1.0	<1.0
Dibromochloromethane	<1.0	<1.0	<1.0	<1.0
1, 1, 2 - Trichloroethane	<1.0	<1.0	<1.0	<1.0
Benzene	**14.3**	**2.0**	**26.1**	**28.7**
cis-1, 3-Dichloropropene	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinylether	<10.0	<10.0	<10.0	<10.0
Bromoform	<1.0	<1.0	<1.0	<1.0
4-Methyl-2-Pentanone	<50.0	<50.0	<50.0	<50.0
2-Hexanone	<50.0	<50.0	<50.0	<50.0
Tetrachloroethene	<1.0	<1.0	<1.0	<1.0
1, 1, 2, 2-Tetrachloroethane	<1.0	<1.0	**1.4**	<1.0
Toluene	**227**	**6.2**	**1.7**	<1.0
Chlorobenzene	<1.0	<1.0	**2.2**	**1.1**
Ethylbenzene	**1.8**	<1.0	**2.3**	<1.0
Styrene	<1.0	<1.0	<1.0	<1.0
Total Xylenes	**14.0**	<10.0	**47.0**	**54.9**

Client I.D.:	ME-OB3B-GW	ME-BR4-GW	ME-BR5-GW	ME-BR6-GW
Sample No.:	91-2896	91-2897	91-2898	91-2899
		(Units in mg/L)		
Parameter				
Total Iron	68.8	48.7	75.8	65.0
Total Manganese	3.24	6.78	3.49	1.88
Total Sodium	1.22	2.26	<1.0	1.58
Alkalinity	750	1450	160	1200
Ammonia	31.2	37.2	3.05	73.3
Chloride	126	295	16	142
Nitrate	2.55	8.49	<1.0	5.99
Total Dissolved Solids	904	1972	250	1264
Total Cyanide	<0.02	<0.02	<0.02	<0.02

Client I.D.:	ME-OB3B-GW	ME-BR4-GW	ME-BR5-GW	ME-BR6-GW
Sample No.:	91-2896	91-2897	91-2898	91-2899
		(Units in ppb)		
Parameter				
EPA Method 8240				
Chloromethane	<10.0	<10.0	<10.0	129
Bromomethane	<10.0	<10.0	<10.0	<10.0
Vinyl Chloride	<10.0	<10.0	<10.0	<10.0
Chloroethane	92.4	130	177	192
Methylene Chloride	1.1	2.9	2.1	2.0
Acetone	<10.0	<10.0	<10.0	<10.0
Carbon Disulfide	<10.0	<10.0	<10.0	<10.0
1, 1-Dichloroethene	<1.0	<1.0	<1.0	<1.0
1, 1-Dichloroethane	2.3	1.1	7.8	5.5
Trans-1, 2-Dichloroethene	1.3	<1.0	<1.0	<1.0
Chloroform	<1.0	<1.0	<1.0	<1.0
1, 2-Dichloroethane	<1.0	<1.0	<1.0	<1.0
2-Butanone	<50.0	<50.0	<50.0	<50.0
1, 1, 1-Trichloroethane	<1.0	<1.0	<1.0	<1.0
Carbon Tetrachloride	<1.0	<1.0	<1.0	<1.0
Vinyl Acetate	<50.0	<50.0	<50.0	<50.0
Bromodichloromethane	<1.0	<1.0	<1.0	<1.0
1, 2-Dichloropropane	<1.0	<1.0	<1.0	<1.0
Trans-1, 3-Dichloropropene	<1.0	<1.0	<1.0	<1.0
Trichloroethene	<1.0	<1.0	<1.0	<1.0
Dibromochloromethane	<1.0	<1.0	<1.0	<1.0
1, 1, 2 - Trichloroethane	<1.0	<1.0	<1.0	<1.0
Benzene	28.7	30.3	8.6	29.0
cis-1, 3-Dichloropropene	<1.0	<1.0	<1.0	<1.0
2-Chloroethylvinylether	<10.0	<10.0	<10.0	<10.0
Bromoform	<1.0	<1.0	<1.0	<1.0
4-Methyl-2-Pentanone	<50.0	<50.0	<50.0	<50.0
2-Hexanone	<50.0	<50.0	<50.0	<50.0
Tetrachloroethene	<1.0	<1.0	<1.0	<1.0
1, 1, 2, 2-Tetrachloroethane	<1.0	<1.0	<1.0	<1.0
Toluene	1.7	2.1	2.2	2.0
Chlorobenzene	1.1	3.1	3.1	12.1
Ethylbenzene	7.1	5.8	14.0	6.5
Styrene	<1.0	<1.0	<1.0	<1.0
Total Xylenes	55.0	150	42.4	168

Client I.D.:	ME-SW2-GW	ME-BR7-GW	ME-OB7-GW
Sample No.:	91-2901	91-2902	91-2903
		(Units in mg/L)	
Parameter			
Total Iron	38.6	27.6	69.9
Total Manganese	1.01	3.14	1.08
Total Sodium	2.75	<1.0	<1.0
Alkalinity	1700	62	72
Ammonia	69.5	1.68	6.23
Chloride	128	6.0	4.0
Nitrate	6.34	<1.0	<1.0
Total Dissolved Solids	1982	136	108
Total Cyanide	<0.02	<0.02	<0.02

Client I.D.:	ME-SW2-GW	ME-BR7-GW	ME-OB7-GW
Sample No.:	91-2901	91-2902	91-2903
		(Units in ppb)	
Parameter			
EPA Method 8240			
Chloromethane	<10.0	<10.0	<10.0
Bromomethane	<10.0	<10.0	<10.0
Vinyl Chloride	<10.0	<10.0	<10.0
Chloroethane	**123**	<10.0	<10.0
Methylene Chloride	<1.0	<1.0	<1.0
Acetone	<10.0	<10.0	<10.0
Carbon Disulfide	<10.0	<10.0	<10.0
1, 1-Dichloroethene	<1.0	<1.0	<1.0
1, 1-Dichloroethane	**2.3**	**12.2**	<1.0
Trans-1, 2-Dichloroethene	<1.0	<1.0	<1.0
Chloroform	<1.0	<1.0	<1.0
1, 2-Dichloroethane	<1.0	<1.0	<1.0
2-Butanone	<50.0	<50.0	<50.0
1, 1, 1-Trichloroethane	<1.0	<1.0	<1.0
Carbon Tetrachloride	<1.0	<1.0	<1.0
Vinyl Acetate	<50.0	<50.0	<50.0
Bromodichloromethane	<1.0	<1.0	<1.0
1, 2-Dichloropropane	<1.0	<1.0	<1.0
Trans-1, 3-Dichloropropene	<1.0	<1.0	<1.0
Trichloroethene	<1.0	<1.0	<1.0
Dibromochloromethane	<1.0	<1.0	<1.0
1, 1, 2 - Trichloroethane	<1.0	<1.0	<1.0
Benzene	**38.0**	**3.2**	**1.7**
cis-1, 3-Dichloropropene	<1.0	<1.0	<1.0
2-Chloroethylvinylether	<10.0	<10.0	<10.0
Bromoform	<1.0	<1.0	<1.0
4-Methyl-2-Pentanone	<50.0	<50.0	<50.0
2-Hexanone	<50.0	<50.0	<50.0
Tetrachloroethene	<1.0	<1.0	<1.0
1, 1, 2, 2-Tetrachloroethane	<1.0	<1.0	<1.0
Toluene	**2.6**	**1.9**	**32.1**
Chlorobenzene	**7.5**	**2.0**	**2.1**
Ethylbenzene	**80.1**	<1.0	<1.0
Styrene	<1.0	<1.0	<1.0
Total Xylenes	**95.9**	<10.0	<10.0

Client I.D.:	ME-BR8-GW	ME-BR9-GW	ME-OB4-GW
Sample No.:	91-2904	91-2905	91-2906
		(Units in mg/L)	
Parameter			
Total Iron	NR	NR	64.1
Total Manganese	NR	NR	6.12
Total Sodium	NR	NR	4.30
Alkalinity	NR	NR	1390
Ammonia	NR	NR	20.3
Chloride	NR	NR	325
Nitrate	NR	NR	2.49
Total Dissolved Solids	NR	NR	1944
Total Cyanide	NR	NR	<0.02

NR = Not Requested

Client I.D.:	ME-BR8-GW	ME-BR9-GW	ME-OB4-GW
Sample No.:	91-2904	91-2905	91-2906
		(Units in ppb)	
Parameter			
EPA Method 8240			
Chloromethane	<10.0	<10.0	<10.0
Bromomethane	<10.0	<10.0	<10.0
Vinyl Chloride	<10.0	<10.0	<10.0
Chloroethane	<10.0	<10.0	**136**
Methylene Chloride	<1.0	<1.0	**1.4**
Acetone	<10.0	<10.0	<10.0
Carbon Disulfide	<10.0	<10.0	<10.0
1, 1-Dichloroethene	<1.0	<1.0	<1.0
1, 1-Dichloroethane	<1.0	<1.0	<1.0
Trans-1, 2-Dichloroethene	<1.0	<1.0	<1.0
Chloroform	<1.0	<1.0	<1.0
1, 2-Dichloroethane	<1.0	<1.0	<1.0
2-Butanone	<50.0	<50.0	<50.0
1, 1, 1-Trichloroethane	<1.0	<1.0	<1.0
Carbon Tetrachloride	<1.0	<1.0	<1.0
Vinyl Acetate	<50.0	<50.0	<50.0
Bromodichloromethane	<1.0	<1.0	<1.0
1, 2-Dichloropropane	<1.0	<1.0	<1.0
Trans-1, 3-Dichloropropene	<1.0	<1.0	<1.0
Trichloroethene	<1.0	<1.0	<1.0
Dibromochloromethane	<1.0	<1.0	<1.0
1, 1, 2 - Trichloroethane	<1.0	<1.0	<1.0
Benzene	<1.0	<1.0	**28.0**
cis-1, 3-Dichloropropene	<1.0	<1.0	<1.0
2-Chloroethylvinylether	<10.0	<10.0	<10.0
Bromoform	<1.0	<1.0	<1.0
4-Methyl-2-Pentanone	<50.0	<50.0	<50.0
2-Hexanone	<50.0	<50.0	<50.0
Tetrachloroethene	<1.0	<1.0	<1.0
1, 1, 2, 2-Tetrachloroethane	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	**1.5**
Chlorobenzene	<1.0	<1.0	**2.2**
Ethylbenzene	<1.0	<1.0	**1.1**
Styrene	<1.0	<1.0	<1.0
Total Xylenes	<10.0	<10.0	**116**

COLLEGE PLAZA
51 COLLEGE STREET
NEW HAVEN, CT 06510
TEI ONE 203/776-9624

ENVIRONMENTAL
CONSULTING LABORATORIES, INC.

CONNECTICUT TOLL-FREE
1-800-343-4569
Connecticut Certification PH-0535

June 26, 1991

Mr. D. James Fitting
Metcalf & Eddy, Inc.
One Research Parkway
Suite 2
Meriden, CT 06450

Dear Mr. Fitting:

Enclosed is an Addendum corresponding to Report No. M91-1592 for the Quality Assurance/Quality Control Data.

Should you have any questions, please feel free to contact me.

Sincerely,

David C. Barris
Laboratory Director

/js

Enclosure

Metcalf & Eddy, Inc.
June 26, 1991
Report No.: M91-1592

ADDENDUM

Quality Assurance/Quality Control Data
Inorganics

Duplicates

ECL I.D.:	Initial Sample	Duplicate Sample	Percent Difference
ECL Sample No.:	91-2899	91-2900D	
Units:	mg/L	mg/L	%
Parameter			
Iron	65.0	62.8	3.4
Manganese	1.88	1.84	2.2
Sodium	1.58	1.68	6.1
Alkalinity	1200	1150	4.3
Chloride	142	154	8.1
Ammonia	73.3	79.7	8.4
Nitrate	5.99	6.19	3.3
Total Dissolved Solids	1264	1216	3.9
Total Cyanide	<0.02	<0.02	0

ADDENDUM

Quality Assurance/Quality Control Data Inorganics

Spikes

ECL Sample No.: 91-2892

ECL I.D.:	Initial Sample Value	Spiked Sample Value	Spiked @	Percent Recovery
Units:	mg/L	mg/L	mg/L	%
Parameter				
Iron *	5.68	15.25	10.00	97.3
Manganese *	0.17	9.51	10.00	93.5
Sodium	<1.0	10.06	10.00	100.6
Alkalinity	50	80	37.5	91.4
Chloride	3.5	27.0	25.0	94.7
Ammonia	2.35	4.16	2.0	95.6
Nitrate	0.26	0.90	0.50	118.4
Total Cyanide	<0.02	0.54	0.50	108.0

* 1:5 Sample Dilution.

Metcalf & Eddy, Inc.
June 26, 1991
Report No.: M91-1592

ADDENDUM

Quality Assurance/Quality Control Data
GC/MS Volatile Organics

Percent Surrogate Recovery (%)

ECL Sample Number	Compound: 4-BromofluoroBenzene	Compound: 1,2 Dichloroethane-D4	Compound: Toluene D8
91-2892	114	112	105
91-2893	96	100	95
91-2894	101	105	96
91-2895	101	106	100
91-2896	110	115	117
91-2897	94	124	88
91-2898	114	119	104
91-2899	109	116	96
91-2901	89	84	82
91-2902	100	107	105
91-2903	108	118	106
91-2904	106	112	102
91-2905	103	115	103
91-2906	95	111	104
91-2907	91	94	86

Surrogates spiked at 25 ppb level.

Surrogate Recovery dependent on sample matrix.

ADDENDUM

Quality Assurance/Quality Control Data
GC/MS Volatile Organics

	Method Blank	
ECL I.D.: ECL Sample No:	Start Run Blank	End Run Blank
Units:	ppb	ppb
Parameter		
EPA Method 8240		
Chloromethane	<10.0	<10.0
Bromomethane	<10.0	<10.0
Vinyl Chloride	<10.0	<10.0
Chloroethane	<10.0	<10.0
Methylene Chloride	<1.0	<1.0
Acetone	<10.0	<10.0
Carbon Disulfide	<10.0	<10.0
1, 1-Dichloroethene	<1.0	<1.0
1, 1-Dichloroethane	<1.0	<1.0
Trans-1, 2-Dichloroethene	<1.0	<1.0
Chloroform	<1.0	<1.0
1, 2-Dichloroethane	<1.0	<1.0
2-Butanone	<50.0	<50.0
1, 1, 1-Trichloroethane	<1.0	<1.0
Carbon Tetrachloride	<1.0	<1.0
Vinyl Acetate	<50.0	<50.0
Bromodichloromethane	<1.0	<1.0
1, 2-Dichloropropane	<1.0	<1.0
Trans-1, 3-Dichloropropene	<1.0	<1.0
Trichloroethene	<1.0	<1.0
Dibromochloromethane	<1.0	<1.0
1, 1, 2 - Trichloroethane	<1.0	<1.0
Benzene	<1.0	<1.0
cis-1, 3-Dichloropropene	<1.0	<1.0
2-Chloroethylvinylether	<10.0	<10.0
Bromoform	<1.0	<1.0
4-Methyl-2-Pentanone	<50.0	<50.0
2-Hexanone	<50.0	<50.0
Tetrachloroethene	<1.0	<1.0
1, 1, 2, 2-Tetrachloroethane	<1.0	<1.0
Toluene	<1.0	<1.0
Chlorobenzene	<1.0	<1.0
Ethylbenzene	<1.0	<1.0
Styrene	<1.0	<1.0
Total Xylenes	<10.0	<10.0

ADDENDUM

Quality Assurance/Quality Control Data
GC/MS Volatile Organics

Spike Recovery CLP Spike Mix at 25 ppb

ECL I.D.: ECL Sample No.:	Initial 91-2892	Spiked 91-2892S	Percent Recovery
Units:	ppb	ppb	%
Parameter			
EPA Method 8240			
1, 1-Dichloroethene	<1.0	23.5	94
Trichloroethene	<1.0	25.5	102
Benzene	14.3	43.4	110
Toluene	227	197	78
Chlorobenzene	<1.0	24.2	97

Metcalf & Eddy, Inc.
June 26, 1991
Report No.: M91-1592

ADDENDUM

Quality Assurance/Quality Control Data
GC/MS Volatile Organics

Duplicates

ECL I.D.: ECL Sample No.:	Initial 91-2899	Duplicate 91-2899D	Percent Difference
Units:	ppb	ppb	%
Parameter			
EPA Method 8240			
Chloromethane	129	78.0	39
Chloroethane	192	196	2.0
Methylene Chloride	2.0	1.7	15
1, 1-Dichloroethane	5.5	5.8	5.4
Benzene	29.0	29.5	1.7
1, 1, 2, 2-Tetra-chloroethane	<1.0	1.2	20
Toluene	2.0	1.8	10
Chlorobenzene	12.1	12.6	4.1
Ethylbenzene	6.5	6.8	4.6
Total Xylenes	168	170	1.2

ENVIRONMENTAL CONSULTING LABORATORIES, INC.

THE COLLEGE PLAZA • 51 COLLEGE STREET • NEW HAVEN, CT 06510 • (203) 776-9624
149 DURHAM ROAD • MADISON, CT 06443 • (203) 245-7039

Page 1 of 2

CHAIN OF CUSTODY RECORD

Client: Metcalf & Eddy (M&E)
(Note: Complete reverse side if new client only.)

Project No./Name Clinton Landfill

Samplers: Jim Fritting / Phil Muller

Sample Location	Date	Time	Sample Type				No. of Containers	Analysis Required
			Water	Solid	Comp	Grab		
ME-BR1-GW	6/11/91	11:30	✓			✓	5	8240, iron, manganese, alkalinity, ammonia, chloride, nitrate, sodium, total dissolved ~~[illegible]~~ solids, total cyanide
ME-BR2-GW	"	14:10	✓			✓	5	
ME-BR3-GW	"	17:40	✓			✓	5	
ME-OB3A-GW	"	16:57	✓			✓	5	
ME-OB3B-GW	"	16:55	✓			✓	5	
BR4-GW	6/12/91	14:30	✓			✓	5	
ME-OB4-GW	"	11:22	✓			✓	5	
ME-BR5-GW	"	15:00	✓			✓	5	
ME-BR6-GW	"	12:03	✓			✓	5	
ME- ~~ME~~-SW2-GW	"	12:30	✓			✓	5	
ME-BR7-GW	6/11/91	11:30	✓			✓	5	
ME-OB7-GW	"	10:38	✓			✓	5	

Relinquished by: Signature	Date/Time	Received by: Signature	Date/Time
Donald James Fritting	6/12/91 17:22		
Relinquished by: Signature	Date/Time	Received by: Signature	Date/Time
Relinquished by: Signature	Date/Time	Received by: Signature	Date/Time
		J. Yoni	6/12/91 5:25 pm

Lab Remarks:

Turn-Around Time: Normal ___ Rush ___ 14 calendar days

ENVIRONMENTAL CONSULTING LABORATORIES, INC.

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Page ~~1~~ 2 of 2

CHAIN OF CUSTODY RECORD

Client: Metcalf & Eddy
(Note: Complete reverse side if new client only.)

Project No./Name Clinton Landfill

Samplers: Jim Fitting / Phil Muller

Sample Location	Date	Time	Sample Type				No. of Containers	Analysis Required
			Water	Solid	Comp	Grab		
ME-BR8-GW	6/11/91	16:30	✓			✓	2	8240
ME-BR9-GW	6/12/91	09:00	✓			✓	2	↓

Relinquished by: Signature Date/Time
Donald James Fitting 6/12/91 17:22

Received by: Signature Date/Time

Relinquished by: Signature Date/Time

Received by: Signature Date/Time

Relinquished by: Signature Date/Time

Received by: Signature Date/Time
J. Yon 6/12/91 5:25 pm

Lab Remarks:

Turn-Around Time: Normal ___ Rush ___ 14 calendar days

COLLEGE PLAZA
51 COLLEGE STREET
NEW HAVEN, CT 06510
TELEPHONE 203-776-9624

ENVIRONMENTAL
CONSULTING LABORATORIES, INC.

CONNECTICUT TOLL-FREE
1-800-343-4569
Connecticut Certification PH-0535

August 15, 1991

Mr. Jim Fitting
Metcalf & Eddy, Inc.
One Research Parkway, Suite 2
Meriden, CT 06450-1135

Dear Jim:

This letter is in response to your inquiry concerning chloromethane and chloroethane found at the Clinton landfill.

I have verified that chloromethane was detected in samples reported on December 13, 1990, and chloroethane was detected in samples reported on June 26, 1991. These two compounds have different mass spectra and retention times which makes it difficult to mistake their identity.

Environmental Consulting Laboratories, Inc., has been working with the Clinton Health Department on a related project involving the Clinton landfill, and we have also been finding chloroethane in Clinton landfill wells and residential house water supplies.

Should you have any further questions, please contact me at 776-9624 or 1-800-343-4569.

Sincerely,

David C. Barris
Laboratory Director

/jy

ADMINISTRATION: 149 DURHAM ROAD • OAK PARK • MADISON, CT 06443

**ENVIRONMENTAL
SCIENCE
CORPORATION**
362 Industrial Park Rd.
Middletown, CT 06457
(203) 632-0600, FAX (203) 632-7743

LABORATORY REPORT

LAB. REPORT NO.
C-11900

State Certification No. PH-0476
EPA Number CT013

DATE RECEIVED	06/14/91
PURCHASE ORDER NO.	7967
CLIENT I.D.	MET & EDDY
CLIENT PROJECT NO.	91-005936-04
TELEPHONE NO.	630-1735

CLIENT

Mr. James Fitting
Metcalf & Eddy
One Research Parkway
Meriden, CT 06450

CLINTON LANDFILL

SAMPLE ID:	ME-OB3B-GW			ME-BR6-GW		
LOCATION:	CLINTON, CT			CLINTON, CT		
TYPE:	WATER			WATER		
DATE:	06/11/91			06/12/91		
** TEST ** (ALL UNITS ARE PPB)		DATE	TIME		DATE	TIME
** METHOD 8240						
Acetone	<100	06/17/91	17:05	<500	06/17/91	17:54
Acrolein	<1000	06/17/91	17:05	<5000	06/17/91	17:54
Acrylonitrile	<500	06/17/91	17:05	<2500	06/17/91	17:54
Benzene	20	06/17/91	17:05	22	06/17/91	17:54
Bromodichloromethane	<2.0	06/17/91	17:05	<10	06/17/91	17:54
Bromoform	<2.0	06/17/91	17:05	<10	06/17/91	17:54
Bromomethane	<10	06/17/91	17:05	<50	06/17/91	17:54
2-Butanone	<20	06/17/91	17:05	<100	06/17/91	17:54
Carbon Disulfide	<2.0	06/17/91	17:05	25	06/17/91	17:54
Carbon Tetrachloride	<2.0	06/17/91	17:05	<10	06/17/91	17:54
Chlorobenzene	<2.0	06/17/91	17:05	11	06/17/91	17:54
Chlorodibromomethane	<2.0	06/17/91	17:05	<10	06/17/91	17:54
Chloroethane	84	06/17/91	17:05	420	06/17/91	17:54
2-Chloroethyl Vinyl Ether	<10	06/17/91	17:05	<50	06/17/91	17:54
Chloroform	<2.0	06/17/91	17:05	<10	06/17/91	17:54
Chloromethane	<10	06/17/91	17:05	<50	06/17/91	17:54
Dibromomethane	<2.0	06/17/91	17:05	<10	06/17/91	17:54
1,4-Dichloro-2-butane	<2.0	06/17/91	17:05	<10	06/17/91	17:54
Dichlorodifluoromethane	<2.0	06/17/91	17:05	<10	06/17/91	17:54
1,1-Dichloroethane	<2.0	06/17/91	17:05	<10	06/17/91	17:54
1,2-Dichloroethane	<2.0	06/17/91	17:05	<10	06/17/91	17:54
1,1-Dichloroethene	<2.0	06/17/91	17:05	<10	06/17/91	17:54
trans-1,2-Dichloroethene	<2.0	06/17/91	17:05	<10	06/17/91	17:54
1,2-Dichloropropane	<2.0	06/17/91	17:05	<10	06/17/91	17:54
cis-1,3-Dichloropropene	<2.0	06/17/91	17:05	<10	06/17/91	17:54

< - Below Minimum Detectable Level

Minimum Detectable level 1 ppb.

07/01/91
DATE REPORTED

Thomas T. McAloon
LABORATORY DIRECTOR

ENVIRONMENTAL SCIENCE CORPORATION
362 Industrial Park Rd.
Middletown, CT 06457
(203) 632-0600, FAX (203) 632-7743

LABORATORY REPORT

LAB. REPORT NO.
C-11900

State Certification No. PH-0476
EPA Number CT013

CLIENT

Mr. James Fitting
Metcalf & Eddy
One Research Parkway
Meriden, CT 06450

DATE RECEIVED	06/14/91
PURCHASE ORDER NO.	7967
CLIENT I.D.	MET & EDDY
CLIENT PROJECT NO.	91-005936-04
TELEPHONE NO.	630-1735

CLINTON LANDFILL

SAMPLE ID:	ME-OB3B-GW			ME-BR6-GW		
LOCATION:	CLINTON, CT			CLINTON, CT		
TYPE:	WATER			WATER		
DATE:	06/11/91			06/12/91		
** TEST ** (ALL UNITS ARE PPB)		DATE	TIME		DATE	TIME
METHOD 8240 (continued)						
trans-1,3-Dichloropropene	<2.0	06/17/91	17:05	<10	06/17/91	17:54
Ethanol	<10000	06/17/91	17:05	<50000	06/17/91	17:54
Ethylbenzene	5.5	06/17/91	17:05	<10	06/17/91	17:54
Ethyl Methacrylate	<2.0	06/17/91	17:05	<10	06/17/91	17:54
2-Hexanone	<10	06/17/91	17:05	<50	06/17/91	17:54
Iodomethane	<2.0	06/17/91	17:05	<10	06/17/91	17:54
Methylene Chloride	2.8	06/17/91	17:05	<10	06/17/91	17:54
4-Methyl-2-Pentanone	<10	06/17/91	17:05	<50	06/17/91	17:54
Styrene	<2.0	06/17/91	17:05	<10	06/17/91	17:54
1,1,2,2-Tetrachloroethane	<2.0	06/17/91	17:05	<10	06/17/91	17:54
Tetrachloroethene	<2.0	06/17/91	17:05	<10	06/17/91	17:54
Toluene	<2.0	06/17/91	17:05	<10	06/17/91	17:54
1,1,1-Trichloroethane	<2.0	06/17/91	17:05	<10	06/17/91	17:54
1,1,2-Trichloroethane	<2.0	06/17/91	17:05	<10	06/17/91	17:54
Trichloroethene	<2.0	06/17/91	17:05	<10	06/17/91	17:54
Trichlorofluoromethane	<2.0	06/17/91	17:05	<10	06/17/91	17:54
1,2,3-Trichloropropane	<2.0	06/17/91	17:05	<10	06/17/91	17:54
Vinyl Acetate	<10	06/17/91	17:05	<50	06/17/91	17:54
Vinyl Chloride	<10	06/17/91	17:05	<50	06/17/91	17:54
Xylene	23	06/17/91	17:05	130	06/17/91	17:54

< - Below Minimum Detectable Level

Minimum Detectable level 1 ppb.

07/01/91
DATE REPORTED

Thomas T. McAloon
LABORATORY DIRECTOR

ENVIRONMENTAL SCIENCE CORPORATION
362 Industrial Park Rd.
Middletown, CT 06457
(203) 632-0600, FAX (203) 632-7743

LABORATORY REPORT

LAB. REPORT NO.
C-11900

State Certification No. PH-0476
EPA Number CT013

DATE RECEIVED	06/14/91
PURCHASE ORDER NO.	7967
CLIENT I.D.	MET & EDDY
CLIENT PROJECT NO.	91-005936-04
TELEPHONE NO.	630-1735

CLIENT
Mr. James Fitting
Metcalf & Eddy
One Research Parkway
Meriden, CT 06450

CLINTON LANDFILL

SAMPLE ID: ME-BR4-GW
LOCATION: CLINTON, CT
TYPE: WATER
DATE: 06/12/91

** TEST ** (ALL UNITS ARE PPB)		DATE	TIME
** METHOD 8240			
Acetone	<500	06/17/91	18:45
Acrolein	<5000	06/17/91	18:45
Acrylonitrile	<2500	06/17/91	18:45
Benzene	26	06/17/91	18:45
Bromodichloromethane	<10	06/17/91	18:45
Bromoform	<10	06/17/91	18:45
Bromomethane	<50	06/17/91	18:45
2-Butanone	<100	06/17/91	18:45
Carbon Disulfide	<10	06/17/91	18:45
Carbon Tetrachloride	<10	06/17/91	18:45
Chlorobenzene	<10	06/17/91	18:45
Chlorodibromomethane	<10	06/17/91	18:45
Chloroethane	150	06/17/91	18:45
2-Chloroethyl Vinyl Ether	<50	06/17/91	18:45
Chloroform	<10	06/17/91	18:45
Chloromethane	<50	06/17/91	18:45
Dibromomethane	<10	06/17/91	18:45
1,4-Dichloro-2-butane	<10	06/17/91	18:45
Dichlorodifluoromethane	<10	06/17/91	18:45
1,1-Dichloroethane	<10	06/17/91	18:45
1,2-Dichloroethane	<10	06/17/91	18:45
1,1-Dichloroethene	<10	06/17/91	18:45
trans-1,2-Dichloroethene	<10	06/17/91	18:45
1,2-Dichloropropane	<10	06/17/91	18:45
cis-1,3-Dichloropropene	<10	06/17/91	18:45

< - Below Minimum Detectable Level

Minimum Detectable level 1 ppb.

07/01/91
DATE REPORTED

Thomas F. McAloon
LABORATORY DIRECTOR

ENVIRONMENTAL SCIENCE CORPORATION
362 Industrial Park Rd.
Middletown, CT 06457
(203) 632-0600, FAX (203) 632-7743

LABORATORY REPORT

LAB. REPORT NO.
C-11900

State Certification No. PH-0476
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DATE RECEIVED	06/14/91
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CLIENT I.D.	MET & EDDY
CLIENT PROJECT NO.	91-005936-04
TELEPHONE NO.	630-1735

CLIENT

Mr. James Fitting
Metcalf & Eddy
One Research Parkway
Meriden, CT 06450

CLINTON LANDFILL

SAMPLE ID: ME-BR4-GW
LOCATION: CLINTON, CT
TYPE: WATER
DATE: 06/12/91

** TEST ** (ALL UNITS ARE PPB)		DATE	TIME
METHOD 8240 (continued)			
trans-1,3-Dichloropropene	<10	06/17/91	18:45
Ethanol	<50000	06/17/91	18:45
Ethylbenzene	<10	06/17/91	18:45
Ethyl Methacrylate	<10	06/17/91	18:45
2-Hexanone	<50	06/17/91	18:45
Iodomethane	<10	06/17/91	18:45
Methylene Chloride	10	06/17/91	18:45
4-Methyl-2-Pentanone	<50	06/17/91	18:45
Styrene	<10	06/17/91	18:45
1,1,2,2-Tetrachloroethane	<10	06/17/91	18:45
Tetrachloroethene	<10	06/17/91	18:45
Toluene	<10	06/17/91	18:45
1,1,1-Trichloroethane	<10	06/17/91	18:45
1,1,2-Trichloroethane	<10	06/17/91	18:45
Trichloroethene	<10	06/17/91	18:45
Trichlorofluoromethane	<10	06/17/91	18:45
1,2,3-Trichloropropane	<10	06/17/91	18:45
Vinyl Acetate	<50	06/17/91	18:45
Vinyl Chloride	<50	06/17/91	18:45
Xylene	410	06/17/91	18:45

< - Below Minimum Detectable Level

Minimum Detectable level 1 ppb.

07/01/91
DATE REPORTED

Thomas F. McAloon
LABORATORY DIRECTOR

QC SUMMARY

MATRIX: WATER UNITS: PPB

EPA QC WP483 Conc. #2 COMPOUND	TRUE VALUE	95% C.I.	RESULT
Chloroform	43.0	24.6-54.6	46.166
1,2-Dichloroethane	22.2	13.5-30.5	25.928
1,1,1-Trichloroethane	14.3	6.9-18.5	13.415
Carbon Tetrachloride	10.0	5.0-18.5	8.894
Bromodichloromethane	7.9	4.9-10.7	8.465
Trichloroethene	12.0	5.2-16.0	9.969
Dibromochloromethane	10.7	6.0-14.4	10.407
Bromoform	9.9	5.7-13.3	9.841
Tetrachloroethene	6.2	3.9-7.9	5.269
EPA QC WP 879 Conc. #2			
Benzene	12.3	5.8-18.0	12.062
Toluene	37.1	21.3-49.7	36.563
Ethylbenzene	32.9	14.5-47.9	31.643
SURROGATES			
1,2-Dichloroethane-d4	50.0	38.0-57.0	52.508
Toluene-d8	50.0	44.0-55.0	50.747
Bromofluorobenzene	50.0	43.0-57.6	51.329

DATE/TIME ANALYZED: 6/17/91 9:48

INSTRUMENT # 1

METCALF & EDDY
CLINTON LF

REPORT #: C-11900

DATE: 6/17/91 METHOD BLANK SUMMARY

COMPOUND	MATRIX: WATER	UNITS: PPB
Acetone	< 100	
Acrolein	< 1000	
Acrylonitrile	< 500	
Benzene	< 2.0	
Bromodichloromethane	< 2.0	
Bromoform	< 2.0	
Bromomethane	< 10	
2-Butanone	< 20	
Carbon Disulfide	< 2.0	
Carbon Tetrachloride	< 2.0	
Chlorobenzene	< 2.0	
Chlorodibromomethane	< 2.0	
Chloroethane	< 10	
2-Chloroethylvinyl ether	< 10	
Chloroform	< 2.0	
Chloromethane	< 10	
Dibromomethane	< 2.0	
1,4-Dichloro-2-butane	< 2.0	
Dichlorodifluoromethane	< 2.0	
1,1-Dichloroethane	< 2.0	
1,2-Dichloroethane	< 2.0	
1,1-Dichloroethene	< 2.0	
1,2-Dichloroethene (total)	< 2.0	
1,2-Dichloropropane	< 2.0	
cis-1,3-Dichloropropene	< 2.0	
trans-1,3-Dichloropropene	< 2.0	
Ethanol	< 10000	
Ethylbenzene	< 2.0	
Ethyl Methacrylate	< 2.0	
2-Hexanone	< 10	
Iodomethane	< 2.0	
Methylene Chloride	< 2.0	
4-Methyl-2-Pentanone	< 10	
Styrene	< 2.0	
1,1,2,2-Tetrachloroethane	< 2.0	
Tetrachloroethene	< 2.0	
Toluene	< 2.0	
1,1,1-Trichloroethane	< 2.0	
1,1,2-Trichloroethane	< 2.0	
Trichloroethene	< 2.0	
Trichlorofluoromethane	< 2.0	
1,2,3-Trichloropropane	< 2.0	
Vinyl Acetate	< 10	
Vinyl Chloride	< 10	
m-Xylene	< 2.0	
o- and p-Xylene	< 2.0	

DUPLICATES

SAMPLE ID:(SEE COMMENTS) REPORT #: C-11900

DATE: 6/17/91 MATRIX: WATER UNITS: PPB

COMPOUND METHOD 8240	SAMPLE	DUPLICATE	RPD
Acetone	< 20	< 20	N/C
Acrolein	< 200	< 200	N/C
Acrylonitrile	< 100	< 100	N/C
Benzene	< 1.0	< 1.0	N/C
Bromodichloromethane	< 1.0	< 1.0	N/C
Bromoform	< 1.0	< 1.0	N/C
Bromomethane	< 5.0	< 5.0	N/C
2-Butanone	< 5.0	< 5.0	N/C
Carbon Disulfide	< 1.0	< 1.0	N/C
Carbon Tetrachloride	< 1.0	< 1.0	N/C
Chlorobenzene	< 1.0	< 1.0	N/C
Chlorodibromomethane	< 1.0	< 1.0	N/C
Chloroethane	< 5.0	< 5.0	N/C
2-Chloroethylvinyl ether	< 5.0	< 5.0	N/C
Chloroform	1.2	1.2	N/C
Chloromethane	< 5.0	< 5.0	N/C
Dibromomethane	< 1.0	< 1.0	N/C
1,4-Dichloro-2-butane	< 1.0	< 1.0	N/C
Dichlorodifluoromethane	< 1.0	< 1.0	N/C
1,1-Dichloroethane	< 1.0	< 1.0	N/C
1,2-Dichloroethane	< 1.0	< 1.0	N/C
1,1-Dichloroethene	< 1.0	< 1.0	N/C
1,2-Dichloroethene (total)	< 1.0	< 1.0	N/C
1,2-Dichloropropane	< 1.0	< 1.0	N/C
cis-1,3-Dichloropropene	< 1.0	< 1.0	N/C
trans-1,3-Dichloropropene	< 1.0	< 1.0	N/C
Ethanol	< 2000	< 2000	N/C
Ethylbenzene	< 1.0	< 1.0	N/C
Ethyl Methacrylate	< 1.0	< 1.0	N/C
2-Hexanone	< 5.0	< 5.0	N/C
Iodomethane	< 1.0	< 1.0	N/C
Methylene Chloride	< 1.0	< 1.0	N/C
4-Methyl-2-Pentanone	< 5.0	< 5.0	N/C
Styrene	< 1.0	< 1.0	N/C
1,1,2,2-Tetrachloroethane	< 1.0	< 1.0	N/C
Tetrachloroethene	< 1.0	< 1.0	N/C
Toluene	< 1.0	< 1.0	N/C
1,1,1-Trichloroethane	< 1.0	< 1.0	N/C
1,1,2-Trichloroethane	< 1.0	< 1.0	N/C
Trichloroethene	< 1.0	< 1.0	N/C
Trichlorofluoromethane	< 1.0	< 1.0	N/C
1,2,3-Trichloropropane	< 1.0	< 1.0	N/C
Vinyl Acetate	< 5.0	< 5.0	N/C
Vinyl Chloride	< 5.0	< 5.0	N/C
m-Xylene	< 1.0	< 1.0	N/C
o- and p-Xylene	< 1.0	< 1.0	N/C

COMMENTS: The results reported above represent values obtained for a sample analyzed with your sample unless your sample ID is reported above.

METCALF & EDDY
CLINTON LF

ANALYZED WITH REPORT #C-11900

3A
WATER VOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: ENVIRONMENTAL SCIENCE CORPORATION

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: NA

Matrix Spike - EPA Sample No.: NA

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC LIMITS REC.
1,1-Dichloroethene	20.00	< 2.0	20.02	100	61-145
Trichloroethene	20.00	< 2.0	20.02	100	71-120
Benzene	20.00	< 2.0	21.73	108	76-127
Toluene	20.00	< 2.0	21.41	107	76-125
Chlorobenzene	20.00	< 2.0	21.92	109	75-130

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD #	QC LIMITS	
					RPD	REC.
1,1-Dichloroethene	20.00	19.92	99	1	20	61-145
Trichloroethene	20.00	20.43	102	1	14	71-120
Benzene	20.00	22.12	110	1	11	76-127
Toluene	20.00	21.28	106	0	13	76-125
Chlorobenzene	20.00	22.21	111	1	13	75-130

\# Column to be used to flag recovery and RPD values with an asterisk

* Values outside of qc limits

RPD: 0 out of 5 outside limits
Spike Recovery: 0 out of 10 outside limits

COMMENTS: ______________________________

DATE/TIME ANALYZED: 6/12/91 14:10
INSTRUMENT # 1

FORM III VOA-1 1/87 Rev.

Metcalf & Eddy

CHAIN OF CUSTODY FORM

P.O.

Job/Project Name: CLINTON LANDFILL
Job/Project Location: CLINTON
~~Job/Project~~ Number: 7967
Samplers: (Signatures) D. James Fitting
Recorder: (Signature) D. James Fitting
Date: 6/12/91
Lab (Samples Sent To): E. S. C.

SAMPLING		SAMPLE NUMBER	SAMPLE LOCATION	MATRIX					COMPOSITE/GRAB	PRESERVATIVE (Y/N)	ANALYSIS REQUESTED							Total # BOTTLES	COMMENTS
Date	Time			Water	Soil						8240								
6/11/91	16:55	ME-OB3B-GW		✓					G	N	✓							2	
6/12/91	12:03	ME-BR6-GW		✓					G	N	✓							2	
6/12/91	14:30	ME-BR4-GW		✓					G	N	✓							2	

Relinquished By: (Signature) D. James Fitting	Date:	Time:	Received By: (Signature) M Sterling	Relinquished By: (Signature)	Date:	Time:	Received By: (Signature)
Relinquished By: (Signature)	Date:	Time:	Received By: (Signature)	Relinquished By: (Signature)	Date:	Time:	Received By: (Signature)
Relinquished By: (Signature)	Date:	Time:	Received for Lab By: (Signature)	Date:	Time:	Comments: minimum detection limit 1 ppb	

Method of Shipment: lab courier

Distribution: **Original** to Lab. **Copy 1** to Field Files. **Copy 2** to Project Manager

Preliminary Geotechnical Engineering Report
Proposed Ice Rink
Old Nod Road
Clinton, Connecticut

Prepared For:

Payne Environmental, LLC
85 Willow Street
New Haven, Connecticut 06511

Prepared By:

Heller and Johnsen
Foot of Broad Street
Stratford, Connecticut 06615

File No. 111501
June 2014

HELLER AND JOHNSEN
Geotechnical Engineering Consultants

June 10, 2014
File No. 111501

Payne Environmental, LLC
85 Willow Street
New Haven, Connecticut 06511

Attn: Mr. Neil Payne

Re: Proposed Ice Rink
Old Nod Road
Clinton, Connecticut

Dear Mr. Payne:

In accordance with our proposal of April 14, 2014, we have completed our geotechnical investigation for the proposed ice rink on Old Nod Road in Clinton, Connecticut. The attached report "Preliminary Geotechnical Engineering Report, Proposed Ice Rink, Old Nod Road, Clinton, Connecticut", summarizes our findings.

Very truly yours,

LAWRENCE F. JOHNSEN
No. 11943

Lawrence F. Johnsen, P.E.

Foot of Broad Street, Stratford, CT 06615 *203-380-8188* *Fax: 203-380-8198*

1.0 Introduction

1.1 General

This report presents the results of a preliminary subsurface investigation performed for a proposed ice rink on Old Nod Road in Clinton, Connecticut. The entrance road to the site is located on the south side of Old Nod Road, about 200 feet south of the junction of Nod Court with Old Nod Road. The site is a closed municipal landfill and is currently undeveloped.

1.2 Proposed Development

Planned development will include a 60,000 sf ice rink arena with parking surrounding the building. The structure will be "L" shaped as shown on the attached Figure 1. Its overall length is 350 feet. Its width varies from 150 to 200 feet. It will have a finish floor elevation of 92 feet. A water quality basin is also planned at the site.

The existing grades in the proposed building area vary between elevation 104 and 74 feet. Proposed cut and fill depths in the building area are up to 12 and 18 feet, respectively. Existing grades in the pavement areas vary between elevation 104 and 64 feet. Proposed cut and fill depths in the pavement areas are up to 14 and 20 feet, respectively.

All elevations in this report refer to the NAVD1988 datum.

1.3 Scope of Study

This study analyzes available subsurface information to determine the physical properties and characteristics of subsurface materials and evaluates this information for the purpose of establishing preliminary geotechnical design criteria.

Preliminary conclusions and recommendations are presented regarding the following:

1. Suitable foundation types.
2. Support of utilities.
3. Site subsidence.
4. Seismic site class and potential for soil liquefaction.

This report has been written for the exclusive use of Payne Environmental, LLC for specific application to the proposed ice rink on Old Nod Road in Clinton, Connecticut, in accordance with generally accepted geotechnical engineering practices in this area. In the event that the nature, design or location of the proposed construction changes, the conclusions and recommendations in this report may no longer be valid.

2.0 Subsurface Investigation

2.1 Test Borings

On May 12, 15-16, and 19, 2014, General Borings, Inc. took six test borings at the approximate locations shown on Figure 1. The test borings were monitored by Heller and Johnsen personnel. Logs are provided in Appendix A.

The test borings were advanced with 3 ¼ inch I.D. hollow-stem augers that provided a cased hole from which samples could be extracted. Samples were taken with a 1-3/8 inch I.D. split-spoon sampler driven (normally) 24 inches into the ground with a 140-lb hammer falling 30 inches. Blows per 6 inches on the sampler were recorded. The foregoing constitutes a standard penetration test from which relative density and other soil characteristics can be estimated. The Standard Penetration Tests were performed with a wireline safety hammer, which has an energy transfer of approximately 45%, based on previous testing.

Surface elevations at each boring were obtained by the client and are listed on the logs. The test borings were located by taping from the staked building corners and are considered approximate.

2.2 Previous Investigations

Thirteen test borings were previously conducted at the site. The test borings were conducted around the perimeter of the landfill limits. Eleven monitoring wells were installed. In addition, soil and/or rock samples were collected in nine of the test borings conducted. Water samples were also collected and tested for water quality. The logs of the thirteen test borings and boring location plan are provided in Appendix B.

2.3 Water Level Readings

Water level readings were measured by the driller at the times recorded on the boring logs. It should be noted that future water level readings may vary due to seasonal and climatic fluctuations, changes caused by construction and stabilization time. Delayed readings are recorded on the logs.

3.0 Site and Subsurface Conditions

3.1 Site

The site is a closed municipal landfill, which was operated between 1970 and 1990. It is mostly wooded. A high knoll exists at elevation 104 feet, and slopes to the southeast to elevation 46 feet and to the northeast to elevation 76 feet.

Old aerial photographs show that the site was originally a wooded ravine with a stream flowing southward from Old Nod Road down the middle of the ravine. In 1970, the presence of waste material was evident on the site. It also appears that a large pile of possible scrap metal was present along the west edge of the landfill. In subsequent years, the landfill continued to expand in height and width. In the latter part of the life of the landfill (the mid to late 1980's), the landfill had little changes.

The original grades prior to the landfill activities varied between elevations 42 ft. at the southeast corner of the landfill and 90 ft. at points along the west side of the landfill. The thickness of landfill placed is generally 20 to 40 feet, based on original and existing grades (HJ-4A encountered fill up to 51 feet).

3.2 Subsurface Conditions

The test borings provide a generalized subsurface profile consisting in descending order of: cover material, municipal landfill materials, naturally deposited granular soil, decomposed rock and bedrock.

The cover material was encountered to a maximum depth of 8 feet, or elevation 75.2 feet. This material generally consists of poorly graded sand with gravel. The landfill materials consists of sand, with debris of plastic, cardboard, paper, wood, rubber, glass and metal. The fill extends to depths varying between 19 and 51 feet, or elevation 77.3 and 36.2 feet, respectively. Several of the test borings were terminated at refusal in the fill. In four test borings, HJ-1, HJ-2, HJ-3, and HJ-4A, naturally granular soils or rock was encountered below the fill.

Gneiss bedrock was encountered in test boring HJ-2 from a depth of 35 feet, or elevation 48.2 feet.

4.0 Evaluation

4.1 Foundations

The municipal landfill materials are highly compressible, and therefore are not suitable for support of the proposed structure, its slab-on-grade or utilities.

The structure, its slab and utilities must be supported on pile foundations that achieve bearing in the naturally deposited granular soils or on bedrock. Concrete filled steel pipe piles are recommended due to the corrosive nature of the landfill materials and the ability to verify the integrity of the piles after installation. Service loads on concrete filled steel pipe are limited by the pile's structural capacity and its drivability. An additional pipe thickness of 1/8 inch should be included to account for possible corrosion, which will also improve the pile's drivability. Service loads on pipe piles should include a downdrag load equal to two kips per inch of pile diameter.

Utilities should be grouped so that a pile supported utility tunnel can be constructed to support the utilities. Flexible utilities, such as power lines connecting light poles, can be placed in pipes provided that they have sufficient slack to accommodate settlement. Access should be provided to maintain the utilities.

4.2 Site Subsidence and Grading

Even though the landfill has been closed for approximately 25 years, it is settling due to secondary consolidation, which is a long term component of settlement due partly to decomposition of organic materials. Typical values of secondary consolidation vary from 0.02 to 0.2 times the thickness of the compressible material per log cycle of time. If the site remained undisturbed, an area underlain by 30 feet of landfill would settle up to about 2 feet in the next 30 years.

If the load is increased by grading, the landfill will undergo primary consolidation followed by a new round of secondary consolidation. A ten foot raise in grade over an extensive area underlain by 30 feet of landfill material could produce 4 feet of primary consolidation followed by an additional secondary consolidation of 3 feet in the next 30 years.

The post-construction settlement can be reduced by placing a surcharge for a period of several months, completing the grading several months prior to the start of construction, using lightweight fill materials or densifying the landfill with a method such as dynamic compaction. However, even with these methods, the magnitude of settlement is too large to support a structure on shallow foundations.

4.3 Slope Stability

Some of the proposed cut elevations are within the landfill material. These areas will likely need to be over-excavated and replaced with suitable structural fill in order to provide adequate cover over the unsuitable fill. Several studies have estimated the strength of landfill materials on the basis of pressuremeter testing and by load testing a portion of a landfill. Landfill materials have been found to have strengths similar to soft to medium clay.

4.4 Methane Collection System

Any system that results in the refuse fill remaining under the proposed structure may require a ventilation system designed to remove gases and odor from below the floor slab. In addition to regulatory requirements which may or may not require a ventilation system, air quality issues may drive the placement of ventilation.

4.5 Seismic Considerations

Based on the results of the test boring, the naturally deposited soils were determined not to be susceptible to liquefaction during the IBC design earthquake. In accordance with IBC 2003, the site may be classified as Site Class E.

The mapped spectral response accelerations according to the 2009 Amendment to the 2005 Connecticut Supplement to the State Building Code are $S_S= 0.219$ and $S_1= 0.059$.

5.0 Summary

Based upon our review of available subsurface information and our understanding of the proposed development, we offer the following conclusions and recommendations:

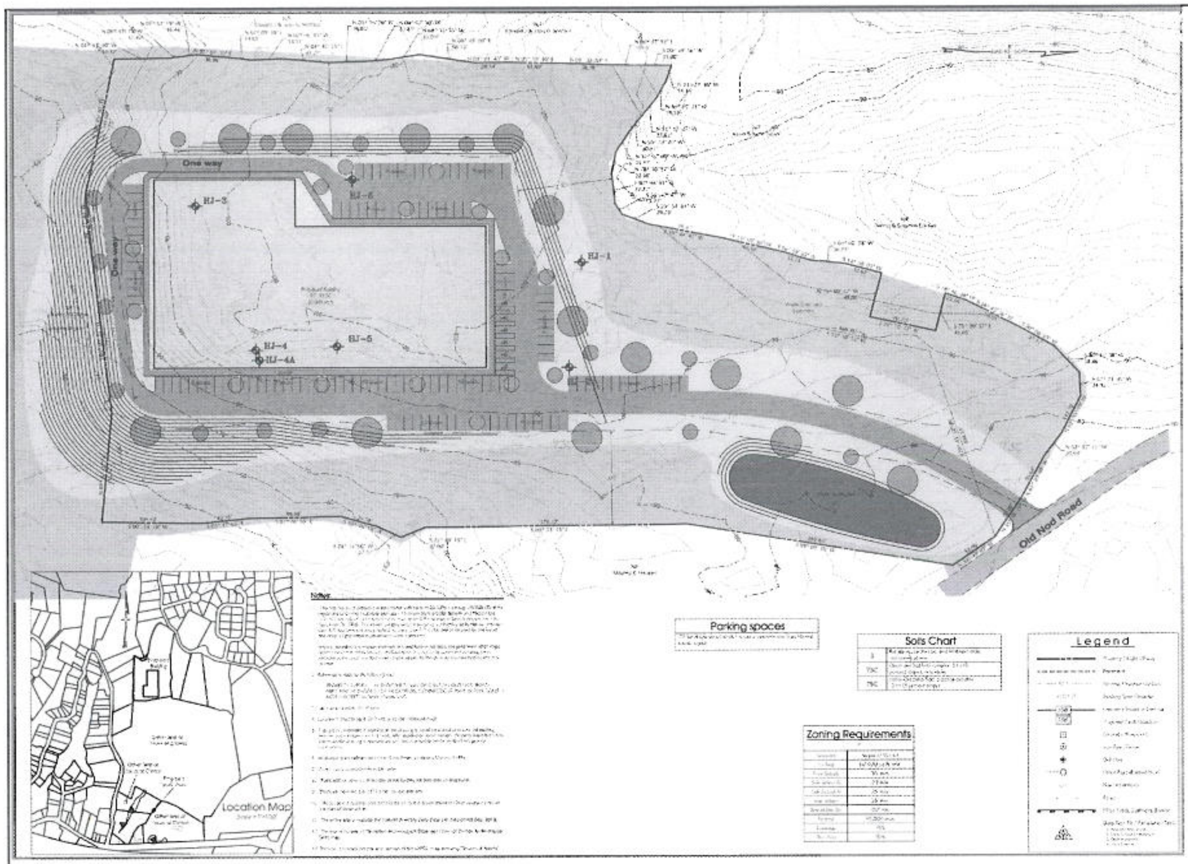
1. The landfill materials are highly compressible and not suitable for support of building loads. The entire structure and slab, and all utilities sensitive to settlement, must be supported on pile foundations that achieve bearing in the underlying naturally deposited soils or on bedrock. Concrete filled steel pipe piles are recommended. The piles should be provided with a sacrificial steel thickness of 1/8 inch to account for corrosion. A downdrag of 2 kips per inch diameter of pile should be included in the pile service load. It may be beneficial to run utilities together through a utility tunnel that is pile supported. Some piles may require pre-drilling past obstructions.

2. The proposed grading changes will result in site subsidence of several feet. Post-construction settlement can be reduced by surcharging, delaying the start of construction after finishing grading, using lightweight fill or dynamic compaction.

3. The entire building should be underlain with a methane collection system. The system should be designed so that it will remain functional after site subsidence on the order of several feet occurs.

4. The underlying naturally deposited soils were determined not to be susceptible to liquefaction in the event of the IBC design earthquake. Using IBC 2003, the site may be classified as Site Class E.

5. A supplemental geotechnical investigation with additional test borings will be required once the development plans are finalized. The stability of side slopes should be analyzed as part of that study. Additional borings should be taken to better estimate pile depths and to help quantify obstructions for pile foundations.



LEGEND

HJ–1 —— TEST BORING NUMBER

⊕ —— TEST BORING LOCATION

BORING LOCATION PLAN

SCALE: 1/128" = 1'-0"

HELLER AND JOHNSEN
Geotechnical Engineering Consultants
Foot of Broad Street, Stratford, CT 06615
(203) 380-8188 Fax: (203) 380-8198

DESIGNED BY: PW
CHECKED BY: LJ
DRAWN BY: PW
SCALE: AS NOTED
DATE: JUNE 10, 2014

OLD NOD ROAD LANDFILL
CLINTON, CONNECTICUT
–
BORING LOCATION PLAN

PROJECT No.
111501

SHEET No.
FIG. 1

© HELLER AND JOHNSEN

APPENDIX A

HELLER AND JOHNSEN
FOOT OF BROAD STREET
STRATFORD, CONNECTICUT 06615

TEST BORING REPORT

BORING NO. HJ-1

PROJECT Old Nod Road Landfill
LOCATION Clinton, Connecticut
CLIENT Payne Environmental, LLC
CONTRACTOR General Borings, Inc.

GROUNDWATER READINGS		
DATE	TIME	DEPTH
5/12/14		Dry

FILE NO. 111501
SHEET NO. 1 OF 1
LOCATION SEE PLAN
ELEVATION 96.3'
DATUM NAVD 1988
DATE 5/12/14 TO 5/12/14
START 0800 FINISH 1030
DRILLER Bob Poynton
H&J REP Garry Jacobsen/Matthew Bagley

ITEM	CASING	DRIVE SAMPLER	CORE BARREL
TYPE	HSA	SS	
INSIDE DIAMETER (IN)	3-1/4	1-3/8	
HAMMER WEIGHT (LB)	--	140	
HAMMER FALL (IN)	--	30	

DRILLING EQUIPMENT & PROCEDURES

RIG TYPE Bombardier with Mobile B-53
BIT TYPE Hollow Stem Auger
DRILL HEAD
HAMMER TYPE Safety Hammer with Wire Line

DEPTH	CASING BLOWS PER FT	SAMPLER BLOWS PER 6 IN	SAMPLE TYPE NO. & REC.	SAMPLE DEPTH (FT)	VISUAL DESCRIPTION AND REMARKS	ELEV./ DEPTH (FT)	STRATUM DESCRIPTION
0		1 6 17 12	SS1 12"	0 2.0	Medium dense, brown, fine to medium SAND, little fine to coarse Gravel.		COVER MATERIAL
5		9 22 6 5	SS2 12"	5.0 7.0	Medium dense, dark grey, fine to coarse GRAVEL and fine to coarse SAND.		
						7.0'	REFUSE FILL
10		9 4 16 24	SS3 14"	10.0 12.0	Medium dense, black, fine SAND and Decomposed Debris (White plastic) (Layer of mottled grey to brown, fine to medium SAND, little Silt).		
15		5 4 5 10	SS4 14"	15.0 17.0	CARDBOARD and PAPER (Possible natural soil and decomposed rock).		
						19.0'	NATURAL SOIL
20		50/0"	SS5	20.0	No Penetration.		
						21.0'	E.O.B. Auger Refusal
25							

HELLER AND JOHNSEN
FOOT OF BROAD STREET
STRATFORD, CONNECTICUT 06615

TEST BORING REPORT

BORING NO. HJ-2

PROJECT Old Nod Road Landfill
LOCATION Clinton, Connecticut
CLIENT Payne Environmental, LLC
CONTRACTOR General Borings, Inc.

GROUNDWATER READINGS		
DATE	TIME	DEPTH
5/12/14		Dry

FILE NO. 111501
SHEET NO. 1 OF 2
LOCATION SEE PLAN
ELEVATION 83.2′
DATUM NAVD 1988
DATE 5/12/14 TO 5/12/14
START 1130 FINISH 1300
DRILLER Bob Poynton
H&J REP Garry Jacobsen/Matthew Bagley

ITEM	CASING	DRIVE SAMPLER	CORE BARREL
TYPE	HSA	SS	
INSIDE DIAMETER (IN)	3-1/4	1-3/8	
HAMMER WEIGHT (LB)	--	140	
HAMMER FALL (IN)	--	30	

DRILLING EQUIPMENT & PROCEDURES
RIG TYPE Bombardier with Mobile B-53
BIT TYPE Hollow Stem Auger
DRILL HEAD
HAMMER TYPE Safety Hammer with Wire Line

DEPTH	CASING BLOWS PER FT	SAMPLER BLOWS PER 6 IN	SAMPLE TYPE NO. & REC.	SAMPLE DEPTH (FT)	VISUAL DESCRIPTION AND REMARKS	ELEV./ DEPTH (FT)	STRATUM DESCRIPTION
0		1 5 8 3	SS1 8″	0 2.0	Medium dense, brown, fine to medium SAND, little fine Gravel.		COVER MATERIAL
5		5 5 4 8	SS2 6″	5.0 7.0	Loose, brown, fine to coarse SAND, little fine Gravel.		
						8.0′	
10		5 5 17 13	SS3 3″	10.0 12.0	Medium dense, black, fine SAND, Decomposed Material/Plastic.		REFUSE FILL
15		12 8 7 7	SS4 12″	15.0 17.0	Medium dense, brown, fine to coarse SAND, Decomposed Material.		
20		9 9 8 13	SS5 7″	20.0 22.0	Medium dense, brown, fine to coarse SAND, Decomposed Material, trace fine Gravel.		
25		7 9 9 8	SS6 12″	25.0 27.0	Medium dense, brown/black, fine to coarse SAND, Decomposed Material.		

HELLER AND JOHNSEN
FOOT OF BROAD STREET
STRATFORD, CONNECTICUT 06615

TEST BORING REPORT

BORING NO. HJ-2

PROJECT Old Nod Road Landfill
LOCATION Clinton, Connecticut
CLIENT Payne Environmental, LLC
CONTRACTOR General Borings, Inc.

GROUNDWATER READINGS		
DATE	TIME	DEPTH
5/12/14		Dry

FILE NO. 111501
SHEET NO. 2 OF 2
LOCATION SEE PLAN
ELEVATION 83.2'
DATUM NAVD 1988
DATE 5/12/14 TO 5/12/14
START 1130 FINISH 1300
DRILLER Bob Poynton
H&J REP Garry Jacobsen/Matthew Bagley

ITEM	CASING	DRIVE SAMPLER	CORE BARREL
TYPE	HSA	SS	NX
INSIDE DIAMETER (IN)	3-1/4	1-3/8	2"
HAMMER WEIGHT (LB)	--	140	
HAMMER FALL (IN)	--	30	

DRILLING EQUIPMENT & PROCEDURES
RIG TYPE Bombardier with Mobile B-53
BIT TYPE Hollow Stem Auger
DRILL HEAD
HAMMER TYPE Safety Hammer with Wire Line

DEPTH	CASING BLOWS PER FT	SAMPLER BLOWS PER 6 IN	SAMPLE TYPE NO. & REC.	SAMPLE DEPTH (FT)	VISUAL DESCRIPTION AND REMARKS	ELEV./ DEPTH (FT)	STRATUM DESCRIPTION
30		5 5 6 10	SS7 6"	30.0 32.0	Medium dense, brown, fine to medium SAND, Decomposed Material.		REFUSE FILL
35		50/0"	SS8	35.0	No Penetration.	35.0'	
			C1	35.5 39.5	Very hard, fresh, grey GNEISS. Foliation is thin, steeply dipping. Several steeply dipping joints, rough, planer, moderately weathered. Dip direction perpendicular to foliation dip direction. RQD=100%		GNEISS
40						39.5'	E.O.B. Auger Refusal
45							
50							
55							
					Note: Left core in borehole, presumed to also be 100% RQD.		

HELLER AND JOHNSEN
FOOT OF BROAD STREET
STRATFORD, CONNECTICUT 06615

TEST BORING REPORT

BORING NO. HJ-3

PROJECT Old Nod Road Landfill
LOCATION Clinton, Connecticut
CLIENT Payne Environmental, LLC
CONTRACTOR General Borings, Inc.

GROUNDWATER READINGS		
DATE	TIME	DEPTH
5/15/14	0930	24.0'

FILE NO. 111501
SHEET NO. 1 OF 2
LOCATION SEE PLAN
ELEVATION 97.9'
DATUM NAVD 1988
DATE 5/15/14 TO 5/15/14
START 0700 FINISH 1030
DRILLER Jim Casson
H&J REP Garry Jacobsen/Matthew Bagley

ITEM	CASING	DRIVE SAMPLER	CORE BARREL
TYPE	HSA	SS	
INSIDE DIAMETER (IN)	3-1/4	1-3/8	
HAMMER WEIGHT (LB)	--	140	
HAMMER FALL (IN)	--	30	

DRILLING EQUIPMENT & PROCEDURES

RIG TYPE Bombardier with Mobile B-53
BIT TYPE Hollow Stem Auger
DRILL HEAD
HAMMER TYPE Safety Hammer with Wire Line

DEPTH	CASING BLOWS PER FT	SAMPLER BLOWS PER 6 IN	SAMPLE TYPE NO. & REC.	SAMPLE DEPTH (FT)	VISUAL DESCRIPTION AND REMARKS	ELEV./ DEPTH (FT)	STRATUM DESCRIPTION
0		1 2 7 23	SS1 18"	0 2.0	Medium dense, brown, fine to medium SAND, little coarse Gravel.		COVER MATERIAL
5		5 4 13 19	SS2 28"	5.0 7.0	Medium dense, dark grey, fine to medium SAND, little Gravel, Refuse, Decomposed Newspaper.	6.0'	
10		70 12 8 12	SS3 11"	10.0 12.0	Dense, brown, fine to coarse SAND, little coarse Gravel, trace Refuse.		
15		24 10 3 4	SS4 6"	15.0 17.0	Medium dense, dark grey, fine to medium SAND, little Gravel, Refuse.		REFUSE FILL
20		14 7 8 17	SS5 3"	20.0 22.0	Wood.		
25		31 18 12 12	SS6 4"	25.0 27.0	Dark grey, fine to medium Gravel, Refuse (Wet).		
					Note: Sample appeared wet at 25'. Subsequent samples did not appear to be saturated.		

HELLER AND JOHNSEN
FOOT OF BROAD STREET
STRATFORD, CONNECTICUT 06615

TEST BORING REPORT

BORING NO. HJ-3

PROJECT Old Nod Road Landfill
LOCATION Clinton, Connecticut
CLIENT Payne Environmental, LLC
CONTRACTOR General Borings, Inc.

GROUNDWATER READINGS

DATE	TIME	DEPTH
5/15/14	0930	24.0'

FILE NO. 111501
SHEET NO. 2 OF 2
LOCATION SEE PLAN
ELEVATION 97.9'
DATUM NAVD 1988
DATE 5/15/14 TO 5/15/14
START 0700 FINISH 1030
DRILLER Jim Casson
H&J REP Garry Jacobsen/Matthew Bagley

ITEM	CASING	DRIVE SAMPLER	CORE BARREL
TYPE	HSA	SS	
INSIDE DIAMETER (IN)	3-1/4	1-3/8	
HAMMER WEIGHT (LB)	--	140	
HAMMER FALL (IN)	--	30	

DRILLING EQUIPMENT & PROCEDURES

RIG TYPE Bombardier with Mobile B-53
BIT TYPE Hollow Stem Auger
DRILL HEAD
HAMMER TYPE Safety Hammer with Wire Line

DEPTH	CASING BLOWS PER FT	SAMPLER BLOWS PER 6 IN	SAMPLE TYPE NO. & REC.	SAMPLE DEPTH (FT)	VISUAL DESCRIPTION AND REMARKS	ELEV./ DEPTH (FT)	STRATUM DESCRIPTION
30		31 19 7 10	SS7 0"	30.0 32.0	No Recovery.		
35		7 3 3 6	SS8 18"	35.0 37.0	Loose, brown, fine to medium SAND.		
						38.5'	POSSIBLE WEATHERED BEDROCK
		75/1"	SS9 0"	39.0 39.1	No Recovery.		
40						39.5'	E.O.B. Auger Refusal
45							
50							
55							

HELLER AND JOHNSEN
FOOT OF BROAD STREET
STRATFORD, CONNECTICUT 06615

TEST BORING REPORT

BORING NO. HJ-4

PROJECT Old Nod Road Landfill
LOCATION Clinton, Connecticut
CLIENT Payne Environmental, LLC
CONTRACTOR General Borings, Inc.

GROUNDWATER READINGS		
DATE	TIME	DEPTH
5/15/14		Dry

FILE NO. 111501
SHEET NO. 1 OF 1
LOCATION SEE PLAN
ELEVATION 88.6'
DATUM NAVD 1988
DATE 5/15/14 TO 5/15/14
START 1100 FINISH 1315
DRILLER Jim Casson
H&J REP Matthew Bagley

ITEM	CASING	DRIVE SAMPLER	CORE BARREL
TYPE	HSA	SS	
INSIDE DIAMETER (IN)	3-1/4	1-3/8	
HAMMER WEIGHT (LB)	--	140	
HAMMER FALL (IN)	--	30	

DRILLING EQUIPMENT & PROCEDURES

RIG TYPE Bombardier with Mobile B-53
BIT TYPE Hollow Stem Auger
DRILL HEAD
HAMMER TYPE Safety Hammer with Wire Line

DEPTH	CASING BLOWS PER FT	SAMPLER BLOWS PER 6 IN	SAMPLE TYPE NO. & REC.	SAMPLE DEPTH (FT)	VISUAL DESCRIPTION AND REMARKS	ELEV./ DEPTH (FT)	STRATUM DESCRIPTION
0		2 6 6 6	SS1 12"	0 2.0	Medium dense, grey, fine to medium SAND, little course Gravel.		COVER MATERIAL
5		12 5 6 8	SS2 4"	5.0 7.0	Medium dense, grey, fine to medium SAND, little coarse Gravel, Wood.		
						7.0'	REFUSE FILL
10		39 38 11 4	SS3 3"	10.0 12.0	Dense, grey, fine to medium SAND, little Gravel, Decomposed Material, Wood.		
15		70/3"	SS4 3"	15.0 15.3	Black, Wood, Rubber, Plastic, fine to medium Sand.		
20		50/5"	SS5 5"	20.0 20.4	Wood.		
						21.0'	E.O.B. Auger Refusal
25							

HELLER AND JOHNSEN
FOOT OF BROAD STREET
STRATFORD, CONNECTICUT 06615

TEST BORING REPORT

BORING NO. HJ-4A

PROJECT Old Nod Road Landfill
LOCATION Clinton, Connecticut
CLIENT Payne Environmental, LLC
CONTRACTOR General Borings, Inc.

GROUNDWATER READINGS		
DATE	TIME	DEPTH
5/16/14		Dry

FILE NO. 111501
SHEET NO. 1 OF 2
LOCATION SEE PLAN
ELEVATION 87.2′
DATUM NAVD 1988
DATE 5/15/14 TO 5/16/14
START 1100 FINISH 1315
DRILLER Jim Casson
H&J REP Matthew Bagley

ITEM	CASING	DRIVE SAMPLER	CORE BARREL
TYPE	HSA	SS	
INSIDE DIAMETER (IN)	3-1/4	1-3/8	
HAMMER WEIGHT (LB)	--	140	
HAMMER FALL (IN)	--	30	

DRILLING EQUIPMENT & PROCEDURES

RIG TYPE Bombardier with Mobile B-53
BIT TYPE Hollow Stem Auger
DRILL HEAD
HAMMER TYPE Safety Hammer with Wire Line

DEPTH	CASING BLOWS PER FT	SAMPLER BLOWS PER 6 IN	SAMPLE TYPE NO. & REC.	SAMPLE DEPTH (FT)	VISUAL DESCRIPTION AND REMARKS	ELEV./ DEPTH (FT)	STRATUM DESCRIPTION
0					Augering to 25 ft.		
5							
10							
15							
20							
25		32	SS1 6″	25.0 27.0	Black Wood, fine to coarse Sand, trace fine Gravel.	25.0′	
		18					
		13					
		12					
							DECOMPOSED MATERIAL FILL

HELLER AND JOHNSEN
FOOT OF BROAD STREET
STRATFORD, CONNECTICUT 06615

TEST BORING REPORT

BORING NO. HJ-4A

PROJECT Old Nod Road Landfill
LOCATION Clinton, Connecticut
CLIENT Payne Environmental, LLC
CONTRACTOR General Borings, Inc.

GROUNDWATER READINGS		
DATE	TIME	DEPTH
5/16/14		Dry

FILE NO. 111501
SHEET NO. 2 OF 2
LOCATION SEE PLAN
ELEVATION 87.2′
DATUM NAVD 1988
DATE 5/15/14 TO 5/16/14
START 1100 FINISH 1315
DRILLER Jim Casson
H&J REP Matthew Bagley

ITEM	CASING	DRIVE SAMPLER	CORE BARREL
TYPE	HSA	SS	
INSIDE DIAMETER (IN)	3-1/4	1-3/8	
HAMMER WEIGHT (LB)	--	140	
HAMMER FALL (IN)	--	30	

DRILLING EQUIPMENT & PROCEDURES

RIG TYPE Bombardier with Mobile B-53
BIT TYPE Hollow Stem Auger
DRILL HEAD
HAMMER TYPE Safety Hammer with Wire Line

DEPTH	CASING BLOWS PER FT	SAMPLER BLOWS PER 6 IN	SAMPLE TYPE NO. & REC.	SAMPLE DEPTH (FT)	VISUAL DESCRIPTION AND REMARKS	ELEV./ DEPTH (FT)	STRATUM DESCRIPTION
30		7	SS2	30.0	Medium dense, brown, fine to medium SAND, some Silt, Wood.		REFUSE FILL
		11	10″	32.0			
		7					
		38					
35		22	SS3	35.0	Medium dense, grey, brown, fine to coarse SAND, little Silt, Plastic, Wood.		
		13	6″	37.0			
		13					
		31					
40		24	SS4	40.0	Wood, Decomposed material.		
		19	3″	42.0			
		12					
		22					
45		6	SS5	45.0	Medium dense, brown, fine to medium SAND, Glass, Decomposed material.		
		5	8″	47.0			
		7					
		13					
50		12	SS6	50.0	Top 3″: Grey/brown, fine to medium SAND, some Silt.		
		14	6″	51.1	Bottom 3″: Grey, Decomposed Rock Fragments.		
		50/1″				51.0′	DECOMPOSED ROCK
						52.5′	E.O.B. Auger Refusal
55							

HELLER AND JOHNSEN
FOOT OF BROAD STREET
STRATFORD, CONNECTICUT 06615

TEST BORING REPORT

BORING NO. HJ-5

PROJECT Old Nod Road Landfill
LOCATION Clinton, Connecticut
CLIENT Payne Environmental, LLC
CONTRACTOR General Borings, Inc.

GROUNDWATER READINGS		
DATE	TIME	DEPTH
5/19/14		Dry

FILE NO. 111501
SHEET NO. 1 OF 2
LOCATION SEE PLAN
ELEVATION 96'
DATUM NAVD 1988
DATE 5/19/14 TO 5/19/14
START 1018 FINISH 1245
DRILLER Jim Casson
H&J REP Matthew Bagley

ITEM	CASING	DRIVE SAMPLER	CORE BARREL
TYPE	HSA	SS	
INSIDE DIAMETER (IN)	3-1/4	1-3/8	
HAMMER WEIGHT (LB)	--	140	
HAMMER FALL (IN)	--	30	

DRILLING EQUIPMENT & PROCEDURES

RIG TYPE Bombardier with Mobile B-53
BIT TYPE Hollow Stem Auger
DRILL HEAD
HAMMER TYPE Safety Hammer with Wire Line

DEPTH	CASING BLOWS PER FT	SAMPLER BLOWS PER 6 IN	SAMPLE TYPE NO. & REC.	SAMPLE DEPTH (FT)	VISUAL DESCRIPTION AND REMARKS	ELEV./ DEPTH (FT)	STRATUM DESCRIPTION
0					Fill, Topsoil.		COVER MATERIAL
5							
						7.0'	REFUSE FILL
10							
15							
20							
25							

HELLER AND JOHNSEN
FOOT OF BROAD STREET
STRATFORD, CONNECTICUT 06615

TEST BORING REPORT

BORING NO. HJ-5

PROJECT Old Nod Road Landfill
LOCATION Clinton, Connecticut
CLIENT Payne Environmental, LLC
CONTRACTOR General Borings, Inc.

GROUNDWATER READINGS

DATE	TIME	DEPTH
5/19/14		Dry

FILE NO. 111501
SHEET NO. 2 OF 2
LOCATION SEE PLAN
ELEVATION 96'
DATUM NAVD 1988
DATE 5/19/14 TO 5/19/14
START 1018 FINISH 1245
DRILLER Jim Casson
H&J REP Matthew Bagley

ITEM	CASING	DRIVE SAMPLER	CORE BARREL
TYPE	HSA	SS	
INSIDE DIAMETER (IN)	3-1/4	1-3/8	
HAMMER WEIGHT (LB)	--	140	
HAMMER FALL (IN)	--	30	

DRILLING EQUIPMENT & PROCEDURES

RIG TYPE Bombardier with Mobile B-53
BIT TYPE Hollow Stem Auger
DRILL HEAD
HAMMER TYPE Safety Hammer with Wire Line

DEPTH	CASING BLOWS PER FT	SAMPLER BLOWS PER 6 IN	SAMPLE TYPE NO. & REC.	SAMPLE DEPTH (FT)	VISUAL DESCRIPTION AND REMARKS	ELEV./ DEPTH (FT)	STRATUM DESCRIPTION
30							
35		25 21 31 66	SS1 0"	35.0	No Recovery.		REFUSE FILL
40							
						42.0'	E.O.B. Auger Refusal
45							
50							
55							

HELLER AND JOHNSEN
FOOT OF BROAD STREET
STRATFORD, CONNECTICUT 06615

TEST BORING REPORT

BORING NO. HJ-6

PROJECT Old Nod Road Landfill
LOCATION Clinton, Connecticut
CLIENT Payne Environmental, LLC
CONTRACTOR General Borings, Inc.

GROUNDWATER READINGS		
DATE	TIME	DEPTH
5/19/14		Dry

FILE NO. 111501
SHEET NO. 1 OF 1
LOCATION SEE PLAN
ELEVATION 99.1'
DATUM NAVD 1988
DATE 5/19/14 TO 5/19/14
START 1300 FINISH 1530
DRILLER Jim Casson
H&J REP Matthew Bagley

ITEM	CASING	DRIVE SAMPLER	CORE BARREL
TYPE	HSA	SS	
INSIDE DIAMETER (IN)	3-1/4	1-3/8	
HAMMER WEIGHT (LB)	--	140	
HAMMER FALL (IN)	--	30	

DRILLING EQUIPMENT & PROCEDURES
RIG TYPE Bombardier with Mobile B-53
BIT TYPE Hollow Stem Auger
DRILL HEAD
HAMMER TYPE Safety Hammer with Wire Line

DEPTH	CASING BLOWS PER FT	SAMPLER BLOWS PER 6 IN	SAMPLE TYPE NO. & REC.	SAMPLE DEPTH (FT)	VISUAL DESCRIPTION AND REMARKS	ELEV./DEPTH (FT)	STRATUM DESCRIPTION
0							COVER MATERIAL
						4.0'	
5							
10							
15		4 8 15 23	SS1 8"	15.0 17.0	Medium dense, brown, fine to coarse SAND, Decomposed Material/Plastic.		REFUSE FILL
20							
25		4 5 6 4	SS2 0"	25.0 27.0	Brown, Metal, Wood, Plastic.		
30							
						31.0'	E.O.B. Auger Refusal

APPENDIX B

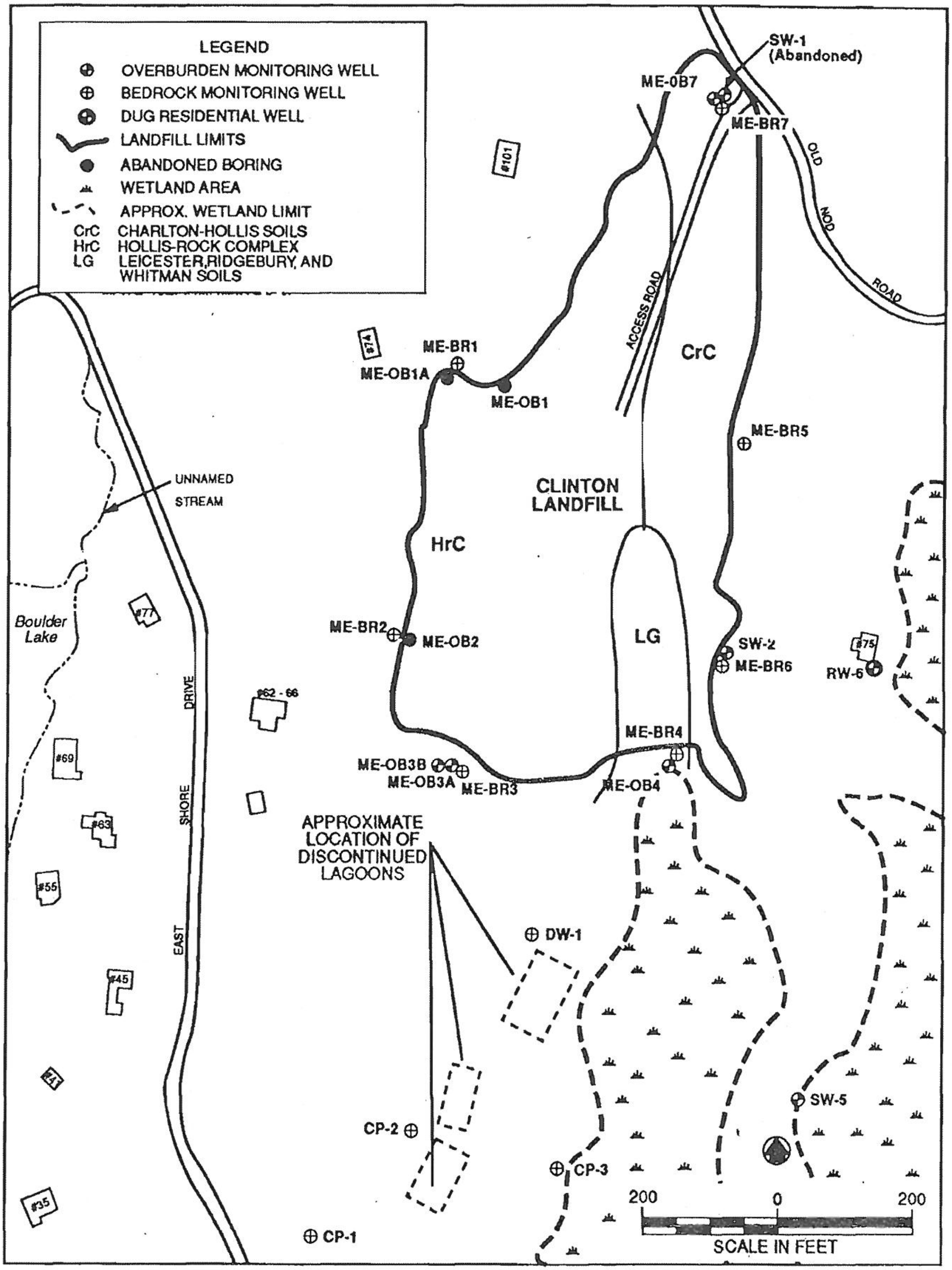


FIGURE 2-1. APPROXIMATE DISTRIBUTION OF ORGINAL SOILS.

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
GLASTONBURY, CT 06033
(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy
PROJECT NAME Landfill
LOCATION Clinton, CT

BORING NUMBER ME-BR-1
SHEET No. 1 of 1

DRILLER W. Burns
INSPECTOR J. Fitting
DATE START 10-4-90
DATE FINISH 10-5-90

ARCHITECT ENGINEER

	Casing	Sampler	Core Barrel
TYPE	HW	SS	NX
SIZE I.D.	4"	1-3/8"	2"
HAMMER WT.	300	140	
HAMMER FALL	24	30	

FILE NO.
SURFACE ELEV.
LINE & STATION
OFFSET

DEPTH	SAMPLE NO.	DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	S-1	0-2.0	2	6					.2 Topsoil
				6	6	15"			Dark Brown Silt, Little Fine Sand,
	S-2	2.0-2.9	3	120					Trace of Gravel.
5'	R-1	4.2-9.2	Cored			60"	13	4.2	
							10		Run 1
							9		Cored Gneiss Rock
							13		from 4.2-9.2'
							14		Rec. 60".
10'	R-2	9.2-14.2	Cored			60"	11		
							13		Run 2
							15		Cored Gneiss Rock
							25		from 9.2-14.2'
							18		Rec. 60".
	R-3	14.2-18.7	Cored			53"	18		
							27		Run 3
							27		Cored Gneiss Rock
							40		from 14.2-18.7'
							42		Rec. 53".
20'	R-4	18.7-23.2	Cored			55"	11		Run 4
							12		Cored Gneiss Rock
							13		from 18.7-23.2'
							17	23.2	Rec. 55".
25'									End of Boring @ 23.2'
									Water @ 14.7'.
									Reamed Hole to 4" Dia. to 11.7'
									Installed: 10'-2" PVC Screen
30'									14.5'-2" PVC Riser
									Sand to 10.9'
									Seal to 4.0'
									1 Locking Protector
									Pipe.
35'									

S: 1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:
.5 Hrs. Well Devp't
.25 Hrs. DCON

COL. A Coring Times/FT.

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
GLASTONBURY, CT 06033
(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy
PROJECT NAME Landfill
LOCATION Clinton, CT

BORING NUMBER ME-BR-2
SHEET No. 1 of 1

DRILLER K. Regan
INSPECTOR J. Fitting
DATE START 10-23-90
DATE FINISH 10-25-90

ARCHITECT ENGINEER

	Casing	Sampler	Core Barrel
TYPE	HW		NX
SIZE I.D.	4"		2-7/8"
HAMMER WT.	300		
HAMMER FALL	24/ SPIN		

FILE NO.
SURFACE ELEV.
LINE & STATION
OFFSET

DEPTH	SAMPLE NO.	SAMPLE DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
								2.1	Top of Rock.
								4.5	Roller Bit to 4.5'.
5'	R-1	4.5-9.5	Cored			57"	22		
							9		Run 1
							3		Cored Gneiss Rock
							5		from 4.5-9.5'
							11		Rec. 57".
10'	R-2	9.5-14.5	Cored			56"	8		Run 2
							7		from 9.5-14.5'
							4		Rec. 56".
							8		
							11		
'	R-3	14.5-19.5	Cored			60"	14		Run 3
							11		from 14.5-19.5'
							13		Rec. 60".
							13		
							12		
20'	R-4	19.5-24.5	Cored			60"	9		Run 4
							8		from 19.5-24.5'
							8		Rec. 60".
							9		
							9	24.5	
25'									
									End of Boring @ 24.5'
									Water @ 10.2'.
30'									
									Reamed Hole to 4" Dia. to 14.5'
									Installed: 10'-2" PVC Screen
									17'-2" PVC Riser
35'									Sand to 11.1'
									Seal to 2.6'
									1-LPP

ES: 1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:
.3 Hrs. Well Devp.
1 Hr. DCON

COL. A Coring Times/Ft.

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
GLASTONBURY, CT 06033
(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy
PROJECT NAME Landfill
LOCATION Clinton, CT

BORING NUMBER ME-BR-3
SHEET No. 1 of 1

DRILLER K. Regan
INSPECTOR J. Fitting
DATE START 10-19-90
DATE FINISH 10-23-90

ARCHITECT ENGINEER

	Casing	Sampler	Core Barrel
TYPE	HW		NX
SIZE I.D.	4"		2"
HAMMER WT.	300		
HAMMER FALL	24		

FILE NO.
SURFACE ELEV.
LINE & STATION
OFFSET

DEPTH	SAMPLE NO.	SAMPLE DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
		No Samples Required							
5'									
10'									
								11.1	Top of Rock.
	R-1	12.0-17.3	Cored			64"	17	12.0	Roller Bit to 12.0'.
							21		Run 1
							12		Cored Gneiss Rock
							15		from 12.0-17.3'
							18		Rec. 64".
							9		
	R-2	17.3-22.3	Cored			60"	10		Run 2
							12		from 17.3-22.3'
20'							15		Rec. 60".
							14		
							16		
	R-3	22.3-28.0	Cored			68"	17		Run 3
							19		from 22.3-28.0'
25'							24		Rec. 68".
							29		
							4/8"		
								28.0	
30'									End of Boring @ 28.0'
									Water @ 0.5'.
									Reamed Hole to 4" Dia. 11.1-17.0'
									Installed: 10'-2" PVC Screen
35'									20'-2" PVC Riser
									Sand to 16.0'
									Seal to 2.0'
									1-LPP

1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:
1 Hr. Well Devp.

COL. A Coring Times/ Ft.

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
GLASTONBURY, CT 06033
(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy
PROJECT NAME Landfill
LOCATION Clinton, CT

BORING NUMBER ME-BR-4
SHEET No. 1 of 1

DRILLER W. Burns
INSPECTOR J. Fitting
DATE START 10-11-90
DATE FINISH 10-12-90

ARCHITECT ENGINEER

	Casing	Sampler	Core Barrel
TYPE	HW		NX
SIZE I.D.	4"		2"
HAMMER WT.	300		
HAMMER FALL	24		

FILE NO.
SURFACE ELEV.
LINE & STATION
OFFSET

DEPTH	SAMPLE NO.	SAMPLE DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
5'									
10'									
								17.0	Top of Rock.
								18.0	Roller Bit Rock 17-18.0'.
	R-1	18.0-23.0	Cored			59"	9		Run 1
20'							7		from 18.0-23.0'
							6		Rec. 59".
							8		
							9		
	R-2	23.0-28.0	Cored			58"	8		Run 2
25'							10		from 23.0-28.0'
							10		Rec. 58".
							10		
							11		
	R-3	28.0-31.5	Cored			47"	12		Run 3
30'							17		from 28.0-31.5'
							35	31.5	Rec. 47".
							5/6"		
35'									

End of Boring @ 31.5'
Water @ Ground Level.

Reamed Rock to 4" Dia. 17-22.0'
Installed: 10'-2" PVC Screen
23'-2" PVC Riser
Sand to 20', Seal to
Ground Level.

NOTES: 1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:
.25 Well Devp.

COL. A Coring Times/Ft.

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
GLASTONBURY, CT 06033
(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy
PROJECT NAME Landfill
LOCATION Clinton, CT

BORING NUMBER ME-BR-5
SHEET No. 1 of 1

DRILLER W. Burns
INSPECTOR J. Fitting
DATE START 10-9-90
DATE FINISH 10-10-90

ARCHITECT ENGINEER

	Casing	Sampler	Core Barrel
TYPE	HW	SS	NX
SIZE I.D.	4"	1-3/8"	2"
HAMMER WT.	300	140	
HAMMER FALL	24	30"	

FILE NO.
SURFACE ELEV.
LINE & STATION
OFFSET

DEPTH	SAMPLE NO.	SAMPLE DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	S-1	0-2.0	1	1				.6	Fine-Crs. Sand.
				1	2	13"			Brown Silt, Trace of Fine Sand,
	S-2	2.0-3.0	8	17		6"			Roots.
	S-3	3.0-4.5	5	14	35	10"			
5'								5.1	
	R-1	5.1-10.1	Cored			58"	5		Run 1
							5		Cored Gneiss Rock
							4		from 5.1-10.1'
10'							2		Rec. 58".
							3		
	R-2	10.1-15.1	Cored			50"	4		Run 2
							5		from 10.1-15.1'
							6		Rec. 50".
							6		
'							9		
	R-3	15.1-19.7	Cored			63"	8		Run 3
							8		from 15.1-19.7'
							9		Rec. 63".
20'							12		
							15		
	R-4	19.7-23.3	Cored			45"	9		Run 4
							8		from 19.7-23.3'
							12	23.3	Rec. 45".
25'							8		
									End of Boring @ 23.3'
									Water @ 14.0'.
									Reamed Hole to 4" Dia. to 13.0'.
30'									Installed: 10'-2" PVC Screen
									15'-2" PVC Riser
									Sand pack to 11.0'
									Seal to 4.0'
35'									1-LPP

ES: 1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS: 40 min. Devp. Time

COL. A Coring Times/Ft.

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
GLASTONBURY, CT 06033
(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy
PROJECT NAME Landfill
LOCATION Clinton, CT

BORING NUMBER ME-BR-6
SHEET No. 1 of 1

DRILLER K. Regan
INSPECTOR J. Fitting
DATE START 10-15-90
DATE FINISH 10-16-90

ARCHITECT ENGINEER

	Casing	Sampler	Core Barrel
TYPE	HW		NX
SIZE I.D.	4"		2"
HAMMER WT.	300		
HAMMER FALL	24		

FILE NO.
SURFACE ELEV.
LINE & STATION
OFFSET

DEPTH	SAMPLE NO.	SAMPLE DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	BLOWS PER 6" ON SAMPLER 6-12	BLOWS PER 6" ON SAMPLER 12-18	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
		No Samples Required							
5'									
10'									
								12.0	Top of Rock.
	R-1	13.0-18.0	Cored			48"	10		Run 1
							10		Cored Gneiss Rock
'							10		from 13.0-18.0'
							6		Rec. 48".
							5		
	R-2	18.0-23.0	Cored			55"	7		Run 2
							11		from 18.0-23.0'
20'							12		Rec. 55".
							11		
							11		
	R-3	23.0-28.0	Cored			54"	10		Run 3
							10		from 23.0-28.0'
25'							13		Rec. 54".
							15		
							15		
								28.0	
30'									End of Boring @ 28.0'
									Water @ 6.0'.
									Reamed Hole to 4" Dia. 12-18.0'
									Installed: 10'-2" PVC Screen
35'									17'-2" PVC Riser
									Seal 15'-4"
									Sand 27.1'-15'
									Sand above Seal
									1-LPP

S: 1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:
50 min. DCON
.75 Hr. Well Devp.

COL. A Coring Times/Ft.

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
GLASTONBURY, CT 06033
(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy
PROJECT NAME Landfill
LOCATION Clinton, CT

BORING NUMBER ME-BR-7
SHEET No. 1 of 1

DRILLER C. Reil
INSPECTOR J. Fitting
DATE START 10-1-90
DATE FINISH 10-3-90

ARCHITECT ENGINEER

	Casing	Sampler	Core Barrel
TYPE	HW	SS	NX
SIZE I.D.	4"	1-3/8"	2"
HAMMER WT.	300	140	
HAMMER FALL	24	30"	

FILE NO.
SURFACE ELEV.
LINE & STATION
OFFSET

DEPTH	SAMPLE NO.	SAMPLE DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	S-1	0-2.0	10	12					
				15	21	17"			Brown Fine-Med. Sand, Little Silt and Gravel.
	S-2	2.0-4.0	13	18					
				13	10	10"			
5'	S-3	4.0-6.0	8	9					
				6	5	8"		6.0	
	S-4	6.0-8.0	1	1					Brown Silt, Trace of Fine Sand.
				1	0	6"		8.0	
	S-5	8.0-10.0	0	0					
10'				1	9	2"			Fine-Crs. Sand, Silt and Garbage, Fill.
	S-6	10.0-12.0	13	35					
				36	32	19"		12.0	
	S-7	12.0-14.0	0	30					Brown Fine-Crs. Sand, Some Silt, Trace of Clay, Gravel.
				33	25	24"			
'	S-8	14.0-15.0	7	15	61/0	9"		15.0	
	R-1	15.0-20.0	Cored			60"			Run 1 Cored Black & White Gneiss Rock from 15.0-20.0' Rec. 60".
20'									
	R-2	20.0-25.0	Cored			60"			Run 2 from 20.0-25.0' Rec. 60".
25'									
	R-3	25.0-30.0	Cored			60"			Run 3 from 25.0-30.0' Rec. 60".
30'								30.0	
									End of Boring @ 30.0' Water @ 6.0'.
									Reamed Hole to 4" Dia. to 15.0'.
35'									Installed: 10'-2" PVC Screen 20'-2" PVC Riser 1-LPP

ES: 1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:
1 Hr. DCON
1.16 Well Devp.

COL. A

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
GLASTONBURY, CT 06033
(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy
PROJECT NAME Landfill
LOCATION Clinton, CT

BORING NUMBER ME-OB-1
SHEET No. 1 of 1

DRILLER W. Burns
INSPECTOR J. Fitting
DATE START 10-9-90
DATE FINISH 10-9-90

ARCHITECT ENGINEER

	Casing	Sampler	Core Barrel
TYPE	HSA		
SIZE I.D.	4-1/4"		
HAMMER WT.			
HAMMER FALL			

FILE NO.
SURFACE ELEV.
LINE & STATION
OFFSET

DEPTH	SAMPLE						COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	NO.	DEPTH RANGE	BLOWS PER 6" ON SAMPLER			REC.			
			0-6	6-12	12-18				
		No Samples Required							
5'									
								8.0	
10'									Auger Refusal @ 8.0' No Well.

ES: 1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:

COL. A

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
GLASTONBURY, CT 06033
(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy
PROJECT NAME Landfill
LOCATION Clinton, CT

BORING NUMBER ME-OB-1A
SHEET No. 1 of 1

ILLER W. Burns
INSPECTOR J. Fitting
DATE START 10-9-90
DATE FINISH 10-9-90

ARCHITECT ENGINEER

	Casing	Sampler	Core Barrel
TYPE	HSA		
SIZE I.D.	4-1/4"		
HAMMER WT.			
HAMMER FALL			

FILE NO.
SURFACE ELEV.
LINE & STATION
OFFSET

DEPTH	SAMPLE						COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	NO.	DEPTH RANGE	BLOWS PER 6" ON SAMPLER			REC.			
			0-6	6-12	12-18				
		No Samples Required							
5'									
								7.0	
									Auger Refusal @ 7.0' No Well.
10'									

1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:

COL. A

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
GLASTONBURY, CT 06033
(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy
PROJECT NAME Landfill
LOCATION Clinton, CT

BORING NUMBER ME-OB-2
SHEET No. 1 of 1

DRILLER K. Regan
INSPECTOR J. Fitting
DATE START 10-23-90
DATE FINISH 10-23-90

ARCHITECT ENGINEER

	Casing	Sampler	Core Barrel
TYPE	HSA		
SIZE I.D.	4-1/4"		
HAMMER WT.			
HAMMER FALL			

FILE NO.
SURFACE ELEV.
LINE & STATION
OFFSET

DEPTH	SAMPLE NO.	SAMPLE DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	BLOWS PER 6" ON SAMPLER 6-12	BLOWS PER 6" ON SAMPLER 12-18	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
		No Samples Required							
								4.0	
5'									
									Auger Refusal @ 4.0'.
10'									

S: 1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:

COL. A

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
GLASTONBURY, CT 06033
(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy
PROJECT NAME Landfill
LOCATION Clinton, CT

BORING NUMBER ME-OB-3
SHEET No. 1 of 1

DRILLER K. Regan
INSPECTOR J. Fitting
DATE START 10-17-90
DATE FINISH 10-18-90

ARCHITECT ENGINEER

	Casing	Sampler	Core Barrel
TYPE	HSA	SS	
SIZE I.D.	4-1/4"	1-3/8"	
HAMMER WT.		140	
HAMMER FALL		30"	

FILE NO.
SURFACE ELEV.
LINE & STATION
OFFSET

DEPTH	SAMPLE NO.	DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	S-1	0-2.0	2	12					Brown Silt, Little Fine-Med. Sand,
				11	7	9"		2.0	Trace of Wood, .1 Peat and Wood.
	S-2	2.0-4.0	1	5					Gray Fine-Med. Sand, Little Silt.
				7	3	15"			
5'	S-3	4.0-6.0	3	2				5.0	
				4	5	22"		6.0	Gray Silt, Little Fine-Med. Sand,
	S-4	6.0-8.0	13	15					Trace of Clay.
				15	18	14"		8.0	Gray Brown Fine-Med. Sand, Trace of
	S-5	8.0-10.0	13	17					Silt, Black Fine Sand Layer.
10'				20	24	24"			
	S-6	10.0-12.0	17	18					Brown Fine-Med. Sand, Trace of
				18	19	17"		12.0	Gravel, Silt.
	S-7	12.0-14.0	22	18					Brown Fine-Crs. Sand, Trace of
				27	21	24"		14.0	Gravel, Brown Fine Sand, Little Silt
	S-8	14.0-16.0	3	7				15.0	Brown Fine-Med. Sand, Trace of
				13	6	24"		16.0	Gravel, Little Silt.
	S-9	16.0-18.0	7	11					Brown Fine-Crs. Sand, Some Gravel,
				13	9	12"			Trace of Silt.
	S-10	18.0-20.0	20	11					Gray Brown Fine-Crs. Sand and
20'				7	12	5"			Gravel, Trace of Silt.
	S-11	20.0-22.0	32	44					
				103	200	24"		22.0	
	S-12	22.0-22.3	200/4"					22.3	Gray Silt, Trace of Fine-Crs. Sand,
									Gravel, Clay.
25'									
									Auger Refusal @ 22.6'
									Water @ Ground Level.
30'									
35'									

1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:

COL. A

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
GLASTONBURY, CT 06033
(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy
PROJECT NAME Landfill
LOCATION Clinton, CT

BORING NUMBER ME-OB-3A
SHEET No. 1 of 1

DRILLER K. Regan
INSPECTOR J. Fitting
DATE START 10-19-90
DATE FINISH 10-19-90

ARCHITECT ENGINEER

	Casing	Sampler	Core Barrel
TYPE	HW		
SIZE I.D.	4"		
HAMMER WT.	300		
HAMMER FALL	24		

FILE NO.
SURFACE ELEV.
LINE & STATION
OFFSET

DEPTH	SAMPLE NO.	SAMPLE DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
		No Samples Required							
5'									
10'								11.0	
									End of Boring @ 11.0' Water @ Ground Level. Installed: 5'-2" PVC Screen 8'-2" PVC Riser Sand to 4.0' Seal to Surface 1-LPP
20'									
25'									
30'									
35'									

ES: 1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:

COL. A

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
GLASTONBURY, CT 06033
(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy
PROJECT NAME Landfill
LOCATION Clinton, CT

BORING NUMBER ME-OB-3B
SHEET No. 1 of 1

DRILLER K. Regan
INSPECTOR J. Fitting
DATE START 10-18-90
DATE FINISH 10-18-90

ARCHITECT ENGINEER

	Casing	Sampler	Core Barrel
TYPE	HW		
SIZE I.D.	4"		
HAMMER WT.	300		
HAMMER FALL	24		

FILE NO.
SURFACE ELEV.
LINE & STATION
OFFSET

DEPTH	SAMPLE NO.	SAMPLE DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
		No Samples Required							
5'									
10'									
20'								20.3	
									End of Boring @ 20.3' Water @ Ground Level. Installed: 5'-2" PVC Screen 17'-2" PVC Riser Sand to 13.0' Seal to 4.0' Sand to Surface 1-LPP
25'									
30'									
35'									

ES: 1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:
.25 Hr. Well Devp.

COL. A

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
GLASTONBURY, CT 06033
(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy

PROJECT NAME Landfill

LOCATION Clinton, CT

BORING NUMBER ME-OB-4

SHEET No. 1 of 1

DRILLER W. Burns

INSPECTOR J. Fitting

DATE START 10-10-90

DATE FINISH 10-11-90

ARCHITECT ENGINEER

	Casing	Sampler	Core Barrel
TYPE	HSA	SS	
SIZE I.D.	4-1/4"	1-3/8"	
HAMMER WT.		140	
HAMMER FALL		30"	

FILE NO.

SURFACE ELEV.

LINE & STATION

OFFSET

DEPTH	SAMPLE						COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
	NO.	DEPTH RANGE	BLOWS PER 6" ON SAMPLER			REC.			
			0-6	6-12	12-18				
	S-1	0-2.0	1	1					Brown Fine-Crs. Sand, Trace of Gravel, Wood, Plastic, Black Fine-Med. Sand, Trace of Silt.
				1	2	14"			
	S-2	2.0-4.0	1	1				3.5	
				2	5	24"			
5'	S-3	4.0-6.0	1	5					Brown Gray Silt and Clay.
				10	13	17"		5.7	
	S-4	6.0-8.0	4	5				6.0	Gray Fine-Crs. Sand, Trace of Gravel, Silt.
				9	4			8.0	
	S-5	8.0-9.6	43	41					Gray Silt, Trace of Fine-Crs. Sand, Little Gravel, Trace of Silt.
10'				47	100/2"			9.6	Red Brown Fine-Crs. Sand and Gravel, Little Silt.
20'									
25'									

Auger Refusal @ 9.6'
Water @ Ground Level.

Installed: 5'-2" PVC Screen
6.5'-2" PVC Riser
Sand to 3.5'
Seal to 1.0'
1-LPP

1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:
1 Hr. DCON

COL. A

NEW ENGLAND BORING CONTRACTORS OF CT. INC.
129 KREIGER LANE
GLASTONBURY, CT 06033
(203) 633-4649 — (413) 733-1232
FAX (203) 657-8046

CLIENT Metcalf & Eddy
PROJECT NAME Landfill
LOCATION Clinton, CT

BORING NUMBER ME-OB-7
SHEET No. 1 of 1

DRILLER C. Reil
INSPECTOR J. Fitting
DATE START 10-3-90
DATE FINISH 10-3-90

ARCHITECT ENGINEER

	Casing	Sampler	Core Barrel
TYPE	HSA		
SIZE I.D.	4-1/4"		
HAMMER WT.			
HAMMER FALL			

FILE NO.
SURFACE ELEV.
LINE & STATION
OFFSET

DEPTH	SAMPLE NO.	DEPTH RANGE	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	REC.	COL. A	STRATA CHANGE	FIELD CLASSIFICATION AND REMARKS
		No Samples Required							
5'									
10'									
								13.5	
'									End of Boring @ 13.5' Water @ 6.0'. Installed: 10'-2" PVC Screen 4'-2" PVC Riser 1-LPP
20'									
25'									
30'									
35'									
'									

ES: 1) The stratification lines represent the approximate boundary between soil types, transitions may be gradual.
2) Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the level of groundwater may occur due to other factors than those present at the time measurements were made.

SAMPLE PENETRATION RESISTANCE
140 lb. Wt. falling 30" on 2" O.D. Sampler

Cohesionless Density		Cohesive Consistency	
0-4	Very Loose	0-2	Very Soft
5-9	Loose	3-4	Soft
10-29	Med. Dense	5-8	M/Stiff
30-49	Dense	9-15	Stiff
50 +	Very Dense	16-30	V-Stiff
		31 +	Hard

PROPORTIONS

trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

REMARKS:

COL. A

BORING LOCATION PLAN

SCALE: 1/128 " = 1'-0"

LEGEND

HJ-1	TEST BORING NUMBER
⌖	TEST BORING LOCATION

HELLER AND JOHNSEN
Geotechnical Engineering Consultants
Foot of Broad Street, Stratford, CT 06615
(203) 380-8188 Fax: (203) 380-8198

DESIGNED BY: PW
CHECKED BY: LJ
DRAWN BY: PW
SCALE: AS NOTED
DATE: JUNE 10, 2014

OLD NOD ROAD LANDFILL
CLINTON, CONNECTICUT

BORING LOCATION PLAN

PROJECT No.
111501

SHEET No.
FIG. 1

IMTL

Accurate information you can rely on.

Soil Gradation Report

GRADATION ASTM D-422; WET WASH ASTM D-1140; ATTERBERG LIMITS ASTM D-4318; SOIL CLASS ASTM D-2487

PROJECT:	LOUREIRO – INFO	PROJECT NO.:	1866
CLIENT:	LOUREIRO ENGINEERING ASSOC., INC.	REPORT NO.:	001
LAB NO.:	31656	DATE:	06/23/14
USE:	NOT AVAILABLE	SAMPLED BY:	LOUREIRO ENG.
SPEC A:	NOT AVAILABLE*	SOURCE:	CLINTON LANDFILL TOWN MATERIAL
SAMPLE ID:	1328314	EST. PARTICLE SHAPE/HARDNESS:	ROUNDED, ANGULAR/ HARD

GRADATION RESULTS

SIEVE #		% PASS	SPEC A
75 mm	(3")	100.0	
63 mm	(2-1/2")	87.1	
50 mm	(2")	87.1	
37.5 mm	(1-1/2")	87.1	
25 mm	(1")	87.1	
19 mm	(3/4")	86.8	
12.5 mm	(1/2")	86.4	
6.3 mm	(1/4")	85.5	
4.75 mm	(#4)	84.9	
2.0 mm	(#10)	77.5	
425 µm	(#40)	65.3	
150 µm	(#100)	57.3	
75 µm	(#200)	49.4	
COMPLIED WITH:			SPEC A: *

. . .AS PER GRADATION ABOVE

SOIL DESCRIPTION: DARK OLIVE BROWN FINES & SAND; SOME GRAVEL
MATERIAL CONTAINS STICKS, ROOT FRAGMENTS, LEAF DEBRIS, GRASS

SOIL CLASSIFICATION: MATERIAL IS CLASSIFIED AS SILTY SAND WITH GRAVEL (SM)

ATTERBERG LIMITS: LL = 33 PL = 25 PI = 8

JOHN M. WALERY
6-24-14

REVIEWED BY: 6-24-14

pc: George Andrews, Loureiro Engineering Assoc., Inc.

km

Independent Materials Testing Laboratories, Inc. T 860.747.1000 mail@imtlct.com
57 N. Washington St., P.O. Box 745, Plainville, CT 06062 F 860.747.6455 www.imtlct.com

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Soil Gradation Report

GRADATION ASTM D-422; WET WASH ASTM D-1140; ATTERBERG LIMITS ASTM D-4318; SOIL CLASS ASTM D-2487

PROJECT:	LOUREIRO – INFO	PROJECT NO.:	1866
CLIENT:	LOUREIRO ENGINEERING ASSOC., INC.	REPORT NO.:	002
LAB NO.:	31655	DATE:	06/23/14
USE:	NOT AVAILABLE	SAMPLED BY:	LOUREIRO ENG.
SPEC A:	NOT AVAILABLE*	SOURCE:	CLINTON LANDFILL TOWN MATERIAL
SAMPLE ID:	1328313	EST. PARTICLE SHAPE/HARDNESS:	ROUNDED/SOFT

GRADATION RESULTS

SIEVE #		% PASS	SPEC A
37.5 mm	(1-1/2")	100.0	
25 mm	(1")	96.1	
19 mm	(3/4")	94.4	
12.5 mm	(1/2")	92.0	
6.3 mm	(1/4")	88.8	
4.75 mm	(#4)	87.0	
2.0 mm	(#10)	80.9	
425 µm	(#40)	48.8	
150 µm	(#100)	21.5	
75 µm	(#200)	14.1	
COMPLIED WITH:			SPEC A: *
. . .AS PER GRADATION ABOVE			

STATE OF CONNECTICUT
JOHN M. WALEYS
LICENSED PROFESSIONAL ENGINEER
6-24-14

SOIL DESCRIPTION: DARK YELLOW/BROWN SAND; LITTLE FINES; LITTLE GRAVEL
MATERIAL CONTAINS ROOTS, SMALL STICKS, PLANT DEBRIS

SOIL CLASSIFICATION: MATERIAL IS CLASSIFIED AS SILTY SAND (SM)

ATTERBERG LIMITS: MATERIAL IS NON-PLASTIC (NP). UNABLE TO ROLL INTO A THREAD 3.2MM IN DIAMETER

REVIEWED BY: 6-24-14
pc: George Andrews, Loureiro Engineering Assoc., Inc.
km

IMTL

Accurate information you can rely on.

Soil Gradation Report

GRADATION ASTM D-422; WET WASH ASTM D-1140; SOIL CLASS ASTM D-2487

PROJECT:	LOUREIRO – INFO	PROJECT NO.:	1866
CLIENT:	LOUREIRO ENGINEERING ASSOC., INC.	REPORT NO.:	003
LAB NO.:	31654	DATE:	06/23/14
USE:	NOT AVAILABLE	SAMPLED BY:	LOUREIRO ENG.
SPEC A:	NOT AVAILABLE*	SOURCE:	CLINTON LANDFILL TOWN MATERIAL
SAMPLE ID:	1328312	EST. PARTICLE SHAPE/HARDNESS:	ROUNDED, ANGULAR/ SOFT
		PAGE:	1 OF 2

GRADATION RESULTS

SIEVE #		% PASS	SPEC A
37.5 mm	(1-1/2")	100.0	
25 mm	(1")	98.4	
19 mm	(3/4")	97.3	
12.5 mm	(1/2")	93.0	
6.3 mm	(1/4")	85.1	
4.75 mm	(#4)	80.6	
2.0 mm	(#10)	67.3	
425 μm	(#40)	28.9	
150 μm	(#100)	8.3	
75 μm	(#200)	4.1	
COMPLIED WITH:			SPEC A: *
. . .AS PER GRADATION ABOVE			

STATE OF CONNECTICUT
JOHN M. WALERYSIAK
No. 17781
PROFESSIONAL ENGINEER

SOIL DESCRIPTION: VERY DARK BROWN SAND; SOME GRAVEL; TRACE FINES
MATERIAL CONTAINS SMALL ROOTS, LEAF DEBRIS, SMALL STICKS, PLANT DEBRIS

SOIL CLASSIFICATION: MATERIAL IS CLASSIFIED AS POORLY GRADED SAND WITH GRAVEL (SP)

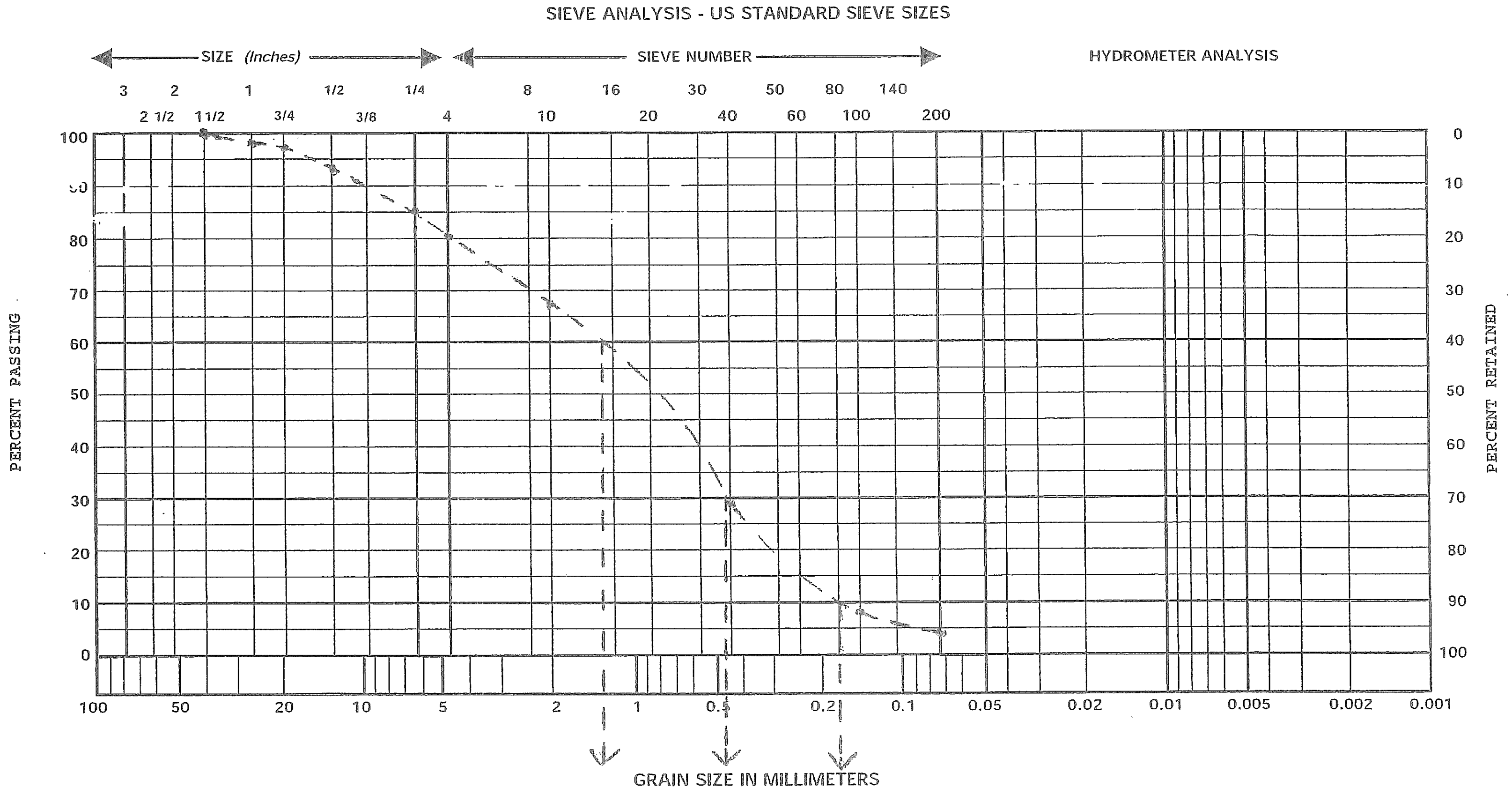
REVIEWED BY: 6-24-14

pc: George Andrews, Loureiro Engineering Assoc., Inc.
km

GRAIN SIZE DISTRIBUTION GRAPH - AGGREGATE GRADATION CHART

1. PROJECT
LOUREIRO INFO (P.O. # 5315) SAMPLE ID # 1328312 LAB # 31654

2. DATE
6/19/2014



D60=1.4 D30=0.47 D10=0.18

EXCAVATION NUMBER	SAMPLE NUMBER	LL	PL	PI	Cu (D₆₀/D₁₀)	Cc $(D_{30})^2/(D_{60} \times D_{10})$	SOIL DESCRIPTION/REMARKS	CLASSIFICATION (USCS)
					(1.4/0.18) 7.7	(0.47)2/(1.4x0.18) 0.9		SP

3. TECHNICIAN *(Signature)*
AB

4. PLOTTED BY *(Signature)*
AB

5. CHECKED BY *(Signature)*
RC

DD FORM 1207, DEC 1999

PREVIOUS EDITION IS OBSOLETE.

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Soil Gradation Report

GRADATION ASTM D-422; WET WASH ASTM D-1140; ATTERBERG LIMITS ASTM D-4318; SOIL CLASS ASTM D-2487

PROJECT:	LOUREIRO – INFO	PROJECT NO.:	1866
CLIENT:	LOUREIRO ENGINEERING ASSOC., INC.	REPORT NO.:	004
LAB NO.:	31653	DATE:	06/23/14
USE:	NOT AVAILABLE	SAMPLED BY:	LOUREIRO ENG.
SPEC A:	NOT AVAILABLE*	SOURCE:	CLINTON LANDFILL TOWN MATERIAL
SAMPLE ID:	1328311	EST. PARTICLE SHAPE/HARDNESS:	ROUNDED, ANGULAR/ SOFT

GRADATION RESULTS

SIEVE #		% PASS	SPEC A
90 mm	(3-1/2")	100.0	
75 mm	(3")	85.7	
63 mm	(2-1/2")	85.7	
50 mm	(2")	79.3	
37.5 mm	(1-1/2")	76.4	
25 mm	(1")	70.2	
19 mm	(3/4")	69.0	
12.5 mm	(1/2")	65.4	
6.3 mm	(1/4")	61.0	
4.75 mm	(#4)	58.9	
2.0 mm	(#10)	52.8	
425 µm	(#40)	31.6	
150 µm	(#100)	17.2	
75 µm	(#200)	13.5	
COMPLIED WITH:			SPEC A: *

. . .AS PER GRADATION ABOVE

JOHN M. WALERYSIAK

6-24-14

SOIL DESCRIPTION: VERY DARK BROWN SAND; SOME GRAVEL; LITTLE COBBLE; LITTLE FINES
MATERIAL CONTAINS WOOD FRAGMENTS, SMALL STICKS, SMALL ROOTS, LEAF DEBRIS, CONCRETE, ASPHALT

SOIL CLASSIFICATION: MATERIAL IS CLASSIFIED AS SILTY SAND WITH GRAVEL (SM)

ATTERBERG LIMITS: MATERIAL IS NON-PLASTIC (NP). UNABLE TO ROLL INTO A THREAD 3.2MM IN DIAMETER

REVIEWED BY: 6-24-14

pc: George Andrews, Loureiro Engineering Assoc., Inc.

km