Site Management Plan

Love Canal Site
Niagara Falls, New York

Glenn Springs Holdings, Inc.

Executive Summary

The following provides a brief summary of the controls implemented for the Site, as well as the inspections, monitoring, maintenance and reporting activities required by the Site Management Plan.

Site Identification	NYSDEC Site No. 932020 - Love Canal Site
Institutional Controls:	1. The Site is not available for use or development, other than operation of remedial systems.
	2. The use of groundwater underlying the Site is prohibited without necessary water quality treatment as determined by the NYSDOH or the Niagara County Department of Health.
	3. Groundwater monitoring must be performed as defined in this SMP.
	4. Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP.
	5. All ECs must be inspected at a frequency and in a manner defined in the SMP.
Engineering Controls:	1. Cover System
	2. Collection Systems
	3. Leachate Treatment System
	4. Fencing and Access Control

Inspections:	**Frequency**
1. Barrier System/Pump Chamber Inspection	Semi-Annually
2. Landfill Cap, Site Cover, Fence Inspection	Semi-Annually
3. Barrier Drain Manhole Inspection	Semi-Annually
4. NYSDEC Annual Inspection	Annually
Monitoring:	
1. Hydraulic Monitoring	Quarterly
2. Groundwater Quality Monitoring	Annually
Maintenance:	
1. Per Operation and Maintenance Manual	As needed
Reporting:	
1. NFWB SIU Wastewater Discharge Permit No. 44 Report	Monthly/Quarterly
2. Periodic Review Report	Annually

Table of Contents

Table of Contents

Figure Index

Table Index

Appendix Index

Acronyms

BHC	Benzene Hexachloride
cm/sec	centimeters per second
CRA	Conestoga-Rovers & Associates
DCF	Dewatering Containment Facility
EC	Engineering Control
EDA	Emergency Declaration Area
GSH	Glenn Springs Holdings, Inc.
HASP	Health and Safety Plan
HDPE	High density polyethylene
HMI	Human-Machine Interface
IC	Institutional Control
LCTF	Love Canal Treatment Facility
NFWB	Niagara Falls Water Board
NYSDEC	New York State Department of Environmental Quality
NYSDOH	New York State Department of Health
OCC	Occidental Chemical Corporation
O&M	Operation and Maintenance
PLC	Programmable Logic Controller
POTW	Publicly Owned Treatment Works
PRR	Periodic Review Report
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
ROD	Record of Decision
RSO	Remedial Site Optimization
Site	Love Canal Site
SIU	Significant Industrial User
SMP	Site Management Plan
TDH	Total Dynamic Head
USEPA	United States Environmental Protection Agency
WAN	Wide Area Network

1. Introduction

1.1 General

This Site Management Plan (SMP) has been prepared at the request of the New York State Department of Environmental Conservation (NYSDEC) for the remedial program associated with the Love Canal Site located in Niagara Falls, New York (hereinafter referred to as the "Site"). The location of the Site is presented on Figure 1.1. The Site is currently listed as site No. 932020 in the Inactive Hazardous Waste Disposal Site Remedial Program, which is administered by the NYSDEC.

Occidental Chemical Corporation (OCC) entered into a Consent Judgement with the State of New York in 1994 to assume responsibility for operation, maintenance, and monitoring of the remedial systems the Site. Effective July 1, 1998, Site responsibility was assigned by OCC to Glenn Springs Holdings, Inc. (GSH), an affiliate of OCC. A figure showing the boundaries of this Site is provided in Figure 1.2.

After completion of the remedial work, some contamination was left at this Site, which is hereafter referred to as "remaining contamination". Institutional and Engineering Controls (ICs and ECs) have been incorporated into the Site remedy to control exposure to remaining contamination to ensure protection of public health and the environment.

This SMP was prepared to manage remaining contamination at the Site, as requested by NYSDEC, in accordance with the NYSDEC approved Sampling Manual, Long-term Groundwater Monitoring Program (Sampling Manual) and Operation and Maintenance (O&M) Manual for the Site. This plan has been approved by the NYSDEC, and compliance with this plan is required by the Consent Judgment. This SMP may only be revised with the approval of the NYSDEC.

All reports associated with the Site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State. A list of contacts for persons involved with the Site is provided in Appendix A of this SMP.

This SMP was prepared by GHD, on behalf of Glenn Springs Holdings, Inc., in general accordance with the requirements of the NYSDEC's DER-10 ("Technical Guidance for Site Investigation and Remediation"), dated November 2017, and the guidelines provided by the NYSDEC, as applicable. This SMP addresses the means for implementing the ICs and/or ECs that are required by the Consent Judgement for the Site.

1.2 Revisions

Revisions to this plan will be submitted in writing to the NYSDEC's project manager. Revisions will be necessary upon, but not limited to, the following occurring: a change in media monitoring requirements, upgrades to or shut-down of a remedial system, post-remedial removal of contaminated soil, or other significant change to the site conditions. In accordance with the Consent Judgement for the site, the NYSDEC will provide a notice of any approved changes to the SMP, and append these notices to the SMP that is retained in its files.

1.3 Notifications

Notifications will be submitted to the NYSDEC, as needed, in accordance with NYSDEC's DER-10 for the following reasons:

- 60-day advance notice of any proposed changes in Site use that are required under the terms of the Consent Decree, 6NYCRR Part 375 and/or Environmental Conservation Law.
- 7-day advance notice of the annual groundwater monitoring event associated with the remedial program.
- 15-day advance notice of any proposed ground-intrusive activity.
- Notice within 48 hours of any damage or defect to the foundation, structures or EC that reduces or has the potential to reduce the effectiveness of an EC, and likewise, any action to be taken to mitigate the damage or defect.
- Verbal notice by noon of the following day of any emergency, such as a fire; flood; or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.
- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to the NYSDEC within 45 days describing and documenting actions taken to restore the effectiveness of the ECs.

Table 1.1 includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix A.

Table 1.1 Notifications

Name	Contact Information
Brian Sadowski	716-851-7220 brian.sadowski@dec.ny.gov
Glenn May	716-851-7220 glenn.may@dec.ny.gov
Stan Radon	716-851-7220 Stanley.radon@dec.ny.gov

2. Summary of Previous Investigations and Remedial Actions

2.1 Site Location and Description

The Site is located in Niagara Falls, Niagara County, New York and consists of 232 land parcels (see Appendix B). The Site is an approximately 70-acre area and is bounded by Colvin Boulevard to the north, Frontier Avenue to the south, 100th Street to the east, and 95th Street to the west (see

Figure 1.2 – Site Layout Map). The boundaries of the site are more fully described in Appendix B. The owner(s) of the site parcel(s) at the time of issuance of this SMP are:

- City of Niagara Falls
- Niagara Falls Board of Education
- Niagara Falls Housing
- UDC Love Canal, Inc.
- Armstrong, Lee C.

2.2 Physical Setting

2.2.1 Land Use

The Site consists of a fenced 70-acre area. The Site is zoned OS - Open Space and is currently vacant.

The properties adjoining the Site and in the neighborhood surrounding the Site primarily include commercial, residential, and open space properties. The properties immediately south of the Site include open space properties; the properties immediately north of the Site include residential properties; the properties immediately east of the Site include open space and commercial properties; and the properties to the west of the Site include open space and residential properties.

Surrounding the main Site area are seven "Emergency Declaration Areas" (EDAs). EDAs 4 through 7 are now suitable for residential use, however EDAs 1 through 3 are currently suitable only for commercial and/or industrial use. These EDAs are not part of the Site described in this SMP.

2.2.2 Geology

The geology of the Site, with increasing depth below ground surface, is as follows:

- Fill (1.8 to 2.5 feet thick outside of the Canal and 10 to possibly 35 feet within the Canal), overlying
- Alluvium (1.5 to 3.7 feet thick), overlying
- Clay (13.5 to 23.0 feet thick), overlying
- Till (at depth 19 to 27 feet), overlying
- Lockport Formation Bedrock

A geologic cross section is shown in Figure 2.1. Site specific boring logs are contained in the Sampling Manual, Long-Term Groundwater Monitoring Program, provided in Appendix C.

2.2.2.1 Hydrogeology

Due to the primarily clayey nature of the subsurface soils at and surrounding the Love Canal, there is very little overburden groundwater movement. The clays act as an aquitard and restrict vertical and horizontal groundwater migration. The measured hydraulic conductivity of the clay layer is on the order of 1 x 10^{8} centimeters per second (cm/sec). There is a perched water table in the thin alluvium layer overlying the clay. However, this layer is very shallow and would be expected to respond to seasonal variations fairly quickly (i.e., wet during rainy periods and drier in hot dry weather). The hydraulic conductivity of the alluvium layer is estimated to be on the order of 1 x 10^{4} cm/sec.

The clay/till layers beneath the Canal act as an aquitard and have prevented chemicals from seeping from the Canal into the underlying bedrock. This is evident from the ongoing hydraulic and chemical monitoring performed at the Site.

The bedrock hydrogeologic description was obtained from the results of investigative activities performed at the 102nd Street Landfill Site, located immediately south of the Canal.

The bedrock is comprised of several bedrock stratigraphic units. The uppermost bedrock formation encountered is the dolomite of the Oak Orchard Formation, which is massive and dense. Although some porosity and permeability is present within the rock mass, the majority of the porosity and permeability occurs along fracture surfaces, bedding planes, partings, and joints. Distribution of these features is irregular and unpredictable. The nature of the bedrock is also evidenced by the wide range of hydraulic conductivities determined by the in situ response tests. These values vary between 6.9 x 10^{6} and 9.4 x 10^{2} cm/sec. The geometric mean hydraulic conductivity is 1.0 x 10^{3} cm/sec.

The groundwater flow is toward the Niagara River with a very shallow gradient.

Water-bearing zones exist only within the upper portion of the Oak Orchard Formation. No water-bearing zones were found at depth. In fact, no water-bearing intervals were found below a depth of 75 feet into the bedrock.

Groundwater monitoring well construction logs are contained in the Sampling Manual, Long-Term Groundwater Monitoring Program, provided in Appendix C.

2.3 Investigation and Remedial History

The following narrative provides a remedial history timeline. A brief summary of the available project records which document key investigative and remedial milestones for the Site is not included in this report due to the size and nature of the project, but a list of reports relevant to the Site's history can be found in the most recent United States Environmental Protection Agency (USEPA) Five-Year Review.

The Love Canal was initially designed to provide inexpensive hydroelectric power for industrial development around the turn of the 20th century, but was abandoned shortly after construction commenced. Between 1942 and 1952, Hooker Chemical and Plastics Corporation (now OCC) disposed of over 21,000 tons of various chemicals into the Love Canal. The solid and liquid wastes deposited into the Canal included acids, chlorides, mercaptans, phenols, toluenes, pesticides, chlorophenols, chlorobenzenes, and sulfides.

The remedial program at Love Canal has been extensive. Construction was initiated in 1978 for a project designed to contain leachate migration from the Canal. A permanent treatment plant has been in operation since December 7, 1979. A 3-foot thick clay cap was installed in 1980. A 40-mil high density polyethylene (HDPE) liner covered by 18 inches of clean soil and vegetation was installed over the initial clay cap area in 1985 to decrease infiltration over the Canal and to enhance inward migration of groundwater from the surrounding area.

In October 1994, a Consent Judgment between OCC and the State of New York was approved by the court. This judgment required operation and maintenance activities for the Love Canal Site. On January 12, 1995, the NYSDEC reclassified the Site to a Class 4 Site. Operation of the Love Canal Site (Site) was transferred from the NYSDEC to OCC in April 1995. Effective July 1, 1998, Site responsibility was assigned by OCC to GSH, an affiliate of OCC. Since October 1, 2008, GHD Services, Inc. (GHD), formerly Conestoga-Rovers & Associates (CRA), has performed operation, maintenance, monitoring, and reporting activities for the Site under contract and direct management of GSH.

2.4 Remedial Action Objectives

The 1994 Consent Judgement document states that the O&M activities at the Site are "necessary to prevent the migration of chemical wastes through operation of the Love Canal leachate collection system and treatment plant, maintenance and repair of the cap, the leachate collection system, the treatment plant, related facilities, and the monitoring system; and, monitoring of the effectiveness of the remediation within the Love Canal Area".

2.5 Remaining Contamination

Contaminants identified in Site soil and groundwater during initial investigations included metals (such as antiomony arsenic, lead, and mercury), PAHs (such as benzo(a) anthracene, benzo(b)fluoroanthene, benzo(a)pyrene, chrysene, indeno(1,2,3-cd)pyrene), pesticides (such as benzene hexachloride (BHC) isomers), and dioxin. Remaining contamination is limited to the area underneath the cap, specifically in the area of the landfill.

2.5.1 Soil

The soils underneath the cap are presumed to be impacted by the contaminants listed above. This is the area where historical disposal occurred of drummed and liquid chemical wastes. Containment of this soil is achieved by the landfill cap and collection systems.

2.5.2 Groundwater

Groundwater contamination exists within the barrier drain system and landfill cap, in the same area where soil contamination is presumed to exist. This contamination is contained by the operation of the collection systems.

3. Institutional and Engineering Control Plan

3.1 General

Since remaining contamination exists at the site, Institutional Controls (ICs) and Engineering Controls (ECs) are required to protect human health and the environment. This IC/EC Plan describes the procedures for the implementation and management of all IC/ECs at the Site. The IC/EC Plan is one component of the SMP and is subject to revision by the NYSDEC.

This plan provides:

- A description of all IC/ECs on the site
- The basic implementation and intended role of each IC/EC
- A description of the key components of the ICs
- A description of the controls to be evaluated during each required inspection and periodic review
- A description of plans and procedures to be followed for implementation of IC/ECs for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the site
- Any other provisions necessary to identify or establish methods for implementing the IC/ECs required by the site remedy, as determined by the NYSDEC

3.2 Institutional Controls

A series of ICs is required to: (1) implement, maintain and monitor Engineering Control systems; (2) prevent future exposure to remaining contamination; and, (3) restrict the use and development of the Site. The IC boundaries are shown on Figure 1.2. These ICs are:

- The Site is not available for use or development, other than operation of the remedial systems
- All ECs must be operated and maintained as specified in this SMP
- All ECs must be inspected at a frequency and in a manner defined in the SMP
- The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the New York State Department of Health (NYSDOH) or the Niagara County Department of Health to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department
- Groundwater monitoring must be performed as defined in this SMP
- Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SM
- All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP
- Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SM
- Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SM

Access to the Site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice.

3.3 Engineering Controls

Detailed information about the engineering controls, including inspection and operation procedures, are provided in the Operation and Maintenance (O&M) Manual provided in Appendix D.

3.3.1 Cover

Exposure to remaining contamination at the site is prevented by a cover system placed over the Site. This cover system is comprised of a minimum 3-foot thick, 22-acre, clay cap covering the entire former Canal area. A second, 40-acre cap was installed over the initial clay cap area. The second cap consists of a 40-mil HDPE liner covered by 18 inches of clean soil and vegetation. In the event the cover system is breached, penetrated or temporarily removed, or any underlying remaining contamination is disturbed, appropriate action will be taken to restore the area to previous conditions. Any work conducted regarding the cover must also be conducted in accordance with the procedures defined in the Site Specific Health and Safety Plan (HASP), a copy of which is maintained at the Site office. Procedures for inspection of the Site cover are provided in the O&M Manual in Appendix D.

3.3.2 Collection Systems

Operation of remedial systems to prevent the off Site migration of chemical contaminants from the Site began in October 1978 with the installation of a barrier drain along the east and west sides of the Southern Sector of the Canal. The barrier drain was later extended to completely encompass the entire area of disposed waste within the Central and Northern Sectors of the Canal. The locations of the barrier drain and associated collection system are shown on Figure 1.2.

The remedial collection systems for the Site are the systems defined in the 1982 Record of Decision (ROD) and the Consent Judgment from 1994. These systems have been periodically modified to attain the objectives of the ROD. Presently, the remedial collection system is composed of the following:

- Barrier Drain System
- Collection System (Pump Chambers)

The barrier drain, designed to intercept the shallow overburden lateral groundwater flow, consists of a trench approximately 4 feet wide that varies in depth from approximately 12 to 25 feet depending on location at the Site. Installed within the trench is a perforated vitrified clay tile pipe. The pipe is 6-inch diameter in the Central and Northern Sectors and both 6-inch and 8-inch diameter in the Southern Sector. The pipe is centered in a minimum of 2 feet of uniformly sized gravel, which is overlain with coarse sand extending to the existing ground surface present at the time of construction. Thirty-two lateral trenches, approximately 12 to 19 feet deep, filled with a minimum of 2 feet of gravel and overlain with sand similar to the barrier drain, were dug perpendicular to the barrier drain in the direction of the Canal. The majority of these laterals extend into the disposed waste. The entire barrier drain system consists of 6,800 feet of trench and perforated vitrified clay tile pipe and an additional 2,100 feet of lateral trenches.

The barrier drain is graded from two highpoints, one in the southeast corner and the other in the northeast corner, toward a series of manholes which drain to four pump chambers (PC-1A/PC-2A in the Northern/Central Sector and PC-1/PC-2 in the Southern Sector) where the leachate is collected. The leachate is pumped from the pump chambers to two other pump chambers connected to underground holding tanks (PC-3A in the Northern/Central Sector and PC-3 in the Southern Sector) where it is temporarily stored.

These systems are designed to contain groundwater, preventing off-Site migration. Collected groundwater is sent to the Love Canal Treatment Facility (LCTF) for treatment.

In March 1999, the adjacent 102nd Street Landfill Site leachate collection system was connected to the Love Canal Site to facilitate the transfer of leachate from the 102nd Street Landfill into Love Canal's pump chamber PC 3 for treatment at the LCTF.

3.3.3 Leachate Treatment System

The LCTF collects impacted groundwater from the Love Canal Site as well as the 102nd Street Landfill and treats it prior to discharge. The treatment process consists of several process steps for the removal of various constituents prior to discharge into the Niagara Falls Water Board (NFWB) sanitary sewer system under the Site's Significant Industrial User (SIU) Permit #44. The primary steps in the treatment process include the process feed, clarification, filtration, and carbon treatment (Figure 3.1).

The Raw Water Feed Pump pumps leachate to the Clarifier from the Raw Water Tank for the first stage of solids removal. Leachate overflows from the Clarifier to the Filter Feed Tank and is then pumped to the series of bag filters.

After solids removal using the clarifier and the bag filters, the flow stream enters a train of two carbon beds in series. The carbon system is utilized to reduce the concentration of organic contaminants to below the required discharge limits. After passing through the carbon beds, the water is directed to the NFWB sanitary sewer system and ultimately the NFWB Publicly Owned Treatment Works (POTW).

3.3.4 Fencing and Access Control

The entire Site is secured by an 8-foot chain-link fence. Access to the Site is controlled through a main automatic gate located on 805 97th Street, and locked except to allow entry to and exit from the Site. Additional gates are located around the perimeter of the Site; however, these gates are always kept locked and used only when required by special activities. Entry to and exit from the Site is controlled by individuals who possess gate keys or a transmitter for the automatic gate. The location of Site fencing is presented on Figure 1.2.

4. Monitoring and Sampling Plan

4.1 General

This Monitoring and Sampling Plan describes the measures for evaluating the overall performance and effectiveness of the remedy. This Monitoring and Sampling Plan may only be revised with the approval of the NYSDEC. Details regarding the sampling procedures, data quality usability objectives, analytical methods, etc. for all samples collected as part of site management for the Site are included in the Sampling Manual provided in Appendix C.

This Monitoring and Sampling Plan describes the methods to be used for:

- Sampling and analysis of groundwater
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment

To adequately address these issues, this Monitoring and Sampling Plan provides information on:

- Sampling locations, protocol, and frequency
- Information on all designed monitoring systems
- Analytical sampling program requirements
- Inspection and maintenance requirements for monitoring wells
- Monitoring well decommissioning procedures
- Annual inspection and periodic certification

Reporting requirements are provided in Section 7.0 of this SMP.

4.2 Site-Wide Inspection

Site-wide inspections will be performed annually. Modification to the frequency or duration of the inspections will require approval from the NYSDEC. Site-wide inspections will also be performed after all severe weather conditions that may affect ECs or monitoring devices. Other components of the Site are inspected on daily, weekly, monthly, semiannual, and annual frequencies. An inspection schedule for these other components of the Site, as well as inspection forms, are presented in the O&M Manual in Appendix D.

The Annual Inspection will document the following:

- Compliance with all ICs, including Site usage
- An evaluation of the condition and continued effectiveness of ECs
- General Site conditions at the time of the inspection
- Confirm that Site records are up to date

Inspections of all remedial components installed at the Site will be conducted. A comprehensive Site-wide inspection will be conducted and documented according to the SMP schedule, regardless of the frequency of the Periodic Review Report. The inspections will determine and document the following:

- Whether ECs continue to perform as designed
- If these controls continue to be protective of human health and the environment
- Compliance with requirements of this SMP

- Achievement of remedial performance criteria
- If Site records are complete and up to date

Reporting requirements are outlined in Section 7.0 of this plan.

Inspections will also be performed in the event of an emergency. If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs that reduces or has the potential to reduce the effectiveness of ECs in place at the site, verbal notice to the NYSDEC must be given by noon of the following day. In addition, an inspection of the site will be conducted within 5 days of the event to verify the effectiveness of the IC/ECs implemented at the site by a qualified environmental professional, as determined by the NYSDEC. Written confirmation must be provided to the NYSDEC within 7 days of the event that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

4.3 Remedial System Monitoring and Sampling

Monitoring of the barrier drain system and LCTF is conducted in accordance with the O&M Manual presented in Appendix D. Modification to the frequency or sampling requirements will require approval from the NYSDEC. Unscheduled inspections and/or sampling may take place when a suspected failure of the barrier drain system or LCTF system has been reported or an emergency occurs that is deemed likely to affect the operation of the barrier drain system or LCTF.

A complete list of components to be inspected and inspection forms are presented in the O&M Manual in Appendix D. If any equipment readings are not within their specified operation range, any equipment is observed to be malfunctioning or the system is not performing within specifications; maintenance and repair, as per the O&M Manual is required.

4.4 Post-Remediation Media Monitoring and Sampling

Hydraulic and chemical monitoring will be performed on a routine basis. Hydraulic monitoring is performed on a quarterly basis and chemical monitoring is performed on an annual basis. Details are provided in the Sampling Manual presented in Appendix C. Modification to the frequency or sampling requirements will require approval from the NYSDEC. A visual inspection of the monitoring well network will be conducted during the annual chemical monitoring event. Unscheduled inspections and/or sampling may take place when a suspected failure of the groundwater collection system has been reported or an emergency occurs that is deemed likely to affect the operation of the system. The groundwater collection system components to be monitored are specified in the O&M Manual in Appendix D. If any equipment readings are not within their specified operation range, any equipment is observed to be malfunctioning or the system is not performing within specifications; maintenance and repair, as per the O&M Manual is required.

4.4.1 Hydraulic Monitoring

In order to monitor the effectiveness of the barrier drain system in capturing leachate from the Site and preventing off Site migration of chemicals, a network of overburden piezometers and overburden and bedrock groundwater monitoring wells have been installed on the Site, along the perimeter of the Site, and in the surrounding community. The hydraulic monitoring program consists of the quarterly measurement of water levels in 92 piezometers located in 6 nested piezometer strings around the Site and 13 groundwater monitoring wells. Table 4.1 summarizes the wells utilized for quarterly hydraulic monitoring. Figure 4.1 presents the hydraulic monitoring locations in relation to the barrier drain.

The alignment of the six nested piezometer strings includes piezometers both within and outside the barrier drain. Therefore, it is possible to determine the hydraulic gradient in relation to the barrier drain system and to establish whether this gradient is inward (toward the barrier drain). An inward gradient indicates that the system is functioning properly, capturing leachate from the Site, and preventing off Site migration of chemicals.

Information on construction of the wells included in the hydraulic monitoring program is presented in the Sampling Manual in Appendix C. Boring logs and well installations for the piezometers and observation wells are included in the Sampling Manual in Appendix C.

4.4.2 Chemical Monitoring

Chemical monitoring will be performed on an annual basis to assess the performance of the remedy. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

The network of monitoring wells has been installed to monitor upgradient, on-site and downgradient groundwater conditions at the site. The network of on-site and off-site wells has been designed based on the following criteria:

The monitoring program consists of 24 overburden and bedrock monitoring wells monitored on an annual basis and an additional 25 overburden monitoring wells monitored on a biannual basis.

Table 4.2 summarizes the wells identification number and the sampling schedule. Figure 4.2 presents the chemical monitoring locations in relation to the barrier drain.

Monitoring well construction logs are included in the Sampling Manual in Appendix C of this document.

If biofouling or silt accumulation occurs in the on-site and/or off-site monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and replaced, if an event renders the wells unusable.

Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance.

The NYSDEC will be notified prior to any repair or decommissioning of any monitoring well for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent Periodic Review Report. Well decommissioning without replacement will be done only with the prior approval of the NYSDEC. Well abandonment will be performed in accordance with NYSDEC's guidance entitled "CP-43: Groundwater Monitoring Well Decommissioning Procedures". Monitoring wells that are decommissioned because they have been rendered unusable will be replaced in kind in the nearest available location, unless otherwise approved by the NYSDEC.

The sampling frequency may only be modified with the approval of the NYSDEC. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC.

Deliverables for the groundwater monitoring program are specified in Section 7.0 – Reporting Requirements.

4.4.3 Monitoring and Sampling Protocol

All sampling activities will be recorded in a field book or associated sampling. Other observations (e.g., groundwater monitoring well integrity, etc.) will be noted on the sampling log. The sampling log will serve as the inspection form for the monitoring network. Additional detail regarding monitoring and sampling protocols are provided in the Sampling Manual provided as Appendix C of this document.

5. Operation and Maintenance Plan

5.1 General

This Operation and Maintenance Plan provides a brief description of the measures necessary to operate, monitor and maintain the mechanical components of the remedy selected for the Site. This Operation and Maintenance Plan:

- Includes the procedures necessary to allow individuals unfamiliar with the site to operate and maintain the collection and leachate treatment systems
- Will be updated periodically to reflect changes in Site conditions or the manner in which the collection and leachate treatment systems are operated and maintained

Further detail regarding the Operation and Maintenance of the collection and leachate treatment systems is detailed in the O&M Manual in Appendix D. A copy of this O&M Manual, along with the complete SMP, is to be maintained at the Site. This Operation and Maintenance Plan is not to be used as a stand-alone document, but as a component document of this SMP.

5.2 Remedial System Performance Criteria

Performance criteria for the remedial systems are as follows:

- Prevent off-Site migration of chemicals
- Maintain treated effluent discharge compliance with NFWB SIU Permit #44

5.3 Operation and Maintenance of Remedial Systems

Procedures for operation and maintenance of the remedial systems are presented in the O&M Manual in Appendix D. An overview from the O&M Manual is reproduced in this section. For specific details, please refer to the O&M Manual.

5.3.1 Barrier Drain System

The barrier drain is graded from two highpoints, one in the southeast corner and the other in the northeast corner, toward a series of manholes which drain to four pump chambers (PC-1A/PC-2A in the Northern/Central sector and PC-1/PC-2 in the Southern Sector), where the leachate is collected, The leachate is pumped from the pump chambers to two other pump chambers connected to underground holding tanks (PC-3A in the Northern/Central Sector and PC-3 in the Southern Sector) where it is temporarily stored. The leachate is then pumped to the LCTF where it is treated and discharged to the NFWB sanitary sewer system under the Site's SIU Permit #44.

5.3.2 Collection System (Pump Chambers)

In the Northern/Central Collection Systems, the tree pump chambers (PC-1A, PC-2A, and PC-3A) each contain two Gorman-Rupp pumps (Model S2B65-E2). These pumps are rated at 50 gallons per minute (GPM) at 35 feet of total dynamic head (TDH). The pumps operate on an as needed basis (individually or simultaneously).

In the Southern Collection System, PC-1 (MH-7) and PC-2 (MH-8) each contain one Gorman-Rupp pump (Model S2B65-E2). These pumps are rated to 100 GPM at 40 feet TDH. Pump Chamber 3 contains two Gorman-Rupp pumps (Model S2B65-E2). These pumps are each rated at 50 GPM at 50 feet TDH. The pumps operate on an as-needed basis (individually or simultaneously).

There are two pump stations associated with the Dewatering Containment Facility (DCF). Water collected form the DCF drains to DCF pump chamber 3 (MH-6B). From there, the water is pumped via a 2-inch diameter HDPE forcemain to a 10,000-gallon underground storage tank (UST). (DCF pump chamber 4). The pump in DCF pump chamber 3 is a Flygt pump (Model 3085.092, 2.2 hp, 460 volt, 1,750 rpm). The pump in DCF pump chamber 4 is a Gorman-Rupp stainless steel vertical sump pump (Model S2B65-E2, 2 hp, 115 volt, 3450 rpm). Water from pump chamber 4 is pumped back to PC-3A via a 6-inch HDPE forcemain.

Water is also collected in a grated trench surrounding the drum storage facility. A trench also runs through the middle of the drum storage facility. These trenches empty into a sump outside and adjacent to the drum storage facility, The sump houses duplex Gorman-Rupp stainless steel submersible pumps (Model S2B65-E2 with 2 hp, 115 volt, 3450 rpm). These units pump water to PC-3A, via a 4-inch diameter HDPE forcemain.

5.3.2.1 Instrument/Control Overview

All pump chamber pumps may be operated in either automatic or manual mode. For manual control, the remote switch at the pump must be set in the HAND position. For automatic control, this switch must be set to AUTO.

Automatic operation also requires that the pump be set to AUTO at the Human Machine Interface (HMI). When the remote switch is in AUTO and the HMI control is set to AUTO, the pump will be controlled directly through the Programmable Logic Controller (PLC). When the water level reaches a pump start (high level) permissive elevation, the pump chamber pump energizes and begins operation. The pump will shut down when the pump stop (low level) permissive elevation is reached.

In addition to the start/stop elevation control, the PLC also monitors downstream levels in the system to prevent system overflows. For example, both PC 1A and PC 2A pump into PC 3A. There are set level permissives at the HMI, which allow the pumps in PC 1A, PC 2A, and DCF PC 4 to operate only if the level in PC 3A is not above the selected setpoint. This same level permissive requirement is required for the pumping of MH 7 and MH 8 (PC 1 and PC 2) and wet wells at the 102nd Street Landfill to PC 3 and the pumping of PC 3A and PC 3 to the process Raw Water Tank.

PC 2, PC 3 and the Southern Collection Holding Tank each have a high level switch that will disable the pumps in MH 7 and MH 8 if the level exceeds the selected setpoint. The pumps will remain disabled until the condition is cleared.

The two pumps in the DCF run off of two level switches in each pump chamber. The pump starts at the high level permissive switch and pumps down to the low level permissive switch. The pump in DCF PC 3 will only operate if the level in DCF PC 4 is not above a selected setpoint. The flow from the DCF is measured with a magnetic flow meter, which is displayed on the HMI. The pump status for the pump and high level alarms from high level switches in DCF PC 3 and DCF PC 4 are also displayed on the HMI.

DCF PC 4 has a high high level switch that will disable the pump in DCF PC 3 if the level exceeds the selected setpoint. The pump will remain disabled until the condition is cleared.

The two pumps in the drum storage facility run off of three level switches in the sump. The pumps stop at the low level permissive switch, which is at the lowest point in the sump. As the water rises to the high level permissive switch, the primary pump will turn on. If the level continues to rise to the next level switch (second pump level permissive), the second pump will turn on. The pumps will continue to run until the level reaches the low level permissive. At this point, the pumps will alternate, and the primary pump will become the secondary pump for the next cycle. A sump high level alarm from a fourth level switch in the sump is displayed with an audio and visual alarm on the local control panel. The two switches for the pumps at the panel must both be in the ON position in order for the pumps to operate.

5.4 Operation and Maintenance of Love Canal Treatment Facility

The treatment process consists of several process steps for the removal or various constituents prior to the discharge into the NFWB sanitary sewer system. The main system components, detailed further in Appendix D, are the following:

- Raw Water Tank
- Clarifier
- Filter Feed Tank
- Bag Filters
- Liquid Phase Carbon Adsoption
- Solids Handling
- Vapor Phase Carbon Adsorbers
- Waste Disposal

To bring the treatment System online, the SEQ ENABLE button Start GWT must be selected on the HMI screen. This will enable both treatment system pumps (Raw Water Feed Pump and Filter Feed Tank Discharge Pump). The discharge valve (FCV-107) is opened automatically when the SEQ ENABLE button is pressed. This can also be done manually at the valve. Treatment System pumps may be operated manually by placing the Auto/Hand switch to Hand.

5.4.1 Control Components

5.4.1.1 Programmable Logic Controller

A PLC is used as the primary control device. The PLC receives a series of digital inputs and analog inputs and interprets them based on a written program. The PLC then sends a series of digital outputs and analog outputs to control pumps, valves, and a variety of other equipment. The PLC program is designed to operate the collection and treatment systems in a fail safe manner. The PLC also serves to trigger alarms for the process.

The PLC that controls the collection and treatment system at the Love Canal Site is an Allen Bradley Control Logix Processor. Remote locations (PC 1, PC 2, PC 3, PC 1A, PC 2A, and PC 3A) are controlled by Allen Bradley Point IO hardware. The remote Point IO hardware controls the equipment and monitors the conditions at their respective pump chambers. Data is passed from the remote Point IO to the master PLC and vice versa. The main PLC is connected to the HMI.

The 102nd Street system is also controlled by Allen Bradley Point IO hardware is tied into the Love Canal system at the PC 3 via fiber optics.

The above control components reflect upgrades that were implemented in 2013.

5.4.1.2 Human Machine Interface

The operator is provided with all critical process information through the PLC/HMI interface. The PLC is tied in to an HMI software package that allows the operator to view the collection and treatment process from a computer screen. This system offers flexibility in process control and allows the operator efficient management of the collection and treatment processes. Alarms that are triggered by the PLC are displayed on the HMI screen.

In addition, the interface setpoints are hard coded and allow the operator to enable/disable well pumps from the control room.

The HMI produces a daily report detailing pumping volume for each well, average water level for each well, and process tank levels. In addition, a real time well summary is available on the HMI.

5.4.2 Alarms

Alarms are set to advise the operator when conditions are not within the normal limits. The alarms are displayed on the HMI.

5.4.3 Operational Controls and Sequences

The automated control of each piece of equipment is a combination of operational controls and sequences.

5.4.3.1 Operational Controls

Operational controls manage parameters that change within selected ranges during routine operation of a piece of equipment. These controls are typically used as part of the normal automated operation of the equipment. As an example, the level in a well is used to routinely start and stop a pump. In the Collection System, the pump chamber pumps are designed to operate in a routine manner without impacting critical alarms. Alarms are set to advise the operator when conditions are not within the normal limits.

The operator is provided with all critical process information in the control room. Equipment can be started and shut down from the control room through the HMI. The pump chambers demonstrate a type of operational control as follows.

5.4.3.1.1 Pump Chambers

The pump chambers all operate in a similar fashion. Each chamber is equipped with a variety of instrumentation to monitor and control operation of the pump.

The pump chambers are equipped with fixed level probes. If the HAND OFF AUTO switch local to the pump is in AUTO, the pump is enabled at the HMI, downstream levels permit pumping, and the level is above the high level setpoint, the pump will start. The pump will continue to operate until the level drops below the low level setpoint. The pump will also stop if the local switch is switched OFF; it is disabled through the HMI/PLC or levels downstream are too high. The pump will continue to cycle on and off as the level in the pump chamber changes.

Float switches in addition to level transmitters are located in PC 3, PC 3A, and DCF PC 4 to alarm in high high level conditions. A high high level condition will disable any upstream pumping until the high high level condition is cleared.

A more detailed description of the operational controls can be found in the Collection System and Leachate Treatment System sections above.

5.4.3.2 Sequences

Sequences can be broken down into two types of sequences: routine and shutdown sequences.

Shutdown sequences are designed to provide failsafe operation of the treatment plant. Shutdown sequences are parameters or a series of parameters that indicate that equipment is operating out of normal limits or may be contributing to an undesirable condition. A shutdown sequence triggers an alarm and locks out the designated equipment without operator intervention. The equipment cannot be restarted until an operator resets the shutdown sequence alarm.

When any of the shutdown sequences are tripped, an alarm statement will be posted on the HMI computer screen and specific automated control actions will occur.

Routine sequences are normal operating parameters or a series of parameters that define the normal operation of equipment. No alarms are associated with routine sequences.

The system sequences are listed in the following two sections.

5.4.3.2.1 Shutdown Sequences

Shutdown Treatment Plant: When the level in the floor drain is above the high level switch, the Treatment System will shut down. The pumps that will be inhibited from running include the Raw Water Feed Pump and the Filter Feed Pump. The above pumps will be enabled for normal operation when all applicable levels and conditions are cleared.

5.4.3.2.2 Routine Sequences

- Shutdown Treatment Plant
- Inhibit MH 7 Pump From Running
- Inhibit MH 8 Pump From Running
- Inhibit PC 3 Pump A From Running
- Inhibit PC 3 Pump B From Running
- Inhibit 102nd Street Well Pumps From Running
- Inhibit PC 1A Pump A From Running
- Inhibit PC 1A Pump B From Running
- Inhibit PC 2A Pump A From Running
- Inhibit PC 2A Pump B From Running
- Inhibit PC 3A Pump A From Running
- Inhibit PC 3A Pump B From Running
- Inhibit Raw Water Feed Pump From Running
- Inhibit Filter Feed Pump From Running
- Inhibit DCF Pump Chamber 4 Pump From Running
- Inhibit DCF Pump Chamber 3 Pump From Running

5.4.3.3 Sequence Override

The control system is not designed to permit a shutdown sequence override. If necessary, the system must be run in manual until the condition is corrected.

5.4.4 Remote Access

The HMI system is part of a wide area network (WAN) that connects several GSH Sites. This network allows for full control and alarming capabilities of the Collection System and the LCTF from any of the other connected GSH Sites (Durez North Tonawanda, Hyde Park Landfill, S Area Landfill and Niagara Plant [F Area Treatment System]).

6. Periodic Assessments/Evaluations

6.1 Climate Change Variability Assessments

Increases in both the severity and frequency of storms/weather events, an increase in sea level elevations along with accompanying flooding impacts, shifting precipitation patterns and wide temperature fluctuation, resulting from global climactic change and instability, have the potential to impact the performance, effectiveness and protectiveness of a given site and associated remedial systems. Vulnerability assessments provide information so that the site and associated remedial systems are prepared for the impacts of the increasing frequency and intensity of severe storms/weather events and associated flooding.

Based on more than 30 years of remedial system operation, there have been no significant issues with climate events. As such, no vulnerability assessments have been performed or are currently anticipated to be performed.

6.2 Green Remediation

NYSDEC's DER-31 Green Remediation requires that green remediation concepts and techniques be considered during all stages of the remedial program including site management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. Green remediation principals will be considered for any upgrades associated with the existing remedial system. If implemented, these measures will be reported in the Periodic Review Report (PRR).

6.3 Remedial System Optimization

A Remedial Site Optimization (RSO) study will be conducted any time that the NYSDEC or the remedial party requests in writing that an in-depth evaluation of the remedy is needed. An RSO may be appropriate if any of the following occur:

- The remedial actions have not met or are not expected to meet Remedial Action Objectives (RAOs) in the time frame estimated in the Decision Document
- The management and operation of the remedial system is exceeding the estimated costs
- The remedial system is not performing as expected or as designed
- Previously unidentified source material may be suspected
- Plume shift has potentially occurred
- Site conditions change due to development, change of use, change in groundwater use, etc.
- There is an anticipated transfer of the site management to another remedial party or agency
- A new and applicable remedial technology becomes available

An RSO will provide a critique of a site's conceptual model, give a summary of past performance, document current cleanup practices, summarize progress made toward the site's cleanup goals, gather additional performance or media specific data and information and provide recommendations for improvements to enhance the ability of the present system to reach RAOs or to provide a basis for changing the remedial strategy.

The RSO study will focuses on overall site cleanup strategy, process optimization and management with the intent of identifying impediments to cleanup and improvements to site operations to increase efficiency, cost effectiveness and remedial time frames. Green remediation technology and principals are to be considered when performing the RSO.

7. Reporting Requirements

7.1 Site Management Reports

All site management inspection, maintenance and monitoring events will be recorded on the appropriate inspection forms found within Appendix D. These forms are subject to NYSDEC revision.

All applicable inspection forms and other records, including media sampling data and system maintenance reports, generated for the Site during the reporting period will be maintained at the Site and available from NYSDEC review. Specific inspection forms will be included in the Periodic Review Report.

Routine maintenance event reporting forms will include, at a minimum:

- Date of event
- Name of person(s) conducting maintenance activities
- Description of maintenance activities performed
- Any modifications to the system
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet)

Non-routine maintenance event reporting will include, at a minimum:

- Date of event
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities
- Description of non-routine activities performed
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet)
- Other relevant documentation

7.2 Discharge Monitoring Report

In accordance with NFWB SIU Permit #44, monthly and quarterly discharge reports are submitted to the NFWB and NYSDEC.

7.3 Periodic Review Report

A PRR will be submitted to the Department annually. The report will be prepared in accordance with NYSDEC's DER-10 and submitted by the date established each year by NYSDEC. Media sampling results will also be incorporated into the Periodic Review Report. The report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the site.
- Results of the required annual Site inspections and severe condition inspections, if applicable.

- Applicable site inspection forms during the reporting period in the NYSDEC-approved electronic format, if not previously submitted.
- A summary of any discharge monitoring data and/or information generated during the reporting period, with comments and conclusions.
- Data summary tables and graphical representations of groundwater contaminants of concern, which include a listing of all compounds analyzed. These will include a presentation of past data as part of an evaluation of contaminant concentration trends.
- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted in digital format as determined by the NYSDEC. Currently, data is supplied electronically and submitted to the NYSDEC EQuISTM database in accordance with the requirements found at this link: http://www.dec.ny.gov/chemical/62440.html.
- A site evaluation, which includes the following:
    - The compliance of the remedy with the requirements of the site-specific Remedial Action Work Plan (RAWP), ROD or Decision Document
    - The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications
    - Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring and Sampling Plan for the media being monitored
    - Recommendations regarding any necessary changes to the remedy and/or Monitoring and Sampling Plan
    - Trends in contaminant levels in the affected media will be evaluated to determine if the remedy continues to be effective in achieving remedial goals
    - The overall performance and effectiveness of the remedy.
- A performance summary for all treatment systems at the Site during the calendar year, including information such as:
    - The number of days the system operated for the reporting period
    - The contaminant mass removed
    - A description of breakdowns and/or repairs along with an explanation for any significant downtime
    - A description of the resolution of performance problems
    - A summary of the performance, effluent and/or effectiveness monitoring
    - Comments, conclusions, and recommendations based on data evaluation

7.3.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, a qualified environmental professional or Professional Engineer licensed to practice in New York State will review the Periodic Review Report and sign the IC/EC form as seen in Appendix E.

The Periodic Review Report will be submitted, in electronic format, to the NYSDEC Regional Office in which the Site is located, United States Environmental Protection Agency (USEPA), and the NYSDOH. The Periodic Review Report will only be submitted in hard-copy format if requested.

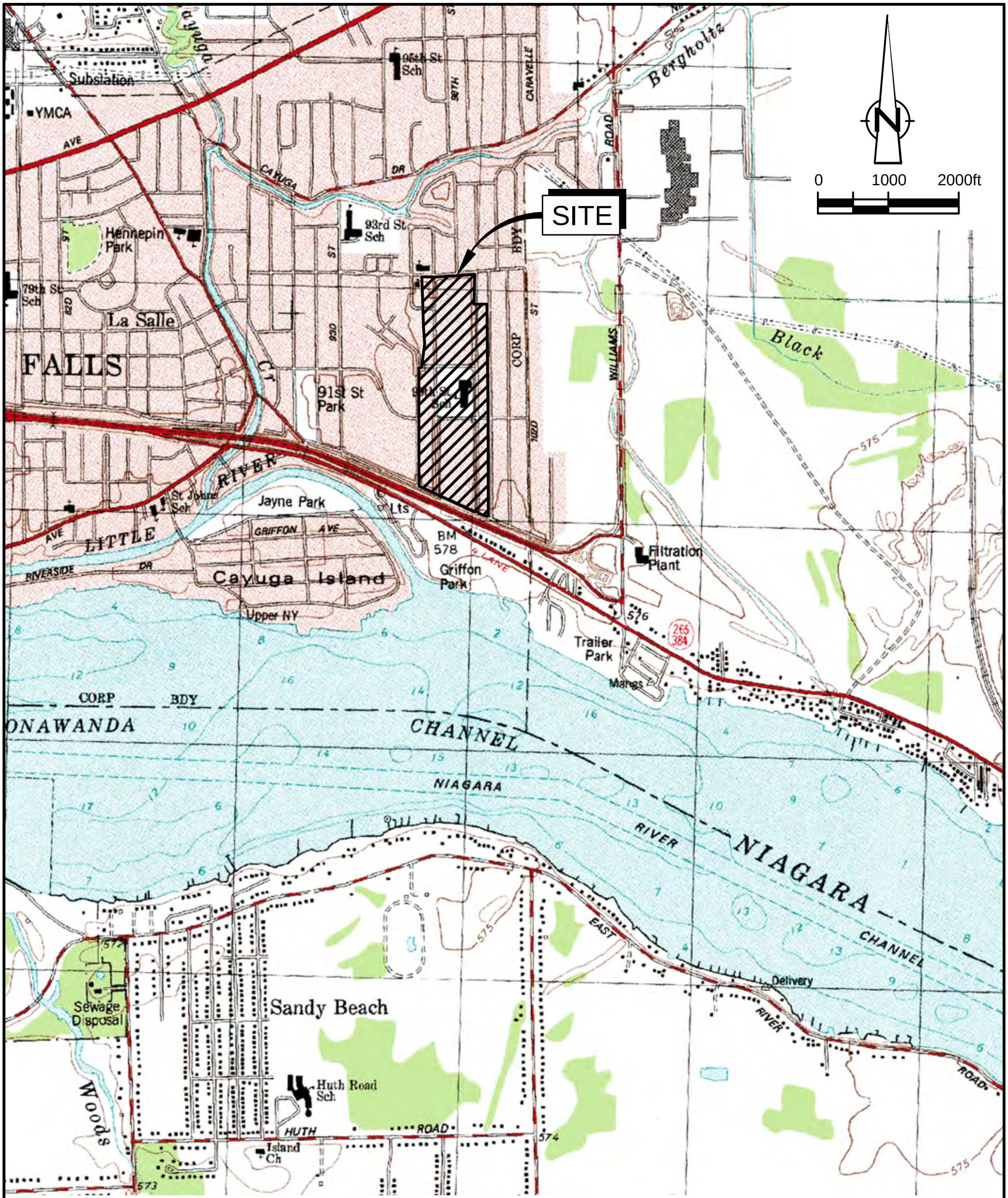
7.4 Corrective Measures Work Plan

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an institutional or engineering control, a Corrective Measures Work Plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the Corrective Measures Work Plan until it has been approved by the NYSDEC.

7.5 Remedial Site Optimization Report

In the event that an RSO is to be performed (see Section 6.1, upon completion of an RSO, an RSO report must be submitted to the Department for approval. A general outline for the RSO report is provided in Appendix F. The RSO report will document the research/ investigation and data gathering that was conducted, evaluate the results and facts obtained, present a revised conceptual site model and present recommendations. RSO recommendations are to be implemented upon approval from the NYSDEC. Additional work plans, design documents, HASPs etc., may still be required to implement the recommendations, based upon the actions that need to be taken. A final engineering report and update to the SMP may also be required.

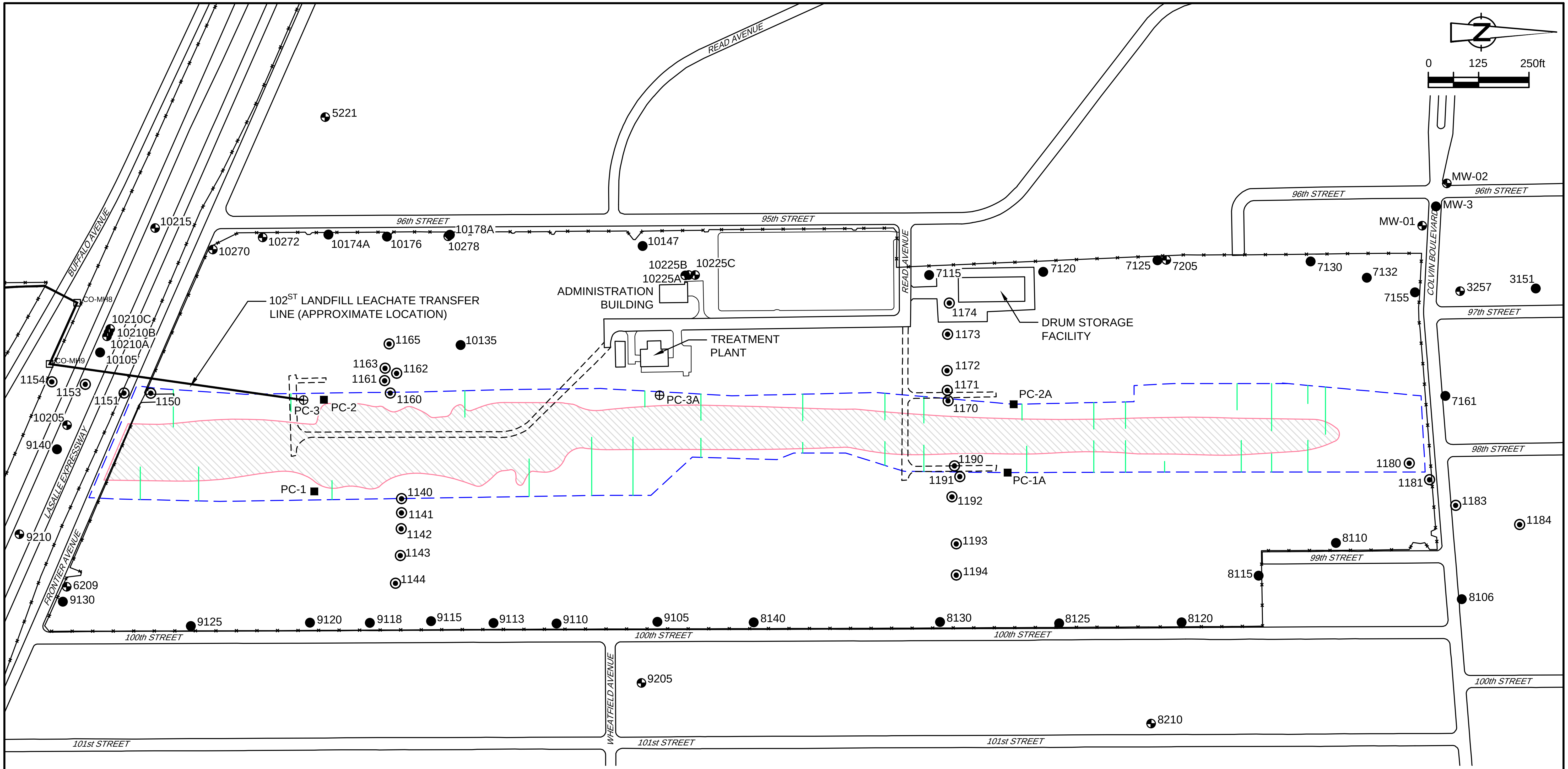
The RSO report will be submitted, in electronic format, to the NYSDEC Regional Office in which the site is located, USEPA, and the NYSDOH.



SOURCE: USGS QUADRANGLE MAP;
TONAWANDA WEST, NEW YORK, 1980

figure 1.1

SITE LOCATION
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
Niagara Falls, New York



LEGEND

—×—×—	FENCE LINE
– – – –	BARRIER DRAIN
——	LATERAL TRENCH
◉ 7105	PIEZOMETER
● 9120	OVERBURDEN OBSERVATION WELL
◐ 10270	BEDROCK OBSERVATION WELL
■ PC-1	PUMP CHAMBER FOR LEACHATE COLLECTION
⊕ PC-3	PUMP CHAMBER / UNDERGROUND LEACHATE STORAGE TANK FOR LEACHATE COLLECTION AND TRANSFER
□ CO-MH3	FORCEMAIN CLEAN OUT MANHOLE
▨	APPROXIMATE LIMITS OF DISPOSED WASTE

NOTE:
WELL 3151 IS UNABLE TO BE LOCATED
(ASSUMED TO BE PAVED OVER)

figure 1.2

SITE LAYOUT
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
Niagara Falls, New York

09954-D23101(035)GN-WA002 NOV 7, 2018

FORMATION	COLUMNAR SECTION	THICKNESS IN FEET	CHARACTER
FILL	▨	0.1-3	LOCAL SOIL MATERIAL, INDUSTRIAL WASTE, CONSTRUCTION RUBBLE
GLACIOLACUSTRINE CLAY	▨	6-29	REDDISH BROWN TO GRAY, SILTY, VARVED, IN UPPER PART GRADING TO VERY PLASTIC, MOIST TO WET, IN LOWER PART
TILL	▨	1-25	REDDISH BROWN SILTY TO SANDY CLAY, GRAVEL AND COBBLES, SANDY ZONES, FIRM, MOIST
BEDROCK	▨	160-180	LOCKPORT DOLOMITE
BEDROCK	▨	~60	ROCHESTER SHALE

figure 2.1

GEOLOGIC CROSS SECTION
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
Niagara Falls, New York

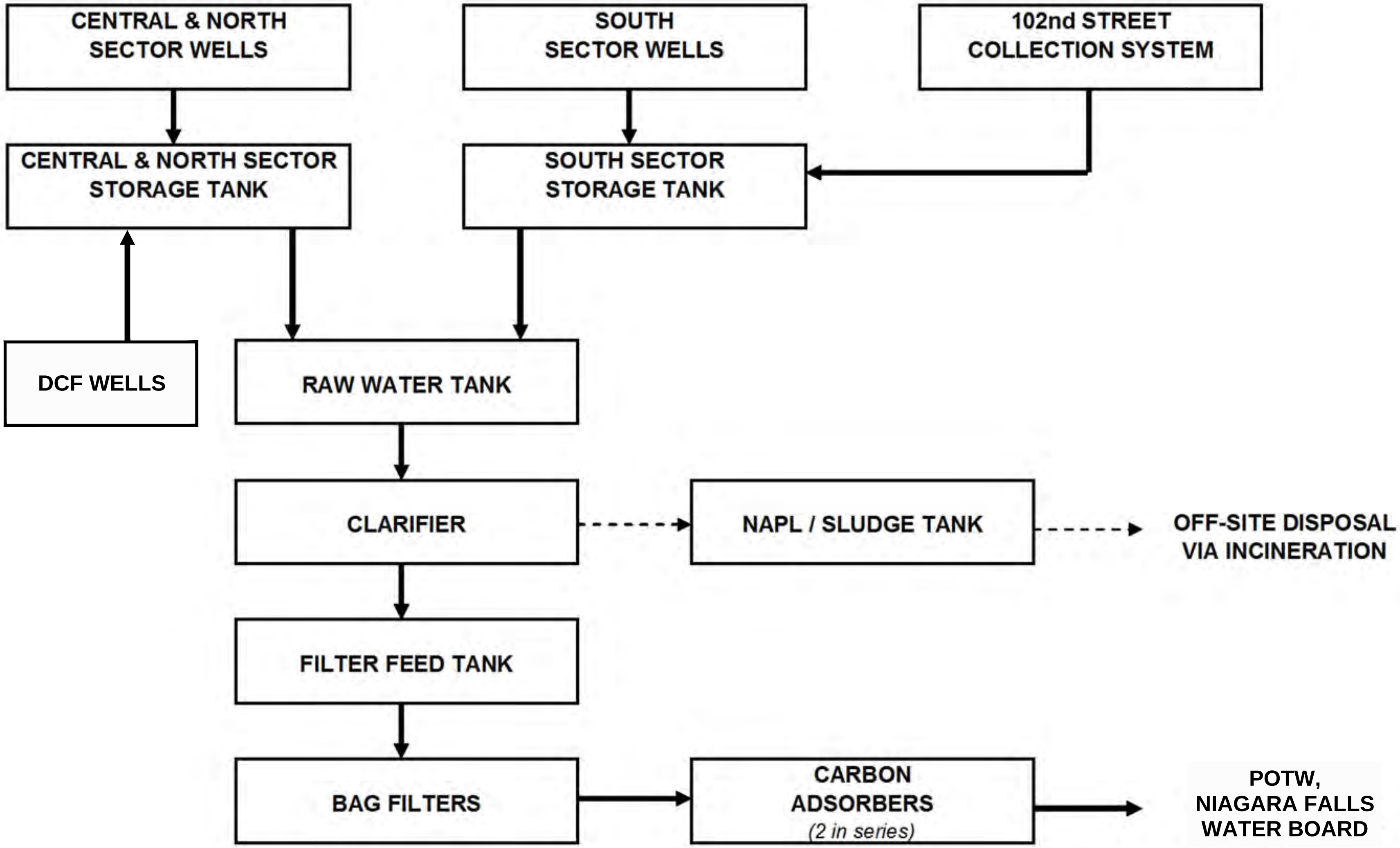
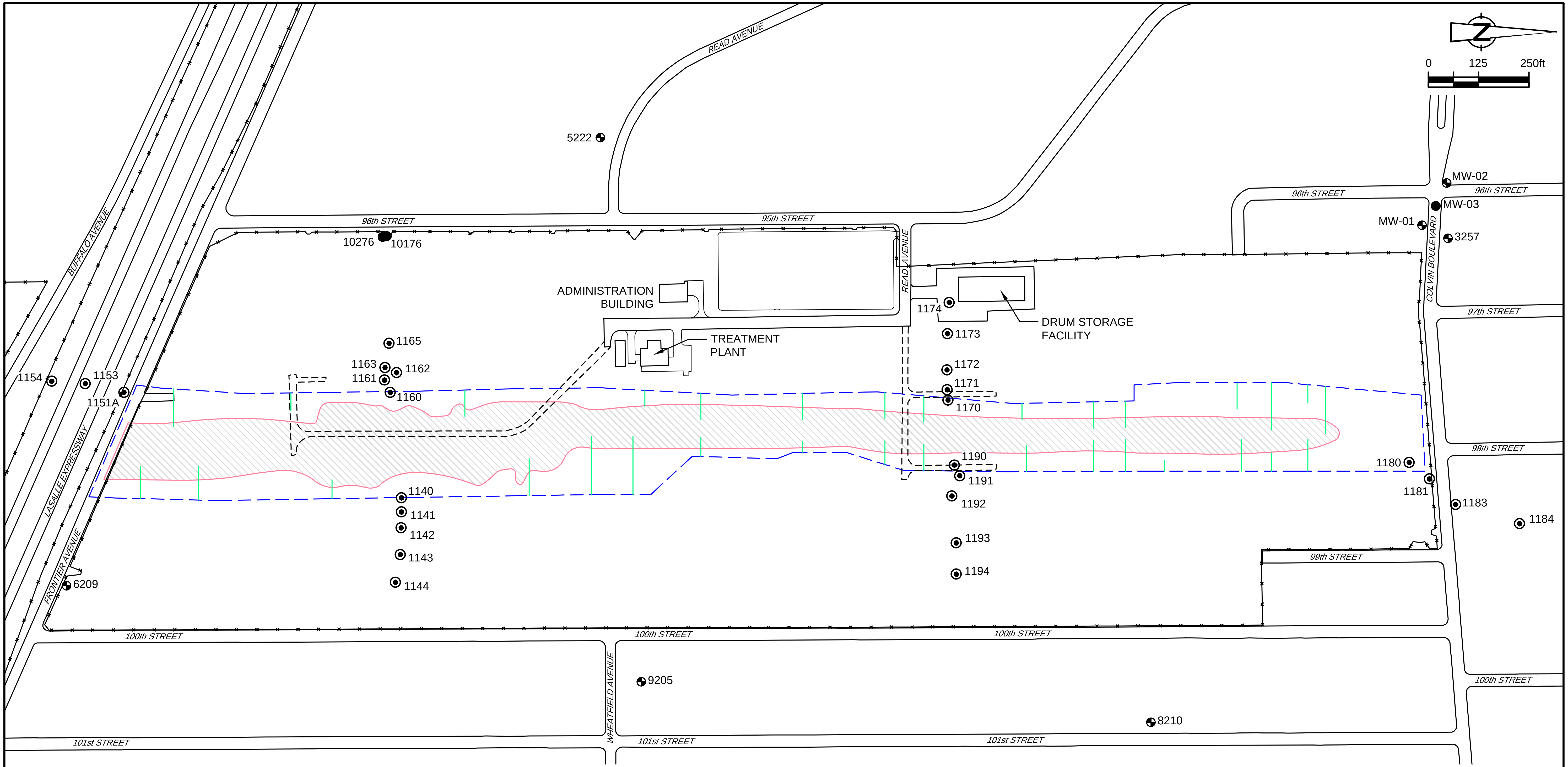


figure 3.1

PROCESS SCHEMATIC
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
Niagara Falls, New York

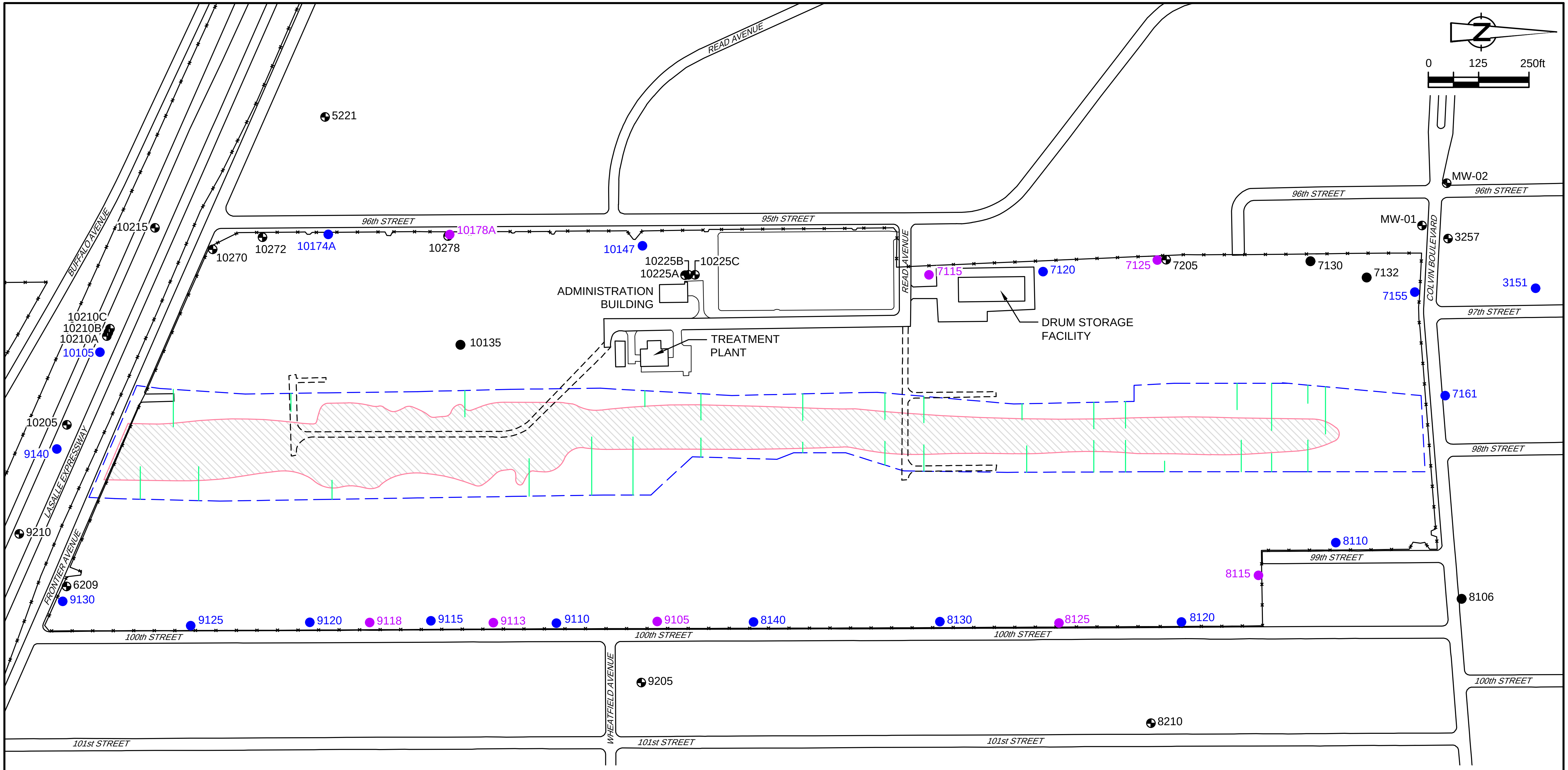


LEGEND

—x——x—	FENCE LINE
— — — —	BARRIER DRAIN
——	LATERAL TRENCH
⊙7105	PIEZOMETER
⊕5222	BEDROCK OBSERVATION WELL
●9120	OVERBURDEN OBSERVATION WELL
▨	APPROXIMATE LIMITS OF DISPOSED WASTE

figure 4.1

HYDRAULIC MONITORING LOCATIONS
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
Niagara Falls, New York



LEGEND

-x-x- FENCE LINE

– – – BARRIER DRAIN

— LATERAL TRENCH

● 10135 OVERBURDEN OBSERVATION WELL - ANNUAL

● 9130 OVERBURDEN OBSERVATION WELL - GROUP 1

● 9118 OVERBURDEN OBSERVATION WELL - GROUP 2

⊕ 5221 BEDROCK OBSERVATION WELL

▨ APPROXIMATE LIMITS OF DISPOSED WASTE

NOTE:
WELL 3151 IS UNABLE TO BE LOCATED
(ASSUMED TO BE PAVED OVER)

figure 4.2

CHEMICAL MONITORING LOCATIONS
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
Niagara Falls, New York

09954-D23101(035)GN-WA006 NOV 7, 2018

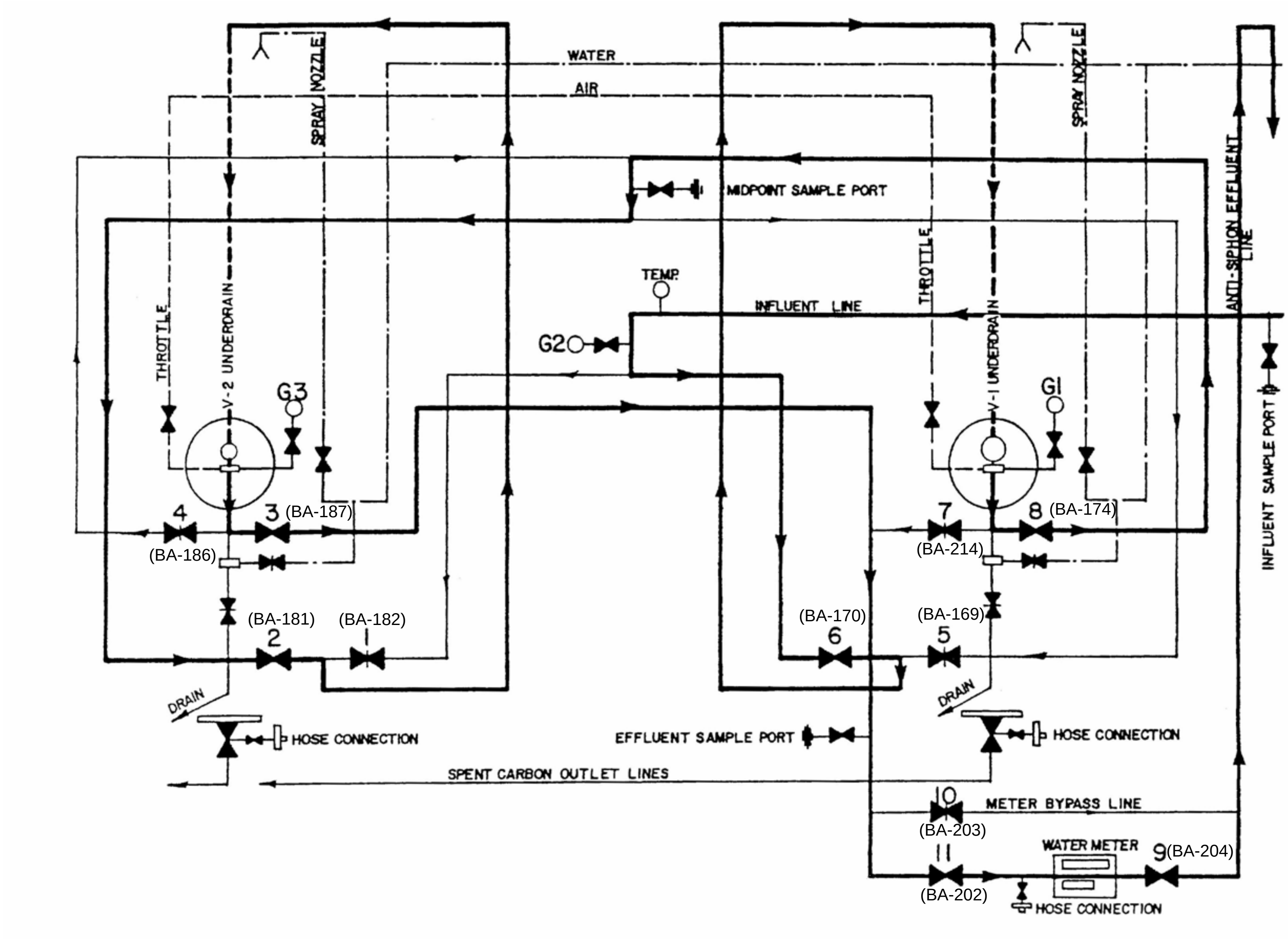


figure 5.1

ADSORBER SEQUENCING SCHEMATIC
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
Niagara Falls, New York

Table 4.1

Hydraulic Monitoring Locations
Love Canal Site
Glenn Springs Holdings, Inc.
Niagara Falls, New York

Piezometer Identification	Geologic Zone Monitored	Top of Riser Elevation (feet AMSL)
North Sector Wells		
1170A	A	584.12
1170B	B	583.97
1171A	A	582.84
1171B	B	583.30
1171C	B	582.76
1172A	A	581.58
1172B	B	581.61
1172C	B	581.63
1173A	A	577.96
1173B	B	578.28
1173C	B	578.34
1173D	C	578.48
1174A	D	573.24
1174B	C	573.47
1174C	B	573.78
1174D	B	573.86
1180A	A	582.06
1180B	B	581.93
1180C	C	582.80
1181A	A	576.29
1181B	B	576.69
1181C	C	576.65
1190A	A	585.84
1190B	B	585.67
1191A	B	584.41
1191B	B	584.35
1191C	B	584.67
1192A	A	582.91
1192B	B	582.91
1192C	C	583.30
1193A	A	579.42
1193B	B	578.93
1193C	B	579.08
1193D	C	578.94
1194A	A	577.88
1194B	B	577.48
1194C	B	578.02
1194D	C	578.19

Table 4.1

Hydraulic Monitoring Locations
Love Canal Site
Glenn Springs Holdings, Inc.
Niagara Falls, New York

Piezometer Identification	Geologic Zone Monitored	Top of Riser Elevation (feet AMSL)
South Sector Wells		
1140A	B	582.92
1140B	A	582.98
1141A	B	581.28
1141B	A	581.47
1142A	C/D	579.75
1142B	B	579.63
1142C	A	579.67
1143A	C	577.37
1143B	B	576.98
1143C	B	576.54
1143D	A	577.14
1144A	D	577.69
1144B	C	577.25
1144C	B	577.72
1144D	A	577.59
1160A	C	584.51
1160C	C	584.24
1161A	A	582.54
1161B	B	582.62
1161C	B	582.64
1161D	C	582.55
1161E	B	583.70
1162A	C	580.84
1162C	C	581.60
1162D	A	582.14
1163A	B	580.84
1163B	C	580.89
1163C	C	580.85
1163D	D	580.92
1165A	B	583.70
1165B	C	583.64
1165C	C	583.68
1165D	D	583.71
10176A*	B	576.64
10176B*	B	576.80
10176C*	B	576.85
10176D*	A	579.98
10276*	-	577.04

Table 4.1

Hydraulic Monitoring Locations
Love Canal Site
Glenn Springs Holdings, Inc.
Niagara Falls, New York

Piezometer Identification	Geologic Zone Monitored	Top of Riser Elevation (feet AMSL)
Frontier Avenue and LaSalle Expressway		
1151A	A	577.52
1151B	B	577.57
1151C	C	577.75
1151D	D	577.84
1153A	A	577.44
1153B	B	576.64
1153C	B	577.36
1153D	C	577.18
1153E	C	576.37
1154A	A	572.69
1154B	B	573.48
1154C	B	573.59
1154D	C	573.24
Colvin Boulevard Area		
1183A	A	572.84
1183B	C	572.74
1183C	C	572.82
1183D	D	572.79
1184A	A	571.11
1184B	B	570.79
1184C	C	571.19
1184D	D	571.11
Other Wells		
6209*	BR	577.55
5222*	BR	576.80
8210*	BR	573.36
9205*	BR	574.38
3257*	BR	572.38
MW-01*	BR	572.09
MW-02*	BR	571.64
MW-03*	I	571.25

Notes:

A = Glacial till.
B = Lower soft silty clay.
C = Upper stiff silty clay (fractured clay).
D = Upper fractured stiff clay or fill.
BR = Bedrock.
I = Installed in sewer bedding.
* = Observation well.
- = Information not available.
AMSL = Above mean sea level.

Table 4.2

Chemical Monitoring Locations and Schedule
Love Canal Site
Glenn Springs Holdings, Inc.
Niagara Falls, New York

Annual Wells	**Biannual Wells**	
Bedrock Wells	**Overburden Wells Group I**	**Overburden Wells Group II**
3257	3151	7115
5221	7120	7125
6209	7155	8115
7205	7161	8125
8210	8110	9105
9205	8120	9113
9210	8130	9118
10178A	8140	
10205	9110	
10210A	9115	
10210B	9120	
10210C	9125	
10215	9130	
10225A	9140	
10225B	10105	
10225C	10147	
10270	10174A	
10272		
10278		
MW-01		
MW-02		
Overburden Wells		
7130		
7132		
8106		
10135		

Notes:

Group I wells are to be measured in odd years (i.e., 2019).
Group II wells are to be measured in even years (i.e., 2018).

Appendices

Appendix A

List of Site Contacts

Appendix A

Site Contact List
Love Canal Landfill Site
Niagara Falls, New York

Joseph Branch (Glenn Springs Holdings, Inc. [GSH])
Western New York Operations Manager (WNYOM)
cell – 231-670-6809

Clint Babcock (GSH)
Western New York Operations Coordinator (WNYOC)
231-421-4233; cell – 859-421-4233

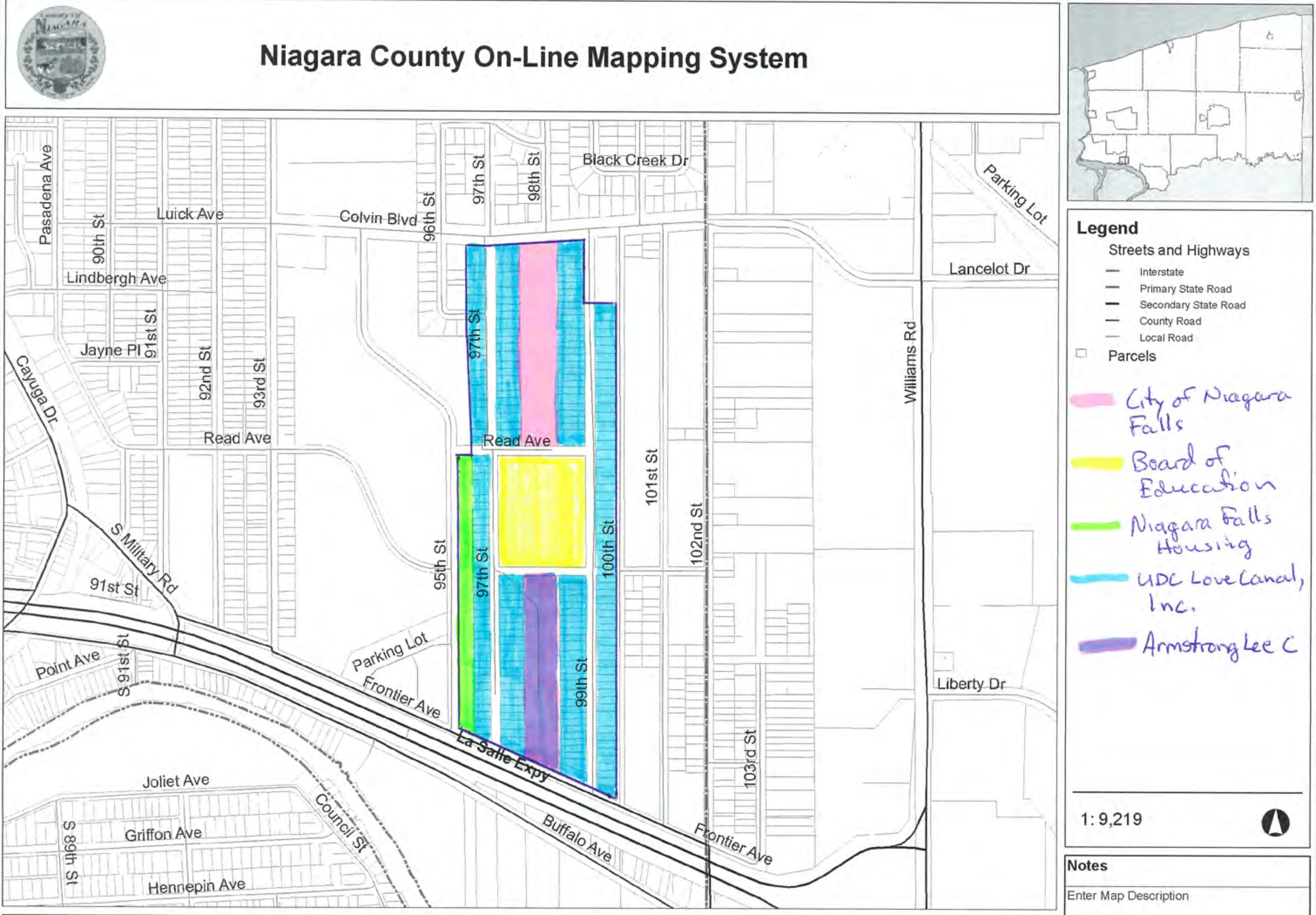
John Pentilchuk (GHD)
Project Manager, reports to GSH
519-340-4313; cell - 519-572-5644

Dennis Hoyt (GHD)
Project Coordinator, reports to GSH
716-205-1912; cell – 716-345-1978

Darrell Crockett (GHD)
Facility Coordinator, reports to GHD PM/PC
cell 716-998-5804

Appendix B
Land Parcels

Niagara County On-Line Mapping System



0.3 0 0.15 0.3 Miles

NIAGARA COUNTY, NEW YORK
DEPARTMENT OF REAL PROPERTY SERVICES

Notes

Enter Map Description

Appendix C
Sampling Manual

SAMPLING MANUAL
LONG-TERM GROUNDWATER MONITORING PROGRAM

LOVE CANAL SITE
NIAGARA FALLS, NEW YORK

Prepared For:

Glenn Springs Holdings, Inc.

Prepared by:
Conestoga-Rovers
& Associates

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JUNE 2013
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TABLE OF CONTENTS

Page

TABLE OF CONTENTS

Page

LIST OF FIGURES
(Following Text)

LIST OF TABLES
(Following Text)

LIST OF APPENDICES

1.0 INTRODUCTION

This report presents the Sampling Manual for the Long-Term Groundwater Monitoring Program (LTGMP) for the Love Canal (Site) located in Niagara Falls, New York. The purpose of the LTGMP is to collect hydraulic and chemical monitoring data to demonstrate that the barrier drain system is effective in capturing leachate from the Site and preventing off-Site migration of chemicals. Details and procedures for implementing the LTGMP are presented herein.

2.0 SITE OVERVIEW

2.1 SITE DESCRIPTION

The Site is a 70-acre rectangular site bounded by Colvin Boulevard on the north, 99th and 100th Streets to the east, 95th and 97th Streets to the west, and Frontier Avenue to the south. A Site Plan is provided as Figure 2.1.

Operation of the Site was transferred from the New York State Department of Environmental Conservation (NYSDEC) to Occidental Chemical Corporation (OCC) in April 1995. Effective July 1, 1998, Site responsibility was assigned by OCC to Glenn Springs Holdings, Inc. (GSH), an affiliate of OCC. Beginning October 1, 2008, GSH contracted Conestoga-Rovers & Associates (CRA) to perform operation, maintenance, monitoring, and reporting activities for the Site under direct management of GSH.

2.2 REMEDIAL SYSTEMS

Operation of remedial systems to prevent the off-Site migration of chemical contaminants from the Site began in October 1978 with the installation of a barrier drain along the east and west sides of the Southern Sector of the Canal. The barrier drain was later extended to completely encompass the entire area of disposed waste within the Central and Northern Sectors of the Canal. The barrier drain, designed to intercept the shallow overburden lateral groundwater flow, consists of a trench approximately 4 feet wide that varies in depth from approximately 12 to 25 feet depending on location at the Site. Installed within the trench is a perforated vitrified clay tile pipe. The pipe is 6-inch diameter in the Central and Northern Sectors and both 6-inch and 8-inch diameter in the Southern Sector. The pipe is centered in a minimum of 2 feet of uniformly sized gravel, which is overlain with coarse sand extending to the existing ground surface present at the time of construction. Thirty-two lateral trenches, approximately 12 to 19 feet deep, filled with a minimum of 2 feet of gravel and overlain with sand similar to the barrier drain, were dug perpendicular to the barrier drain in the direction of the Canal. The majority of these laterals extend into the disposed waste. The barrier drain is graded from two highpoints, one in the southeast corner and the other in the northeast corner, toward a series of manholes which drain to four pump chambers (PC-1A/PC-2A in the Northern/Central Sector and PC-1/PC-2 in the Southern Sector) where the leachate is collected. The leachate is pumped from the pump chambers to two other pump chambers connected to underground holding tanks (PC-3A in the Northern/Central Sector and PC-3 in the Southern Sector) where it is temporarily stored. The leachate is then pumped to the on-Site Love Canal Treatment Facility (LCTF) where it is treated and discharged to the Niagara Falls Water Board (NFWB) sanitary sewer system under the Site's Significant Industrial User (SIU) Permit #44. The locations of the remedial system components are illustrated on the Site Plan presented as Figure 2.1.

The installation of a 22-acre clay cap over the entire former Canal area was completed in October 1980 following completion of the barrier drain collection system. The purpose of the cap is to reduce infiltration of precipitation. The thickness of the clay cap is a minimum of 3 feet. In 1985, a second (40-acre) cap was installed over the initial clay cap area. The newer cap consists of a 40-mil high density polyethylene (HDPE) liner covered by 18 inches of clean soil and vegetation.

In March 1999, the adjacent 102nd Street Landfill Site leachate collection system was connected to the Love Canal Site to facilitate the transfer of leachate from the 102nd Street Landfill into Love Canal's pump chamber PC-3 for treatment at the LCTF.

Figure 2.1 shows the layout of the Site, including the location of the barrier drain, the lateral trenches, the collection sumps, and the LCTF. Figure 2.2 is a generalized cross-section of the Site, depicting the general location of the waste materials, the caps, and the barrier drain system.

2.3 SITE GEOLOGY

2.3.1 OVERBURDEN

The overburden materials at the Site can be classified from ground surface to top of bedrock as:

i) Thin upper layer of fill and more permeable glacially-derived materials
ii) Clay unit
iii) Till unit

The total thickness of the overburden deposits is about 33 feet for the northern and central portions of the Site property and 36 to 39 feet for the southern portion.

Various layers of silty sand and clayey silt (fill) overlie the clay unit and appear to be derived locally although construction debris and industrial wastes such as coarse-grained carbon wastes are also present. The thickness of the silty sand and clayey silt layer ranges from 0 to 20 feet but is generally about 5 feet. The variable composition at this upper most unit is due in part to the effect of the past activities of excavations and residential development in the Site area.

The glaciolacustrine deposits (clay unit) overlying the till consist of 0 to 31 feet of silty clay. The upper 3 to 8 feet of the silty clay is mostly reddish-brown with dark greyish-brown, greyish-brown and yellowish-brown patches observed. Sandy clay zones were also encountered in the glaciolacustrine deposits.

The glacial till in the vicinity of the Site varies from 0 to 23.8 feet in thickness. At the Canal itself, the till is roughly 14 feet thick in the north decreasing to 4 or 5 feet around Read Avenue and then increasing to 18 feet for most of the area south of Wheatfield Avenue. The till generally consists of reddish brown, silty clay containing from 20 to 60 percent gravel and some cobbles.

2.3.2 BEDROCK

Bedrock conditions beneath the Site are typical of those found on a regional scale. The upper surface of the Lockport Formation is relatively smooth and slopes gently to the south. The bedrock surface elevation is about 540 feet above mean sea level (AMSL) beneath the northern and middle portions of the Site and 537 feet AMSL beneath the southern portion. The thickness of the Lockport Formation in the Canal area is reported to range from 162 to 178 feet.

2.4 SITE HYDROGEOLOGY

The hydrogeological regime at the Site has been subdivided into five different zones. From uppermost to lowermost, they are:

i) Shallow Overburden
  - Fill, silty sand, and clay loam
  - Seasonally saturated/unsaturated

ii) Confining Overburden Material
  - Clay and till overlying the Lockport Dolomite

iii) Upper Lockport Dolomite
  - Main aquifer located in upper 10-15 feet of formation
  - Horizontal bedding joints that are extensive over a large area
  - Significant vertical fracturing present

iv) Lower Lockport Dolomite

- Lower part of formation (maximum 165 feet thick)
- Bedding joints are the primary groundwater conveyance mechanism
- Rochester Shale
- Regional aquitard

2.4.1 OVERBURDEN

Hydraulic testing indicated that all zones of overburden materials have relatively low hydraulic conductivities ranging from 1×10^{-5} centimeter per second (cm/s) for the more permeable shallow system to on the order of 1×10^{-8} cm/s for the confining clay/till layer. The relatively impermeable deeper clay and till, in which fractures have not been noted, directly overlie the bedrock and serve to impede the vertical movement of groundwater between the overburden and Lockport Dolomite.

Overburden groundwater table elevations are generally in the range of 568 to 571 feet AMSL. For comparison to the overburden groundwater levels, bedrock groundwater levels range from 560 to 565 feet AMSL. These groundwater levels suggest that a significant downward hydraulic gradient would exist from the overburden to the bedrock if it were not for the relatively impermeable deeper clay and till within the overburden which impedes the vertical movement of groundwater.

2.4.2 BEDROCK

The Lockport Dolomite has an average transmissivity on the order of 13.9 square centimeters per second (cm^2/s) and a storage coefficient of 0.00015. Within the Lockport Dolomite, groundwater is present in bedding joints, vertical joints, and solution cavities. Of these, bedding joints are the dominant mechanisms of groundwater flow. The nearly horizontal bedding joints, which follow the dip of the formation, are usually less than 1/8 inch in size although some have been enlarged by gypsum dissolution. The bedding joints are of much higher permeability than the surrounding bedrock. The bedding joints are fairly continuous in areal extent so that groundwater may flow over long distances within a single bedding joint. Groundwater levels within these joints were found to decrease with depth. Groundwater movement through vertically oriented joints is relatively significant in the top 10 to 15 feet of the formation. In this zone, weathering and dissolution have widened the joints and created a relatively good aquifer at the top of the dolomite. This upper zone is generally considered much more permeable than the remainder of the underlying bedrock.

In general, groundwater flow in the Upper Lockport Dolomite is to the north or northwest away from the Niagara River. The Niagara River is a source of bedrock recharge.

3.0 MONITORING PROGRAM

In order to demonstrate that the barrier drain system is functioning as designed, a hydraulic and chemical monitoring program has been established to measure and record overburden and bedrock groundwater levels quarterly and to collect groundwater samples from the Site for laboratory analysis on an annual basis. Details of the program are provided below.

To adequately monitor the performance of the containment system, alteration of the monitoring program may occur following review of previous hydraulic and/or chemical monitoring data or upon request of the NYSDEC or other regulatory agencies.

3.1 HYDRAULIC MONITORING

In order to monitor the effectiveness of the barrier drain system in capturing leachate from the Site and preventing off-Site migration of chemicals, a network of overburden piezometers and overburden and bedrock groundwater monitoring wells have been installed on the Site, along the perimeter of the Site, and in the surrounding community. The hydraulic monitoring program consists of the quarterly measurement of water levels in 92 piezometers located in 6 nested piezometer strings around the Site and 13 groundwater monitoring wells. Table 3.1 summarizes the wells utilized for quarterly hydraulic monitoring. Figure 3.1 presents the hydraulic monitoring locations in relation to the barrier drain.

The alignment of the six nested piezometer strings includes piezometers both within and outside the barrier drain. Therefore, it is possible to determine the hydraulic gradient in relation to the barrier drain system and to establish whether this gradient is inward (toward the barrier drain). An inward gradient indicates that the system is functioning properly, capturing leachate from the Site, and preventing off-Site migration of chemicals.

Information on construction of the wells included in the hydraulic monitoring program is presented in Table 3.2. Boring logs and well installations for the piezometers and observation wells are included as Appendix A.

Procedures for hydraulic monitoring are described in Section 5.3.

3.2 CHEMICAL MONITORING

In order to measure and monitor groundwater chemistry at the Site, a selection of monitoring wells is sampled on an annual and biannual basis. The chemical monitoring program consists of 24 overburden and bedrock monitoring wells monitored on an annual basis and an additional 25 overburden monitoring wells monitored on a biannual basis. The 25 biannual wells are divided into two groups, with each group being sampled in alternating years. Group 1 consists of 17 wells measured in odd numbered years. Group 2 consists of eight wells measured in even numbered years. Table 3.3 lists the monitoring wells to be sampled annually and the two groups of additional wells which are sampled biannually. Figure 3.2 presents the chemical monitoring locations in relation to the barrier drain.

Additional wells may be added to the chemical monitoring program at the request of the NYSDEC prior to the start of each annual sampling event.

Groundwater samples are analyzed for Site-specific volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, and polychlorinated biphenyls (PCBs). A complete list of the analytical parameters is presented in Table 3.4.

Information regarding documentation of laboratory processing steps, analytical methodologies, quality assurance/quality control (QA/QC) protocols, and reporting format is presented in the "Quality Assurance Project Plan – Groundwater Monitoring" (QAPP), presented as Appendix B.

Information on construction of the wells included in the chemical monitoring program is presented in Table 3.2. Boring logs and well installations for the piezometers and observation wells are included as Appendix A.

Procedures for chemical monitoring are described in Sections 5.4 through 5.11.

3.3 MONITORING SCHEDULE

As discussed above, the monitoring programs include quarterly rounds of groundwater level measurements at the locations listed in Table 3.1 and annual chemical monitoring at the locations in Table 3.3, as per the prescribed schedule. Quarterly groundwater level measurements are taken in March, June, September, and December of each year. The annual chemical monitoring program occurs during June of each year. A monitoring summary for the Site is provided in Table 3.5.

4.0 PREPARATION FOR CHEMICAL MONITORING

Preparation for the annual chemical monitoring should include the tasks detailed in the following sections.

4.1 AGENCY NOTIFICATIONS

The following notifications should be made prior to conducting the sampling field work.

Mr. Brian Sadowski
New York State Department of Environmental Conservation
270 Michigan Avenue
Buffalo, New York 14203-2999
(716) 851-7220

- Notify in writing via email at least 1 week prior to start date
- Notification to be made by project personnel

4.2 SAMPLING SUPPLIES AND EQUIPMENT

Sampling supplies and equipment required are listed in the task specific field procedures (FP) included in Appendix C.

4.3 EQUIPMENT OPERATION

All project personnel will be trained in the proper use and operation of sampling equipment.

4.4 METER CALIBRATION

During field activities, a multi-parameter meter and a turbidity meter are used to obtain measurements of the groundwater (pH, temperature, conductivity, turbidity) in the well. This section provides information on the calibration of these meters to assure accurate and reliable readings are obtained.

4.4.1 GENERAL

Each meter to be used should be calibrated to the appropriate calibration reference standard(s) prior to use and in accordance with the manufacturer's directions, guidelines, and specifications. Reference standards must be fresh, untainted, and within the expiration date.

4.4.2 MULTI-PARAMETER METER CALIBRATION

A multi-parameter meter (i.e., QED MicroPurge) is used to obtain pH, temperature, and conductivity measurements of the groundwater.

The pH sensor takes a measurement of the available hydrogen ions of a solution. The meter reads on a scale of 0 to 14 with 0 being a very strong acid and 14 being a very strong base. A pH of 7 is neutral. The calibration of this meter is affected by the temperature and age of the reference solution(s).

The specific conductivity sensor measures the conductivity of a liquid, which gives an indication of the presence of dissolved ions in solution. Readings are typically provided on four scales, 0 to 10 micromhos, 0 to 100 micromhos, 0 to 1,000 micromhos, and 0 to 10,000 micromhos.

The temperature sensor measures the temperature of a liquid and is used as an indicator of purging stability. Readings are recorded in degrees Celsius (C).

Manufacturer's information should be consulted prior to calibration and use. Multi-parameter meters require separate calibration of each parameter. The meter is calibrated at the beginning of each day prior to use. Field Procedure 10 (FP-10) and FP-11, contained in Appendix C, describe the procedures to be used to calibrate this meter for pH and specific conductivity, respectively.

4.4.3 TURBIDIMETER CALIBRATION

The turbidimeter measures the turbidity (cloudiness) of an aqueous solution. Measurement is made in nephelometric turbidity units (NTU), with a higher reading denoting a cloudier sample, which can affect certain volatile organic and metals analyses. A 0.02-NTU reference standard is supplied with the meter, and daily calibration of the meter is recommended when in use. FP-12, contained in Appendix C, presents the procedure for calibration of the turbidimeter used at the Site.

4.5 CLEANING REQUIREMENTS

Any equipment which is not dedicated for use in a specific well must be cleaned before being used and between uses. The cleaning procedure at the Site consists of:

- A wash with a biodegradable non-phosphate soap
- A tap water rinse
- A deionized water rinse
- Allow equipment to air dry and wrap in aluminum foil or plastic to avoid contamination of the equipment

FP-06b, contained in Appendix C, more fully describes the cleaning protocols for the Site.

5.0 MONITORING PROCEDURES

The proper collection of water levels and groundwater samples is essential for the Site and, therefore, requires that a consistent set of procedures be followed for each well every time water levels and/or groundwater samples are obtained. Following these procedures will result in the collection of quality data, which is representative of conditions at the Site.

5.1 GENERAL PROCEDURES

Certain activities can adversely affect sample quality; therefore, it is imperative that these activities not be done while sampling:

i) Do not smoke.
ii) Do not use bug repellents.
iii) Do not use wasp/hornet spray near a well.
iv) Do not use aftershaves, cologne, or astringents .
v) Be aware of wind direction. Do not run vehicle or small engines upwind of a well being sampled.
vi) Be cognizant of traffic fumes and nearby activities. Suspend sampling if fumes are strong. Make a notation of any such observations in the Groundwater Purge/Sample Record Log.
vii) Be cognizant that the New York State Department of Transportation (NYSDOT) uses herbicides near the wells on the LaSalle Expressway. Suspend sampling if such activities are observed, and make note of type of applications by NYSDOT in the Groundwater Purge/Sample Record Log.
viii) Do not handle or pour gasoline or fuel oils near a well being sampled.

5.2 GENERAL HEALTH AND SAFETY

A Site-specific Health and Safety Plan (HASP) has been generated and will be reviewed prior to any field activities. A copy of the HASP is available at the LCTF and also upon request.

During collection of groundwater samples, the following health and safety rules should be applied:

i) Modified Occupational Safety and Health Administration (OSHA) Level D personal protective equipment (PPE), including safety glasses, full length pants, and industrial quality work boots with steel-toe reinforcement is the minimum required personal safety equipment.

ii) Hard hats are to be worn in any areas with the potential for objects to fall from overhead.

iii) Do not eat, drink, or smoke.

iv) Be aware of potential slip, trip, and fall hazards and uneven terrain.

v) Be aware of the hazards of working with portable machinery, electrically operated equipment, and gasoline powered equipment.

vi) Use proper lifting techniques when lifting is required.

vii) Some sampling takes place along a high speed expressway. Be aware of moving vehicles. High visibility safety vests should be worn when working near high traffic areas. Additionally, two people are required for sampling in high traffic areas necessitating a spotter.

viii) Groundwater removed during sampling activities should be considered contaminated and handled accordingly (FP-01a).

ix) Use caution when opening protective covers on wells - wasps, hornets, or bees may be present.

5.3 WATER LEVEL MEASUREMENT

Once each quarter, water levels are measured at piezometers and monitoring wells at the Site (refer to Table 3.1 and Figure 3.1).

A water level tape will be used for water level measurements in the piezometers and/or wells on Site. FP-02a describes the water level measurement procedures in detail. Water level measurements shall be recorded on the appropriate field sheets with date and time indicated, and water level tapes must be accurate to the nearest 0.01 foot.

5.4 WELL PURGING

Prior to sampling each well, the standing water in the well casing and the water surrounding the well screen will be purged so that representative fresh formation water may be sampled. FP-09a describes the purging procedures in detail.

The volume of water in the well will be calculated by subtracting the depth to water from the total depth of the well. This value (the water column length) will then be multiplied by a coefficient which relates the diameter of the well to gallons per linear foot:

- Multiply by 0.163 for a 2-inch diameter well
- Multiply by 0.367 for a 3-inch diameter well
- Multiply by 0.653 for a 4-inch diameter well
- Multiply by 1.47 for a 6-inch diameter well

Purging may be conducted by several methods including a peristaltic pump, an air lift pump, a bladder pump, or hand bailing. Non-dedicated equipment must be decontaminated between wells as described in FP-06a and FP-06b.

Two criteria will be used to determine if a sufficient volume of groundwater has been purged from the well to yield a representative sample.

These criteria are:

i) The removal of three to five standing well volumes
ii) If a well goes dry, purge one time to dryness

Unless a well goes dry during purging, a minimum of three well volumes will be removed from each well prior to sampling. During purging, field parameters (pH, specific conductance, temperature, and turbidity) will be measured and recorded. One set of readings will be taken at the start of purging, and an additional set will be taken after removal of each standing well volume. If the field parameters stabilize and remain stable, purging can stop when three well volumes are removed.

Field parameters will be considered stable once the following criteria are met:

i) pH varies by less than 0.5 pH units
ii) Specific conductance varies by less than 10 percent
iii) Temperature varies by less than 1°C for two successive measurements

If the field parameters do not stabilize - purging will continue until a maximum of five well volumes have been removed. Sampling will then take place, even if the field parameters have not stabilized. The meters for measuring the field parameters shall be calibrated each morning and whenever deemed necessary by field technicians using the procedures provided in FP-10, FP-11, and FP-12. Periodic recalibration during sampling may be required and should be carried out based on the field technician's knowledge of the Site and experience.

If a well is pumped dry, the well will be allowed to recover a sufficient volume to collect the required samples. The water level measurement tape should be used to verify the well has gone dry, especially when using a peristaltic pump, which has a limited pumping depth. If the well has not gone dry, troubleshoot the pump or switch purging methods.

5.5 SAMPLE COLLECTION

After completion of well purging, groundwater samples will be collected. Analytical requirements, sample containers, and laboratory arrangements are discussed in the QAPP (Appendix B).

All samples should be collected using disposable bailers except where dedicated equipment is provided for sampling at an individual well.

Procedures detailing the collection of groundwater samples are presented in FP-04b.

Where a well will not yield the volume of water necessary to immediately fill all required sample containers, as many of the containers as possible will be filled, with the remainder filled as water comes into the well. Samples for VOCs are to be collected within 2 hours of completion of well purging.

Priority of sampling is as follows:

i) Field parameters
ii) VOCs
iii) SVOCs
iv) PCBs
v) All others

Sampling of wells on the expressway during "rush hour" should be avoided due to possible effects of vehicle exhaust and safety concerns. Also, if possible, sampling in the rain should be avoided due to potential for cross-contamination from airborne contaminants picked up by the precipitation. Clean wells should be sampled first to prevent potential cross-contamination. Thus, previous analytical results need to be reviewed to determine the order in which wells will be sampled.

5.6 SAMPLE HANDLING AND SAMPLING DOCUMENTATION

The information presented in the following sections describes the proper documentation of field activities, sample storage, sample handling, and chain of custody procedures to be used during the annual chemical monitoring program.

5.6.1 SAMPLING DOCUMENTATION

Documentation is a critical part of sampling. The validity of samples collected in the field can only be proven through the use of field activity records. Field conditions, collection, and handling of samples, as well as information about each sample collected, will be recorded in the field and stored on a standardized record form (either hard copy or electronic) or in a designated bound project field notebook. This type of documentation along with chain of custody documentation provides a permanent record of all significant activities during a field investigation. All field sheets and logs should be completed using waterproof pens to prevent smudging if the notes get wet in the field or use of a digital pen with associated hard copy or electronic field forms. Once complete, the standardized forms and logs should be signed and dated on the bottom of each page.

5.6.1.1 FIELD RECORDS

The field team will keep field records, including daily logs, sampling events, and field observations in accordance with the QAPP. All field records shall be dated and signed (or initialed) on each page by the person making the entry. Field records will be kept in a secure dry place. Entries must not be made in water-soluble ink. The type of information to be included in field records is:

i) Date
ii) Time
iii) Location
iv) Weather (temperature, cloud cover, humidity, wind, etc.)
v) Sample crew
vi) Work progress
vii) Control samples
viii) Delays
ix) Unusual situations
x) Well damage
xi) Departure from established QA/QC field procedures
xii) Instrument problems
xiii) Accidents
xiv) Field calibrations performed during the sampling
xv) Pertinent health and safety concerns
xvi) Up/down gradient or clean/contaminated designation
xvii) Physical condition of well
xviii) Depth of well (both installed and measured)
xix) Measuring point elevation
xx) Depth to water
xxi) Purge volume
xxii) Purge time (start/stop)
xxiii) Recharge time
xxiv) Time of sample collection
xxv) Important field observations regarding purge or sample water or conditions related to sample integrity

Additional field sheets may be required dependent on the task; specifics are described in the FPs. Any corrections made to the original entries will be initialed by the observer. Any incorrect entries will be crossed out with a single line using permanent ink and initialed by the observer.

5.6.1.2 SAMPLE COLLECTION LOGS

The sampling team shall maintain all sampling logs which record information about each sample collected. The logs will be completed at the time of sampling and will provide documentation to indicate that sampling requirements have been met. In addition to project information and well evacuation data, the following information is also included on the sampling log in accordance with the QAPP:

i) Physical appearance of samples
ii) Field observations
iii) Results of field analyses
iv) Sampling methods and materials
v) Constituents sampled
vi) Split sample and QA/QC sample information
vii) Sampling personnel

5.6.1.3 INSTRUMENT CALIBRATION AND USE LOGS

Standardized Instrument Calibration Logs for each field instrument will be maintained during all sampling activities to demonstrate properly functioning equipment. Included in the log should be documentation of time of instrument use, operator, and any maintenance performed. Logs for the photoionization detector (PID) will also include daily calibration, type of calibration gas, warm-up time, and lamp type (10.2 eV). This information can be entered onto standardized field data record forms specific to the field instrument.

5.7 SAMPLE CONTAINERS

All samples will be placed in new containers provided by the analytical laboratory then sent to the laboratory for chemical analyses. These bottles will be shipped by overnight courier in clean insulated coolers equipped with bottle custody forms. Packing materials will be used to prevent bottle breakage.

5.8 SAMPLE IDENTIFICATION

Sample labels are necessary to identify and prevent misidentification of the samples. The labels shall be affixed to the sample container (not the caps) prior to the time of sampling. The labels shall be filled out in waterproof ink at the time of collection. The labels will include the following information:

i) Sample number/identification code
ii) Name/initials of collector
iii) Date and time of sample collection
iv) Site name
v) Project number
vi) Required analysis
vii) Type of preservation (if applicable)

A unique sample numbering system will be used to identify each sample collected. An example of a sample identification number is as follows:

Example: WG-9954-081012–AA–XXX

Where:	WG	Designates sample type (WG=Groundwater)
	9954:	Project number
	081012:	Date of collection (mm/dd/yy)
	AA:	Sampler initials
	XXX:	Unique sample number or location ID

QC samples will also be numbered with a unique well ID, with the exception of matrix spikes and matrix spike duplicates.

5.9 SAMPLE CUSTODY

Sample custody procedures are designed to provide documentation of preparation, handling, storage, and shipping of collected samples. In order to maintain the integrity of samples, chain of custody procedures will be followed. The chain of custody procedures are designed to ensure that:

i) The samples are not tampered with
ii) All persons handling the samples can be traced
iii) All persons handling the samples are accountable

Samples collected will be the responsibility of identified persons from the time they are collected until they, or their derived data, are incorporated into the final report. Stringent chain of custody procedures will be followed to maintain and document sample possession.

5.9.1 <u>FIELD CUSTODY</u>

The field personnel are responsible for the care and custody of the samples collected until they are personally delivered to the analytical laboratory or entrusted to a courier. Immediately upon collection, the sample will be placed in the laboratory-supplied insulated cooler and chilled with ice to maintain <6°C within the cooler. Packing materials will be used to prevent bottle breakage. Samples which are not shipped to the laboratory on the same day they are collected will be transferred to the on-Site refrigerator at the end of the day's sampling. A custody seal will be placed on the container prior to placement in the refrigerator to ensure the chain of custody is maintained. The interior of the refrigerator will be maintained at <6°C.

Chain of custody forms will be completed to the fullest extent possible prior to sample shipment. These forms will include the following information:

i) Sample number
ii) Time collected
iii) Date collected
iv) Sample matrix
v) Number of containers
vi) Parameters to be tested
vii) Preservative
viii) Name of sampler

These forms will be filled out in a legible manner, using waterproof ink, and will be signed by the sampler. Similar information will be provided on the sample label, which is securely attached to the sample bottle. In addition, sampling forms will be used to document collection, filtration, and preparation procedures.

5.9.2 TRANSFER OF CUSTODY

The following procedures will be used when transferring custody of samples:

i) Samples will always be accompanied by a chain of custody record. When transferring samples, the individuals relinquishing and accepting them will sign, date, and note the time on the record. This record documents sample custody transfer from the sampler, often through another person, to the laboratory. Upon arrival at the laboratory, internal custody procedures will be followed.

ii) Samples will be packaged properly for shipment and dispatched to the appropriate laboratory for analysis, with a separate custody record accompanying each shipment. Shipping containers will be sealed for shipment to the laboratory. The original record of the chain of custody will be sealed within the shipping container. One copy will be retained with the field records, and a photocopy will be transmitted to the project chemist by the next working day. The method of shipment, courier name, and other pertinent information will be entered in the remarks section of the custody record.

5.9.3 SAMPLE SHIPMENT PROCEDURES

The following procedures will be followed when shipping samples for laboratory analysis:

i) Only shipping containers which meet all applicable State and Federal standards for safe shipment will be used.

ii) Samples requiring refrigeration will be promptly chilled with ice (in zip-locked bags) to a temperature of <6 C and packaged (with bubble wrap to prevent bottle breakage) in an insulated cooler for transport to the analytical laboratory.

iii) The shipping containers will be sealed with tape and chain of custody seal. Tape is wrapped around the cooler in two locations (across hinges) and custody seal placed across cooler opening. This allows the receiver to quickly identify any tampering which may have taken place during transport to the laboratory.

iv) A copy of the field chain of custody document will be placed inside the shipping container in a sealed plastic envelope.

v) Shipment of all analytical samples will be by commercial or laboratory courier or delivered to the laboratory by the sampler on each day of sampling prior to 8:00 p.m. Samples are to be shipped to the laboratory within 24 to 48 hours of collection.

vi) Proper documentation will be maintained for shipments by commercial courier. (e.g., waybills or bills of lading). (Note: Most common couriers, e.g., FedEx or UPS, will not sign chain of custody records).

5.10 DECONTAMINATION PROCEDURES

Decontamination of non-dedicated sampling equipment at the Site is critical to avoid cross-contamination when this equipment is used at multiple locations at the same or different well locations. All non-dedicated equipment is to be cleaned prior to use in a well and after having been used in any other well.

FP-06a and FP-06b present general decontamination procedures at the Site. As no solvents are used, decontamination fluids can be collected and disposed to the LCTF system.

As described in the QAPP (Appendix B), rinse blanks will be collected from cleaned sampling equipment to validate the effectiveness of the decontamination of that equipment.

5.11 WASTE MATERIAL HANDLING

5.11.1 DECONTAMINATION FLUIDS DISPOSAL

Waste liquids generated from the cleaning of non-dedicated sampling equipment can be disposed of at the LCTF for treatment. Decontamination should be carried out in the designated decontamination bay (first bay) of the Love Canal Drum Storage Facility. Wash water should be disposed of in the trench within the decontamination bay. Where decontamination occurs in the field, wash water should be collected into a 5-gallon pail or can be placed into the overpack drums used to contain groundwater from purging and sampling activities and disposed of within the trench in the decontamination bay.

5.11.2 GROUNDWATER DISPOSAL

All groundwater generated from purging and sampling activities will be discharged to the LCTF for treatment.

Discharge to the LCTF will take place by pouring or pumping the water into the trench in the decontamination bay of the Love Canal Drum Storage Facility. The trench flows into a vault that is pumped through a forcemain to the LCTF.

5.11.3 SOLID WASTE

Solid waste generated during water level monitoring and groundwater sample collection activities will be placed in plastic garbage bags or 55-gallon drums and stored in the Love Canal Drum Storage Facility pending final disposal in accordance with applicable regulations.

6.0 INTERPRETING RESULTS

Hydraulic monitoring data will be used to determine the hydraulic gradient in relation to the barrier drain system and to establish whether this gradient is inward (toward the barrier drain). An inward gradient indicates that the system is functioning properly, capturing leachate from the Site, and preventing off-Site migration of chemicals.

The chemical monitoring data obtained from the laboratory will be used as a determination of whether changes in groundwater chemistry over time are occurring. All analytical results will be subjected to QA/QC review to assess the validity of the data. The validated analytical results, provided by the project chemist, will be compared to historical analytical information for the evaluation.

As a majority of the chemical monitoring wells are placed outside the known limits of contamination, the organic chemistry from these wells should be non-detectable at the method detection limits. MW-10135 is located within a known contaminated area and serves as a "Worst Case" well.

7.0 REPORTING

In accordance with the conditions set out in Appendix B of the Consent Judgment between OCC and the State of New York, an annual Periodic Review Report discussing the activities of the previous calendar year (January 1 to December 31) will be prepared for submittal to the NYSDEC.

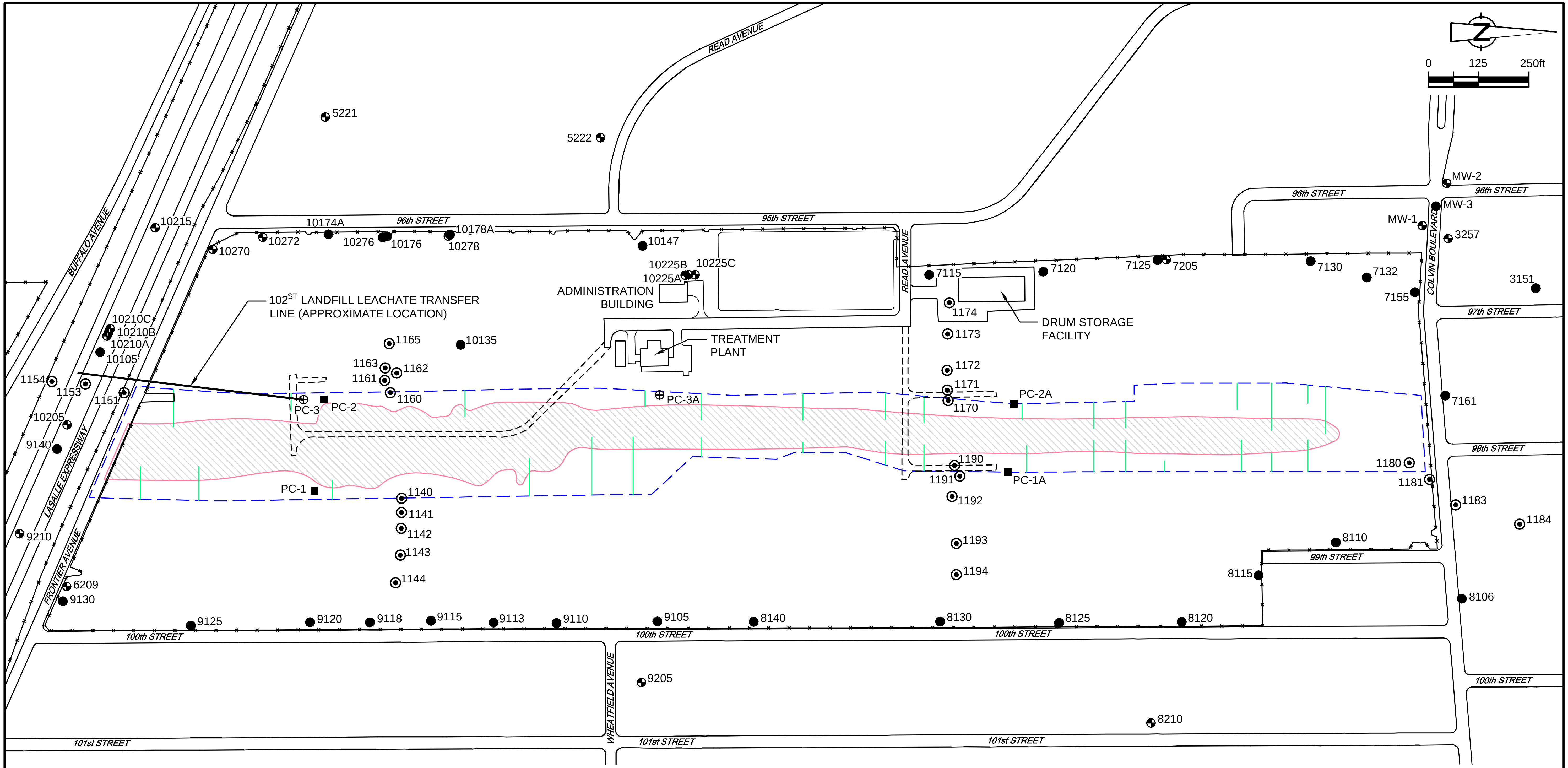
This report is to be submitted on or before March 30 of each year. The report will be provided as hard (paper) copy and in an acceptable digital format (pdf).

The report will include the following information:

i) A discussion of the major activities occurring at the Site during the reporting period
ii) A summary of the operation of the barrier drain and treatment system, including monthly average flows and any major problems, equipment repairs, and/or changes in the operation of the system
iii) A summary of the findings of the four rounds of hydraulic monitoring, including hydrographs demonstrating hydraulic gradients
iv) A summary of the chemical monitoring program, including a listing of the wells sampled, a discussion of the analytical results, and a comparison of the analytical results to historical Site chemistry
v) Tables listing the water level measurements, the analytical results by well, and the monthly treatment plant flows
vi) A conclusion regarding the overall effectiveness of the remedial systems at the Site
vii) The Institutional and Engineering Controls Certification submittal signed by a representative of GSH and signed and stamped by a Professional Engineer (PE) or a Qualified Environmental Professional (QEP)

Separate annual report requirements applicable to hazardous waste generation, transportation, and storage are also required, as per the appropriate regulations. Any spill events that may occur must also be reported according to the appropriate regulations.

FIGURES



LEGEND	
—×—×—	FENCE LINE
— — —	BARRIER DRAIN
——	LATERAL TRENCH
⊙ 7105	PIEZOMETER
● 9120	OVERBURDEN OBSERVATION WELL
⊕ 10270	BEDROCK OBSERVATION WELL
■ PC-1	PUMP CHAMBER FOR LEACHATE COLLECTION
⊕ PC-3	PUMP CHAMBER / UNDERGROUND LEACHATE STORAGE TANK FOR LEACHATE COLLECTION AND TRANSFER
▨	APPROXIMATE LIMITS OF DISPOSED WASTE

NOTE:
WELL 3151 IS UNABLE TO BE LOCATED
(ASSUMED TO BE PAVED OVER)

figure 2.1

SITE PLAN
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
Niagara Falls, New York

09954-D23101(025)GN-WA001 JUN 3/2013

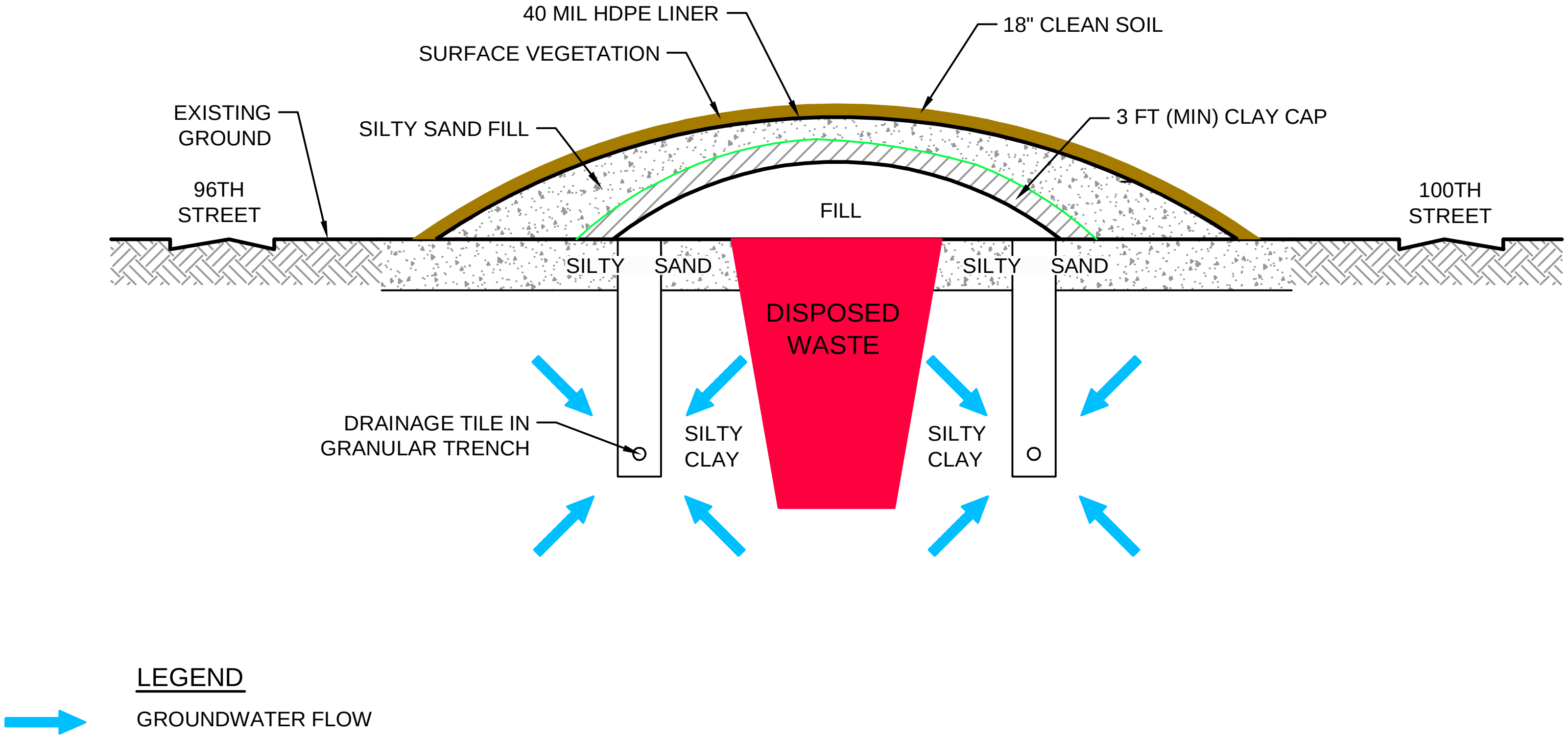
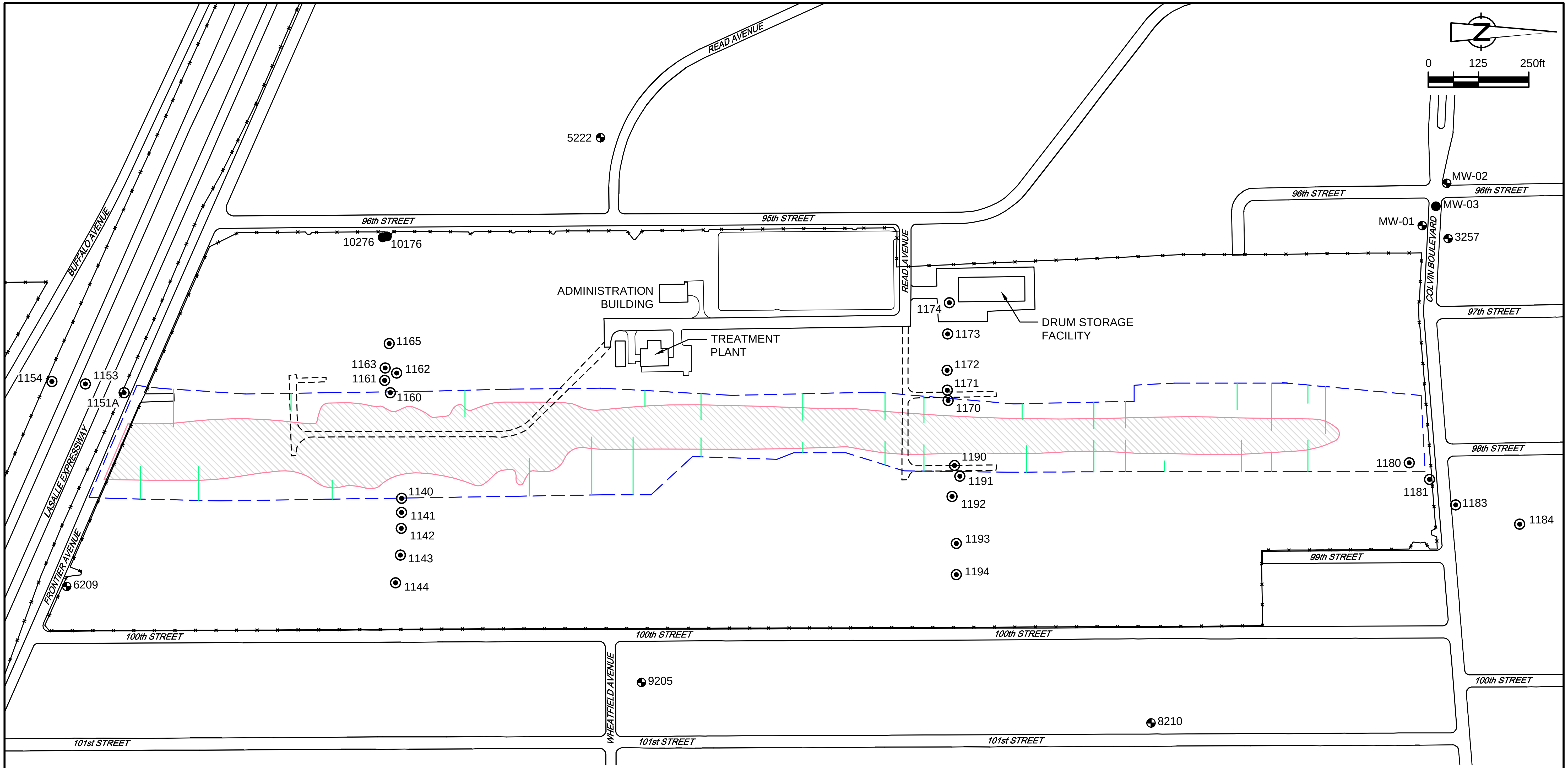


figure 2.2

TYPICAL BARRIER COLLECTION SYSTEM CROSS-SECTION
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
Niagara Falls, New York



LEGEND

—×—×— FENCE LINE

– – – – BARRIER DRAIN

—— LATERAL TRENCH

⊙ 7105 PIEZOMETER

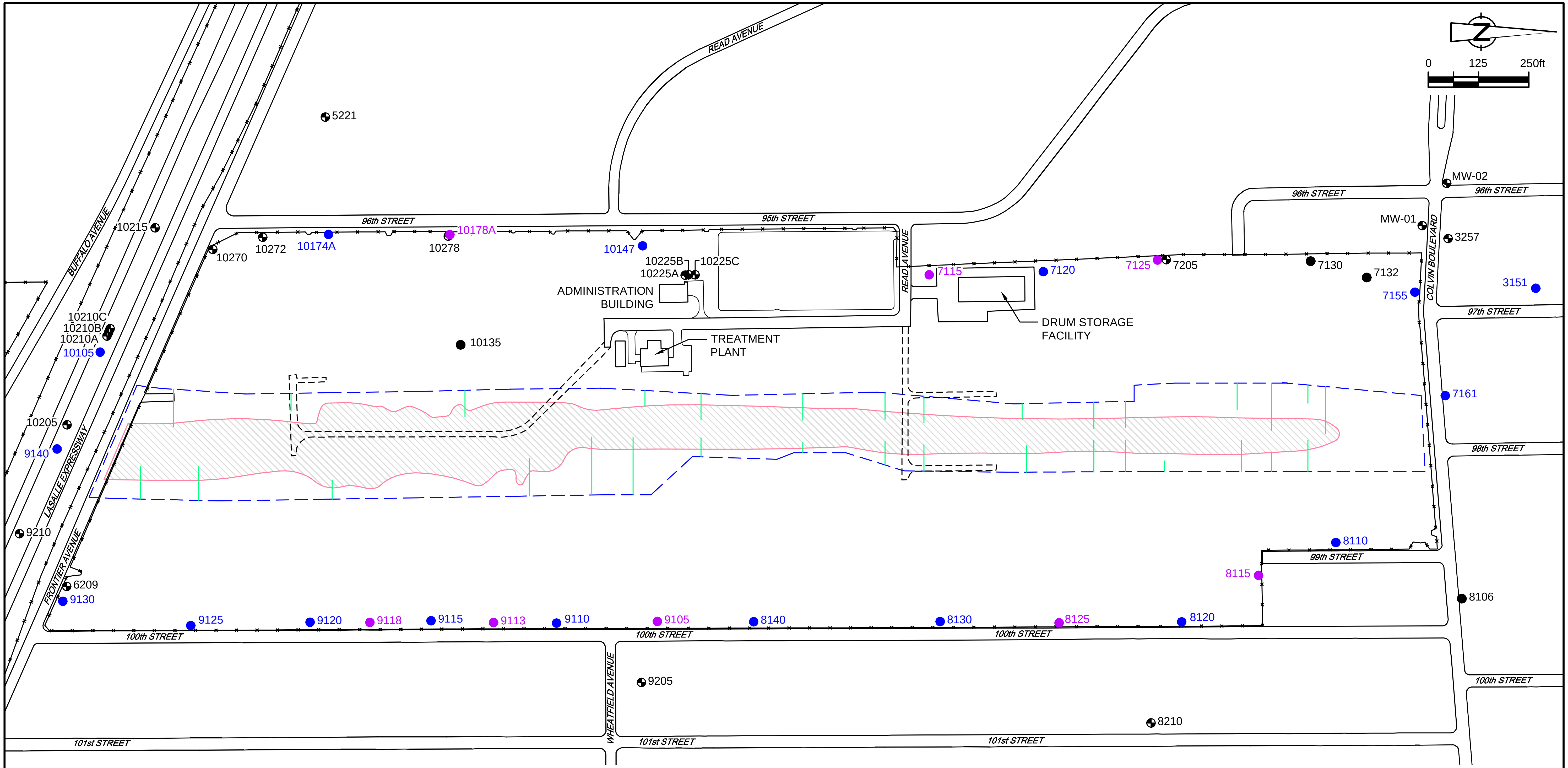
⊕ 5222 BEDROCK OBSERVATION WELL

● 9120 OVERBURDEN OBSERVATION WELL

▨ APPROXIMATE LIMITS OF DISPOSED WASTE

figure 3.1

HYDRAULIC MONITORING LOCATIONS
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
Niagara Falls, New York



NOTE:
WELL 3151 IS UNABLE TO BE LOCATED
(ASSUMED TO BE PAVED OVER)

figure 3.2

CHEMICAL MONITORING LOCATIONS
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
Niagara Falls, New York

TABLES

TABLE 3.1

HYDRAULIC MONITORING LOCATIONS
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
NIAGARA FALLS, NEW YORK

Piezometer Identification	*Geologic Zone Monitored*	*Top of Riser Elevation (feet AMSL)*
North Sector Wells		
1170A	A	584.12
1170B	B	583.97
1171A	A	582.84
1171B	B	583.30
1171C	B	582.76
1172A	A	581.58
1172B	B	581.61
1172C	B	581.63
1173A	A	577.96
1173B	B	578.28
1173C	B	578.34
1173D	C	578.48
1174A	D	573.24
1174B	C	573.47
1174C	B	573.78
1174D	B	573.86
1180A	A	582.06
1180B	B	581.93
1180C	C	582.80
1181A	A	576.29
1181B	B	576.69
1181C	C	576.65
1190A	A	585.84
1190B	B	585.67
1191A	B	584.41
1191B	B	584.35
1191C	B	584.67
1192A	A	582.91
1192B	B	582.91
1192C	C	583.30
1193A	A	579.42
1193B	B	578.93
1193C	B	579.08
1193D	C	578.94
1194A	A	577.88
1194B	B	577.48
1194C	B	578.02
1194D	C	578.19

TABLE 3.1

HYDRAULIC MONITORING LOCATIONS
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
NIAGARA FALLS, NEW YORK

Piezometer Identification	*Geologic Zone Monitored*	*Top of Riser Elevation (feet AMSL)*
South Sector Wells		
1140A	B	582.92
1140B	A	582.98
1141A	B	581.28
1141B	A	581.47
1142A	C/D	579.75
1142B	B	579.63
1142C	A	579.67
1143A	C	577.37
1143B	B	576.98
1143C	B	576.54
1143D	A	577.14
1144A	D	577.69
1144B	C	577.25
1144C	B	577.72
1144D	A	577.59
1160A	C	584.51
1160C	C	584.24
1161A	A	582.54
1161B	B	582.62
1161C	B	582.64
1161D	C	582.55
1161E	B	583.70
1162A	C	580.84
1162C	C	581.60
1162D	A	582.14
1163A	B	580.84
1163B	C	580.89
1163C	C	580.85
1163D	D	580.92
1165A	B	583.70
1165B	C	583.64
1165C	C	583.68
1165D	D	583.71
10176A*	B	576.64
10176B*	B	576.80
10176C*	B	576.85
10176D*	A	579.98
10276*	-	577.04

TABLE 3.1

HYDRAULIC MONITORING LOCATIONS
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
NIAGARA FALLS, NEW YORK

Piezometer Identification	*Geologic Zone Monitored*	*Top of Riser Elevation (feet AMSL)*
Frontier Avenue and LaSalle Expressway		
1151A	A	577.52
1151B	B	577.57
1151C	C	577.75
1151D	D	577.84
1153A	A	577.44
1153B	B	576.64
1153C	B	577.36
1153D	C	577.18
1153E	C	576.37
1154A	A	572.69
1154B	B	573.48
1154C	B	573.59
1154D	C	573.24
Colvin Boulevard Area		
1183A	A	572.84
1183B	C	572.74
1183C	C	572.82
1183D	D	572.79
1184A	A	571.11
1184B	B	570.79
1184C	C	571.19
1184D	D	571.11
Other Wells		
6209*	BR	577.55
5222*	BR	576.80
8210*	BR	573.36
9205*	BR	574.38
3257*	BR	572.38
MW-01*	BR	572.09
MW-02*	BR	571.64
MW-03*	I	571.25

Notes:
A = Glacial till.
B = Lower soft silty clay.
C = Upper stiff silty clay (fractured clay).
D = Upper fractured stiff clay or fill.
BR = Bedrock.
I = Installed in sewer bedding.
* = Observation well.
- = Information not available.
AMSL = Above mean sea level.

TABLE 3.2

WELL CONSTRUCTION AND INSTALLATION DETAILS
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
NIAGARA FALLS, NEW YORK

Well Number	*Top of Riser Elevation (AMSL)*	*Ground Elevation (AMSL)*	*Well Type*	*Zone Monitored*	*Depth of Well (feet)*	*Casing Diameter (inches)*	*Well Diameter (inches)*	*Well Material*
3257	572.38	-	Bedrock	BR	29.4	4	2	PVC
5221	-	-	Bedrock	BR	42.6	4	4	BI
6209	577.55	-	Bedrock	BR	42.0	-	2	-
7205	576.77	574.1	Bedrock	BR	48.0	4	2	SS
8210	573.36	573.7	Bedrock	BR	43.8	4	2	SS
9205	574.38	574.5	Bedrock	BR	48.7	3	2	SS
9210	581.43	582.4	Bedrock	BR	82.3	4	2	SS
10205	577.59	578.4	Bedrock	BR	54.3	4	2	SS
10210A	576.12	577.2	Bedrock	BR	217.0	4	2	SS
10210B	576.50	577.1	Bedrock	BR	140.3	4	2	SS
10210C	576.18	577.1	Bedrock	BR	84.0	4	2	SS
10215	576.92	578.2	Bedrock	BR	59.4	4	2	SS
10225A	576.6	574.5	Bedrock	BR	205.0	4	2	SS
10225B	576.49	574.4	Bedrock	BR	137.7	4	2	SS
10225C	576.97	574.7	Bedrock	BR	62.5	4	2	SS
10270	575.86	574.5	Bedrock	BR	47.0	N/A	2	SS
10272	577.32	-	Bedrock	BR	47.7	-	2	SS
10278	575.82	-	Bedrock	BR	47.0	-	2	SS
MW-01	572.09	-	Bedrock	BR	36.9	12	4	BI
MW-02	571.64	-	Bedrock	BR	37.0	12	4	BI
7130	576.21	574.3	Overburden	A/B	27.0	4.25	2	SS
7132	576.94	574.6	Overburden	A	28.0	4.25	2	SS
8106	572.04	573.1	Overburden	A/B	17.0	4.25	2	SS
10135	582.3	577.1	Overburden	A/B	29.5	4.25	2	SS
3151	-	-	Overburden	-	25.1	-	2	-
7120	577.44	575.0	Overburden	A/B	30.3	4.25	2	SS
7155	576.15	573.2	Overburden	A/B	25.6	4.25	2	SS
7161	571.96	573.0	Overburden	A/B	21.7	4.25	2	SS
8110	578.97	576.5	Overburden	A/B/C	24.0	4.25	2	SS
8120	575.97	573.6	Overburden	A/B	27.0	4.25	2	SS
8130	578.08	574.6	Overburden	A/B	29.1	4.25	2	SS
8140	577.77	574.7	Overburden	A/B	31.0	4.25	2	SS
9110	576.43	573.9	Overburden	A/B	24.0	4.25	2	SS
9115	576.96	574.0	Overburden	A/B/C	17.9	4.25	2	SS
9120	576.54	574.2	Overburden	A/B	20.5	4.25	2	SS
9125	576.08	573.5	Overburden	A/B	23.9	4.25	2	SS
9130	575.31	574.3	Overburden	A/B	30.5	4.25	2	SS
9140	577.82	578.9	Overburden	A/B	29.0	4.25	2	SS
10105	576.54	577.3	Overburden	A/B	29.5	4.25	2	SS
10147	575.29	574.4	Overburden	A/B	28.0	4	2	SS

TABLE 3.2

WELL CONSTRUCTION AND INSTALLATION DETAILS
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
NIAGARA FALLS, NEW YORK

Well Number	*Top of Riser Elevation (AMSL)*	*Ground Elevation (AMSL)*	*Well Type*	*Zone Monitored*	*Depth of Well (feet)*	*Casing Diameter (inches)*	*Well Diameter (inches)*	*Well Material*
10174A	576.56	-	Overburden	-	11.71	4	2	SS
7115	578.24	574.7	Overburden	A/B	31.0	4.25	2	SS
7125	576.94	574.3	Overburden	A/B	24.5	4.25	2	SS
8115	577.54	574.6	Overburden	A/B	28.5	4.25	2	SS
8125	577.54	573.6	Overburden	A/B	27.5	4.25	2	SS
9105	576.76	573.9	Overburden	A/B	29.4	4.25	2	SS
9113	575.82	573.4	Overburden	A	34.0	4.25	2	SS
9118	576.17	574.1	Overburden	A	35.5	4.25	2	SS
10178A	574.55	-	Overburden	-	11.01	4	2	SS

Notes:
A = Glacial till.
B = Lower soft silty clay.
C = Upper stiff silty clay (fractured clay).
D = Upper fractured stiff clay or fill.
BR = Bedrock.
- = Information not available.
AMSL = Above mean sea level.
SS = Stainless steel.
PVC = Polyvinyl chloride.
BI = Black Iron.

TABLE 3.3

CHEMICAL MONITORING LOCATIONS AND SCHEDULE
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
NIAGARA FALLS, NEW YORK

Annual Wells	*Biannual Wells*	
	Overburden Wells	*Overburden Wells*
Bedrock Wells	*Group I*	*Group II*
3257	3151	7115
5221	7120	7125
6209	7155	8115
7205	7161	8125
8210	8110	9105
9205	8120	9113
9210	8130	9118
10205	8140	10178A
10210A	9110	
10210B	9115	
10210C	9120	
10215	9125	
10225A	9130	
10225B	9140	
10225C	10105	
10270	10147	
10272	10174A	
10278		
MW-01		
MW-02		
Overburden Wells		
7130		
7132		
8106		
10135		

Notes:
Group I wells are to be measured in odd years (i.e., 2013).
Group II wells are to be measured in even years (i.e., 2014).

TABLE 3.4

SUMMARY OF ANALYTICAL PARAMETERS
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
NIAGARA FALLS, NEW YORK

Volatile Organic Compounds

1,1,1-Trichloroethane
1,1,2,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1-Dichloroethane
1,1-Dichloroethene
1,2-Dichloroethane
1,2-Dichloropropane
2-Butanone (Methyl ethyl ketone) (MEK)
2-Hexanone
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)
Acetone
Benzene
Bromodichloromethane
Bromoform
Bromomethane (Methyl bromide)
Carbon disulfide
Carbon tetrachloride
Chlorobenzene
Chloroethane
Chloroform (Trichloromethane)
Chloromethane (Methyl chloride)
cis-1,2-Dichloroethene
cis-1,3-Dichloropropene
Dibromochloromethane
Ethylbenzene
Methylene chloride
Styrene
Tetrachloroethene
Toluene
trans-1,2-Dichloroethene
trans-1,3-Dichloropropene
Trichloroethene
Vinyl acetate
Vinyl chloride
Xylenes (total)

TABLE 3.4

SUMMARY OF ANALYTICAL PARAMETERS
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
NIAGARA FALLS, NEW YORK

Semi-Volatile Organic Compounds

1,2,4-Trichlorobenzene
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
2,2'-Oxybis(1-chloropropane) (bis(2-Chloroisopropyl) ether)
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol
2,4-Dichlorophenol
2,4-Dimethylphenol
2,4-Dinitrophenol
2,4-Dinitrotoluene
2,6-Dinitrotoluene
2-Chloronaphthalene
2-Chlorophenol
2-Methylnaphthalene
2-Methylphenol
2-Nitroaniline
2-Nitrophenol
3,3'-Dichlorobenzidine
3-Nitroaniline
4,6-Dinitro-2-methylphenol
4-Bromophenyl phenyl ether
4-Chloro-3-methylphenol
4-Chloroaniline
4-Chlorophenyl phenyl ether
4-Methylphenol
4-Nitroaniline
4-Nitrophenol
Acenaphthene
Acenaphthylene
Anthracene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(g,h,i)perylene
Benzo(k)fluoranthene
Benzoic acid
Benzyl alcohol
bis(2-Chloroethoxy)methane
bis(2-Chloroethyl)ether

TABLE 3.4

SUMMARY OF ANALYTICAL PARAMETERS
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
NIAGARA FALLS, NEW YORK

Semi-Volatile Organic Compounds - Continued

bis(2-Ethylhexyl)phthalate (DEHP)
Butyl benzylphthalate (BBP)
Chrysene
Dibenz(a,h)anthracene
Dibenzofuran
Diethyl phthalate
Dimethyl phthalate
Di-n-butylphthalate (DBP)
Di-n-octyl phthalate (DnOP)
Fluoranthene
Fluorene
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Indeno(1,2,3-cd)pyrene
Isophorone
Naphthalene
Nitrobenzene
N-Nitrosodi-n-propylamine
N-Nitrosodiphenylamine
Pentachlorophenol
Phenanthrene
Phenol
Pyrene

Polychlorinated Biphenyls

Aroclor-1016 (PCB-1016)
Aroclor-1221 (PCB-1221)
Aroclor-1232 (PCB-1232)
Aroclor-1242 (PCB-1242)
Aroclor-1248 (PCB-1248)
Aroclor-1254 (PCB-1254)
Aroclor-1260 (PCB-1260)

TABLE 3.4

SUMMARY OF ANALYTICAL PARAMETERS
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
NIAGARA FALLS, NEW YORK

Pesticides

4,4'-DDD
4,4'-DDE
4,4'-DDT
Aldrin
alpha-BHC
alpha-Chlordane
beta-BHC
delta-BHC
Dieldrin
Endosulfan I
Endosulfan II
Endosulfan sulfate
Endrin
Endrin ketone
gamma-BHC (lindane)
gamma-Chlordane
Heptachlor
Heptachlor epoxide
Methoxychlor
Toxaphene

TABLE 3.5

MONITORING SUMMARY
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
NIAGARA FALLS, NEW YORK

Frequency	*Activity*	*Table/Reference*	*Number of Monitoring Locations*	*Field Procedure*	*Report Section*	*Analytical Parameter Suite/Comment*
Quarterly	Hydraulic Monitoring	Table 3.1	105	FP-02a	3.0	See Figure 3.1
Annual	Chemical Monitoring	Tables 3.3 and 3.4	$41^1/32^2$	FP-04b	3.0	VOCs, SVOCs, PCBs, Pesticides/See Figure 3.2
Annual	Report	NA	NA	NA	7.0	Data, Evaluations, Review of System Operations, Institutional and Engineer Controls Certification

Notes:

1	- odd years (i.e., 2013)
2	- even years (i.e., 2014)
VOCs	- Volatile organic compounds.
SVOCs	- Semi-volatile organic compounds.
PCBs	- Polychlorinated biphenyls.

APPENDIX A

BORING LOGS AND WELL INSTALLATIONS

LOVE CANAL REMEDIAL PROJECT

TASK V-C

IMPLEMENTATION OF A LONG-TERM MONITORING PROGRAM

APPENDIX H: BORING LOGS AND WELL INSTALLATIONS

JUNE 1987

FINAL REPORT

prepared by
E.C. JORDAN CO.
for
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF SOLID WASTE
ALBANY, NEW YORK

IMPLEMENTATION OF A
LONG-TERM MONITORING PROGRAM
LOVE CANAL REMEDIAL PROJECT
APPENDIX H - BORING LOGS

PREPARED BY

E. C. JORDAN CO.

JUNE 1987

FOR

DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF SOLID AND HAZARDOUS WASTE
ALBANY, NEW YORK

NORMAN H. NOSENCHUCK, P.E., DIRECTOR

CONTENTS

The logs are arranged in the following sequence of groups.

1. Perimeter overburden borings and wells, including the sewer borings (SB).
2. Nested piezometers.
3. Bedrock wells.
4. Canal wells (CW); swale borings (SW); berm well (BRM-10); and disposal pit (DP) explorations.

KEY TO SOIL DESCRIPTIONS

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
Coarse-grained soils (More than half of material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
			GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
		Gravels with fines (Appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines
			SP	Poorly-graded sands, gravelly sand, little or no fines
		Sands with fines (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
Fine-grained soils (More than half of material is smaller than No. 200 sieve size)	Silts and clays (Liquid limit less than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	Silts and clays (Liquid limit greater than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts
	Highly organic soils		Pt	Peat and other highly organic soils

TERMS DESCRIBING CONDITION, CONSISTENCY AND HARDNESS

COARSE GRAINED SOILS (major portion retained on No. 200 sieve): Includes (1) clean gravels; (2) silty or clayey gravels; and (3) silty, clayey or gravelly sands. Consistency is rated according to standard penetration resistance.

Descriptive Term	Standard Penetration Resistance in Blows/Ft.
Very loose	0 to 4
Loose	5 to 10
Medium dense	11 to 30
Dense	31 to 50
Very dense	Over 50

FINE GRAINED SOILS (major portion passing No. 200 sieve): Includes (1) inorganic and organic silts and clays; (2) gravelly, sandy or silty clays; and (3) clayey silts. Consistency is rated according to shearing strength, as indicated by penetrometer readings, vane test, or by triaxial test.

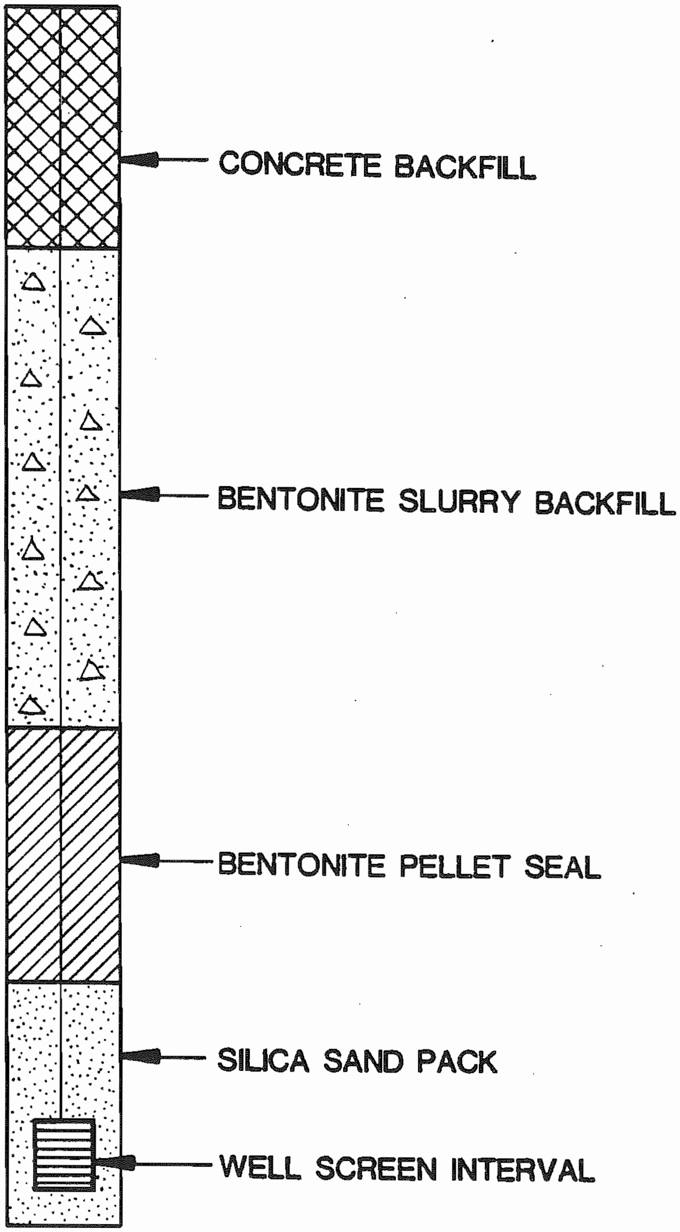
Descriptive Term	Shear Strength (ksf)
Very soft	less than 0.25
Soft	0.25 to 0.50
Firm	0.50 to 1.00
Stiff	1.00 to 2.00
Very stiff	2.00 to 4.00
Hard	4.00 and higher

SIZE PROPORTIONS

Designation	Percent by Weight
Trace	0 to 10
Little	10 to 20
Some	20 to 35
Silty, Sandy or Gravelly	35 to 50

LEGEND

WELL DATA



E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 7115

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-07

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/24/85

COMPLETED 11/25/85

METHOD HSA

CASING SIZE 4.25" ID

HNU 11.7/10.2

PROTECTION LEVEL C

GROUND EL. 574.7'

SOIL DRILLED 33.0'

TOTAL DEPTH 33.0'

▽ BELOW GROUND NA

LOGGED BY C. White

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
	0.0	S-1		Y	N	4.0 1.4	0.0	SILTY CLAY WITH SAND AND GRAVEL AND ORGANICS, LOOSE-STIFF, MOIST (FILL) 4.2'	GM CL	NO BLOW COUNTS TAKEN. USED CONTINUOUS SPLIT SPOON SAMPLER.		574.7
5				Y	N			BROWN SILTY SAND FINE, WET (ALLUVIAL SAND) 5.4'	SM			569.7
10	0.0	S-2		N	Y	5.0 4.7	0.0	REDDISH-BROWN SILTY CLAY; STIFF, DRY, VARVED, FRACTURED, SLIGHTLY PLASTIC (LACUSTRINE CLAY) 11.0'	CL			564.7
15	10.0	S-3				5.0 4.8	0.6	BROWN TO GRAY SILTY CLAY; SOFT, WET, VARVED, PLASTIC (LACUSTRINE CLAY)	CL CH			559.7
20	0.0	S-4		N	N	5.0 5.0	0.0					554.7
25	0.0	S-5		N	N	5.0 4.9	0.0					549.7
	0.0	S-6		N	Y	5.0 4.0	0.0	27.0'				
30	0.0	S-7		N	N	4.0 2.2	1.0	BROWN GRAVELLY SILTY SAND, DENSE, DRY, WIDELY GRADED, ABOUT 20% GRAVEL (GLACIAL TILL) 33.0'	SM			544.7
35								BOTTOM OF BORING AT 33.0 FEET				539.7
40												

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 7120

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-05

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/26/85

COMPLETED 10/26/85

METHOD HSA

CASING SIZE 4.25" ID

HNU 11.7/10.2

PROTECTION LEVEL C

GROUND EL. 575.0'

SOIL DRILLED 31.2'

TOTAL DEPTH 31.2'

▽ BELOW GROUND NA

LOGGED BY B. Fowler

CHECKED BY L. Lewis

DATE 3/24/86

HNU AMBIENT AIR	SAMPLE NO. & TYPE *	CLP	GC	OTHER	HNU HEADSPACE (PPM)
0.0	S-1	Y	N	4.0 3.5	0.1
0.0	S-2	Y	N	5.0 5.0	0.1
0.0	S-3	N	N	5.0 5.0	0.1
0.0	S-4	N	N	5.0 5.0	0.1
0.0	S-5	N	N	5.0 5.0	0.1
0.0	S-6	N	N	5.0 3.5	0.0
0.0	S-7	N	N	2.2 2.0	0.0

SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %
DARK BROWN MOTTLED SANDY SILT WITH ORGANICS, FRACTURED. DRY (FILL) 3.0'	ML	NO BLOW COUNTS TAKEN. USED CONTINUOUS SPLIT SPOON SAMPLER.
GRAY SILTY SAND, DENSE, DRY (ALLUVIAL SAND) 5.5'	SM	
REDDISH-GRAY SILTY CLAY, SOFT, MOIST (LACUSTRINE CLAY) 11.0'	CL	
BROWN TO GRAY SILTY CLAY, SOFT MOIST (LACUSTRINE CLAY) 19.0'	CL-CH	
BROWN TO GRAY CLAY WITH GRAVEL SOFT, LOOSE, WET (TRANSITIONAL TILL) 26.0'		
BROWN GRAVELLY SILTY SAND WITH CLAY. ABOUT 20% GRAVEL. MOIST, DENSE, WIDELY GRADED (GLACIAL TILL) 31.2'	SW ML	
BOTTOM OF BORING AT 31.2 FEET		

DEPTH (FT): 5, 10, 15, 20, 25, 30, 35, 40

WELL DATA

ELEV (FT): 575.0, 570.0, 565.0, 560.0, 555.0, 550.0, 545.0, 540.0

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT LONG TERM MONITORING

TASK VC

BORING NO. 7125

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
PROJECT NO. 4844-05
CONTRACTOR: J. MATHES ASSOC.
DATE STARTED 10/26/85
COMPLETED 10/26/85
METHOD HSA
CASING SIZE 4.25" ID
HNU 11.7/(10.2)
PROTECTION LEVEL C
GROUND EL. 574.3'
SOIL DRILLED 26.5'
TOTAL DEPTH 26.5'
▽ BELOW GROUND NA
LOGGED BY B. Fowler
CHECKED BY A. Lewis
DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	ELEV(FT)
		S-1	Y	N	3.5 2.5	0.1	BROWN, SANDY SILT WITH ORGANICS, MOIST, STIFF (FILL) 2.0'	ML	NO BLOW COUNTS TAKEN. USED CONTINUOUS SPLIT SPOON SAMPLER.	574.3
							BROWN SILTY SAND, FINE, DRY, DENSE (ALLUVIAL SAND) 4.0'	SM		
5		S-2	Y	N	5.0 5.0	0.0	REDDISH-BROWN MOTTLED SILTY CLAY, STIFF, DRY, FRACTURED, VARVED (LACUSTRINE CLAY)	CL		569.3
10							11.0'			564.3
		S-3	N	N	5.0 5.0	0.0	BROWN-GRAY SILTY CLAY, SOFT, MOIST, VARVED, PLASTIC (LACUSTRINE CLAY)	CH CL		
15	0.0	S-4	N	N	5.0 5.0	0.0				559.3
20							21.5'			554.3
	0.0	S-5	N	N	5.0 3.5	0.0	BROWN SANDY, CLAY WITH GRAVEL, WET, SOFT 23.5'			
25	0.0	S-6	N	N	3.0 2.0	0.0	BROWN GRAVELLY SILTY SAND WITH CLAY, MOIST, DENSE. ABOUT 20% GRAVEL, WIDELY GRADED (GLACIAL TILL) 26.5'	SM ML		549.3
							BOTTOM OF BORING AT 26.5 FEET			
30										544.3
35										
40										

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 7130

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-05

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/25/85

COMPLETED 10/25/85

METHOD HSA

CASING SIZE 4.25" ID

HNU 11.7/10.2

PROTECTION LEVEL C

GROUND EL. 574.3'

SOIL DRILLED 28.0'

TOTAL DEPTH 28.0'

▽ **BELOW GROUND** NA

LOGGED BY B. Fowler

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
	0.0	S-1		Y Y	N N	N	0.1	DARK BROWN CLAYEY SILT WITH SAND, MOIST, STIFF (FILL) 2.0	ML	NO BLOW COUNTS TAKEN. USED CONTINUOUS SPLIT SPOON SAMPLER.		574.3
								BROWN MOTTLED SILTY FINE SAND, DRY UNIFORMLY GRADED (ALLUVIAL SAND) 3.5	SM			
5	0.0	S-2		N	N	N	0.1	REDDISH-BROWN SILTY CLAY, STIFF, DRY, FRACTURED, VARVED (LACUSTRINE CLAY)	CL			569.3
10	0.0	S-3		N	N	N	0.1	12.0				564.3
15	0.0	S-4		N	N	N	0.1	BROWNISH-GRAY SILTY CLAY, SOFT WET, PLASTIC (LACUSTRINE CLAY)	CH CL			559.3
20	0.0	S-5		N	N	N	0.1	BROWNISH-RED CLAY WITH GRAVEL, SOFT, WET 20.5'				554.3
								GRAVELLY SAND, WET, LOOSE, WIDELY GRADED (OUTWASH SAND)	SW			
25								28.0				549.3
30								BOTTOM OF BORING AT 28.0 FEET				544.3
35												
40												

*U: THIN WALL TUBE   S: SPLIT SPOON   R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT LONG TERM MONITORING

TASK VC

BORING NO. 7155

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-05

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/30/85

COMPLETED 10/30/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7/10.2

PROTECTION LEVEL C

GROUND EL. 573.2'

SOIL DRILLED 26.9'

TOTAL DEPTH 26.9'

▽ BELOW GROUND NA

LOGGED BY B. Fowler

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	ELEV(FT)
			Y	N			BROWN SANDY SILT WITH ORGANICS (FILL) MOIST, STIFF 1.0	ML	NO BLOW COUNTS TAKEN. USED CONTINUOUS SPLIT SPOON SAMPLER.	573.2
	0.0	S-1		N	4.0 4.0	0.0	BROWN SILTY SAND, FINE, DRY DENSE, UNIFORMLY GRADED (ALLUVIAL SAND) 4.0	SM		
5			Y							568.2
	0.0	S-2		N	5.0 5.0	0.0	BROWN MOTTLED SILTY CLAY, STIFF, DRY, FRACTURED PLASTIC (LACUSTRINE CLAY) 11.0	CL		
10										563.2
	0.0	S-3	N	N	5.0 5.0	2.0	BROWN TO GRAY SILTY CLAY, SOFT, WET, PLASTIC, VARVED (LACUSTRINE CLAY) 16.0	CH-CL		
15										558.2
	0.0	S-4	N	N	5.0 5.0	0.0	SOME SAND AND GRAVEL SOFT, WET, PLASTIC 21.5	CL		
20										553.2
	0.0	S-5	N	N	5.0 3.5	2.0	REDDISH-BROWN SILTY SAND WITH SOME GRAVEL, TRACE OF CLAY, DRY TO MOIST, DENSE, WIDELY GRADED, ABOUT 20% GRAVEL	SM ML		
25										548.2
	0.0	S-6	N	N	3.0 3.0	0.0	(GLACIAL TILL) 26.9			
							BOTTOM OF BORING AT 26.9 FT			
30										543.2
35										
40										

WELL DATA

*U: THIN WALL TUBE   S: SPLIT SPOON   R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 7161

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-07

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/12/85

COMPLETED 11/12/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7 / [✓ 10.2]

PROTECTION LEVEL D

GROUND EL. 573.0'

SOIL DRILLED 21.5'

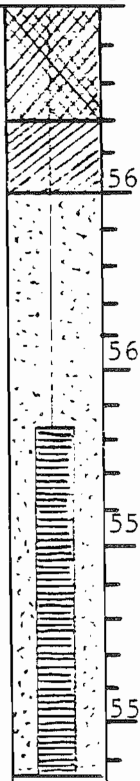
TOTAL DEPTH 21.5'

▽ BELOW GROUND NA

LOGGED BY C. White

CHECKED BY R. Lewis

DATE 3/24/86



DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	ELEV(FT)
	0.0 0.0 0.0	S-1	Y Y	Y Y Y	4.0 3.4	0.0 0.0	BROWN MOTTLED SANDY SILT, MOIST, SOFT, PLASTIC (TOPSOIL) 2.0	SM	NO BLOW COUNTS TAKEN. USED CONTINUOUS SPLIT SPOON SAMPLER.	573.0
							LIGHT BROWN MOTTLED SILTY CLAY MOIST, STIFF, PLASTIC			
5										568.0
	0.0	S-2	N	N	5.0 4.8	0.0	(LACUSTRINE CLAY)	CL		
10										563.0
	0.0	S-3	N	Y	5.0 5.0	0.0	11.5			
							REDDISH-GRAY MOTTLED SILTY CLAY, VARVED, MOIST, SOFT, PLASTIC	CL		
15							(LACUSTRINE CLAY) 16.0			558.0
	0.0	S-4	N	N	5.0 2.3	0.0	REDDISH-BROWN SILTY SAND WITH GRAVEL AND CLAY, MOIST, SOFT, SLIGHTLY PLASTIC	SC		
20								ML		553.0
	0.0	S-5	N	Y	2.5 2.4	0.0	(GLACIAL TILL) 21.7			
							BOTTOM OF BORING AT 21.7 FT			
25										548.0
30										
35										
40										

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 8106

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-07

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/11/85

COMPLETED 11/11/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7 / 10.2

PROTECTION LEVEL C

GROUND EL. 573.1'

SOIL DRILLED 18.0'

TOTAL DEPTH 18.0'

▽ BELOW GROUND NA

LOGGED BY C. White

CHECKED BY L. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	ELEV(FT)
							BROWN MOTTLED SILTY SAND WITH ORGANIC MATTER, MOIST, STIFF, PLASTIC 1.2			573.1
	0.4	S-1	Y	Y	2.0 1.3	≤0.5	BROWN MOTTLED SILTY SAND, MOIST UNIFORMLY GRADED (ALLUVIAL SAND) 3.0	SM	2-4-4-6	
	0.4	S-2	Y	Y	2.0 1.6	≤0.5			2-3-7-13	
5	0.4	S-3	N	N	2.0 2.0	≤0.5	REDDISH-BROWN SILTY CLAY, FRACTURED STAINED, MOIST, STIFF, PLASTIC		5-9-14-20	568.1
	0.4	S-4	N	N	2.0 2.0	≤0.5	(LACUSTRINE CLAY)	CL	4-8-10-12	
	0.0	S-5	N	N	2.0 2.0	0.0			1-3-4-5	
10										563.1
	0.4	S-6	N	N	2.0 2.0	0.0	12.0		3-6 settle 1.0'	
	0.4	S-7	Y	Y	2.0 2.0	0.0	SILTY CLAY WITH GRAVEL AND COARSE SAND, WET, PLASTIC	SC ML	3-3-5	
15	0.4	S-8	N	N	1.7 1.2	0.0	16.0		5-8-14	558.1
	0.4	S-9	N	N	2.0 2.0	0.0	SILTY SAND WITH CLAY AND GRAVEL, BROWN, MOIST, DENSE, PLASTIC (GLACIAL TILL) WIDELY GRADED 18.0	SM ML	5-6-15-17	
							BOTTOM OF BORING AT 18.0 FT			
20										553.1
25										
30										
35										
40										

WELL DATA

***U:** THIN WALL TUBE **S:** SPLIT SPOON **R:** ROCK

LOVE CANAL REMEDIAL PROJECT LONG TERM MONITORING

TASK VC

BORING NO. 8110

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-07

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/8/85

COMPLETED 11/8/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7 (10.2)

PROTECTION LEVEL C

GROUND EL. 576.5'

SOIL DRILLED 27.0'

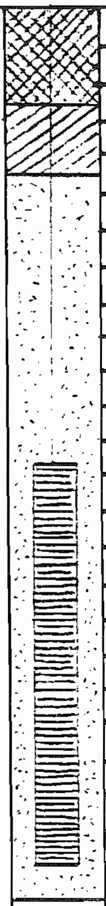
TOTAL DEPTH 27.0'

▽ BELOW GROUND NA

LOGGED BY S. Waite

CHECKED BY L. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
											576.5
	0.0	S-1	Y	Y	1.7 1.7	0.0	LINER DEPTH 1.3 BROWN MOTTLED SANDY SILT WITH ORGANIC MATTER, UNIFORMLY GRADED, MOIST, HARD, PLASTIC 3.0	SM	9-15-14-6		
	0.0	S-2	N	N	2.0 2.0	0.0	BROWN SILTY SAND, UNIFORMLY GRADED, DRY DENSE, NON-PLASTIC (ALLUVIAL SAND) 6.0	SM	6-8-8-8		571.5
5											
	0.0	S-3	Y	Y		0.0	REDDISH-BROWN MOTTLED SILTY CLAY MOIST, STIFF, PLASTIC		3-4-14-20		
	0.0	S-4	N	N	2.0 2.0	0.0		CL	8-16-22-25		
10	0.0	S-5	N	N		0.0	(LACUSTRINE CLAY)		8-15-17-19		566.5
	0.0	S-6	N	N	2.0 2.0	0.0	13.0		3-4-4-6		
	0.0	S-7	N	N	2.0 2.0	0.0	BROWN TO GRAY SILTY CLAY, WET, SOFT, VARVED, PLASTIC	CL	1-1-2-4		561.5
15											
	0.0	S-8	N	N	2.0 1.6	0.0	(LACUSTRINE CLAY) 16.0		3-2-4settle6"		
	0.0	S-9	N	N	2.0 1.5	0.0	SILTY CLAY WITH TRACES OF SAND AND GRAVEL, WET-MOIST, STIFF, PLASTIC		1-2-2-4		
20	0.0	S-10	N	N		1.0		CL	2-3-7settle6"		556.5
	0.0	S-11	N	N		1.0	(LACUSTRINE CLAY) 23.0		3-10-7-15		
	0.0	S-12	N	N		0.0	BROWN SILTY SAND WITH TRACE OF CLAY AND SOME GRAVEL, WIDELY GRADED, MOIST, STIFF, PLASTIC	SM ML	5-10-9-15		
25											551.5
	0.0	S-13	N	N		0.0	(GLACIAL TILL) 27.0		5-8-20-32		
							BOTTOM OF BORING AT 27.0 FT				
30							NOTE: PENETRATION/RECOVERY RATIO NOT RECORDED FOR S-10 - S-13				
35											
40											

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 8115

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-05

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/24/85

COMPLETED 10/24/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7 / (10.2)

PROTECTION LEVEL C

GROUND EL. 574.6'

SOIL DRILLED 29.2'

TOTAL DEPTH 29.2'

▽ BELOW GROUND NA

LOGGED BY B. Fowler

CHECKED BY R. Lewis

DATE 3/24/86

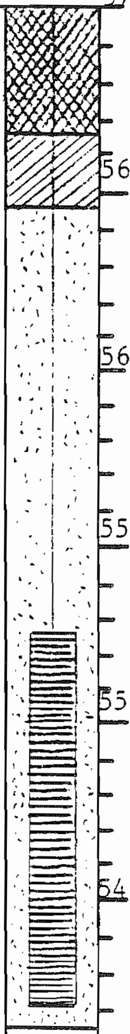
SAMPLE NO. & TYPE *	HNU AMBIENT AIR	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)
S-1	0.0	Y	Y Y	4.0 3.0	0.0
S-2		Y	N	5.0 5.0	0.0
S-3		N	N	5.0 4.6	
S-4	0.0	N	N	5.0 4.0	
S-5		N	N	5.0 4.0	
S-6		N	N	5.0 3.5	

SOIL/ROCK DESCRIPTION	SOIL CLASS
SILTY SANDY CLAY, STIFF, DRY, WITH ORGANICS (FILL) 2.6	CL
BROWN SILTY SAND, FINE, WET, UNIFORMLY GRADED, DENSE 4.0	SM
BROWN SILTY CLAY, STIFF, DRY, FRACTURED (LACUSTRINE CLAY) 11.0	CL
BROWN TO GRAY SILTY CLAY, SOFT, VARVED, WET, PLASTIC 16.5	CH-CL
REDDISH-BROWN SILTY CLAY WITH GRAVEL, SLIGHTLY STIFF, MOIST 20.0	
BROWN SILTY SAND WITH SOME GRAVEL AND CLAY, STIFF, DRY, WIDELY GRADED (GLACIAL TILL) ABOUT 20% GRAVEL 29.2	SM ML
BOTTOM OF BORING AT 29.2 ft	

BLOWS/6-IN: NO BLOW COUNTS TAKEN. USED CONTINUOUS SPLIT SPOON SAMPLER.

DEPTH (FT)	ELEV(FT)
0	574.6
5	569.6
10	564.6
15	559.6
20	554.6
25	549.6
30	544.6
35	
40	

WELL DATA



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT LONG TERM MONITORING

TASK VC

BORING NO. 8120

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-05

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/23/85

COMPLETED 10/23/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7 / (10.2)

PROTECTION LEVEL C

GROUND EL. 573.6'

SOIL DRILLED 28.5'

TOTAL DEPTH 28.5'

▽ BELOW GROUND NA

LOGGED BY B. Fowler

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)
			Y	N		
	0.0	S-1	Y		4.0 4.0	0.0
5	0.0	S-2	N	N	5.0 4.0	1.0
10	0.0	S-3	N	N	5.0 5.0	10.0
15	0.0	S-4	N	N	5.0 5.0	0.0
20	0.0	S-5	N	N	5.0 1.5	0.0
25	0.0	S-6	N	N	5.0 3.0	0.0

SOIL/ROCK DESCRIPTION	SOIL CLASS
DARK BROWN SANDY SILT WITH ORGANICS (FILL) MOIST, STIFF 1.0	SL
BROWN SILTY SAND, FINE, DRY, DENSE (ALLUVIAL SAND) 2.5	SM
REDDISH-BROWN MOTTLED SILTY CLAY, STIFF, DRY, FRACTURED (LACUSTRINE CLAY) 11.5	CL
BROWN TO GRAY SILTY CLAY, SOFT, MOIST, VARVED (LACUSTRINE CLAY) BROWN SILTY CLAY WITH SOME GRAVEL, SOFT, MOIST 22.0	CH-CL
BROWN CLAYEY SILTY SAND WITH SOME GRAVEL, ABOUT 20% GRAVEL, DENSE, MOIST, WIDELY GRADED (GLACIAL TILL) 28.5	SM ML
BOTTOM OF BORING AT 28.5 FT	

BLOWS/6-IN

NO BLOW COUNTS TAKEN. USED CONTINUOUS SPLIT SPOON SAMPLER.

WELL DATA

DEPTH (FT)	ELEV(FT)
	573.6
5	568.6
10	563.6
15	558.6
20	553.6
25	548.6
30	543.6
35	
40	

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT LONG TERM MONITORING

TASK VC

BORING NO. 8125

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
PROJECT NO. 4844-05
CONTRACTOR: J. MATHES ASSOC.
DATE STARTED 10/16/85
COMPLETED 10/16/85
METHOD HSA
CASING SIZE 4.25"
HNU 11.7 [✓ 10.2]
PROTECTION LEVEL C
GROUND EL. 573.6'
SOIL DRILLED 28.0'
TOTAL DEPTH 28.0'
▽ BELOW GROUND NA
LOGGED BY B. Fowler
CHECKED BY L. Lewis
DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE*	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	ELEV(FT)
										573.6
	0.0	S-1 ☒	Y	N	2.0 1.8	4.0	BROWN SANDY SILT WITH CLAY AND (FILL) ORGANICS, MOIST, STIFF 1.0 BROWN SILTY SAND, FINE, DRY, DENSE (ALLUVIAL SAND) 2.5	ML SM	4-11-12-14	
	0.0	S-2 ☒	N	N	1.5 1.5	3.0	BROWN MOTTLED SILTY CLAY, STIFF FRACTURED		10-14-12	
5	0.0	S-3 ☒	Y	N	2.5 1.5	1.5	(LACUSTRINE CLAY)	CL	6-14-15-21-26	568.6
	0.0	S-4 ☒	N	N	2.5 2.5	0.0			4-17-23-29-29	
10	0.0	S-5 ☒	N	N	2.5 2.5	0.0	11.0		5-8-9-10-9	563.6
	0.0	S-6 ☒	N	N	2.5 2.5	0.0	BROWN TO GRAY SILTY CLAY, SOFT MOIST, VARVED		2-1-2-2-2	
15	0.0	S-7 ☒	N	N	2.5 2.5	0.0		CH-CL	WOH-1-1-1-2	558.6
	0.0	S-8 ☒	N	N	2.5 2.5	0.0	(LACUSTRINE CLAY)		WOH/1.5'-1-2	
20	0.0	S-9 ☒	N	N	2.5 2.5	0.0	22.0		WOH/1.5'-2-1	553.6
	0.0	S-10 ☒	N	N	2.5 1.5	0.0	REDDISH-BROWN SILTY CLAY WITH SAND AND GRAVEL, SOFT, MOIST		WOH-1-1-1-2	
25	0.0	S-11 ☒	N	N	2.5 1.0	0.0	26.0		WOH-2-2-8-10	548.6
	0.0	S-12 ☒	N	N	2.0 1.5	0.0	CLAY SILTY SAND WITH GRAVEL, MOIST (GLACIAL TILL) DENSE, WIDELY GRADED	SC-ML	WOH-4-6-13	
							BOTTOM OF BORING AT 28.0 FT			
30										543.6
							WOH = WEIGHT OF HAMMER			
35										
40										

WELL DATA

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 8130

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
PROJECT NO. 4844-05
CONTRACTOR: J. MATHES ASSOC.
DATE STARTED 10/15/85
COMPLETED 10/15/85
METHOD HSA
CASING SIZE 4.25"
HNU 11.7/[✓ 10.2]
PROTECTION LEVEL C/D
GROUND EL. 574.6'
SOIL DRILLED 30.2'
TOTAL DEPTH 30.2'
▽ BELOW GROUND NA
LOGGED BY B. Fowler
CHECKED BY L. Lewis
DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE #	SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
	0.0	S-1	☒	Y	N	2.0 2.0	0.0	BROWN SANDY SILT WITH ORGANICS (FILL) MOIST, STIFF 1.0	ML	3-8-10-16		574.6
	0.0	S-2	☒	N	N	1.5 1.5	0.0	BROWN SILTY SAND, FINE, DRY, DENSE, UNIFORMLY GRADED (ALLUVIAL SAND) 4.5	SM	12-11-11		
5	0.0	S-3	☒	Y	N	2.5 2.0	0.0	BROWN MOTTLED SILTY CLAY, STIFF, DRY, FRACTURED	CL	7-12-8-14-22		569.6
	0.0	S-4	☒	N	N	2.5 2.0	0.0	(LACUSTRINE CLAY)		5-10-15-18-24		
10	0.0	S-5	☒	N	N	2.5 2.0	0.1	11.0		6-8-12-15-14		564.6
	0.0	S-6	☒	N	N	2.5 2.0	0.1	BROWN TO GRAY SILTY CLAY, SOFT, MOIST, VARVED, PLASTIC	CH-CL	2-3-2-4-5		
15	0.0	S-7	☒	N	N	2.5 2.0	0.2			1-1-1-2-3		559.6
	0.0	S-8	☒	N	N	2.5 2.0	0.1	(LACUSTRINE CLAY)		WOR/2.0'-1		
20	0.0	S-9	☒	N	N	2.5 2.0	0.0			WOR/2.0'-1		554.6
	0.0	S-10	☒	N	N	2.5 2.0	0.1		CL	WOR/2.0'-2		
25	0.0	S-11	☒	N	N	2.5 2.0	0.1	26.0		WOR/2.0'-1		549.6
	0.0	S-12	☒	N	N	2.0 1.5	0.1	SILTY CLAY WITH SANDY GRAVEL, SOFT, WET 28.0	CL	WOR/1.3'-3-4-7		
30	0.0	S-13	☒	N	N	1.7 1.7	0.0	SILTY SAND WITH SOME GRAVEL, ABOUT 20% GRAVEL, DENSE, MOIST (GLACIAL TILL) 30.2	SM ML	7-13-39		544.6
								BOTTOM OF BORING AT 30.2 FT				
								WOR = WEIGHT OF RODS				
35												
40												

#U: THIN WALL TUBE   S: SPLIT SPOON   R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT LONG TERM MONITORING

TASK VC

BORING NO. 8140

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION				**PROJECT NO.**	4844-05
CONTRACTOR: J. MATHES ASSOC.		**DATE STARTED**	10/14/85	**COMPLETED**	10/14/85
METHOD	HSA	**CASING SIZE**	4.25"	**HNU** 11.7 / [✓ 10.2]	**PROTECTION LEVEL** C
GROUND EL.	574.7'	**SOIL DRILLED**	32.0'	**TOTAL DEPTH** 32.0'	∇ **BELOW GROUND** NA
LOGGED BY	B. Fowler	**CHECKED BY**	R. Lewis	**DATE** 3/24/86	

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE*	SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
												574.7
	0.0	S-1	☒	N	N	1.0 0.5	0.1	BROWN SILTY CLAY WITH ORGANICS, GRAVEL, MOIST, STIFF (FILL) 2.0	GW CL	3-5		
	3.5	S-2	☒	Y	N	2.5 1.0	0.1	BROWN SILTY SAND, FINE, DRY DENSE (ALLUVIAL SAND) 5.0	SM	7-13-10-12-15		
5	0.0	S-3	☒	Y	N	2.5 0.5	0.1	REDDISH-BROWN CLAY, STIFF, DRY, FRACTURED (LACUSTRINE CLAY) 11.0		7-12-11-13-15		569.7
	0.0	S-4	☒	N	N	2.5 2.0	1.0		CL	15-21-24-19-20		
10	0.0	S-5	☒	N	N	2.5 1.0	1.0			18-21-21-19-14		564.7
	0.0	S-6	☒	N	N	2.5 2.5	1.0	BROWN TO GRAY CLAY, SOFT, MOIST (LACUSTRINE CLAY) 23.5	CH-CL	7-4-2-2-2		
15	0.0	S-7	☒	N	N	2.5 2.5	0.0			WOH-1-2-1-2		559.7
	0.0	S-8	☒	N	N	2.5 2.5	0.0			WOH/2.0'-2		
20	0.0	S-9	☒	N	N	2.5 2.5	0.0			WOH/2.0'-2		554.7
	0.0	S-10	☒	N	N	2.5 2.5	0.0			WOH/2.0'-2		
25	0.0	S-11	☒	N	N	2.5 2.5	0.0	BROWN SILTY CLAY, SOME SAND AND GRAVEL, SOFT 28.0		WOH/2.0'-1		549.7
	0.0	S-12	☒	N	N	2.5 2.5	0.0			WOH-1-12-45-60		
30	0.0	S-13	☒	N	N	1.0 1.0	0.0	SILTY SAND WITH TRACE OF CLAY AND GRAVEL, MOIST, DENSE, WIDELY GRADED, SLIGHTLY PLASTIC (GLACIAL TILL) 32.0	SM ML	58-100		544.7
								BOTTOM OF BORING AT 32.0 FT				
35								WOH = WEIGHT OF HAMMER				539.7
40												

*U: THIN WALL TUBE   S: SPLIT SPOON   R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 9105

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-05

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/31/85

COMPLETED 10/31/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7/[✓ 10.2]

PROTECTION LEVEL C

GROUND EL. 573.9'

SOIL DRILLED 29.9'

TOTAL DEPTH 29.9'

▽ BELOW GROUND NA

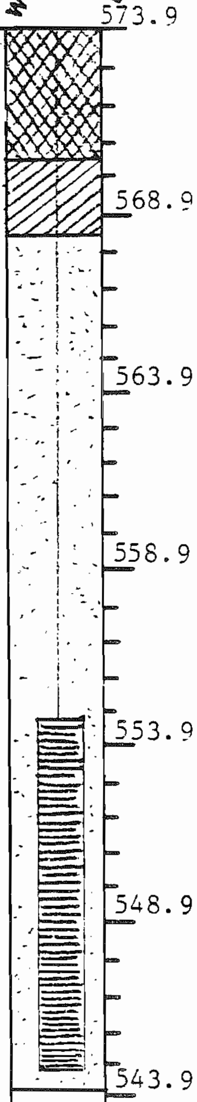
LOGGED BY B. Fowler

CHECKED BY R. Lewis

DATE 3/24/86

HNU AMBIENT AIR	SAMPLE NO.	& TYPE * SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (PPM)
0.0	S-1		Y	N	4.0 3.6	0.0
			Y			
	S-2			N	5.0 5.0	0.0
	S-3		N	N	5.0 5.0	0.0
0.0	S-4		N	N	5.0 4.2	0.0
	S-5		N	N	5.0 3.6	0.0
1.0	S-6		N	N	5.0 0.0	3.0
0.0			N	N		0.0

SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN
DARK-BROWN SANDY SILT WITH GRAVEL AND ORGANICS, DRY, LOOSE (FILL) 2.0	ML	NO BLOW COUNTS TAKEN. USED CONTINUOUS SPLIT SPOON SAMPLER.
BROWN SILTY SAND, FINE, DRY, DENSE (ALLUVIAL SAND) 4.5	SM	
BROWN MOTTLED SILTY CLAY, STIFF FRACTURED (LACUSTRINE CLAY) 11.0	CL	
BROWN TO GRAY MOTTLED CLAY, SOFT WET (LACUSTRINE CLAY) 21.0 TRACES OF SAND AND GRAVEL 24.0	CL	
REDDISH-BROWN SILTY SAND WITH SOME GRAVEL AND TRACE CLAY, MOIST, SLIGHTLY PLASTIC, WIDELY GRADED (GLACIAL TILL) 29.9	SM ML	
BOTTOM OF BORING AT 29.9 FT		



DEPTH (FT): 5, 10, 15, 20, 25, 30, 35, 40

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 9110

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-05

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/13/85

COMPLETED 10/13/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7 (10.2)

PROTECTION LEVEL C

GROUND EL. 573.9'

SOIL DRILLED 24.5'

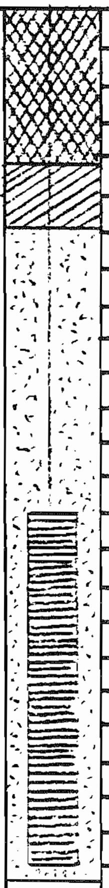
TOTAL DEPTH 24.5'

▽ BELOW GROUND NA

LOGGED BY B. Fowler

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
	0.0	S-1	Y	N	1.0 0.5	0.2	BROWN SANDY SILT WITH ORGANICS, (FILL) MOIST, STIFF 1.0	SM	2-3		573.9
	0.0	S-2	N	Y	2.5 2.5	0.4	BROWN MOTTLED SILTY FINE SAND WITH TRACE ORGANICS, DRY, DENSE, NON-PLASTIC (ALLUVIAL SAND) 5.0	SM	5-8-9-8-6		
5	0.0	S-3	Y	N	2.5 2.5	0.1	REDDISH-BROWN SILTY CLAY, MOIST SLIGHTLY PLASTIC, STIFF, FRACTURES		5-8-8-11-16		568.9
	0.0	S-4	N	N	2.5 2.5	0.0	(LACUSTRINE CLAY)	CL	7-11-15-24-26		
10	0.0	S-5	N	N	2.5 2.5	0.0	— — — — — — 11.0		6-11-16-17-15		563.9
	0.0	S-6	N	N	25 25	0.0	REDDISH-GRAY SILTY CLAY, WET SOFT, PLASTIC	CH	2-2-2-2-2		
15	0.0	S-7	N	N	25 25	0.1- 0.2			1-2-2-2-2		558.9
	0.0	S-8				0.0	(LACUSTRINE CLAY) 19.0	CL	1-2-2		
20	0.0	S-9				0.0	BROWN SILTY SAND WITH SOME GRAVEL AND TRACE OF CLAY, MOIST, DENSE, WIDELY GRADED	SM	1-1-3-24		553.9
	0.0	S-10				0.0		ML			
							(GLACIAL TILL) 24.5		18-37-51-46-103		
25							BOTTOM OF BORING AT 24.5 FT				548.9
30											
35											
40											

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 9115

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-07

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/6/85

COMPLETED 11/6/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7 /(10.2)

PROTECTION LEVEL C

GROUND EL. 574.0'

SOIL DRILLED 19.5'

TOTAL DEPTH 19.5'

▽ BELOW GROUND NA

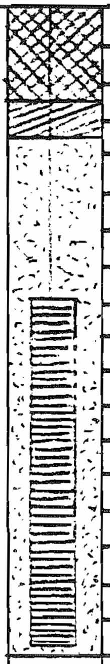
LOGGED BY S. Waite

CHECKED BY L. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	ELEV(FT)
	0.0	S-1	Y	Y	2.0 2.2	0.0	BROWN SANDY SILT, POORLY GRADED, WITH ORGANIC MATTER, SOFT, PLASTIC 2.3	Pt	3-3-3-4	574.0
	0.0	S-2	N	Y	2.2 2.2	0.0	RED MOTTLED BROWN SILTY SAND AND UNIFORMLY GRADED, MOIST, DENSE, PLASTIC		2-4-4-6-5	
5	3.0	S-3	Y	N	2.5 2.5	2.0	(ALLUVIAL SAND) 7.3	SM	4-9-16-20-26	569.0
	0.0	S-4	N	N	2.5 2.5	0.0	REDDISH-BROWN SILTY CLAY, MOIST, STIFF, FRACTURED 9.5		9-15-16-19-18	
10	0.0	S-5	N	N	2.5 2.5	0.0		CL	3-2-3-3-4	564.0
	0.0	S-6	N	N	2.5 2.5	1.0	(LACUSTRINE CLAY)		1-2-4-4-5	
15	0.0	S-7	N	N	2.5 0.5	1.0	15.0 REDDISH-BROWN SILTY CLAY WITH SOME BROWN COBBLES, UNIFORMLY GRADED, (GLACIAL TILL) MOIST, DENSE, SL. PLASTIC	CL	-NO BLOW COUNTS RECORDED FOR S-7 AND S-8	559.0
	0.0	S-8	N	N	2.5 2.5	1.0	SILTY SAND WITH GRAVEL WITH SOME COBBLES, BROWN, UNIFORMLY GRADED, MOIST, DENSE, SLIGHTLY PLASTIC (GLACIAL TILL)	ML		
20							BOTTOM OF BORING AT 19.5 FT			554.0
25										549.0
30										544.0
35										
40										

WELL DATA



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

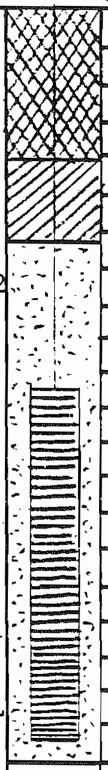
TASK VC

BORING NO. 9120

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
PROJECT NO. 4844-05
CONTRACTOR: J. MATHES ASSOC.
DATE STARTED 10/12/85
COMPLETED 10/12/85
METHOD HSA
CASING SIZE 4.25"
HNU 11.7/10.2
PROTECTION LEVEL C
GROUND EL. 574.2'
SOIL DRILLED 21.0'
TOTAL DEPTH 21.0'
▽ BELOW GROUND NA
LOGGED BY B. Fowler
CHECKED BY R. Lewis
DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	ELEV (FT)
	0.0	S-1	☒	Y	N	1.0 0.5	0.0	BROWN SANDY SILT WITH ORGANICS (FILL) MOIST, STIFF 1.0	ML	6-7	574.2
	0.0	S-2	☒	N	N	2.5 2.5	0.0	BROWN SILTY SAND, DRY, DENSE, FRACTURED, UNIFORMLY GRADED (ALLUVIAL SAND) 4.5	SM	5-8-10-13-14	
5	0.0	S-3	☒	Y	N	2.5 2.5	1.3	REDDISH-BROWN MOTTLED CLAY, STIFF, DRY, FRACTURED		5-10-8-12-18	569.2
	0.0	S-4	☒	N	N	2.5 2.5	0.6	(LACUSTRINE CLAY)	CL	5-11-15-22-32	
10	0.0	S-5	☒	N	N	2.5 2.5	1.2	11.0		5-11-16-18-15	564.2
	0.0	S-6	☒	N	N	2.5 2.5	0.0	BROWN TO GRAY CLAY, SOFT, MOIST		2-3-4-3-5	
15	0.0	S-7	☒	N	N	2.5 2.5	0.0	(LACUSTRINE CLAY)	CH-CL	1-1-2-2-2	559.2
	3.0	S-8	☒	N	N	2.5 2.5	20	18.0		WOR-7-18-42-71	
20	3.0	S-9	☒	Y	N	1.5 1.5	12	BROWN SANDY, CLAYEY SILT WITH GRAVEL, DRY, FRACTURED, DENSE (GLACIAL TILL)	ML SC	50-75-REFUSAL	554.2
								BOTTOM OF BORING AT 21.0 FT			
25								WOR = WEIGHT OF RODS			549.2
30											
35											
40											

WELL DATA



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING
TASK VC
BORING NO. 9125

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
PROJECT NO. 4844-05
CONTRACTOR: J. MATHES ASSOC.
DATE STARTED 10/11/85
COMPLETED 10/11/85
METHOD HSA
CASING SIZE 4.25"
HNU 11.7 10.2
PROTECTION LEVEL C
GROUND EL. 573.5'
SOIL DRILLED 26.0'
TOTAL DEPTH 26.0'
▽ BELOW GROUND NA
LOGGED BY B. Fowler
CHECKED BY R. Lewis
DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	ELEV(FT)
											573.5
	0.0	S-1	☒	Y	N	1.0	1.0	DARK BROWN SANDY SILT WITH ORGANICS (FILL) STIFF, DRY 1.0	ML	7-10	
	0.0	S-2	☒	N	N	0.3 2.5 1.7	1.0	BROWN SILTY SAND, DENSE, DRY, UNIFORMLY GRADED (ALLUVIAL SAND) 4.0	SP	5-6-9-10-11	
5	0.0	S-3	☒	Y	N	2.5 2.5	0.0	REDDISH-BROWN SILTY CLAY, MOIST, STIFF, FRACTURES, SLIGHTLY PLASTIC	CL	4-7-11-13-17	568.5
	0.0	S-4	☒	N	N	2.0 2.0	0.0	(LACUSTRINE CLAY) 9.0		4-9-15-18-20	
10	0.0	S-5	☒	N	N	2.0 2.0	0.0	REDDISH-GRAY SILTY CLAY, WET, PLASTIC, SOFT	CL	4-7-9-10-8	563.5
	0.0	S-6	☒	N	N		0.0	(LACUSTRINE CLAY)		2-2-2-2-2	
15	0.0	S-7	☒	N	N	2.0 2.0	0.0			2-3 18"SETTLE	558.5
	0.0	S-8	☒	N	N	2.0 1.0	0.0	18.0 TRACES OF SAND AND GRAVEL	CL	2-2 20"SETTLE	
20	0.0	S-9	☒	N	N	2.0 1.0	1.0	20.5		4-10-24-34 6" SETTLE	553.5
	0.0	S-10	☒	N	N	2.5 1.0	0.0	BROWN SILTY FINE SAND AND GRAVEL, MOIST, DENSE, SLIGHTLY PLASTIC, WIDELY GRADED	SM ML	34-40-50-63-44	
25	0.0	S-11	☒	N	N	2.5 1.0	0.0	(GLACIAL TILL)		15-24-52-29-54 REFUSAL	548.5
								BOTTOM OF BORING AT 26.0 FT			
30											543.5
35											
40											

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 9130

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-07

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/20/85

COMPLETED 11/20/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7 / 10.2

PROTECTION LEVEL C to D

GROUND EL. 574.3'

SOIL DRILLED 31.0'

TOTAL DEPTH 31.0'

▽ BELOW GROUND NA

LOGGED BY B. Fowler

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE & SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	ELEV(FT)
										574.3
0–5	0.0	S-1	Y	N	3.5 3.5	14.0	BROWN SAND WITH CLAY WITH ORGANIC MATTER, MOIST, MEDIUM STIFF, (FILL) PLASTIC 2.0 LIGHT BROWN SILTY SAND, OXIDATION STAINING, WET, SOFT, PLASTIC, UNIFORMLY GRADED (ALLUVIAL SAND) 5.5	SM SM	NO BLOW COUNTS TAKEN. USED CONTINUOUS SPLIT SPOON SAMPLER.	
5										569.3
5–10	0.0	S-2	Y	Y	5.0 5.0	1.3	REDDISH-BROWN MOTTLED SILTY CLAY, DRY, STIFF, SLIGHTLY PLASTIC FRACTURED (LACUSTRINE CLAY) 11.0	CL		
10										564.3
10–15	0.0	S-3	N	N	5.0 5.0	1.8	REDDISH-GRAY SILTY CLAY, UNIFORMLY GRADED, MOIST, SOFT, PLASTIC			
15										559.3
15–20	0.0	S-4	N	N	5.0 5.0	12.0		CL		
20							(LACUSTRINE CLAY)			554.3
20–25	0.0	S-5	N	N	5.0 5.0	20.0	23.5 TRACE OF SAND AND GRAVEL 25.0			
25										549.3
25–30	0.0	S-6	N	N	5.0 2.0	6.2 5.2	BROWN SANDY SILT WITH CLAY AND GRAVEL, MOIST, SLIGHTLY PLASTIC, DENSE, WIDELY GRADED	SM ML		
30						11.8	(GLACIAL TILL)			544.3
							BOTTOM OF BORING AT 31.0 FT			
35										539.3
40										

WELL DATA

U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT LONG TERM MONITORING

TASK VC

BORING NO. 9140

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
PROJECT NO. 4844-07
CONTRACTOR: J. MATHES ASSOC.
DATE STARTED 11/23/85
COMPLETED 11/23/85
METHOD HSA
CASING SIZE 4.25"
HNU 11.7/10.2
PROTECTION LEVEL C
GROUND EL. 578.9'
SOIL DRILLED 29.5'
TOTAL DEPTH 29.5'
▽ BELOW GROUND NA
LOGGED BY B. Fowler
CHECKED BY L. Lewis
DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (PPM)
	0.0	S-1	X	N	N	3.5 3.5	0.0
	0.0	S-2	X	N	N		5.0-20
5	0.0	S-3	X	N	N	5.0 4.7	0.0
	0.0	S-4	X	N	N		0.0
10	0.0	S-5	X	Y	Y		4.0
	0.0	S-6	X	N	N	5.0 5.0	0.0
15	0.0	S-7	X	N	N	5.0 5.0	0.0
	0.0	S-8	X	N	N		0.0
20	0.0	S-9	X	N	N	5.0 5.0	0.0
	0.0	S-10	X	N	N		0.0
25	0.0	S-11	X	N	N	5.0 4.0	0.0
		S-12	X				
		S-13	X			1.1 1.1	
30							
35							
40							

SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %
TOPSOIL		NO BLOW COUNTS TAKEN. USED CONTINUOUS SPLIT SPOON SAMPLER.
BROWN TO GRAY SAND, SILT, CLAY AND GRAVEL, MOIST, LOOSE, WIDELY GRADED (FILL) 8.2	CL-GW	
BROWN SILTY FINE SAND UNIFORMLY GRADED 9.5	SP	
REDDISH-BROWN SILTY CLAY, MOIST, STIFF, FRACTURES, SLIGHTLY PLASTIC (LACUSTRINE CLAY) 16.0	CL	
REDDISH-GRAY SILTY CLAY, SOFT, WET, PLASTIC 23.5 TRACES OF GRAVEL 26.5	CL	
REDDISH-BROWN SILTY SAND WITH SOME GRAVEL, TRACE COBBLES, MOIST, DENSE, SLIGHTLY PLASTIC (GLACIAL TILL)	SM ML	
BOTTOM OF BORING AT 29.5 FEET		

WELL DATA

ELEV(FT)
578.9
573.9
568.9
563.9
558.9
553.9
548.9
543.9

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT LONG TERM MONITORING

TASK VC

BORING NO. 10105

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-07

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/21/85

COMPLETED 11/22/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7/10.2

PROTECTION LEVEL C to D

GROUND EL. 577.3'

SOIL DRILLED 30.3'

TOTAL DEPTH 30.3'

▽ **BELOW GROUND** NA

LOGGED BY B. Fowler

CHECKED BY R. Lewis

DATE 3/24/86

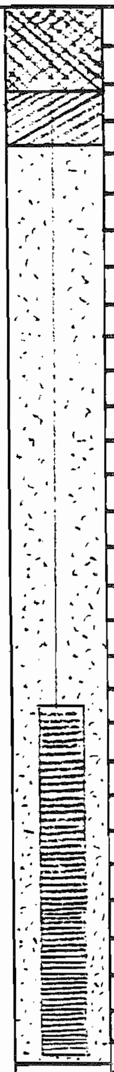
DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV (FT)
	150-200 POSSIBLE MOISTURE	S-1	Y	Y	4.0 4.0	0.1	BROWN TO BLACK MOTTLED SANDY SILT WITH CLAY AND ORGANIC MATTER, FRACTURED, MOIST, STIFF, PLASTIC (FILL) 4.5	ML	NO BLOW COUNTS TAKEN. USED CONTINUOUS SPLIT SPOON SAMPLER.		577.3
5	20-30	S-2	Y	Y	5.0 5.0	0.1	BROWN SILTY FINE SAND WITH TRACES OF GRAVEL, MOIST, LOOSE, NON-PLASTIC, UNIFORMLY GRADED (ALLUVIAL SAND) 8.5	SP			572.3
10	0-1	S-3	N	N	5.0 5.0	0-1	REDDISH-BROWN MOTTLED SILTY CLAY VARVED, MOIST, STIFF, FRACTURED SLIGHTLY PLASTIC (LACUSTRINE CLAY) 14.0	CL			567.3
15	0-1	S-4	N	N	5.0 5.0	0-1	REDDISH-GRAY SILTY CLAY, WET, SOFT, PLASTIC				562.3
20	0-1	S-5	N	N	5.0 5.0	0-1	(LACUSTRINE CLAY) 25.0	CL			557.3
25	0-1	S-6	N	N	5.0 2.0	0-1	BROWN SILTY SAND WITH GRAVEL, MOIST, DENSE, SLIGHTLY PLASTIC, WIDELY GRADED (GLACIAL TILL) 30.5	SM ML			552.3
30		S-7			1.5 0.5		BOTTOM OF BORING AT 30.5 FT				547.3
35											542.3
40											

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT **LONG TERM MONITORING**	**TASK VC**	**BORING NO.** 10135
CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION		**PROJECT NO.** 4844-08
CONTRACTOR: J. MATHES ASSOC.	**DATE STARTED** 11/23/85	**COMPLETED** 11/23/85
METHOD HSA	**CASING SIZE** 4.25"	**HNU** 11.7 (10.2)
PROTECTION LEVEL C		
GROUND EL. 577.1'	**SOIL DRILLED** 29.8'	**TOTAL DEPTH** 29.8'
▽ BELOW GROUND NA		
LOGGED BY H.P. Krahn	**CHECKED BY** R. Lewis	**DATE** 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
								BOOT: AIR 1.4		NO BLOW COUNTS TAKEN. USED CONTINUOUS SPLIT SPOON SAMPLER.		577.1
	0.0	S-1		Y	N	1.6 1.6	0.1	BROWN SILTY SAND, UNIFORMLY GRADED, MEDIUM DENSE, DRY (FILL) 4.2	SP			
5	0.0	S-2		Y	Y	5.0 5.0	0.6	CLAY, SILT AND SANDS WITH GRAVEL MOIST, NON-PLASTIC TO PLASTIC, LOOSE (FILL) 8.0	CL SM			572.1
10	0.0	S-3		N	N	5.0 5.0	500	REDDISH-BROWN SILTY CLAY, MOIST, STIFF, SLIGHTLY PLASTIC, FRACTURES (LACUSTRINE CLAY) 13.0	CL			567.1
15	0.0	S-4		N	N	5.0 5.0	4.5	REDDISH-GRAY SILTY CLAY, WET, PLASTIC, SOFT (LACUSTRINE CLAY) 19.0	CL			562.1
20	0.0	S-5		N	N	5.0 4.6	0.3	SILTY CLAY WITH SAND AND TRACE GRAVEL, WET, PLASTIC, SOFT 23.0				557.1
25	0.0	S-6		N	N	5.0 2.7	0.1	SILTY SAND WITH TRACES OF GRAVEL AND CLAY, ABOUT 20% GRAVEL, MOIST, SLIGHTLY PLASTIC, DENSE, WIDELY GRADED (GLACIAL TILL)	SM ML			552.1
	0.0	S-7		N	Y	1.8 1.0	0.1					547.1
30								BOTTOM OF BORING AT 29.8 FT				
35												
40												



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1151A

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 12/8/85

COMPLETED 12/8/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7/(10.2)

PROTECTION LEVEL B/C

GROUND EL. 575.2'

SOIL DRILLED 27.7'

TOTAL DEPTH 27.7'

▽ BELOW GROUND NA

LOGGED BY M. Guay

CHECKED BY R. Lewis

DATE 3/24/86

HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)
0.0	S-1	N	N	3.2 2.7	0.0
0.0	S-2	N	N	5.0 5.0	7.0
0.0	S-3	N	N	5.0 5.0	50
0.0	S-4	N	N	5.0 5.0	35
0.0	S-5	N	N	5.0 5.0	7.2
0.0	S-6	N	N	4.5 2.7	2.3

SOIL/ROCK DESCRIPTION	SOIL CLASS
TOPSOIL	
BROWN TO BLACK SANDY SILT WITH CLAY, GRAVEL AND ASH, MOIST, NON PLASTIC, WIDELY GRADED (FILL) 5.5'	SM
BROWN MOTTLED SILTY SAND, LOOSE UNIFORMLY GRADED, WET (ALLUVIAL) 7.1'	SP
BROWN MOTTLED SILTY CLAY, SLIGHTLY PLASTIC, STIFF, MOIST, FRACTURES. 13.0'	CL
REDDISH-GRAY SILTY CLAY, PLASTIC SOFT, WET. TRACE SANDY SILT LAYERS. (LACUSTRINE CLAY) 21.9'	CL
TRACES OF GRAVEL 23.5'	
BROWN SILTY SAND WITH GRAVEL, MOIST, SLIGHTLY PLASTIC, DENSE, WIDELY GRADED. (GLACIAL TILL)	SM

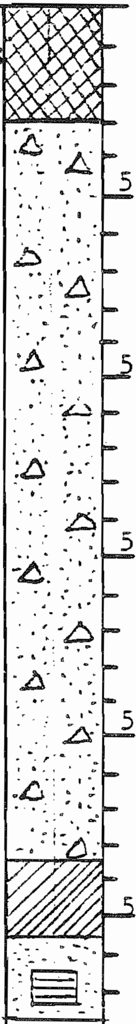
BOTTOM OF BORING
AT 27.7'

BLOWS/6-IN RQD %

NO BLOW COUNTS TAKEN.

USED CONTINUOUS SPLIT SPOON SAMPLER

WELL DATA



DEPTH (FT)	ELEV(FT)
	575.2
5	570.2
10	565.2
15	560.2
20	555.2
25	550.2
30	545.2
35	540.2
40	535.2

*U: THIN WALL TUBE   S: SPLIT SPOON   R: ROCK

E.C. JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1151B

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/24/85

COMPLETED 11/24/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7/10.2

PROTECTION LEVEL B

GROUND EL. 575.2'

SOIL DRILLED 18.7'

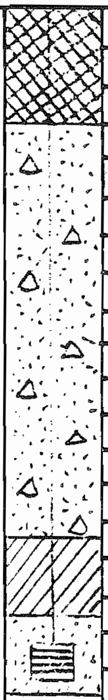
TOTAL DEPTH 18.7'

▽ BELOW GROUND NA

LOGGED BY M. Guay

CHECKED BY L. Lewis

DATE 3/24/86

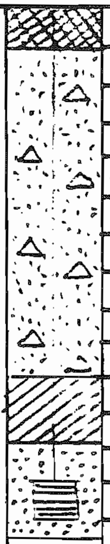
DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
							TOPSOIL 0.5				575.2
							SANDY SILT WITH CLAY, GRAVEL AND ASH (FILL)	SM			
5							5.5				570.2
						15*	BROWN FINE SILTY SAND. (ALLUVIAL SAND) 7.1	SP			
10							BROWN MOTTLED SILTY CLAY, STIFF, MOIST, FRACTURED	CL			565.2
						50*	13.0				
15							REDDISH-GRAY SILTY CLAY, PLASTIC, SOFT				560.2
						1*	(LACUSTRINE CLAY)	CL			
							18.7				
20							BOTTOM OF BORING AT 18.5'				555.2
25											550.2
							RAN AUGERS TO 18.7'. NO SOIL SAMPLES TAKEN. FOR DETAILED SOIL DESCRIPTIONS, SEE LOG OF BORING 1151A.				
30											
							* HNU READINGS TAKEN ON AUGER CUTTINGS				
35											
40											

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C. JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC		**BORING NO.** 1151C	
CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION		**PROJECT NO.** 4844-08	
CONTRACTOR: J. MATHES ASSOC.	**DATE STARTED** 11/25/85	**COMPLETED** 11/25/85	
METHOD HSA	**CASING SIZE** 4.25"	**HNU** 11.7 / [✓ 10.2]	**PROTECTION LEVEL** C
GROUND EL. 575.1'	**SOIL DRILLED** 14.5'	**TOTAL DEPTH** 14.5'	**▽ BELOW GROUND** NA
LOGGED BY J. Snowden	**CHECKED BY** L. Lewis	**DATE** 3/24/86	



DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
							TOPSOIL				575.1
						0*	SANDY SILT WITH CLAY, GRAVEL, AND ASH (FILL)	SM			
5							5.5				570.1
						0*	BROWN SILTY FINE SAND (ALLUVIAL SAND) 7.1	SP			
						50*	BROWN MOTTLED SILTY CLAY, STIFF MOIST, FRACTURED	CL			
10							(LACUSTRINE CLAY)				565.1
						20*					
15							BOTTOM OF BORING AT 14.5'				560.1
20							RAN AUGERS TO 14.5'. NO SOIL SAMPLES TAKEN. FOR DETAILED SOIL DESCRIPTIONS, SEE LOG OF BORING 1151A				555.1
25							* HNU READINGS TAKEN ON AUGER CUTTINGS				550.1
30											
35											
40											

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL TASK VC

BORING NO. 1151D

CLIENT: New York State Department of Environmental Conservation

PROJECT NO. 4844-24

CONTRACTOR: J. Mathes & Assoc.

DATE STARTED 11/18/86

COMPLETED 11/18/86

METHOD HSA

CASING SIZE 4.25" I.D.

HNU 11.7/10.2 10.2

PROTECTION LEVEL D

GROUND EL. 575.2

SOIL DRILLED 7.1'

TOTAL DEPTH 7.1'

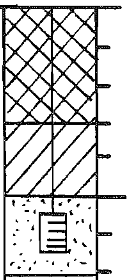
▽ **BELOW GROUND**

LOGGED BY C. White

CHECKED BY R. Lewis

DATE 6/10/87

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
							For Detailed Soil Descriptions, see Log of Boring 1151A				
5											
							Bottom of Boring at 7.1'				
10											
15											
20											
25											
30											
35											
40											



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT LONG TERM MONITORING

TASK VC

BORING NO. 1153A

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
PROJECT NO. 4844-08
CONTRACTOR: J. MATHES ASSOC.
DATE STARTED 10/25/85
COMPLETED 10/25/85
METHOD HSA
CASING SIZE 4.25"
HNU 11.7 10.2
PROTECTION LEVEL D
GROUND EL. 577.7'
SOIL DRILLED 32.0'
TOTAL DEPTH 32.0'
BELOW GROUND NA
LOGGED BY M. Guay
CHECKED BY L. Lewis
DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	ELEV (FT)
											577.7
	0.0	S-1	☒	N	N	2.0 1.6	0.0	TOPSOIL 1.3 BROWN TO BLACK SAND WITH SOME SILT, CLAY, AND GRAVEL, ASH.	SM	6-6-17-20	
	0.0	S-2	☒	N	N	2.5 1.8	0.0	(FILL) 4.5	SC	5-12-17-9-10	572.7
5	0.0	S-3	☒	N	N	2.5 1.8	0.0	BROWN TO BLACK SILTY FINE SAND, LOOSE, MOIST (ALLUVIAL SAND) 8.1	SP	3-7-8-8-10	
	0.0	S-4	☒	N	N	2.5 2.0	0.0	REDDISH-BROWN SILTY CLAY, STIFF, MOIST, SLIGHTLY PLASTIC FRACTURES PRESENT		3-6-7-7-15	567.7
10	0.0	S-5	☒	N	N	2.5 2.5	0.0		CL	3-10-10-10-20	
	0.0	S-6	☒	N	N	2.5 2.5	0.0	(LACUSTRINE CLAY) 14.5		4-9-12-20-21	562.7
15	0.0	S-7	☒	N	N	2.5 2.5	0.0	REDDISH-GRAY SILTY CLAY SOFT, WET, PLASTIC		1-2-3-4-3	
	0.0	S-8	☒	N	N	2.5 2.5	0.0			1-1-1-2-1	557.7
20	0.0	S-9	☒	N	N	2.5 2.5	0.0		CL	WOH-1-2-3	
	0.0	S-10	☒	N	N	2.5 2.5	0.0			WOH-1-2	552.7
25	0.0	S-11	☒	N	N	2.5 2.5	0.0	26.0 TRACES OF GRAVEL 27.5		WOH-6-4	
	0.0	S-12	☒	N	N	2.5 1.3	0.0	SILTY FINE SAND WITH GRAVEL ABOUT 30% GRAVEL, DENSE, MOIST, NON-PLASTIC		6-54-21-19-25	547.7
30	0.0	S-13	☒	N	N	2.5 2.3	0.0	WIDELY GRADED (GLACIAL TILL)	SM	15-34-45-60-60	
								BOTTOM OF BORING AT 32.0'			
35											542.7
40								WOH = WEIGHT OF HAMMER			

WELL DATA

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C. JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1153B

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/26/85

COMPLETED 10/26/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7 (10.2)

PROTECTION LEVEL D

GROUND EL. 577.5'

SOIL DRILLED 21.2'

TOTAL DEPTH 21.2'

▽ BELOW GROUND NA

LOGGED BY M. Guay

CHECKED BY L. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	ELEV(FT)
	0.1						TOPSOIL 1.3			577.5
							BROWN TO BLACK SAND WITH SOME SILT, CLAY, GRAVEL AND ASH (FILL) 4.5	SM SC		
5	0.1						BROWN TO BLACK SILTY FINE SAND (ALLUVIAL SAND) 8.1	SP		572.5
10	0.1						REDDISH-BROWN, SILTY CLAY MOIST, STIFF, SLIGHTLY PLASTIC, FRACTURES (LACUSTRINE CLAY) 14.5	CL		567.5
15	0.1						REDDISH-GRAY SILTY CLAY SOFT, WET, PLASTIC	CL		562.5
20							21.2			557.5
	0.1						BOTTOM OF BORING AT 21.2'			
25										552.5
							RAN AUGERS TO 21.2'. NO SOIL SAMPLES TAKEN. FOR DETAILED SOIL DESCRIPTIONS, SEE LOG OF BORING 1153A			
30										
35										
40										

WELL DATA

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT LONG TERM MONITORING

TASK VC

BORING NO. 1153C

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/25/85

COMPLETED 10/25/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7/10.2

PROTECTION LEVEL D

GROUND EL. 577.6'

SOIL DRILLED 21.0'

TOTAL DEPTH 21.0'

▽ BELOW GROUND NA

LOGGED BY M. Guay

CHECKED BY K. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	ELEV(FT)
	0.0						TOPSOIL 1.3'			577.6
							BROWN TO BLACK SAND WITH SOME SILT, CLAY AND GRAVEL, ASH. 4.5'	SM SC		
5	0.0						BROWN TO BLACK SILTY FINE SAND LOOSE, MOIST (ALLUVIAL SAND) 8.1'	SP		572.6
10	0.0						REDDISH-BROWN SILTY CLAY, STIFF, MOIST, SLIGHTLY PLASTIC FRACTURES (LACUSTRINE CLAY) 14.5'	CL		567.6
15	0.0						REDDISH-GRAY SILTY CLAY WET, SOFT, PLASTIC			562.6
20	0.0							CL		557.6
							BOTTOM OF BORING AT 21.0'			
25										552.6
							RAN AUGERS TO 21.0'. NO SOIL SAMPLES TAKEN. FOR DETAILED SOIL DESCRIPTIONS, SEE LOG OF BORING 1153A			
30										
35										
40										

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

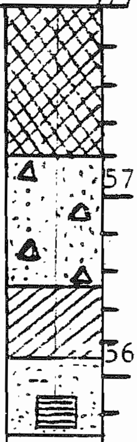
LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1153D

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION			**PROJECT NO.** 4844-08
CONTRACTOR: J. MATHES ASSOC.	**DATE STARTED** 10/26/85		**COMPLETED** 10/26/85
METHOD HSA	**CASING SIZE** 4.25"	**HNU** 11.7/10.2	**PROTECTION LEVEL** D
GROUND EL. 577.7'	**SOIL DRILLED** 11.0'	**TOTAL DEPTH** 11.0'	**▽ BELOW GROUND** NA
LOGGED BY M. Guay	**CHECKED BY** L. Lewis	**DATE** 3/24/86	

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
											577.7
	0.1						TOPSOIL 1.3'				
							BROWN TO BLACK SAND WITH SOME SILT, CLAY, GRAVEL AND ASH. (FILL) 4.5'	SM SC			
5	0.1						BROWN TO BLACK SILTY FINE SAND, LOOSE, MOIST (ALLUVIAL SAND) 8.1	SP			572.2
10	0.1						REDDISH-BROWN SILTY CLAY, STIFF, FRACTURED (LACUSTRINE CLAY) 11.0'	CL			567.7
							BOTTOM OF BORING AT 11.0'				
15											562.7
							RAN AUGERS TO 11.0'. NO SAMPLES TAKEN. FOR DETAILED SOIL DESCRIPTIONS, SEE LOG OF BORING 1153A				
20											557.7
25											552.7
30											
35											
40											



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1153E

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-24

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 5/7/86

COMPLETED 5/7/86

METHOD H.S.A.

CASING SIZE 4.25" I.D.

HNU 11.7/10.2

PROTECTION LEVEL D

GROUND EL. 577.4

SOIL DRILLED 9.0'

TOTAL DEPTH 9.0'

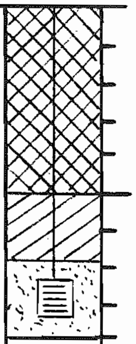
▽ BELOW GROUND

LOGGED BY C. White

CHECKED BY R. Lewis

DATE 6/10/87

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
							Topsoil 1.3				
							Brown to Black Sand with Some Silt Clay, Gravel, and Ash (FILL) 4.5	SM SC			
5							Brown to Black Silty Fine Sand (Alluvial Sand) 8.1	SP			
							Silty Clay 9.0	CL			
10							Bottom of Boring at 9.0'				
15							Ran Augers to 9.0'. No Samples Taken. For Detailed Soil Descriptions, See Log of Boring 1153A.				
20											
25											
30											
35											
40											



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1154A

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/27/85

COMPLETED 10/28/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7 / 10.2

PROTECTION LEVEL D

GROUND EL. 574.6'

SOIL DRILLED 29.0'

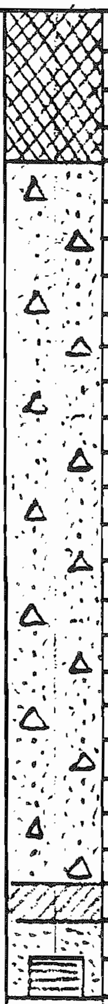
TOTAL DEPTH 29.0'

▽ BELOW GROUND NA

LOGGED BY J. Peterson

CHECKED BY R. Lewis

DATE 3/24/86



DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE #	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	ELEV(FT)
						1.0	TOPSOIL 0.7'			574.6
		S-1	N	N	2.5 1.5		BROWN TO BLACK SILT, SAND, AND GRAVEL, MOIST, WIDELY GRADED (FILL) 2.9'	SM	1-4-9-11-12	
		S-2	N	N	2.5 1.8	0.8	BROWN, SILTY FINE SAND, MOIST, LOOSE, UNIFORMLY GRADED (ALLUVIAL SAND) 5.0'	SP	3-4-11-9-9	
5		S-3	N	N	2.5 2.0	0.6			4-6-6-9-12	569.6
		S-4	N	N	2.5 2.5	0.6	REDDISH-BROWN MOTTLED SILTY CLAY STIFF, MOIST, SLIGHTLY PLASTIC, FRACTURED (LACUSTRINE CLAY) 11.5'	CL	4-7-10-13-16	
10		S-5	N	N	2.5 2.0	0.6			3-4-6-3-4	564.6
		S-6	N	N	2.5 2.8	0.6	REDDISH-GRAY SILTY CLAY, SOFT, WET, PLASTIC		N.A.	
15		S-7	N	N	2.5 2.8	0.7		CL	1-1-1-2-2	559.6
		S-8	N	N	2.5 2.8	0.6			WOH-2-2	
20		S-9	N	N	2.5 2.8	0.7	21.5'		WOH-1	554.6
	0.4	S-10	N	N	2.5 2.2	0.2	TRACES OF GRAVEL		WOH-1-5	
25	0.4	S-11	N	N	2.5 1.4	0.4	REDDISH-BROWN SILTY SAND WITH GRAVEL. About 20% GRAVEL. MOIST, SLIGHTLY PLASTIC, DENSE, WIDELY GRADED.		4-10-20-27-102	549.6
	0.4	S-12	N	N	2.5 1.5	0.4	(GLACIAL TILL) 29.0'	SM	38-64-65-65-84	
30							BOTTOM OF BORING AT 29.0'			544.6
35										
40										

WELL INSTALLED IN A NEW BORING 4.0' FROM ORIGINAL BORING. ORIGINAL BORING WAS ABANDONED AND GROUTED TO SURFACE DUE TO WELL INSTALLATION PROBLEMS.

WOH = WEIGHT OF HAMMER

#U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1154B

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/27/85

COMPLETED 10/27/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7/10.2

PROTECTION LEVEL D

GROUND EL. 574.5'

SOIL DRILLED 17.6'

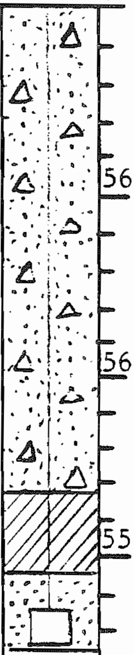
TOTAL DEPTH 17.6'

▽ BELOW GROUND NA

LOGGED BY M. Guay

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
							TOPSOIL 0.7				574.5
	0.2						BROWN TO BLACK SILT, SAND & GRAVEL (FILL) 2.9	SM			
5							BROWN SILTY FINE SAND (ALLUVIAL SAND 5.0	SP			569.5
	0.2						REDDISH-BROWN SILTY CLAY STIFF (LACUSTRINE CLAY)	CL			
10							11.5'				564.5
	0.2						REDDISH-GRAY SILTY CLAY SOFT	CL			
15							17.6'				559.5
20							BOTTOM OF BORING AT 17.6'				554.5
25							RAN AUGERS TO 17.6'. NO SOIL SAMPLES TAKEN. FOR DETAILED SOIL DESCRIPTIONS, SEE LOG OF BORING 1154A.				549.5
30											
35											
40											

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1154C

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/27/85

COMPLETED 10/27/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7/10.2

PROTECTION LEVEL D

GROUND EL. 574.4'

SOIL DRILLED 13.5'

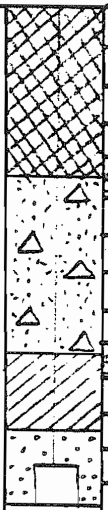
TOTAL DEPTH 13.5'

▽ BELOW GROUND NA

LOGGED BY M. Guay

CHECKED BY A. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
							TOPSOIL 0.7				574.4
	0.2						BROWN TO BLACK SILT, SAND AND GRAVEL (FILL) 2.9	SM			
5							BROWN SILTY FINE SAND (ALLUVIAL SAND) 5.0	SP			569.4
	0.2						REDDISH-BROWN SILTY CLAY STIFF (LACUSTRINE CLAY) 11.5'	CL			
10											564.4
	0.2						REDDISH-GRAY SILTY CLAY SOFT 13.5'	CL			
15							BOTTOM OF BORING AT 13.5'				559.4
20							RAN AUGERS TO 13.5'. NO SOIL SAMPLES TAKEN. FOR DETAILED SOIL DESCRIPTIONS, SEE LOG OF BORING 1154A.				554.4
25											
30											
35											
40											

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1154D

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/28/85

COMPLETED 10/28/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7/10.2

PROTECTION LEVEL D

GROUND EL. 574.3'

SOIL DRILLED 7.0'

TOTAL DEPTH 7.0'

∇ BELOW GROUND NA

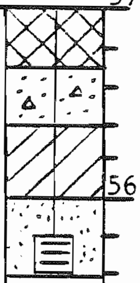
LOGGED BY M. Guay

CHECKED BY L. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	ELEV(FT)
							TOPSOIL 0.7			574.3
							BROWN TO BLACK SILT, SAND AND GRAVEL (FILL) 2.9	SM		
	0.2									
							BROWN SILTY FINE SAND (ALLUVIAL SAND) 5.0	SP		
5										569.3
	0.2						REDDISH-BROWN SILTY CLAY STIFF (LACUSTRINE CLAY) 7.0	CL		
							BOTTOM OF BORING AT 7.0'			
10										564.3
							RAN AUGERS TO 7.0'. NO SAMPLES TAKEN. SEE BORING LOG 1154A FOR DETAILED SOIL DESCRIPTIONS.			
15										559.3
20										554.3
25										
30										
35										
40										

WELL DATA



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1161E

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-24

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 5/2/86

COMPLETED 5/2/86

METHOD H.S.A.

CASING SIZE 4.25" I.D.

HNU 11.7/10.2 10.2

PROTECTION LEVEL B/C

GROUND EL. 580.7

SOIL DRILLED 27.9'

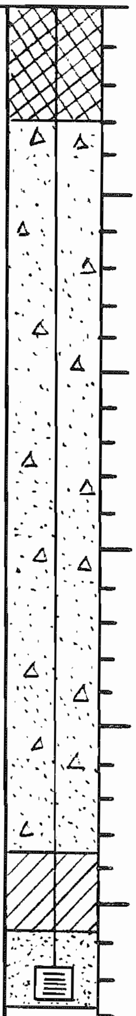
TOTAL DEPTH 27.9'

▽ BELOW GROUND

LOGGED BY S. Wibby

CHECKED BY R. Lewis

DATE 6/10/87

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
							Soil Descriptions Not Available; See Log of EPA Boring 1161A				
5											
10											
15											
20											
25											
							27.9				
							Bottom of Boring at 27.9'				
30											
35											
40											

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1170A

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 12/4/85

COMPLETED 12/4/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7/10.2

PROTECTION LEVEL B/C

GROUND EL. 581.2'

SOIL DRILLED 37.4'

TOTAL DEPTH 37.4'

▽ BELOW GROUND NA

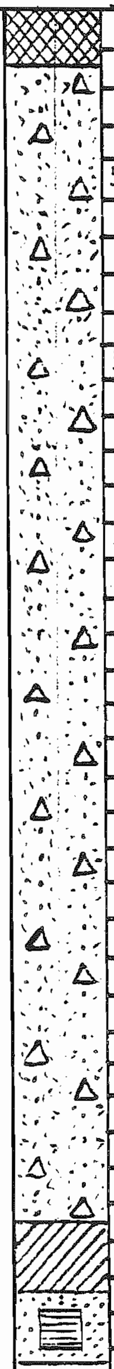
LOGGED BY M. Guay

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	ELEV(FT)
	0.0	S-1		N	N	2.9 1.5	0.0	BROWN SILTY FINE SAND, LOOSE, DRY UNIFORMLY GRADED (FILL) 2.9	SP	NO BLOW COUNTS TAKEN. USED CONTINUOUS SPLIT SPOON SAMPLER.	581.2
5	0.0	S-2		N	N	5.0 3.9	0.0	SILTY SANDY CLAY WITH ORGANICS AND GRAVEL, ABOUT 15% GRAVEL, WOOD AND DEBRIS (FILL) 8.7	SM		576.2
10	0.0	S-3		N	N	5.0 1.7	0.0	BROWN SILTY FINE SAND WITH GRAY STAINS, LOOSE, MOIST, NON-PLASTIC, UNIFORMLY GRADED (ALLUVIAL SAND) 13.1	SP		571.2
15	0.0	S-4		N	N	5.0 5.0	0.0	REDDISH-BROWN SILTY CLAY, DRY TO MOIST, STIFF, SLIGHTLY PLASTIC, FRACTURED (LACUSTRINE CLAY) 20.0	CL		566.2
20	0.0	S-5		N	N	5.0 5.0	0.0	REDDISH-GRAY SILTY CLAY, WET, SOFT, PLASTIC	CL		561.2
25	0.0	S-6		N	N	5.0 5.0	0.0				556.2
30	0.0	S-7		N	N	5.0 5.0	0.0				
35	0.0	S-8		N	N	4.5 3.1	0.0	35.1 BROWN SILTY SAND WITH GRAVEL, ABOUT 15% GRAVEL, DENSE, WET SLIGHTLY PLASTIC (GLACIAL TILL) BOTTOM OF EXPLORATION AT 37.4'	SM		
40											

WELL DATA



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1170B

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 12/4/85

COMPLETED 12/4/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7/ 10.2

PROTECTION LEVEL B

GROUND EL. 581.3 '

SOIL DRILLED 25.6 '

TOTAL DEPTH 25.6 '

▽ BELOW GROUND NA

LOGGED BY M. Guay

CHECKED BY A. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
											581.3
	0.1						BROWN SILTY FINE SAND (FILL) 2.9	SP			
5	0.1						BROWN TO BLACK SILTY SAND CLAY WITH ORGANICS, GRAVEL, WOOD, DEBRIS (FILL) 8.7	SM ML			576.3
10	0.1						BROWN SILTY FINE SAND (ALLUVIAL SAND) 13.1	SP			571.3
15	0.1						REDDISH BROWN SILTY CLAY, STIFF, FRACTURED (LACUSTRINE CLAY) 20.0	CL			566.3
20	0.1						REDDISH GRAY SILTY CLAY, SOFT 25.6	CL			561.3
25							BOTTOM OF EXPLORATION AT 25.6 RAN AUGERS TO 25.6', NO SOIL SAMPLES TAKEN. FOR DETAILED SOIL DESCRIPTIONS, SEE LOG OF BORING 1170A				556.3
30											551.3
35											
40											

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT LONG TERM MONITORING

TASK VC

BORING NO. 1171A

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/22/85

COMPLETED 11/22/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7/10.2

PROTECTION LEVEL B

GROUND EL. 580.2'

SOIL DRILLED 37.3'

TOTAL DEPTH 37.3'

▽ **BELOW GROUND** NA

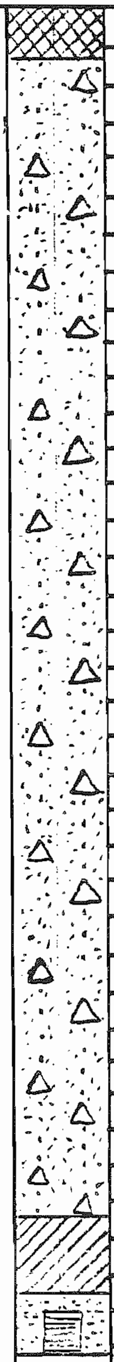
LOGGED BY J. Snowden

CHECKED BY A. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	ELEV(FT)
							AIR: BOOT 1.5		NO BLOW COUNTS TAKEN. USED CONTINUOUS SPLIT SPOON SAMPLER.	580.2
	0.0	S-1	N	N	1.1 1.1	0.0	BROWN SILTY FINE SAND WITH SOME GRAVEL, DRY TO MOIST, NON-PLASTIC UNIFORMLY TO WIDELY GRADED (FILL)	SP SM		
5	0.0	S-2	N	N	5.0 2.3	0.0	8.1			575.2
10	0.0	S-3	N	N	5.0 5.0	0.0	BROWN SILTY FINE SAND, MOIST, LOOSE, NON-PLASTIC, UNIFORMLY GRADED (ALLUVIAL SAND) 12.1	SP		570.2
15	0.0	S-4	N	N	4.8 4.8	0.0	REDDISH-BROWN SILTY CLAY, MOIST, STIFF, SLIGHTLY PLASTIC, FRACTURED 18.0	CL		565.2
20	0.0	S-5	N	N	5.0 4.6	0.0	REDDISH-GRAY SILTY CLAY, WET, SOFT, PLASTIC (LACUSTRINE CLAY)	CL		560.2
25	0.0	S-6	N	N	5.0 5.0	0.0				555.2
30	0.0	S-7	N	N	5.0 5.0	0.0	32.1			550.2
							TRACES OF GRAVEL 34.6			
35	0.0	S-8	N	N	4.0 3.0	0.0	BROWN SILTY SAND, SOME GRAVEL, ABOUT 20% GRAVEL, WIDELY GRADED, DENSE, MOIST (GLACIAL TILL)	SM		545.2
							BOTTOM OF BORING AT 37.3 FT			
40										540.2

WELL DATA



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1171B

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/23/85

COMPLETED 11/23/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7/10.2

PROTECTION LEVEL B

GROUND EL. 580.4'

SOIL DRILLED 25.0'

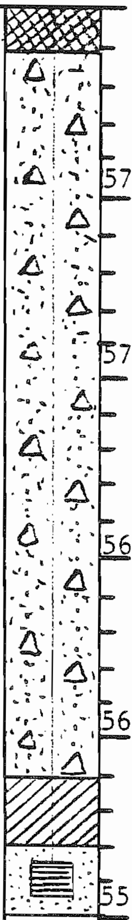
TOTAL DEPTH 25.0'

∇ BELOW GROUND NA

LOGGED BY J. Snowden

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE*	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
							AIR: BOOT 1.5				580.4
	0.0						SILTY FINE SAND WITH SOME GRAVEL (FILL)	SM			
5											575.4
	0.0						8.1				
10							BROWN SILTY FINE SAND (ALLUVIAL SAND) 12.1	SP			570.4
	0.0						REDDISH-BROWN SILTY CLAY, STIFF, FRACTURED				
15								CL			565.4
	0.0						18.0				
20							REDDISH-GRAY SILTY CLAY, SOFT (LACUSTRINE CLAY)	CL			560.4
	0.0										
25							25.0				555.4
							BOTTOM OF BORING AT 25.0 FT NO SOIL SAMPLES TAKEN. FOR DETAILED SOIL DESCRIPTIONS SEE LOG OF BORING 1171A				
30											550.4
35											
40											

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1171C

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-24

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 5/2/86

COMPLETED 5/2/86

METHOD H.S.A.

CASING SIZE 4.25" I.D.

HNU 11.7/10.2 10.2 TIP

PROTECTION LEVEL B/C

GROUND EL. 580.2

SOIL DRILLED 30.6'

TOTAL DEPTH 30.6'

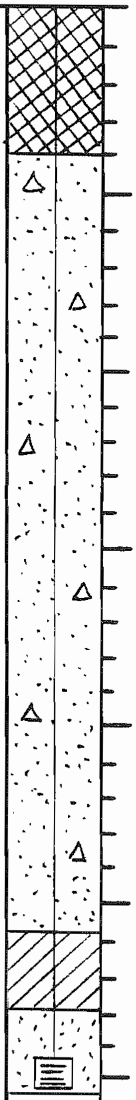
▽ **BELOW GROUND**

LOGGED BY L. Hoyt

CHECKED BY R. Lewis

DATE 6/10/87

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
							Air: Boot 1.5				
5							Silty Fine Sand with Some Gravel (FILL) 8.1	SM			
10							Brown Silty Fine Sand (Alluvial Sand) 12.1	SP			
15							Reddish-Brown Silty Clay, Stiff, Fractured 18.0	CL			
20 25 30							Reddish-Gray Silty Clay, Soft (Lacustrine Clay) 30.6	CL			
35 40							Bottom of Boring at 30.6' No Soil Samples Taken. For Detailed Soil Descriptions, See Log of Boring 1171A.				



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1172A

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/20/85

COMPLETED 11/21/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7/(10.2)

PROTECTION LEVEL C

GROUND EL. 578.5'

SOIL DRILLED 35.1'

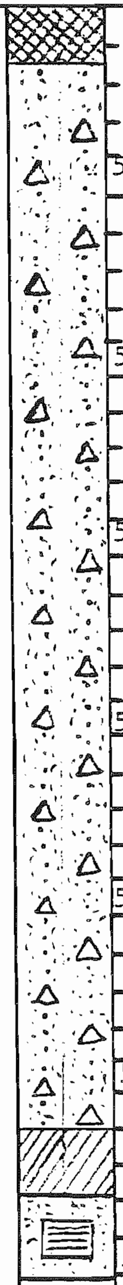
TOTAL DEPTH 35.1'

▽ BELOW GROUND NA

LOGGED BY H. Krahn

CHECKED BY L. Lewis

DATE 3/24/86



DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	ELEV(FT)
			☒					AIR: BOOT 1.4		NO BLOW COUNTS TAKEN. USED CONTINUOUS SPLIT SPOON SAMPLER.	578.5
	0.0	S-1	☒	N	N	1.5 1.6	0.0	BROWN SILTY FINE SAND, LOOSE, DRY, UNIFORMLY GRADED (FILL) 3.9	SP		
5	0.0	S-2		N	N	5.0 4.3	0.0	GRAY TO BLACK CLAY WITH SAND AND ROOTS (FILL) 6.6	CL		573.5
								REDDISH-BROWN SILTY FINE SAND, LOOSE, NON-PLASTIC, UNIFORMLY GRADED (ALLUVIAL SAND) 8.3	SP		
10	0.0	S-3		N	N	5.0 4.9	0.0	REDDISH-BROWN SILTY CLAY, STIFF, MOIST, SLIGHTLY PLASTIC, FRACTURED	CL		568.5
15	0.0	S-4		N	N	5.0 4.9	0.3	17.0			563.5
20	0.0	S-5		N	N	5.0 4.8	2.0	REDDISH-GRAY SILTY CLAY, SOFT, WET, PLASTIC (LACUSTRINE CLAY)	CL		558.5
25	0.0	S-6		N	N	5.0 5.0	0.2	26.0 TRACES OF GRAVEL AND SAND			553.5
30	0.0	S-7		N	N	5.0 5.0	0.2	32.4	CL		548.5
	0.0	S-8	☒	N	N	2.2 2.2	0.3	REDDISH-BROWN SILTY SAND, SOME GRAVEL, ABOUT 20% GRAVEL, DENSE, MOIST, SLIGHTLY PLASTIC, WIDELY GRADED (GLACIAL TILL)	SM		543.5
35								BOTTOM OF BORING AT 35.1 FT			
40											538.5

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1172B

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

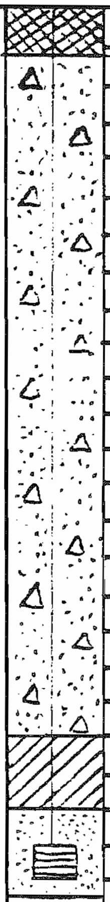
DATE STARTED 11/21/85 **COMPLETED** 11/21/85

METHOD HSA **CASING SIZE** 4.25" **HNU** 11.7 (10.2) **PROTECTION LEVEL** D

GROUND EL. 578.6' **SOIL DRILLED** 25.1' **TOTAL DEPTH** 25.1' ▽ **BELOW GROUND** NA

LOGGED BY H. Krahn **CHECKED BY** L. Lewis **DATE** 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
							AIR: BOOT 1.4				578.6
	0.0						BROWN SILTY FINE SAND (FILL) 3.9	SP			
5							CLAY WITH SAND AND ROOTS (FILL) 6.6	CL			573.6
	0.0						REDDISH-BROWN SILTY FINE SAND (ALLUVIAL SAND) 8.3	SP			
10							REDDISH-BROWN SILTY CLAY STIFF AND FRACTURED				568.6
	0.0							CL			
15											563.6
	0.0						17.0				
20							REDDISH-GRAY SILTY CLAY SOFT AND WET	CL			558.6
	0.0										
25							25.1				553.6
							BOTTOM OF BORING AT 25.1				
30							NO SOIL SAMPLES TAKEN FOR DETAILED SOIL DESCRIPTIONS SEE LOG OF BORING 1172A				548.6
35											
40											



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1172C

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

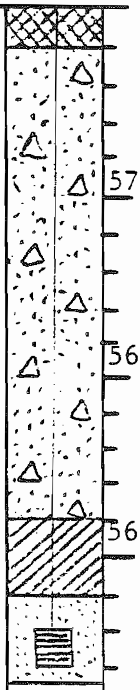
PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.
DATE STARTED 11/21/85
COMPLETED 11/21/85

METHOD HSA
CASING SIZE 4.25"
HNU 11.7 (10.2)
PROTECTION LEVEL D

GROUND EL. 578.5'
SOIL DRILLED 18.5'
TOTAL DEPTH 18.5'
▽ BELOW GROUND NA

LOGGED BY J. Snowden
CHECKED BY R. Lewis
DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE*	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
							AIR: BOOT 1.4				578.5
	0.0						BROWN SILTY FINE SAND (FILL) 3.9	SP			
5							GRAY TO BLACK CLAY WITH SAND AND ROOTS (FILL) 6.6	CL			573.5
	0.0						REDDISH-BROWN SILTY FINE SAND (ALLUVIAL SAND) 8.3	SP			
10							REDDISH-BROWN SILTY CLAY STIFF AND FRACTURED				568.5
	0.0							CL			
15							(LACUSTRINE CLAY)				563.5
	0.0						SILTY CLAY, SOFT, WET 18.5	CL			
20							BOTTOM OF BORING AT 18.5 FT				558.5
							NO SOIL SAMPLES TAKEN FOR DETAILED SOIL DESCRIPTIONS SEE LOG OF BORING 1172A				
25											553.5
30											
35											
40											

*U: THIN WALL TUBE   S: SPLIT SPOON   R: ROCK

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1173A

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/14/85

COMPLETED 11/14/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7 / 10.2

PROTECTION LEVEL C

GROUND EL. 575.3'

SOIL DRILLED 30.8'

TOTAL DEPTH 30.8'

▽ BELOW GROUND

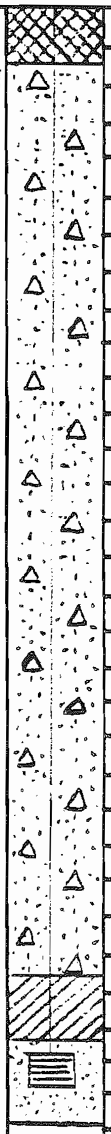
LOGGED BY C. Moore

CHECKED BY K. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	ELEV(FT)
							AIR: BOOT 1.5			575.3
	0.0	S-1	N	N	1.4 1.4	0.2	BROWN SILTY FINE SAND, LOOSE, DRY, UNIFORMLY GRADED (FILL) 3.0	SP	NO BLOW COUNTS TAKEN USED CONTINUOUS SPLIT SPOON SAMPLER.	
5	0.0	S-2	N	N	5.0 4.5	0.0	BROWN MOTTLED SILTY FINE SAND, MOIST, NON-PLASTIC, UNIFORMLY GRADED (ALLUVIAL SAND) 5.9	SP		570.3
10	0.0	S-3	N	N	5.0 5.0	0.8	REDDISH-BROWN MOTTLED SILTY CLAY, STIFF, MOIST, FRACTURES PRESENT 13.0	CL		565.3
15	0.0	S-4	N	N	5.0 5.0	0.2	REDDISH-GRAY SILTY CLAY WET, SOFT, PLASTIC (LACUSTRINE CLAY)	CL		560.3
20	0.0	S-5	N	N	5.0 5.0	0.4	23.0			555.3
25	0.0	S-6	N	N	5.0 5.0	0.0	TRACES OF GRAVEL AND SAND 28.0	CL		550.3
30	0.0	S-7	N	N	1.4 1.4	0.0	REDDISH-BROWN SILTY SAND, SOME GRAVEL, ABOUT 20% GRAVEL, MOIST, DENSE, SLIGHTLY PLASTIC (GLACIAL TILL)	SM		545.3
							BOTTOM OF BORING AT 30.8 FT			
35										540.3
40										

WELL DATA



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT LONG TERM MONITORING	TASK VC	BORING NO. 1173B
CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION		PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.	DATE STARTED 11/14/85		COMPLETED 11/14/85
METHOD HSA	CASING SIZE 4.25"	HNU 11.7/10.2	PROTECTION LEVEL C
GROUND EL. 575.3'	SOIL DRILLED 20.5'	TOTAL DEPTH 20.5'	▽ BELOW GROUND NA
LOGGED BY H.P. Krahn	CHECKED BY R. Lewis	DATE 3/24/86	

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
							AIR: BOOT				575.3
	0.0						BROWN SILTY FINE SAND (FILL) 3.0	SP			
5							BROWN MOTTLED SILTY FINE SAND (ALLUVIAL SAND) 5.9	SP			570.3
	0.0						REDDISH-BROWN SILTY CLAY STIFF AND FRACTURED	CL			
10											565.3
	0.0						13.0				
15							REDDISH-GRAY SILTY CLAY SOFT, WET (LACUSTRINE CLAY)	CL			560.3
	0.0										
20							20.5				555.3
							BOTTOM OF BORING AT 20.5 FT NO SOIL SAMPLES TAKEN. FOR DETAILED SOIL DESCRIPTIONS SEE LOG OF BORING 1173A				
25											550.3
30											545.3
35											
40											

*U: THIN WALL TUBE   S: SPLIT SPOON   R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1173C

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/19/85

COMPLETED 11/19/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7 10.2

PROTECTION LEVEL C

GROUND EL. 575.3'

SOIL DRILLED 12.5'

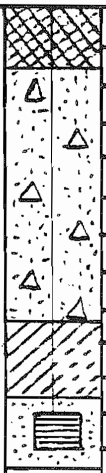
TOTAL DEPTH 12.5'

▽ BELOW GROUND NA

LOGGED BY J. Snowden

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
							AIR: BOOT 1.5				575.3
	0.0						BROWN SILTY FINE SAND (FILL) 3.0	SP			
5							BROWN MOTTLED SILTY FINE SAND (ALLUVIAL SAND) 5.9	SP			570.3
	0.0						REDDISH-BROWN SILTY CLAY STIFF, FRACTURED	CL			
10											565.3
	0.0						12.5				
							BOTTOM OF BORING AT 12.5 FT				
15							NO SOIL SAMPLES TAKEN. FOR DETAILED SOIL DESCRIPTIONS SEE LOG OF BORING 1173A				560.3
20											555.3
25											550.3
30											
35											
40											

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C. JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1173D

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/20/85

COMPLETED 11/20/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7 / 10.2

PROTECTION LEVEL C

GROUND EL. 575.5'

SOIL DRILLED 7.0'

TOTAL DEPTH 7.0'

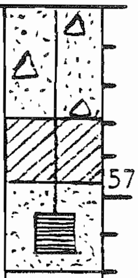
▽ BELOW GROUND NA

LOGGED BY H.P. Krahn

CHECKED BY L. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
											575.5
	0.0						AIR: BOOT 1.5				
							BROWN SILTY FINE SAND (FILL) 3.0	SP			
5	0.0						BROWN MOTTLED SILTY FINE SAND (ALLUVIAL SAND) 5.9	SP			570.5
	0.0						REDDISH-BROWN SILTY CLAY, STIFF, FRACTURED 7.0	CL			
							BOTTOM OF BORING AT 7.0 FT NO SAMPLES TAKEN. FOR DETAILED SOIL DESCRIPTIONS SEE LOG OF BORING 1173A				
10											565.5
15											560.5
20											555.5
25											
30											
35											
40											



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT LONG TERM MONITORING

TASK VC

BORING NO. 1174A

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/14/85

COMPLETED 10/14/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7 ~~10.2~~

PROTECTION LEVEL C/B

GROUND EL. 574.5'

SOIL DRILLED 29.7'

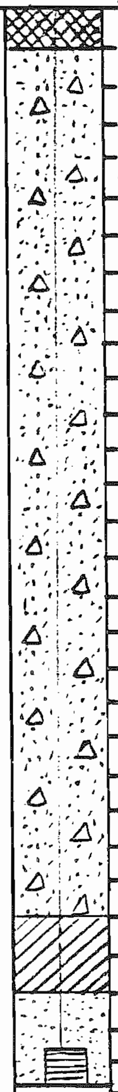
TOTAL DEPTH 29.7'

▽ BELOW GROUND NA

LOGGED BY M. Guay

CHECKED BY A. Louis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
							TOPSOIL 0.2				574.5
	0.3	S-1	N	N	2.5 2.5	0.1	BROWN TO BLACK SILTY FINE SAND, TRACES OF GRAVEL AND ORGANIC MATTER, LOOSE, MOIST TO VERY WET	SM	NO BLOW COUNTS TAKEN. USED CONTINUOUS SPLIT SPOON SAMPLER.		
	0.2	S-2	N	N	2.5 0.9	0.2	(FILL)				
5											569.5
	0.4	S-3	N	N	2.5 1.3	0.0	BRICKS, WOOD, TILE VERY WET 8.2				
	0.3	S-4	N	N	2.5 1.3	0.0	REDDISH-BROWN MOTTLED SILTY CLAY, MOIST, SLIGHTLY PLASTIC, STIFF, FRACTURES	CL			
10											564.5
	0.0	S-5	N	N	2.5 2.5	0.0	(LACUSTRINE CLAY)				
	0.1	S-6	N	N	2.5 2.5	0.0	15.0				
15											559.5
	0.1	S-7	N	N	2.5 2.5	0.0	REDDISH-GRAY SILTY CLAY WET, SOFT, PLASTIC				
	0.2	S-8	N	N	2.5 2.5	0.0	(LACUSTRINE CLAY)	CL			
20											554.5
	0.3	S-9	N	N	2.5 2.5	0.0					
	0.2	S-10	N	N	2.5 2.5	0.0	25.0				
25											549.5
	0.2	S-11	N	N	2.5 2.5	0.0	TRACES OF GRAVEL 26.7				
	0.0	S-12	N	N	1.8 1.3	0.0	REDDISH-BROWN SILTY SAND WITH SOME GRAVEL, MOIST, DENSE, WIDELY GRADED (GLACIAL TILL) 29.7	SM			
30							BOTTOM OF BORING AT 29.7 FT				544.5
35											539.5
40											

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1174B

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/14/85

COMPLETED 10/14/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7 / 10.2

PROTECTION LEVEL C

GROUND EL. 574.6 '

SOIL DRILLED 18.2 '

TOTAL DEPTH 18.2 '

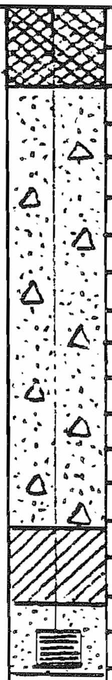
▽ BELOW GROUND NA

LOGGED BY M. Guay

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
							TOPSOIL 0.2				574.6
	0.0						BROWN TO BLACK SILTY FINE SAND WITH TRACES OF GRAVEL (FILL)	SM			
5							BRICKS, WOOD AND TILE				569.6
	0.0						8.2				
10							REDDISH-BROWN MOTTLED SILTY CLAY	CL			564.6
	0.0						(LACUSTRINE CLAY) 15.0				
15							REDDISH-GRAY SILTY CLAY (LACUSTRINE CLAY)	CL			559.6
	0.0						18.2				
20							BOTTOM OF BORING AT 18.2 FT NO SOIL SAMPLES TAKEN. FOR DETAILED SOIL DESCRIPTIONS SEE LOG OF BORING 1174A				554.6
25											549.6
30											
35											
40											



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C. JORDAN CO.

LOVE CANAL REMEDIAL PROJECT LONG TERM MONITORING

TASK VC

BORING NO. 1174C

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/15/85

COMPLETED 10/15/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.~~7~~/10.2

PROTECTION LEVEL C

GROUND EL. 574.6'

SOIL DRILLED 13.5'

TOTAL DEPTH 13.5'

▽ BELOW GROUND NA

LOGGED BY M. Guay

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
							BROWN TO BLACK SILTY FINE SAND, TRACES OF GRAVEL AND ORGANIC MATTER (FILL)	SM			574.6
	0.1										
5							BRICKS, WOOD, TILE 8.2				569.6
10	0.1						REDDISH-BROWN MOTTLED SILTY CLAY (LACUSTRINE CLAY) 13.5	CL			564.6
15							BOTTOM OF BORING AT 13.5 FT				559.6
20							NO SOIL SAMPLES TAKEN. FOR DETAILED SOIL DESCRIPTIONS SEE LOG OF BORING 1174A				554.6
25											549.6
30											
35											
40											

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1174D

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/15/85

COMPLETED 10/15/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7 / 10.2

PROTECTION LEVEL C

GROUND EL. 574.6 '

SOIL DRILLED 7.5 '

TOTAL DEPTH 7.5 '

▽ BELOW GROUND NA

LOGGED BY M. Guay

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
							TOPSOIL ↗ ↖0.2				574.6
							BROWN TO BLACK SILTY FINE SAND TRACES OF FINE GRAVEL AND ORGANIC MATTER	SM			
5							(FILL)				569.6
							7.5				
							BOTTOM OF BORING AT 7.5 FT				
10											564.6
							NO SOIL SAMPLES TAKEN FOR DETAILED SOIL DESCRIPTIONS SEE LOG OF BORING 1174A				
15											559.6
20											554.6
25											
30											
35											
40											

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1180A

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 12/5/85

COMPLETED 12/5/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7/(10.2)

PROTECTION LEVEL B/C

GROUND EL. 579.4'

SOIL DRILLED 32.6'

TOTAL DEPTH 32.6'

▽ BELOW GROUND N/A

LOGGED BY N. Gardner

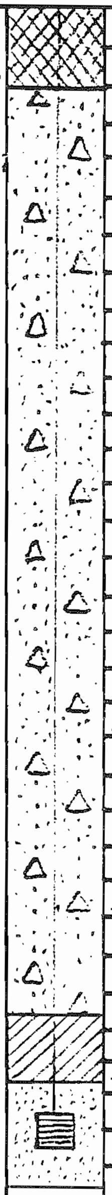
CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE*	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)
	0.8	S-1	N	N	2.6 1.4	
5	0.8	S-2	N	N	5.0 4.4	
10	4.8	S-3	N	N	5.0 4.5	
15	0.8	S-4	N	N	5.0 4.5	
20	0.8	S-5	N	N	5.0 3.0	
25	0.8	S-6	N	N	5.0 1.1	
30		S-7	N	N	5.0 4.7	
35						
40						

SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN
AIR: BOOT 1.4		NO BLOW COUNTS TAKEN. USED CONTINUOUS SPLIT SPOON SAMPLER.
BROWN SILTY FINE SAND UNIFORMLY GRADED (FILL) 2.6	SP	
REDDISH-BROWN SILTY CLAY VERY STIFF, MOIST, SLIGHTLY PLASTIC, TRACES OF PAPER (FILL) 9.6	CL	
BLACK SILTY FINE SAND, WET, LOOSE UNIFORMLY GRADED (ALLUVIAL SAND) 11.0	SP	
REDDISH-BROWN SILTY CLAY, MOIST VERY STIFF, SLIGHTLY PLASTIC, FRACTURES (LACUSTRINE CLAY) 17.6	CL	
REDDISH-GRAY SILTY CLAY SOFT, WET, PLASTIC 20.1 TRACES OF GRAVEL 22.6	CL	
REDDISH-BROWN SILTY SAND, SOME GRAVEL, 20% GRAVEL, MOIST DENSE, SLIGHTLY PLASTIC WIDELY GRADED (GLACIAL TILL)	SM	
BOTTOM OF BORING AT 32.6 FT		

WELL DATA



ELEV(FT)

579.4
574.4
569.4
564.4
559.4
554.4
549.4
544.4

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1180B

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 12/5/85

COMPLETED 12/5/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7/10.2

PROTECTION LEVEL B/C

GROUND EL. 579.5'

SOIL DRILLED 21.6'

TOTAL DEPTH 21.6'

▽ BELOW GROUND NA

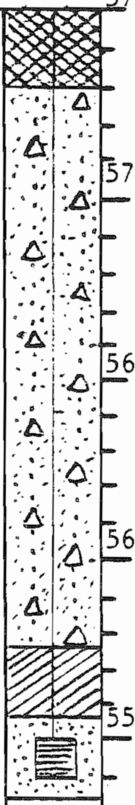
LOGGED BY N. Gardiner

CHECKED BY K. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION		SOIL CLASS	BLOWS/6-IN
							AIR: BOOT	1.4		
							BROWN SILTY FINE SAND (FILL)	2.6	SP	
							REDDISH-BROWN SILTY CLAY TRACES OF PAPER (FILL)	9.6	CL	
							BLACK SILTY FINE SAND (ALLUVIAL SAND)	11.0	SP	
							REDDISH-BROWN SILTY CLAY (LACUSTRINE CLAY)	17.6	CL	
							REDDISH-GRAY SILTY CLAY	20.1		
							TRACES OF GRAVEL		CL	
							BOTTOM OF BORING AT 21.6' NO SOIL SAMPLES TAKEN. FOR DETAILED SOIL DESCRIPTIONS SEE LOG OF BORING 1180A			

WELL DATA



DEPTH (FT)	ELEV(FT)
	579.5
5	574.5
10	569.5
15	564.5
20	559.5
25	554.5
30	549.5
35	
40	

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1180C

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-24

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 4/30/86

COMPLETED 4/30/86

METHOD H.S.A.

CASING SIZE 4.25" I.D.

HNU 11.7 / 10.2 10.2 TIP

PROTECTION LEVEL B/C

GROUND EL. 579.7

SOIL DRILLED 17.1'

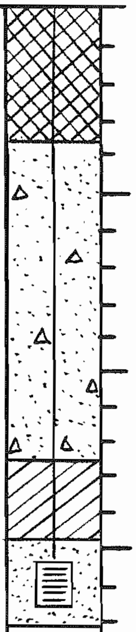
TOTAL DEPTH 17.1'

▽ BELOW GROUND

LOGGED BY S. Wibby

CHECKED BY R. Lewis

DATE 6/10/87



DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
							Air: Boot 1.4				
							Brown Silty Fine Sand (FILL) 2.6	SP			
							Reddish-Brown Silty Clay Traces of Paper (FILL) 9.6	CL			
							Black Silty Fine Sand (Alluvial Sand) 11.0	SP			
							Reddish-Brown Silty Clay (Lacustrine Clay) 17.1				
							Bottom of Boring at 17.1' No Soil Samples Taken. For Detailed Soil Descriptions, See Log of Boring 1180A.				

5 10 15 20 25 30 35 40

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT LONG TERM MONITORING

TASK VC

BORING NO. 1181A

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/23/85

COMPLETED 10/23/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7 (10.2)

PROTECTION LEVEL B/C

GROUND EL. 574.0'

SOIL DRILLED 24.0'

TOTAL DEPTH 24.0'

BELOW GROUND NA

LOGGED BY T. Allen

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	ELEV(FT)
											574.0
	0.0	S-1		N	N	2.5 1.7	0.0	BROWN TO BLACK SAND AND SILT WITH TRACE OF CLAY, DRY, NON PLASTIC ASH		7-8-11-16-12	
	0.0	S-2		N	N	1.5 1.5	0.0	(FILL) 4.0		5-4-4	
5	0.0	S-3		N	N	2.5 2.3	0.0	BROWN TO BLACK SILTY CLAY WITH TRACE SAND AND GRAVEL (FILL) 6.5		10-5-4-4-6	569.0
	0.0	S-4		N	N	2.5 2.2	0.0	REDDISH-BROWN MOTTLED SILTY CLAY, VERY STIFF, MOIST, SLIGHTLY PLASTIC, FRACTURES	CL	3-9-17-19-22	
10	0.0	S-5		N	N	2.5 2.5	0.0	FEW SAND LAYERS		2-4-5-8-8	564.0
	0.0	S-6		N	N	2.5 2.5	0.0	(LACUSTRINE CLAY)		1-3-2-4-4	
15	0.0	S-7		N	N	2.5 2.5	0.0	15.5 TRACES OF GRAVEL 16.5	CL	1-2-3-4-100	559.0
	0.0	S-8		N	N	2.5 2.5	0.0	REDDISH-BROWN SILTY SAND, SOME GRAVEL, 20% GRAVEL, MOIST, SLIGHTLY PLASTIC, WIDELY GRADED, DENSE		16-21-22-27-46	
20	0.0	S-9		N	N	2.5 2.5	0.0		SM	14-36-44-42-57	554.0
	0.0	S-10		N	N	2.5 2.5	0.0	(GLACIAL TILL) 24.0		17-18-33-34-44	
25								BOTTOM OF BORING AT 24.0 FT			549.0
30											544.0
35											
40											

WELL DATA

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1181B

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/24/85

COMPLETED 10/24/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7/(10.2)

PROTECTION LEVEL C

GROUND EL. 574.0'

SOIL DRILLED 16.5'

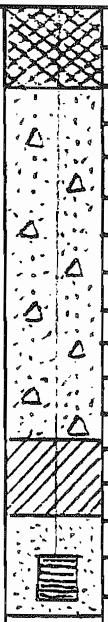
TOTAL DEPTH 16.5'

▽ BELOW GROUND NA

LOGGED BY M. Guay

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
											574.0
							BROWN TO BLACK SAND AND SILT WITH TRACE OF CLAY (FILL) 6.5	SM-ML			
5											569.0
							REDDISH-BROWN SILTY CLAY STIFF AND FRACTURED (LACUSTRINE CLAY)	CL			
10											564.0
15							15.5				559.0
							TRACES OF GRAVEL 16.5				
							BOTTOM OF BORING AT 16.5 FT NO SOIL SAMPLES TAKEN - FOR DETAILED DESCRIPTION OF SOILS SEE BORING 1181A				
20											554.0
25											549.0
30											
35											
40											

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1181C

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/24/85

COMPLETED 10/24/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7 / 10.2

PROTECTION LEVEL C

GROUND EL. 574.1 '

SOIL DRILLED 11.3 '

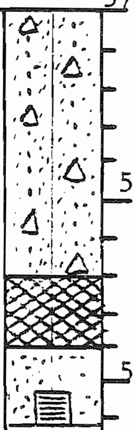
TOTAL DEPTH 11.3 '

▽ **BELOW GROUND** NA

LOGGED BY M. Guay

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
							BROWN TO BLACK SAND AND SILT WITH TRACE OF CLAY (FILL)	SM ML			574.1
5							6.5				569.1
							REDDISH-BROWN SILTY CLAY VERY STIFF, FRACTURED	CL			
10							(LACUSTRINE CLAY) 11.3				564.1
							BOTTOM OF BORING AT 11.3 FT				
15							NO SAMPLES TAKEN - FOR DETAILED SOIL DESCRIPTIONS SEE LOG OF BORING 1181A				559.1
20											554.1
25											
30											
35											
40											

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT LONG TERM MONITORING

TASK VC

BORING NO. 1183A

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
PROJECT NO. 4844-08
CONTRACTOR: J. MATHES ASSOC.
DATE STARTED 12/5/85
COMPLETED 12/5/85
METHOD HSA
CASING SIZE 4.25"
HNU 11.7/10.2
PROTECTION LEVEL D
GROUND EL. 573.8'
SOIL DRILLED 24.4'
TOTAL DEPTH 24.4'
▽ BELOW GROUND NA
LOGGED BY M. Guay
CHECKED BY R. Lewis
DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	ELEV(FT)
							TOPSOIL 0.6			573.8
	0.0	S-1	N	N	3.1 3.1	0.0	BROWN TO BLACK SAND, SILT AND CLAY WITH BRICKS, ROCKS AND WOOD, LOOSE, MOIST.	SM	NO BLOW COUNTS TAKEN. USED CONTINUOUS SPLIT SPOON SAMPLER.	
5							(FILL)			568.8
	0.0	S-2	N	N	5.0 3.2	0.0	8.1			
10							BROWN MOTTLED SILTY CLAY WITH SAND LAYERS, MOIST, SLIGHTLY PLASTIC, STIFF, FRACTURES.	CL		563.8
	0.0	S-3	N	N	5.0 5.0	1.5	(LACUSTRINE CLAY)			
15										558.8
	0.0	S-4	N	N	5.0	0.0	17.6	CL		
							TRACE OF GRAVEL 18.0			
20							REDDISH-BROWN SILTY SAND WITH SOME GRAVEL AND TRACE OF CLAY, WIDELY GRADED DENSE, SLIGHTLY PLASTIC, MOIST			553.8
	0.0	S-5	N	N	5.0 2.5	0.0	(GLACIAL TILL)	SM		
							24.4			
25							BOTTOM OF BORING AT 24.4 FT			548.8
30										543.8
35										
40										

WELL DATA

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1183B

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 12/6/85

COMPLETED 12/6/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7/[✓ 10.2]

PROTECTION LEVEL D

GROUND EL. 573.8'

SOIL DRILLED 17.0'

TOTAL DEPTH 17.0'

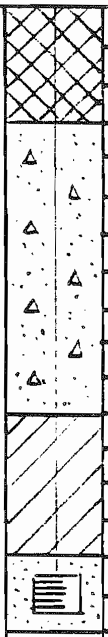
▽ BELOW GROUND NA

LOGGED BY M. Guay

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
							TOPSOIL 0.6				573.8
	0.0						BROWN TO BLACK SAND, SILT AND CLAY (FILL)	SM			
5	0.0										568.8
							8.1				
10	0.1						BROWN MOTTLED SILTY CLAY WITH SAND LAYERS (LACUSTRINE CLAY)	CL			563.8
	0.0										
15											558.8
							17.0				
							BOTTOM OF BORING AT 17.0 FT NO SOIL SAMPLES TAKEN FOR DETAILED SOIL DESCRIPTIONS SEE LOG OF BORING 1183A				
20											553.8
25											
30											
35											
40											



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1183C

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.		**DATE STARTED** 12/7/85		**COMPLETED** 12/7/85	
METHOD HSA	**CASING SIZE** 4.25"		**HNU** 11.7 / 10.2	**PROTECTION LEVEL** D	
GROUND EL. 573.8'	**SOIL DRILLED** 11.0'		**TOTAL DEPTH** 11.0'	**▽ BELOW GROUND** NA	
LOGGED BY M. Guay	**CHECKED BY** R Lewis		**DATE** 3/24/86		

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
							TOPSOIL 0.6				573.8
	0.8						BROWN TO BLACK SAND, SILT AND CLAY (FILL) 8.1	SM			
5	0.6										568.8
	3.0										
10							BROWN MOTTLED SILTY CLAY WITH SAND LAYERS (LACUSTRINE CLAY) 11.0	CL			563.8
							BOTTOM OF BORING AT 11.0 FT NO SAMPLES TAKEN FOR DETAILED SOIL DESCRIPTIONS SEE LOG OF BORING 1183A				
15											558.8
20											553.8
25											
30											
35											
40											

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1183D

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 12/7/85

COMPLETED 12/7/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7 / 10.2

PROTECTION LEVEL D

GROUND EL. 573.8'

SOIL DRILLED 7.5'

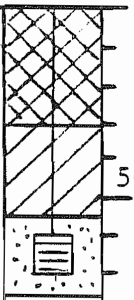
TOTAL DEPTH 7.5'

▽ BELOW GROUND NA

LOGGED BY M. Guay

CHECKED BY L. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
							TOPSOIL 0.6				573.8
							BROWN TO BLACK SAND, SILT AND CLAY WITH BRICKS, WOOD AND DEBRIS (FILL) 7.5	SM			
5											568.8
							BOTTOM OF BORING AT 7.5 FT				
10											563.8
							NO SOIL SAMPLES TAKEN FOR DETAILED SOIL DESCRIPTIONS SEE LOG OF BORING 1183A				
15											558.8
20											
25											
30											
35											
40											

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

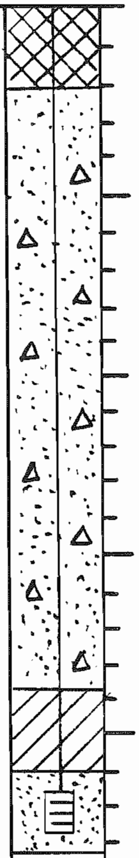
E.C.JORDAN CO.

LOVE CANAL TASK VC

BORING NO. 1184A

CLIENT: New York State Department of Environmental Conservation
PROJECT NO. 4844-24
CONTRACTOR: J. Mathes & Assoc.
DATE STARTED 11/22/86
COMPLETED 11/22/86
METHOD H.S.A.
CASING SIZE 4.25" I.D.
HNU 11.7 / 10.2 10.2 TIP
PROTECTION LEVEL D
GROUND EL. 572.3
SOIL DRILLED 23.3'
TOTAL DEPTH 23.2'
▽ **BELOW GROUND**
LOGGED BY W. Fisher
CHECKED BY R. Lewis
DATE 6/10/87

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
	0.0	S-1		N	N	4.5 3.2	NA	0-0.7 Brown Silty Fine Sand with Root Fibers, Topsoil 0.7-1.9 Brown-Gray Fine Sand and Silt (FILL) 3.2	SM	NA		
5	0.6	S-2		N	N	5.0 4.3	NA	Olive Brown Mottled Silty Clay, Varved, Dry to Moist, Very Stiff, Fractured	CL	NA		
10	0.0	S-3		N	N	5.0 4.7	NA	11.5 Brown to Reddish Brown Silty Clay, Moist to Wet, Soft Very Plastic, Sticky, Massive	CL CL	NA		
15	0.0	S-4		N	N	5.0 2.1	NA	17.0 Reddish-Brown Silty Sand with Gravel & Cobbles, Widely Graded, Dense, Moist, Non-plastic	SM	NA		
20	0.0	S-5		N	N	3.7 0.0	NA	23.2				
25 30 35 40								Bottom of Boring at 23.2'		No Blow Counts Taken. Used Continuous Sample Tube System.		



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL-TASK VC

BORING NO. 1184B

CLIENT: New York State Department of Environmental Conservation

PROJECT NO. 4844-26

CONTRACTOR: J. Mathes & Assoc.

DATE STARTED 11/22/86

COMPLETED 11/22/86

METHOD H.S.A.

CASING SIZE 4.25" I.D.

HNU 11.7 / 10.2 10.2 TIP

PROTECTION LEVEL

GROUND EL. 571.9

SOIL DRILLED 15.5'

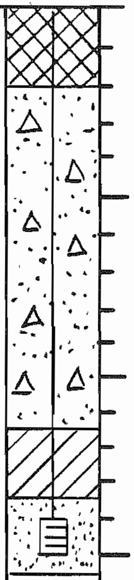
TOTAL DEPTH 15.5'

▽ **BELOW GROUND**

LOGGED BY C. White

CHECKED BY R. Lewis

DATE 6/10/87

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
							Topsoil Brown to Gray Fine Sand and Silt (FILL)	SM			
5 10							Olive Brown Mottled Varved Silty Clay; Fractured 11.5	CL			
15							Brown to Reddish Brown Silty Clay, Soft, Moist to Wet 15.5	CL			
20 25 30 35 40							Bottom of Boring at 15.5' No Soil Samples taken. For Detailed Soil Descriptions, see log of Boring 1184A.				

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL TASK VC

BORING NO. 1184C

CLIENT: New York State Department of Environmental Conservation

PROJECT NO. 4844-24

CONTRACTOR: J. Mathes & Assoc.

DATE STARTED 4/22/86

COMPLETED 4/22/86

METHOD H.S.A.

CASING SIZE 4.25" I.D.

HNU 11.7/10.2 10.2 TIP

PROTECTION LEVEL D

GROUND EL. 572.2

SOIL DRILLED 9.8'

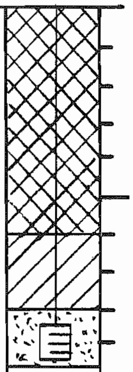
TOTAL DEPTH 9.8'

▽ BELOW GROUND

LOGGED BY W. Fisher

CHECKED BY R. Lewis

DATE 6/10/87

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
							Topsoil Brown to Gray Fine Sand and Silt (FILL) 3.2				
5							Olive Brown Mottled Varved Silty Clay, Stiff and Fractured 9.8				
10 15 20 25 30 35 40							Bottom of Boring at 9.8' No Soil Samples Taken. For Detailed Soil Descriptions, See log of Boring 1184A.				

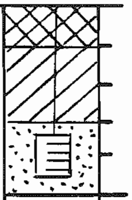
*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL TASK VC

BORING NO. 1184D

CLIENT:	New York State Department of Environmental Conservation			**PROJECT NO.**	4844-
CONTRACTOR:	J. Mathes & Assoc.	**DATE STARTED**	11/22/86	**COMPLETED**	11/22/86
METHOD	H.S.A.	**CASING SIZE** 4.25" I.D.	**HNU** 11.7 / 10.2	**PROTECTION LEVEL**	D
GROUND EL.	571.9	**SOIL DRILLED** 5.0'	**TOTAL DEPTH** 5.0'	▽ **BELOW GROUND**	
LOGGED BY	W. Fisher	**CHECKED BY** R. Lewis	**DATE** 6/10/87		

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
							Topsoil Brown to Gray Fine Sand and Silt (FILL) 3.2				
5							Olive Brown Mottled Varved Silty Clay 5.0	CL	CL		
							Bottom of Boring at 5.0' No Soil Samples Taken. For Detailed Soil Descriptions, See Log of Boring 1184A				
10											
15											
20											
25											
30											
35											
40											

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT LONG TERM MONITORING	TASK VC	BORING NO. 1190A

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/2/85

COMPLETED 11/2/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7 (10.2)

PROTECTION LEVEL B

GROUND EL. 583.0' / 586.53

SOIL DRILLED 40.5'

TOTAL DEPTH 40.5'

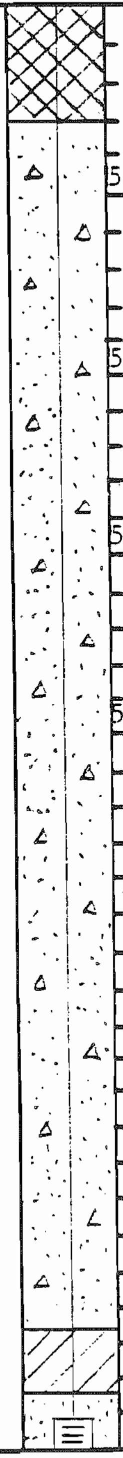
▽ BELOW GROUND NA

LOGGED BY M. Guay

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO.	* TYPE & SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	ELEV(FT)
											583.0
	0.0	S-1		N	N	2.7 1.0	0.0	AIR: BOOT 1.5 BROWN SILTY FINE SAND, UNIFORMLY GRADED (FILL) 2.1	SP	NO BLOW COUNTS TAKEN USED CONTINUOUS SPLIT SPOON SAMPLER	
5	0.0	S-2		N	N	5.0 4.6	0.0	BROWN TO BLACK SILTY CLAY WITH LITTLE FINE SAND, DRY, WIDELY GRADED (FILL) 7.9	ML		578.0
10	0.0	S-3		N	N	5.0 4.5	0.0	BROWN SILTY CLAY WITH ROOTS AND ORGANIC MATTER 9.5 BROWN MOTTLED SILTY FINE SAND, DRY, LOOSE, UNIFORMLY GRADED (ALLUVIAL SANDS) 13.3	SP		573.0
15	0.0	S-4		N	N	5.0 5.0	13.0	REDDISH-BROWN SILTY CLAY, MOIST, SLIGHTLY PLASTIC, STIFF, FRACTURES (LACUSTRINE CLAY) 19.2	CL		568.0
20	0.0	S-5		N	N	5.0 5.0	0.0	REDDISH-GRAY SILTY CLAY, MOIST TO WET, SOFT, PLASTIC			563.0
25	0.0	S-6		N	N	5.0 4.7	0.0	(LACUSTRINE CLAY)	CL		558.0
30	0.0	S-7		N	N	5.0 5.0	0.0				553.0
35	0.0	S-8		N	N	5.0 5.0	0.0	35.6 TRACES OF SAND AND GRAVEL 38.5			548.0
40	0.0	S-9		N	N	2.8 2.7	0.0	REDDISH-BROWN SILTY SAND WITH SOME GRAVEL, DENSE, MOIST (GLACIAL TILL) 40.5	SM		543.0



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT LONG TERM MONITORING

TASK VC

BORING NO. 1190A

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/2/85

COMPLETED 11/2/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7 / [✓ 10.2]

PROTECTION LEVEL B

GROUND EL. 583.0'

SOIL DRILLED 40.5'

TOTAL DEPTH 40.5'

▽ BELOW GROUND NA

LOGGED BY M. Guay

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
							BOTTOM OF BORING AT 40.5 FT				
45											
50											
55											
60											
65											
70											
75											
80											

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT LONG TERM MONITORING

TASK VC

BORING NO. 1190B

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/27/85

COMPLETED 11/27/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7/10.2

PROTECTION LEVEL B

GROUND EL. 583.1'/586.22

SOIL DRILLED 27.4'

TOTAL DEPTH 27.4'

▽ BELOW GROUND NA

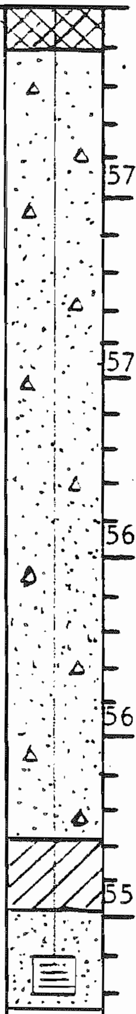
LOGGED BY M. Guay

CHECKED BY K. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE #	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN
	*						AIR: BOOT 1.5		
							BROWN SILTY SAND (FILL) 2.1		
5							BROWN TO BLACK SILTY CLAY WITH LITTLE FINE SAND 7.9	CL	
							BROWN SILTY CLAY WITH ROOTS 9.5	CL	
10							BROWN MOTTLED SILTY FINE SAND (ALLUVIAL SAND) 13.3	SP	
15							REDDISH-BROWN SILTY CLAY STIFF, FRACTURED (LACUSTRINE CLAY) 19.2	CL	
20 25							REDDISH-GRAY SILTY CLAY WET, SOFT (LACUSTRINE CLAY) 27.4	CL	
30 35 40							BOTTOM OF BORING AT 27.4 FT NO SOIL SAMPLES TAKEN FOR DETAILED SOIL DESCRIPTIONS SEE LOG OF BORING 1190B * NOTE: NO PI READINGS PI METER MALFUNCTION DUE TO WEATHER		

WELL DATA



ELEV(FT)
583.1
578.1
573.1
568.1
563.1
558.1
553.1
548.1

#U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C. JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1191A

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/5/85

COMPLETED 11/6/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7 (10.2)

PROTECTION LEVEL B/C

GROUND EL. 582.0'/584.91

SOIL DRILLED 38.0'

TOTAL DEPTH 38.0'

∇ BELOW GROUND NA

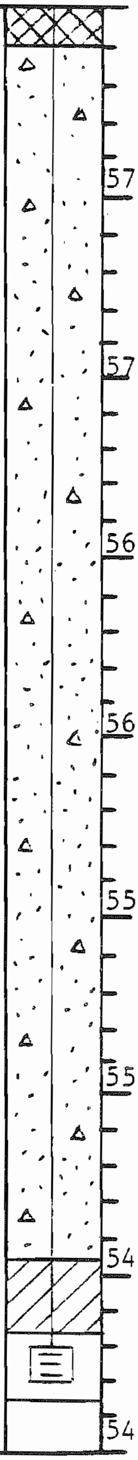
LOGGED BY J. Tewhey

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	ELEV(FT)
							AIR: BOOT 1.5			582.0
							BROWN SILTY FINE SAND (FILL) 3.0			
5							OLIVE BROWN SILTY CLAY WITH SAND (FILL) 8.4	CL		577.0
10							BROWN MOTTLED SILTY FINE SAND (ALLUVIAL SAND) 12.0	SP		572.0
15							REDDISH-BROWN SILTY CLAY STIFF, FRACTURED (LACUSTRINE CLAY) 19.5	CL		567.0
20							REDDISH-GRAY SILTY CLAY WET, SOFT	CL		562.0
25							* NO SOIL SAMPLES TAKEN FROM 0.0 TO 32.0 FT. FOR DETAILED SOIL DESCRIPTIONS SEE LOG OF BORING 1191B			557.0
30										552.0
		S-1	N	N	2.0 2.0	0.4	34.5			
35							TRACES OF GRAVEL			547.0
		S-2	N	N	2.0 2.0	0.4	SILTY SAND WITH SOME CLAY AND GRAVEL (GLACIAL TILL) 38.0	SM		
		S-3	N	N	0.3 0.3	0.4				
40							BOTTOM OF BORING AT 38.0 FT			542.0

WELL DATA



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1191B

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/29/85

COMPLETED 10/31/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7 / (10.2)

PROTECTION LEVEL B

GROUND EL. 582.0' / 584.90

SOIL DRILLED 38.9'

TOTAL DEPTH 38.9'

▽ BELOW GROUND NA

LOGGED BY M. Guay

CHECKED BY L. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO.	& TYPE* SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	ELEV(FT)
								AIR: BOOT 1.5			582.0
	0.5	S-1	☒	N	N	2.5 2.3	1.8	BROWN SILTY FINE SAND, DRY, UNIFORMLY GRADED (FILL) 3.0	SP	4-11-15-16-18	
5		S-2	☒	N	N	2.5 2.3	0.2	OLIVE-BROWN TO BLACK SILTY CLAY WITH SAND, DRY, MEDIUM DENSE, WIDELY GRADED (FILL) 8.4	CL	10-7-5-11-14	577.0
		S-3	☒	N	N	2.5 2.5	0.2			5-7-7-10-10	
10		S-4	☒	N	N	2.5 2.5	0.4	BROWN MOTTLED SILTY FINE SAND DRY, MEDIUM DENSE, NON-PLASTIC, UNIFORMLY GRADED (ALLUVIAL SAND) 12.0	SP	3-4-6-6-7	572.0
		S-5	☒	N	N	2.5 2.5	0.2	REDDISH-BROWN MOTTLED SILTY CLAY DRY TO MOIST, VERY STIFF, FRACTURED (LACUSTRINE CLAY)	CL	3-4-10-13-13	
15		S-6	☒	N	N	2.5 2.5	0.2			4-6-11-15-14	567.0
	3.0	S-7	☒	N	N	2.5 2.5	1.2	19.5		7-6-4-4-4	
20		S-8	☒	N	N	2.5 2.5	0.2	REDDISH-GRAY SILTY CLAY, WET, SOFT, PLASTIC (LACUSTRINE CLAY)	CL	WOH-1-1-2	562.0
25		S-9	☒	N	N	2.5 2.5	0.2			WOH-1-1-1-2	557.0
		S-10	☒	N	N	2.5 2.5	0.2	WOH= WEIGHT OF HAMMER WOR= WEIGHT OF RODS	CL	WOH-1-2-1	
30		S-11	☒	N	N	2.5 2.5	0.2			WOH-WOH-1	552.0
		S-12	☒	N	N	2.5 2.5	0.3	34.5		WOR-WOH-18	
35		S-13	☒	N	N	2.5 2.5	0.2	TRACES OF GRAVEL 37.0		WOR	547.0
		S-14	☒	N	N	1.9 1.8	0.2	REDDISH-BROWN SILTY SAND, SOME CLAY AND GRAVEL, 20% GRAVEL, MOIST SLIGHTLY PLASTIC (GLACIAL TILL)	SM	4-13-15-100/5"	
40								BOTTOM OF BORING AT 38.9 FT			542.0

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1191C

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-24

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 5/1/86

COMPLETED 5/1/86

METHOD H.S.A.

CASING SIZE 4.25" I.D.

HNU 11.7/10.2 10.2 TIP

PROTECTION LEVEL B/C

GROUND EL. 582.1

SOIL DRILLED 32.0'

TOTAL DEPTH 32.0'

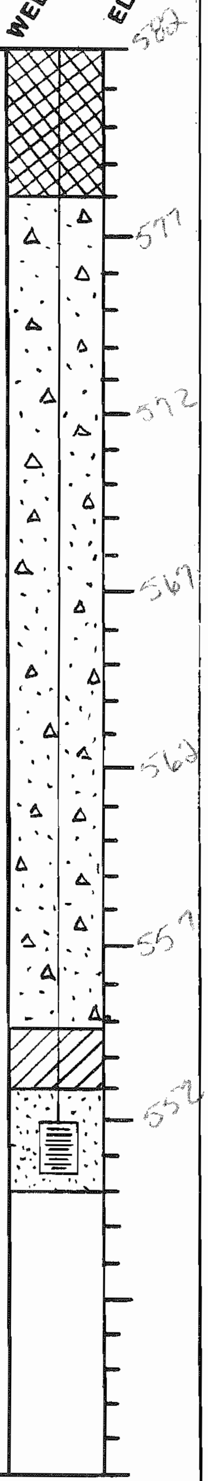
▽ BELOW GROUND

LOGGED BY L. Hoyt

CHECKED BY R. Lewis

DATE 6/10/87

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %
							Air: Boot 1.5		
							Brown Silty Fine Sand (FILL) Olive Brown Silty Clay with Sand (FILL) 8.4	CL	
							Brown Mottled Silty Fine Sand (Alluvial Sand) 12.0	SP	
							Reddish-Brown Silty Clay Stiff, Fractured (Lacustrine Clay) 19.5	CL	
							Reddish-Gray Silty Clay Wet, Soft 32.0		
							Bottom of Boring at 32.0' Ran Hollow Stem Augers to 32.0'. No Soil Samples Collected. For Detailed Soil Descriptions, See Log of Boring 1191B		



Depth scale: 5, 10, 15, 20, 25, 30, 35, 40

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1192A

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/7/85

COMPLETED 11/8/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7/(10.2)

PROTECTION LEVEL C

GROUND EL. 580.3'

SOIL DRILLED 36.3'

TOTAL DEPTH 36.3'

▽ BELOW GROUND NA

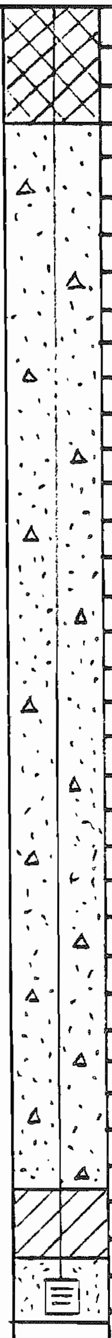
LOGGED BY J. Peterson

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE * SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	ELEV(FT)
							AIR: BOOT 1.1			580.3
	0.4	S-1	N	N	2.8 1.7	0.4	SILTY FINE SAND, MOIST, MEDIUM DENSE, UNIFORMLY GRADED (FILL) 3.3	SP	NO BLOW COUNTS TAKEN. USED CONTINUOUS SPLIT SPOON SAMPLER.	
5	0.4	S-2	N	N	5.0 2.2	0.4 0.4 0.4 0.4	BROWN TO BLACK SANDY SILTY CLAY WITH GRAVEL, ORGANIC MATTER AND ASH, MOIST, WIDELY GRADED (FILL) 8.8	CL		575.3
10	0.4	S-3	N	N	5.0 5.0	0.4 0.4	BROWN MOTTLED SILTY FINE SAND MEDIUM DENSE, MOIST, UNIFORMLY GRADED (ALLUVIAL SAND) 11.3	SP		570.3
15	0.4	S-4	N	N	5.0 5.0	0.4	REDDISH-BROWN MOTTLED SILTY CLAY MOIST, STIFF, SLIGHTLY PLASTIC, FRACTURED (LACUSTRINE CLAY)	CL		565.3
20	0.4	S-5	N	N	5.0 5.0	0.4	22.3			560.3
25		S-6	N	N	5.0 5.0	0.4	REDDISH-GRAY SILTY CLAY, WET, SOFT, PLASTIC (LACUSTRINE CLAY)	CL		555.3
30		S-7	N	N	5.0 5.0	0.4	33.5		WOH	550.3
		S-8	N	N	2.0 2.0	0.4	TRACES OF GRAVEL 34.5			
35		S-9	N	N	2.0 1.5	0.4	REDDISH-BROWN SILTY SAND WITH GRAVEL, DENSE, MOIST (GLACIAL TILL) 36.3	SM	WOH-33	545.3
40							BOTTOM OF BORING AT 36.3 FT WOH = WEIGHT OF HAMMER			540.3

WELL DATA



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C. JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1192B

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/8/85

COMPLETED 11/9/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7 / (10.2)

PROTECTION LEVEL C

GROUND EL. 580.3'

SOIL DRILLED 36.3'

TOTAL DEPTH 36.3'

▽ BELOW GROUND NA

LOGGED BY J. Tewhey

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE*	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN
							AIR: BOOT 1.1		*
							SILTY FINE SAND (FILL) 3.3	SM	
5							BROWN TO BLACK SANDY SILTY CLAY WITH GRAVEL AND ORGANIC MATTER (FILL) 8.8	CL	
10							BROWN MOTTLEDSILTY FINE SAND (ALLUVIAL SAND) 11.3	SP	
15							REDDISH-BROWN MOTTLED SILTY CLAY (LACUSTRINE CLAY) 22.3	CL	
20									
25							REDDISH-GRAY SILTY CLAY, SOFT, WET (LACUSTRINE CLAY) 33.5	CL	
30									
							TRACES OF GRAVEL 34.5		
35							REDDISH-BROWN SILTY SAND WITH GRAVEL (GLACIAL TILL)	SM	
40							BOTTOM OF BORING AT 36.3 FT *NO SOIL SAMPLES TAKEN, FOR DETAILED SOIL DESCRIPTIONS, SEE LOG OF BORING 1192A		

WELL DATA

ELEV(FT)

580.3
575.3
570.3
565.3
560.3
555.3
550.3
545.3
540.3

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT LONG TERM MONITORING

TASK VC

BORING NO. 1192C

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/10/85

COMPLETED 11/10/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7/10.2

PROTECTION LEVEL C

GROUND EL. 580.4'

SOIL DRILLED 20.0'

TOTAL DEPTH 20.0'

▽ BELOW GROUND NA

LOGGED BY J. Tewhey

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
							1.1				580.4
							BROWN SILTY FINE SAND (FILL) 3.3	SM			
5							BROWN TO BLACK SANDY SILTY CLAY WITH GRAVEL (FILL) 8.8	CL			575.4
10							BROWN MOTTLED SILTY FINE SAND, (ALLUVIAL SAND) 11.3	SP			570.4
15							REDDISH-BROWN MOTTLED SILTY CLAY, STIFF (LACUSTRINE CLAY) 20.0	CL			565.4
20							BOTTOM OF BORING AT 20.0 FT NO SOIL SAMPLES TAKEN FOR DETAILED SOIL DESCRIPTIONS SEE LOG OF BORING 1192A				560.4
25											555.4
30											550.4
35											
40											

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1193A

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/11/85

COMPLETED 11/12/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7 (10.2)

PROTECTION LEVEL C

GROUND EL. 577.0'

SOIL DRILLED 28.0'

TOTAL DEPTH 28.0'

▽ BELOW GROUND NA

LOGGED BY J. Tewhey

CHECKED BY R. Lewis

DATE 3/24/86

HNU AMBIENT AIR	SAMPLE NO. & TYPE	CLP	GC	OTHER	HNU HEADSPACE (PPM)
0.4	S-1	N	N	1.6 1.6	0.4 0.4 0.4
0.4	S-2	N	N	5.0 1.0	
0.4	S-3	N	N	5.0 4.5	0.4 0.4
0.4	S-4	N	N	5.0 5.0	0.4
0.4	S-5	N	N	5.0 5.0	0.4
0.4	S-6	N	N	5.0 5.0	0.4
0.4	S-7	N	N	1.5 1.5	0.4 0.4

SOIL/ROCK DESCRIPTION		SOIL CLASS
AIR: BOOT	1.1	
SILTY FINE SAND, BROWN, DRY, LOOSE (FILL)	2.0	SM
BROWN TO BLACK SILTY SANDY CLAY WITH ORGANIC DEBRIS, LOOSE, MOIST (FILL)	9.5	CL
REDDISH-BROWN MOTTLED SILTY CLAY, MOIST, SLIGHTLY PLASTIC, STIFF, FRACTURED (LACUSTRINE CLAY)	18.0	CL
REDDISH-GRAY SILTY CLAY, SOFT, PLASTIC, WET (LACUSTRINE CLAY)	27.5	CL
REDDISH-BROWN SILTY SAND WITH TRACE OF CLAY, 20% GRAVEL, WIDELY GRADED (GLACIAL TILL)		SM
BOTTOM OF BORING AT 29.4 FT		

BLOWS/6-IN: NO BLOW COUNTS TAKEN USED CONTINUOUS SPLIT SPOON SAMPLER

WELL DATA

DEPTH (FT)	ELEV (FT)
	577.0
5	572.0
10	567.0
15	562.0
20	557.0
25	552.0
30	547.0
35	542.0
40	537.0

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

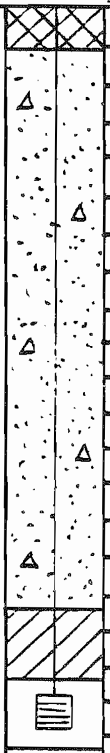
E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1193B

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
PROJECT NO. 4844-08
CONTRACTOR: J. MATHES ASSOC.
DATE STARTED 11/12/85
COMPLETED 11/12/85
METHOD HSA
CASING SIZE 4.25"
HNU 11.7 / 10.2
PROTECTION LEVEL C
GROUND EL. 576.7'
SOIL DRILLED 19.4'
TOTAL DEPTH 19.4'
▽ BELOW GROUND NA
LOGGED BY C. Moore
CHECKED BY A. Lewis
DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
							AIR: BOOT 1.1				576.7
							BROWN SILTY FINE SAND 2.0	SM			
	0.4						BROWN TO BLACK SILTY SANDY CLAY WITH ORGANIC DEBRIS	CL			
5							(FILL)				571.7
	0.4						9.5				
10							REDDISH-BROWN MOTTLED SILTY CLAY, STIFF-FRACTURES				566.7
	0.4						(LACUSTRINE CLAY)				
15								CL			561.7
							18.0				
	0.4						REDDISH-GRAY SILTY CLAY SOFT PLASTIC, WET 20.4				
20											556.7
							BOTTOM OF BORING AT 20.4 FT				
25							NO SOIL SAMPLES TAKEN FOR DETAILED SOIL DESCRIPTIONS SEE LOG OF BORING 1193A				551.7
30											546.7
35											
40											

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1193C

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/12/85

COMPLETED 11/12/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7/10.2

PROTECTION LEVEL C

GROUND EL. 576.5'

SOIL DRILLED 16.6'

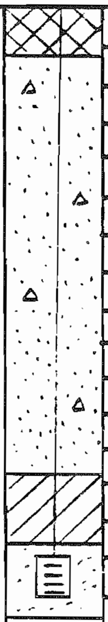
TOTAL DEPTH 16.6'

▽ BELOW GROUND NA

LOGGED BY J. Tewhey

CHECKED BY L. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
											576.5
							AIR: BOOT 1.1				
							BROWN SILTY FINE SAND 2.0	SM			
	0.4						BROWN TO BLACK SILTY SANDY CLAY WITH ORGANIC DEBRIS (FILL) 9.5	CL			
5											571.5
	0.4										
10											566.5
	0.4						REDDISH-BROWN MOTTLED SILTY CLAY, STIFF FRACTURES (LACUSTRINE CLAY) 16.6	CL			
15											561.5
	0.4						BOTTOM OF BORING AT 16.6 FT				
20							NO SAMPLES TAKEN FOR DETAILED SOIL DESCRIPTIONS SEE LOG OF BORING 1193A				556.5
25											551.5
30											546.5
35											
40											

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1193D

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/13/85

COMPLETED 11/13/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7/(10.2)

PROTECTION LEVEL D

GROUND EL. 576.6'

SOIL DRILLED 10.0'

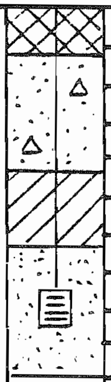
TOTAL DEPTH 10.0'

∇ BELOW GROUND NA

LOGGED BY H.P. Krahn

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE*	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
							AIR: BOOT 1.1				576.6
							BROWN SILTY FINE SAND 2.0	SM			
							BROWN TO BLACK SILTY SANDY CLAY	CL			
5		S-1 ☒	N	N	2.0 1.9		(FILL)		1-1-1-WOH		571.6
		S-2 ☒	N	N	2.0 1.9				1-WOH-6		
		S-3 ☒	N	N	1.5 0.7		REDDISH-BROWN SILTY CLAY, STIFF, FRACTURED 9.5	CL			
10							BOTTOM OF BORING AT 10.0 FT				566.6
							FOR DETAILED SOIL DESCRIPTIONS SEE LOG OF BORING 1193A				
15											561.6
20							WOH = WEIGHT OF HAMMER				556.6
25											
30											
35											
40											

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1194A

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/11/85

COMPLETED 10/11/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7/(10.2)

PROTECTION LEVEL C/B

GROUND EL. 575.3'

SOIL DRILLED 31.0'

TOTAL DEPTH 31.0'

▽ BELOW GROUND NA

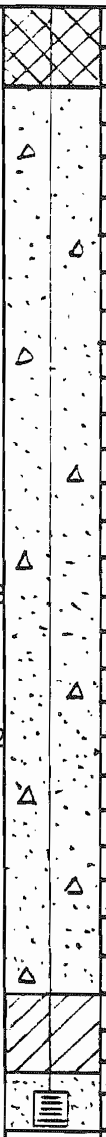
LOGGED BY M. Guay

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	ELEV(FT)
										575.3
	0.5	S-1	N	N	1.7 0.9	0.5	TOPSOIL 0.7 BROWN SILTY CLAY AND SILTY SAND DRY, LOOSE, NON-PLASTIC (FILL) 3.7	CL SM	6-11-37	
	0.5	S-2	N	N	2.0 1.4	0.5			10-11-12-10	
5	0.5	S-3	N	N	2.0 1.3	0.5	BROWN MOTTLED SILTY CLAY, MOIST STIFF, SLIGHTLY PLASTIC, FRACTURED		2-2-3-5	570.3
	0.5	S-4	N	N	2.0 1.3	0.5		CL	2-6-9-11	
	0.5	S-5	N	N	2.0 1.0	4.5	(LACUSTRINE CLAY)		2-4-4-8	
10										565.3
	0.5	S-6	N	N	2.5 2.5	0.5			1-3-6-10-18	
	0.5	S-7	N	N	2.5 2.5	0.5	14.7		2-2-3-3-3	
15										560.3
		S-8	N	N	2.5 2.5	0.5	REDDISH-GRAY SILTY CLAY, VERY SOFT, WET, PLASTIC		WOH-WOH-1-2-3	
		S-9	N	N	2.5 2.5	0.5			WOH-1-2-2-2	
20		S-10	N	N	2.5 2.5	0.5	(LACUSTRINE CLAY)	CL	WOH-WOH-1-2-2	555.3
		S-11	N	N	2.5 2.5	0.5			WOH-WOH-1-2-2	
25		S-12	N	N	2.5 2.5	0.5	26.5		WOH-3-2-1-2	550.3
		S-13	N	N	2.5 2.5	0.5	REDDISH-BROWN SILTY SAND TO SANDY CLAY WITH GRAVEL, VERY WET, DENSE, PLASTIC, WIDELY GRADED	SM ML	WOH-2-6-7	
30		S-14	N	N	1.3 0.3	0.5	(GLACIAL TILL) 31.0		3-4-50 REFUSAL	545.3
							BOTTOM OF BORING AT 31.0 FT			
							WOH = WEIGHT OF HAMMER			
35										540.3
40										535.3

WELL DATA



*U: THIN WALL TUBE   S: SPLIT SPOON   R: ROCK

LOVE CANAL REMEDIAL PROJECT LONG TERM MONITORING

TASK VC

BORING NO. 1194B

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/12/85

COMPLETED 10/12/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7 / [✓ 10.2]

PROTECTION LEVEL C/D

GROUND EL. 575.3'

SOIL DRILLED 21.3'

TOTAL DEPTH 21.3'

▽ BELOW GROUND NA

LOGGED BY M. Guay

CHECKED BY L. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
											575.3
							TOPSOIL 0.7				
	0.4 *						BROWN SILTY CLAY AND SILTY SAND (FILL) 3.7	CL SM			
5							BROWN MOTTLED SILTY CLAY, STIFF, FRACTURES				570.3
							(LACUSTRINE CLAY)	CL			
10											565.3
							14.7				
15							REDDISH-GRAY SILTY CLAY SOFT, WET	CL			560.3
20							(LACUSTRINE CLAY) 21.3				555.3
							BOTTOM OF BORING AT 21.3				
25							NO SAMPLES TAKEN. RAN AUGERS TO 21.3 FT. FOR DETAILED SOIL DESCRIPTIONS, SEE LOG OF BORING 1194A.				550.3
30							* RAIN AND HIGH HUMIDITY PREVENTED ACCURATE AMBIENT AIR HNU READING				545.3
35											540.3
40											535.3

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1194C

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/12/85

COMPLETED 11/13/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7 (10.2)

PROTECTION LEVEL C

GROUND EL. 575.3 '

SOIL DRILLED 16.5 '

TOTAL DEPTH 16.5 '

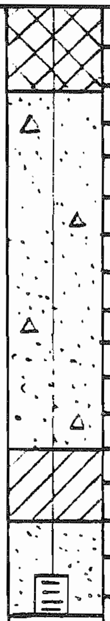
▽ BELOW GROUND NA

LOGGED BY M. Guay

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
							TOPSOIL 0.7				575.3
	0.0						BROWN SILTY CLAY AND SILTY SAND DRY, LOOSE (FILL) 3.7	CL SM			
5							BROWN MOTTLED SILTY CLAY, STIFF, FRACTURES	CL			570.3
							(LACUSTRINE CLAY)				
10	0.0										565.3
							14.7				
15							REDDISH-GRAY SILTY CLAY SOFT, WET 16.5	CL			560.3
							BOTTOM OF BORING AT 16.5 FT				
20											555.3
							NO SAMPLES TAKEN RAN AUGERS TO 16.5 FT FOR DETAILED SOIL DESCRIPTIONS SEE LOG OF BORING 1194A				
25											550.3
30											545.3
35											
40											



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 1194D

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-08

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/13/85

COMPLETED 10/13/85

METHOD HSA

CASING SIZE 4.25"

HNU 11.7/(10.2)

PROTECTION LEVEL C

GROUND EL. 572.2'/575.2 ft. AL

SOIL DRILLED 11.8'

TOTAL DEPTH 11.8'

▽ BELOW GROUND NA

LOGGED BY M. Guay

CHECKED BY L. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN	WELL DATA	ELEV(FT)
							TOPSOIL 0.7				575.2
	0.1						BROWN SILTY CLAY AND SILTY SAND DRY, LOOSE (FILL) 3.7	CL SM			
5							BROWN MOTTLED SILTY SAND, STIFF, FRACTURES (LACUSTRINE CLAY)	CL			570.2
	0.0										
10							11.8	CL			565.2
							BOTTOM OF BORING AT 11.8 FT				
15											560.2
							NO SOIL SAMPLES TAKEN RAN AUGERS TO 11.8 FT FOR DETAILED SOIL DESCRIPTIONS SEE LOG OF BORING 1194A				
20											
25											
30											
35											
40											

* U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 7205

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-09

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/13/85

COMPLETED 10/14/85

METHOD DRIVE/WASH

CASING SIZE 4.0"

HNU 11.7 / 10.2

PROTECTION LEVEL C/D

GROUND EL. 574.1'

SOIL DRILLED 30.0'

TOTAL DEPTH 49.6'

▽ **BELOW GROUND** NA

LOGGED BY J. Peterson

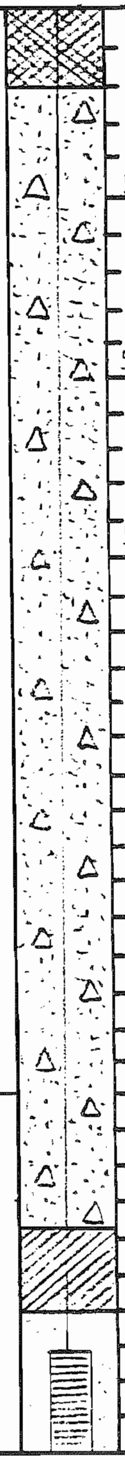
CHECKED BY R. Lewis

DATE 3/24/86

HNU AMBIENT AIR	SAMPLE NO. & TYPE *	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %
0.0	S-1	N	N	2.0/1.7	0.0	TOPSOIL 1.0 BROWN MOTTLED SILTY FINE SAND MEDIUM DENSE, MOIST, NON-PLASTIC, UNIFORMLY GRADED 3.4	SP	28-40-32-30
0.0	S-2	N	N	2.0/1.6	0.0	REDDISH-BROWN SILTY CLAY, MOIST STIFF, FRACTURED, SLIGHTLY PLASTIC (LACUSTRINE CLAY)	CL	10-17-17-23
0.0	S-3	N	N	2.0/1.8	0.0	11.0		3-4-4-4
0.0	S-4	N	N	2.0/2.0	0.0	REDDISH-GRAY SILTY CLAY, WET, SOFT, PLASTIC (LACUSTRINE CLAY)	CL	1-1-2-3
0.0	S-5	N	N	2.0/2.0	0.0	19.0		1-WOH-2-2
0.0	S-6	N	N	2.0/1.3	0.0	BROWN SILTY SAND WITH SOME GRAVEL AND TRACE OF CLAY, ABOUT 20% GRAVEL, WET, DENSE, WIDELY GRADED (GLACIAL TILL)	SM ML	29-59-47-59
0.0	S-7	N	N	0.3/0.3	0.0	30.0		100 FOR 0.3' RQD % 20 40 60 80
	R-1					BEDROCK: GRAY DOLOMITE SEE ROCK LOG FOR DESCRIPTION OF FRACTURES		

DEPTH (FT)	ELEV (FT)
	574.1
5	569.1
10	564.1
15	559.1
20	554.1
25	549.1
30	544.1
35	539.1
40	534.1

WELL DATA



*U: THIN WALL TUBE   S: SPLIT SPOON   R: ROCK

ECJORDANCO

LOVE CANAL REMEDIAL PROJECT LONG TERM MONITORING

TASK VC

BORING NO. 7205

LIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-09

ONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/13/85

COMPLETED 10/14/85

METHOD NX Core

CASING SIZE 3.0"

HNU 11.7 / 10.2

PROTECTION LEVEL C/D

ROUND EL. 574.1'

SOIL DRILLED 30.0'

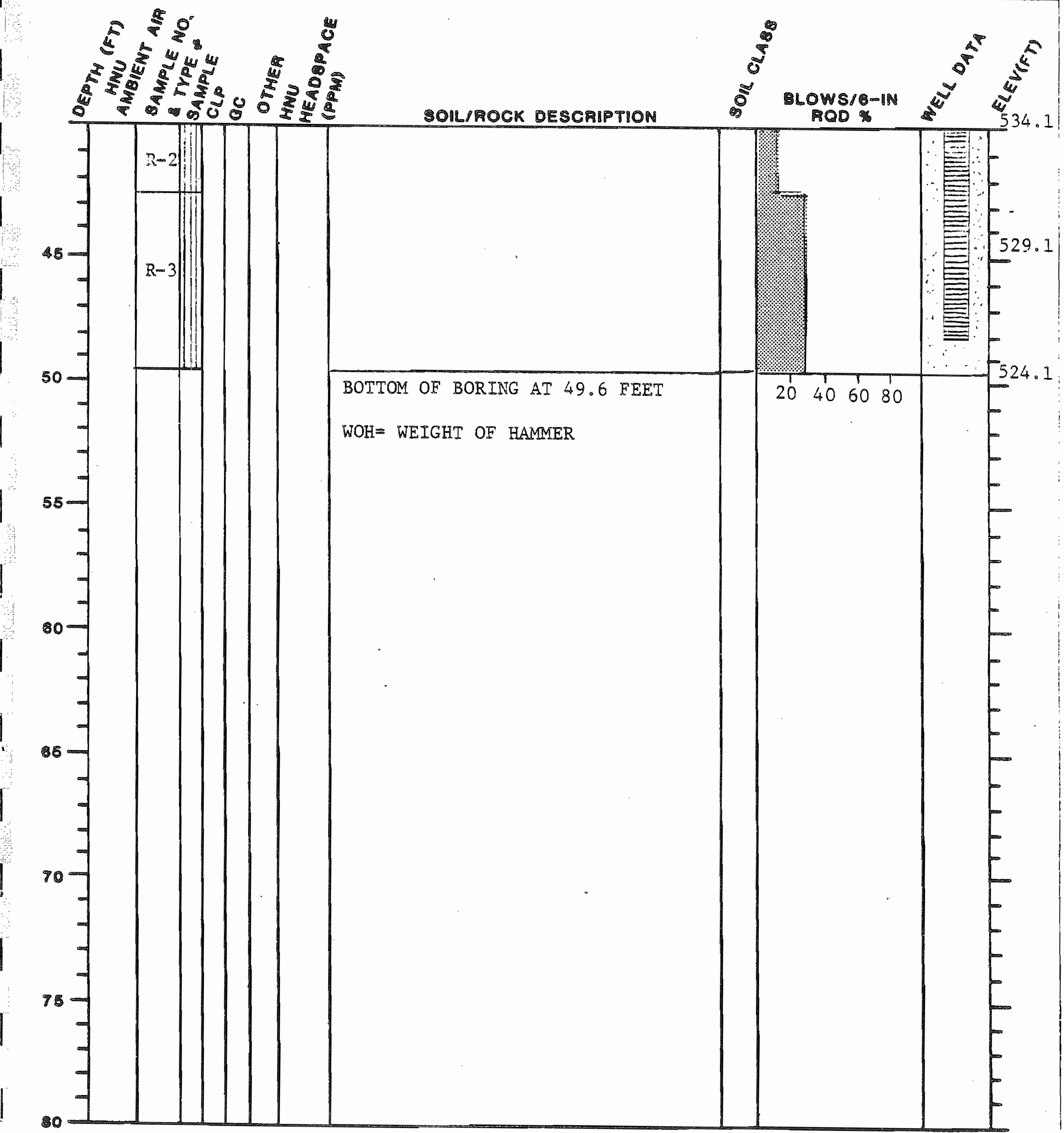
TOTAL DEPTH 49.6'

▽ BELOW GROUND NA

LOGGED BY J. Peterson

CHECKED BY L. Lewis

DATE 3/24/86



BOTTOM OF BORING AT 49.6 FEET

WOH= WEIGHT OF HAMMER

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 7205
LOGGED BY T. Nowack	DATE 10-14-85	PROTECTION LEVEL C/D

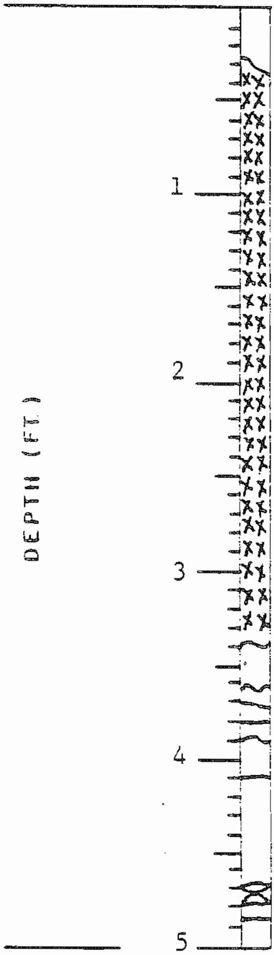
CORE DIAMETER NX	CORE RUN NO. R-1	DEPTH 30 FT. TO 36.3 FT.
CORE RECOVERY 6.3 FT.	RQD 10 %	CORE QUALITY Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

- DOLOMITE GRAY TO DARK GRAY
- MANY SOLUTION CAVITIES, SOME FILLED WITH ANHYDRITE
- WEATHERED



WEATHERED DOLOMITE FRAGMENTS

STAINED FRACTURES

- CHIPS

TOTAL 6.3 (FT)

100 %

TOTAL .63 (FT)

10 %

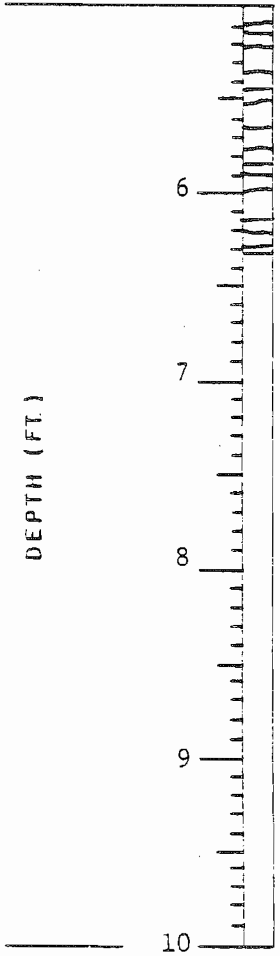
ECJORDANCO

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 7205
LOGGED BY T. Nowack	DATE 10-14-85	PROTECTION LEVEL C/D
CORE DIAMETER NX	CORE RUN NO. R-1	DEPTH 30 FT. TO 36.3 FT.
CORE RECOVERY 6.3 FT.	RQD 10 %	CORE QUALITY Poor

CORE RECOVERY (FT.)	.3 FT. CORE RECOVERY	ROCK DESCRIPTION AND IDENTIFICATION
		DOLOMITE GRAY TO DARK GRAY



- END OF R-1

TOTAL 6.3 (FT)

63 %

TOTAL .63 (FT)

10 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

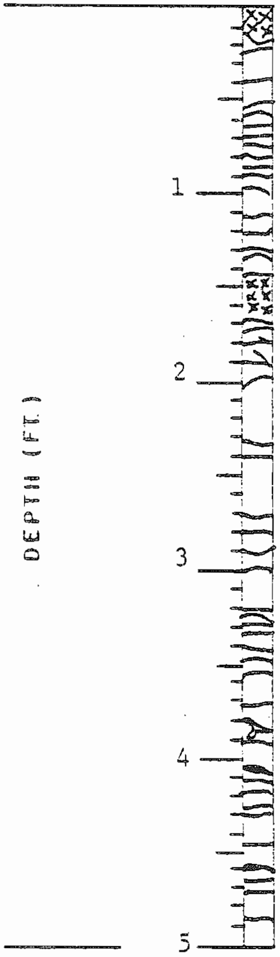
SHEET 1 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 7205
LOGGED BY T. Nowack	DATE 10-14-85	PROTECTION LEVEL C/D
CORE DIAMETER NX	CORE RUN NO. R-2	DEPTH 36.3 FT. TO 42.8 FT.
CORE RECOVERY 6.3 FT.	RQD 10 %	CORE QUALITY Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION



-CHIPS

-CHIPS

-VUG FILLED WITH WITH ANHYDRITE/CALCITE

-MECHANICAL FRACTURE

DOLOMITE GRAY TO DARK GRAY

TOTAL 6.5 (FT)

97 %

TOTAL .65 (FT)

10 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

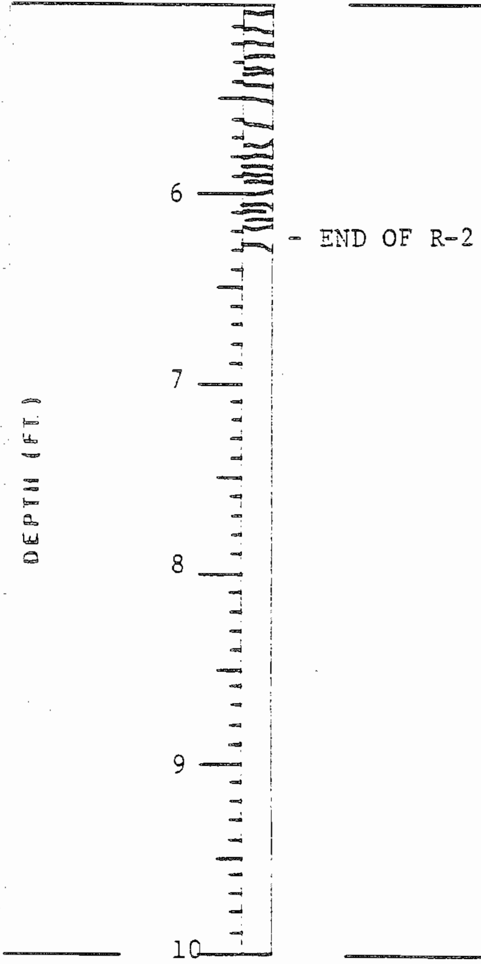
PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 7205
LOGGED BY T. Nowack	DATE 10-14-85	PROTECTION LEVEL C/D
CORE DIAMETER NX	CORE RUN NO. R-2	DEPTH 36.3 FT. TO 42.8 FT.
CORE RECOVERY 6.3 FT.	RQD 10 %	CORE QUALITY Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

DOLOMITE GRAY TO DARK GRAY



TOTAL 6.5 FT

97 %

TOTAL .65 (FT)

10 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

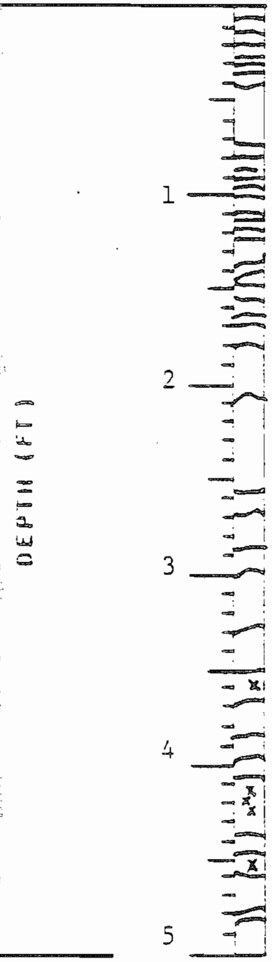
PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 7205
LOGGED BY T. Nowack	DATE 10-14-85	PROTECTION LEVEL C/D
CORE DIAMETER NX	CORE RUN NO. R-3	DEPTH 42.8 FT. TO 49.6 FT.
CORE RECOVERY 6.9 FT.	RQD 25 %	CORE QUALITY Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

DOLOMITE GRAY TO DARK GRAY



CHIPS

ANHYDRITE/CALCITE FILLED VUGS

TOTAL 6.8 (FT)

100+ %

TOTAL 1.7 (FT)

25 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

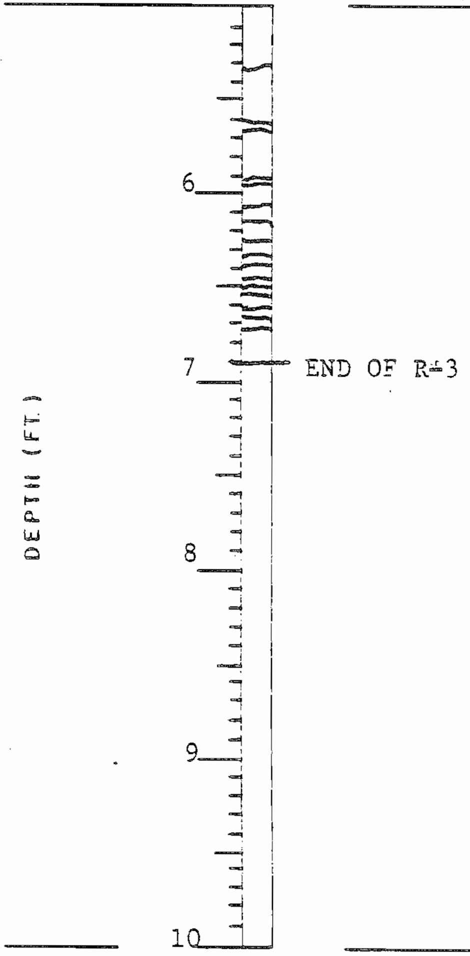
PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 7205
LOGGED BY T. Nowack	DATE 10-14-85	PROTECTION LEVEL C/D
CORE DIAMETER NX	CORE RUN NO. R-3	DEPTH 47.6 FT. TO 49.5 FT.
CORE RECOVERY 6.9 FT.	RQD 25 %	CORE QUALITY Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

DOLOMITE GRAY TO DARK GRAY



TOTAL 6.8 (FT)

100± %

TOTAL 1.7 (FT)

25 %

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT LONG TERM MONITORING

TASK VC

BORING NO. 8210

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-09

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/27/85

COMPLETED 10/27/85

METHOD DRIVE/WASH

CASING SIZE 4.0"

HNU 11.7 / 10.2

PROTECTION LEVEL D

GROUND EL. 573.7'

SOIL DRILLED 29.0'

TOTAL DEPTH 44.9'

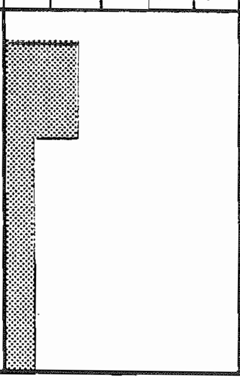
▽ BELOW GROUND NA

LOGGED BY P. Baker

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	ELEV(FT)
								TOPSOIL 0.3			573.7
		S-1	☒	N	N	2.0 1.1	0.2	BROWN SILTY FINE SAND, MOIST, MEDIUM DENSE, UNIFORMLY GRADED	SP	2-5-7-11	
5		S-2	☒	N	N	2.0 1.6	0.2	(ALLUVIAL SAND) 5.5		4-17-21-23	568.7
	0.2							REDDISH-BROWN SILTY CLAY, MOIST, STIFF FRACTURES, SLIGHTLY PLASTIC	CL		
10											563.7
								(LACUSTRINE CLAY) 12.0			
		S-3	☒	N	N	2.0 2.0	0.2	REDDISH-GRAY SILTY CLAY, WET, PLASTIC, SOFT		WOH-WOH-2	
15	0.2										558.7
								(LACUSTRINE CLAY)	CL		
		S-4	☒	N	N	2.0 2.0	0.2			WOH-WOH-2	
20	0.2										553.7
								22.0			
		S-5	☒	N	N	2.0 2.0	0.2	BROWN SILTY SAND WITH SOME GRAVEL AND CLAY, ABOUT 20% GRAVEL, MOIST, SLIGHTLY PLASTIC, WIDELY GRADED		2-7-11-14	
25	0.2								SM ML		548.7
		S-6	☒	N	N	1.5 0.8	0.2	(GLACIAL TILL) 29.0		11-28-50 RQD % 20 40 60 80	
30								BEDROCK: GRAY DOLOMITE SEE ROCK LOGS FOR DESCRIPTION OF FRACTURES			543.7
		R-1									
35											538.7
		R-2									
40											533.7



WELL DATA

*U: THIN WALL TUBE   S: SPLIT SPOON   R: ROCK

LOVE CANAL REMEDIAL PROJECT LONG TERM MONITORING

TASK VC

BORING NO. 8210

LIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-09

CONTRACTOR: J. MATHES ASSOC

DATE STARTED 10/27/85

COMPLETED 10/27/85

METHOD NX CORE

CASING SIZE 3.0"

HNU 11.7 / 10.2

PROTECTION LEVEL D

ROUND EL. 573.7'

SOIL DRILLED 29.0'

TOTAL DEPTH 44.9'

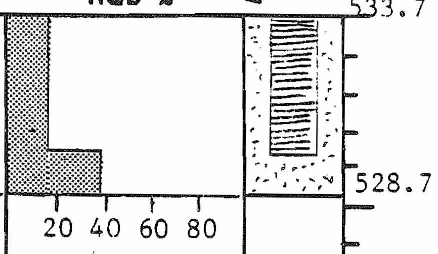
∇ **BELOW GROUND**

LOGGED BY P. Baker

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	QC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS
							GRAY DOLOMITE	
		R-2	N	N				
		R-3	N	N				
45							BOTTOM OF BORING AT 44.9 FEET	
50								
55								
60								
65								
70								
75								
80								



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 1

PROJECT NO. 4844-09

PROJECT NAME Love Canal

BORING NO. 8210

LOGGED BY P. Baker/S. Waite

DATE 10-27-85

PROTECTION LEVEL D

CORE DIAMETER NX

CORE RUN NO. R-1

DEPTH 29.8 FT. TO 33.7 FT.

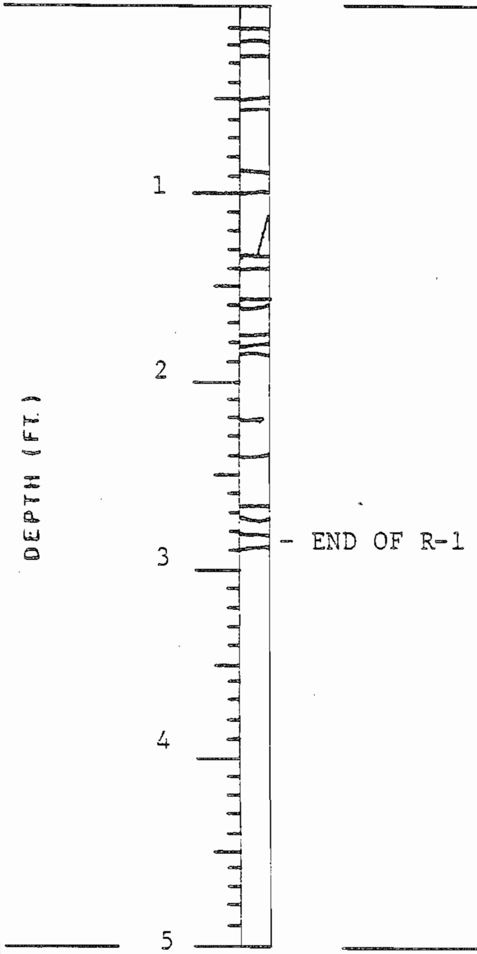
CORE RECOVERY 2.9 FT.

RQD 30 %

CORE QUALITY Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY



ROCK DESCRIPTION AND IDENTIFICATION

-DOLOMITE GRAY

-WEATHERED GYPSUM VUGS

TOTAL 3.9 (FT)

78 %

TOTAL .95 (FT)

30 %

ECJORDANCO.

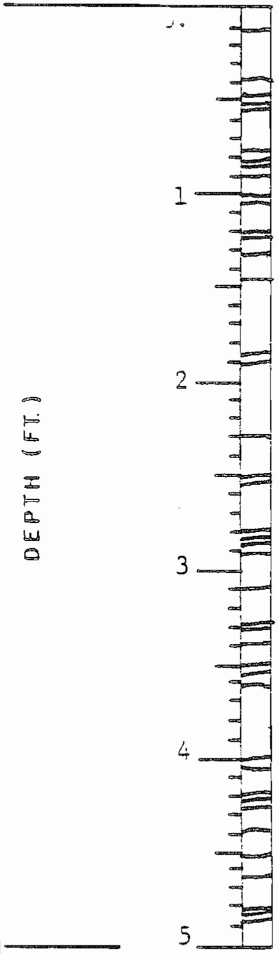
VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 8210
LOGGED BY P. Baker/S. Waite	DATE 10-28-85	PROTECTION LEVEL D

CORE DIAMETER NX	CORE RUN NO. R-2	DEPTH 33.7 FT. TO 43.7 FT.
CORE RECOVERY 8.9 FT.	RQD 17 %	CORE QUALITY Very Poor

CORE RECOVERY (FT.)



.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

- DOLOMITE GRAY
- GYPSUM MINERALS PRESENT
- SOLUTION VUGS

TOTAL 10 (FT)

89 %

TOTAL 1.2 (FT)

17 %

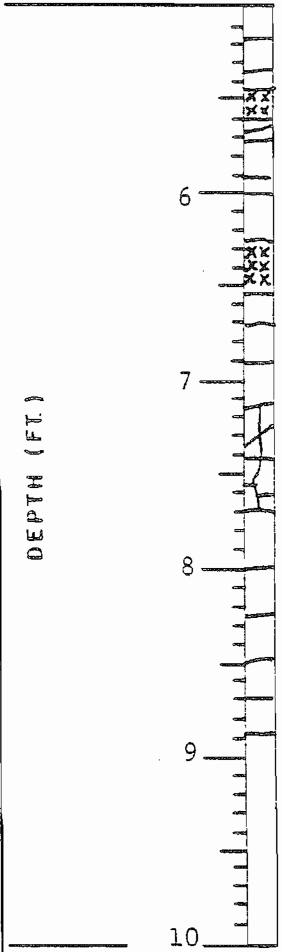
E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 8210
LOGGED BY P. Baker/S. Waite	DATE 10-28-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-2	DEPTH 33.7 FT. TO 43.7 FT.
CORE RECOVERY 8.9 FT.	RQD 17 %	CORE QUALITY Very Poor

CORE RECOVERY (FT.)



.3 FT. CORE RECOVERY

A WASHED SEAM (CLAY?) APPEARS TO CORRESPOND WITH LOSS OF WATER CIRCULATION

- END OF R-2

ROCK DESCRIPTION AND IDENTIFICATION

- DOLOMITE GRAY

TOTAL 10.0 (FT)

89 %

TOTAL 1.5 (FT)

17 %

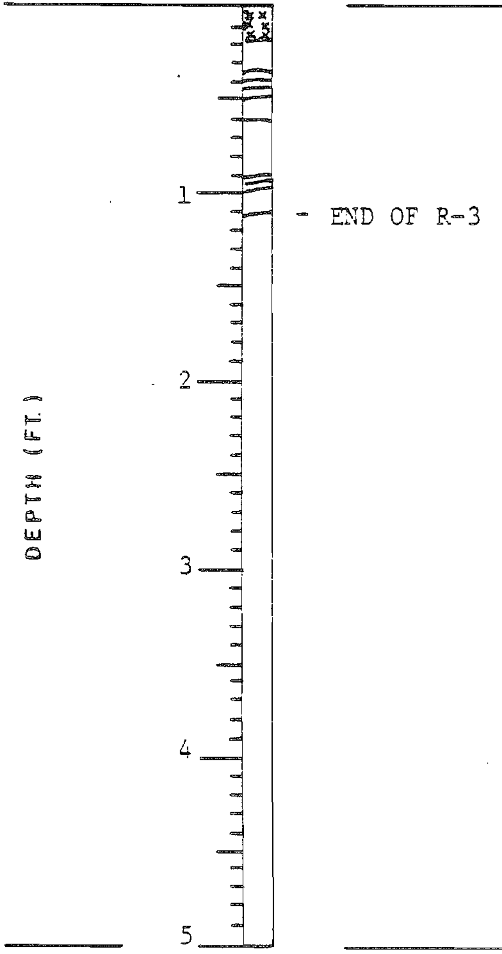
E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 1

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 8210
LOGGED BY P. Baker/S. Waite	DATE 10-28-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-3	DEPTH 43.7 FT. TO 44.8 FT.
CORE RECOVERY 1.1 FT.	RQD 35 %	CORE QUALITY Fair

CORE RECOVERY (FT.)	.3 FT. CORE RECOVERY	ROCK DESCRIPTION AND IDENTIFICATION
		DOLOMITE GRAY



TOTAL 1.1 (FT) TOTAL 0.3 (FT)

100 % 35 %

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 9205

LIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844.09

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/28/85

COMPLETED 10/28/85

METHOD DRIVE/WASH

CASING SIZE 4.0 IN.

HNU 11.7/10.2

PROTECTION LEVEL D

ROUND EL. 574.5'

SOIL DRILLED 32.0'

TOTAL DEPTH 49.7'

▽ BELOW GROUND NA

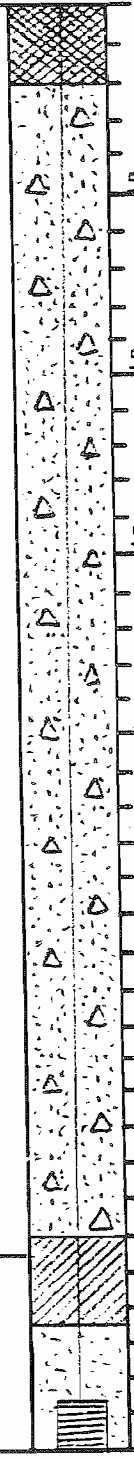
LOGGED BY P. BAKER

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	ELEV(FT)
								TOP SOIL 0.7			574.5
		S-1	☒	N	N	2.0/1.2	0.3	DARK BROWN SILTY CLAY W/SOME SAND AND GRAVEL, ORGANICS, MOIST		3-3-5-5	
	0.2							(FILL) 3.7	CL		
5		S-2	☒	N	N	2.0/1.2	0.3	REDDISH-BROWN MOTTLED SILTY CLAY, STIFF, MOIST, SLIGHTLY PLASTIC, FRACTURES		5-7-12-13	569.5
	0.2								CL		
10											564.5
								(LACUSTRINE CLAY) 12.0			
		S-3	☒	N	N	2.0/2.0	0.3	REDDISH-GRAY SILTY CLAY SOFT, WET, PLASTIC		1-1-2-2	
15	0.2								CL		559.5
		S-4	☒	N	N	2.0/2.0	0.3	(LACUSTRINE CLAY) B.O.		WOH-WOH-2-2	
	0.2							TRACES OF SAND AND GRAVEL	CL		
20								21.0			554.5
		S-5	☒	N	N	2.0/1.2	0.3	BROWN SILTY SAND W/SOME GRAVEL AND TRACES OF CLAY, WET, SLIGHTLY PLASTIC FINES, WELL GRADED		28-50/5"	
25									SM ML		549.5
		S-6	☒	N	N	2.0/1.2	0.3	(GLACIAL TILL)		9-38-50/5"	
30											544.5
		S-7	☒	N	N	0.5/0.5		33.0		16-50/6"	
								BEDROCK: GRAY DOLOMITE SEE ROCK LOG FOR DESCRIPTION OF FRACTURES			
35											539.5
								WOH = WEIGHT OF HAMMER			
40											534.5

WELL DATA



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

ECJORDANCO

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 9205

LIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844.09

ONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/28/85

COMPLETED 10/28/85

METHOD NX CORE

CASING SIZE 3.0"

HNU 11.7 / (10.2)

PROTECTION LEVEL D

ROUND EL. 574.5'

SOIL DRILLED 32.0'

TOTAL DEPTH 49.7'

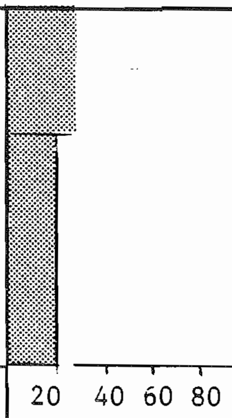
▽ BELOW GROUND

LOGGED BY P. BAKER

CHECKED BY L. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
											534.5
		R-1					GRAY DOLOMITE				
45		R-2									529.5
							49.7				
50											524.5
							BOTTOM OF BORING AT 49.7 FEET				
55											
60											
65											
70											
75											
80											



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

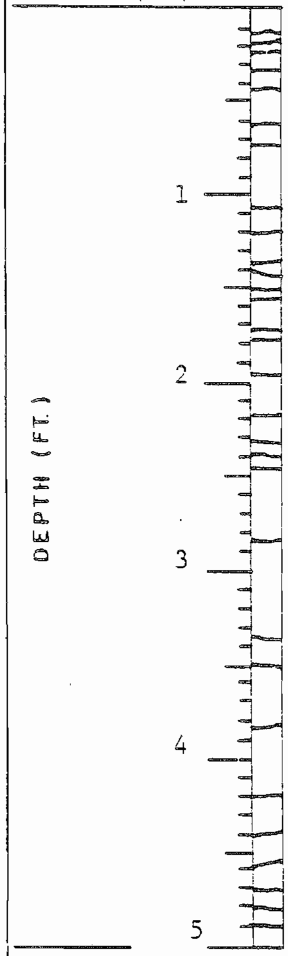
E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 9205
LOGGED BY P. Baker/L. Espy	DATE 10-29-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-1	DEPTH 34.5 FT. TO 43.5 FT.
CORE RECOVERY 8.2 FT.	RQD 31 %	CORE QUALITY Fair

CORE RECOVERY (FT.)



.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

- DOLOMITE GRAY
- GYPSUM AND ANHYDRITE CRYSTALS

TOTAL 9.0 (FT)

91 %

TOTAL 1.8 (FT)

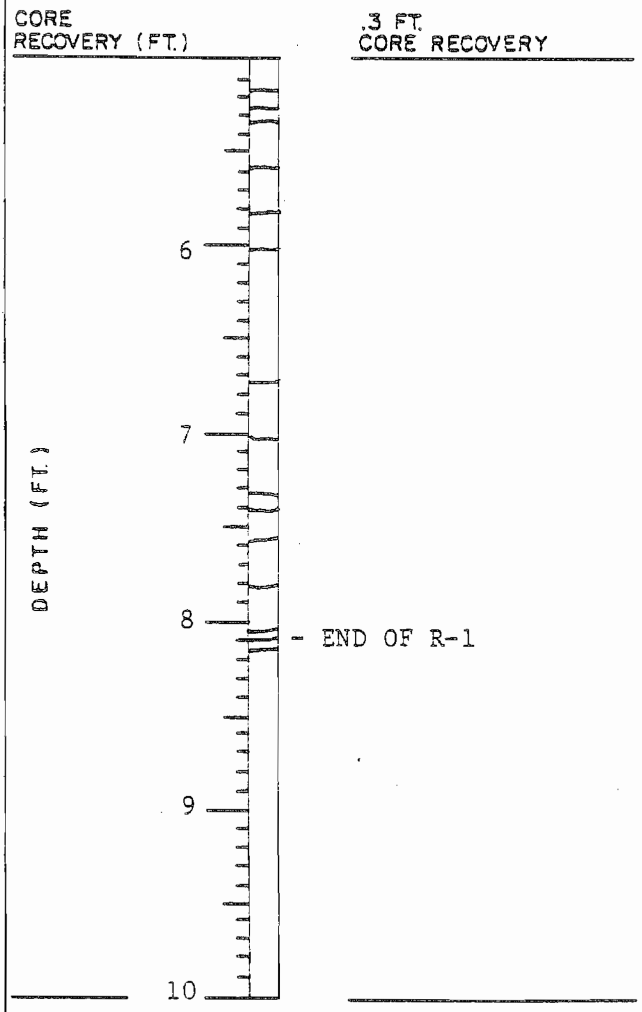
31 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 9205
LOGGED BY P. Baker/L. Espy	DATE 10-29-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-1	DEPTH 34.5 FT. TO 43.5 FT.
CORE RECOVERY 8.2 FT.	RQD 31 %	CORE QUALITY Fair



ROCK DESCRIPTION AND IDENTIFICATION

- DOLOMITE GRAY
- GYPSUM AND ANHYDRITE CRYSTALS

TOTAL 8.2 (FT) TOTAL 1.8 (FT)

91 % 31 %

ECJORDANCO.

VISUAL IDENTIFICATION OF ROCK CORES

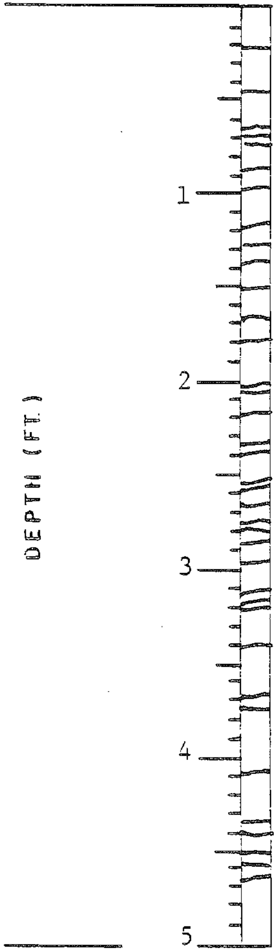
SHEET 1 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 9205
LOGGED BY P. Baker/L. Espy	DATE 10-29-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-2	DEPTH 43.5 FT. TO 49.7 FT.
CORE RECOVERY 6.0 FT.	RQD 12 %	CORE QUALITY Very Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION



-DOLOMITE GRAY
-GYPSUM AND ANHYDRITE CRYSTALS

TOTAL 6.2 (FT)

96 %

TOTAL .75 (FT)

12 %

E.C.JORDAN CO.

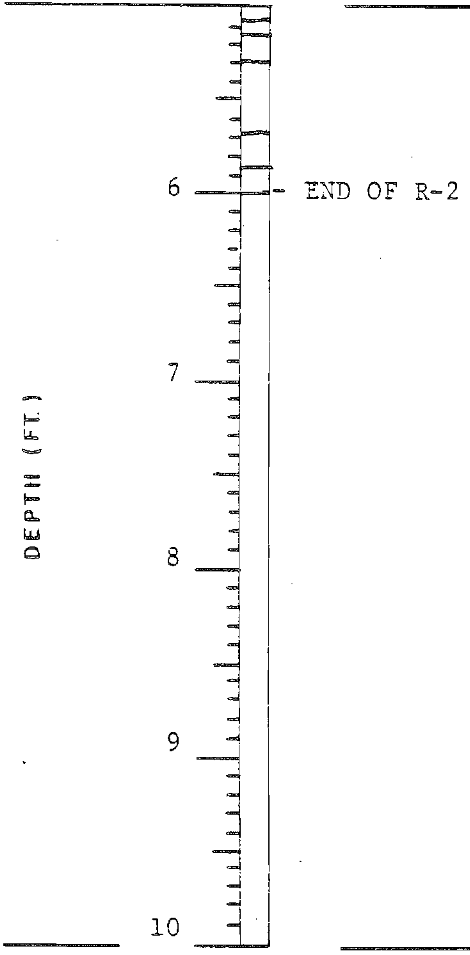
VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 9205
LOGGED BY P. Baker/L. Espy	DATE 10-29-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-2	DEPTH 43.5 FT. TO 49.7 FT.
CORE RECOVERY 6.0 FT.	RQD 12 %	CORE QUALITY Very Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY



ROCK DESCRIPTION AND IDENTIFICATION

- DOLOMITE GRAY
- GYPSUM AND ANHYDRITE CRYSTALS

TOTAL 6.2 (FT)

96 %

TOTAL .75 (FT)

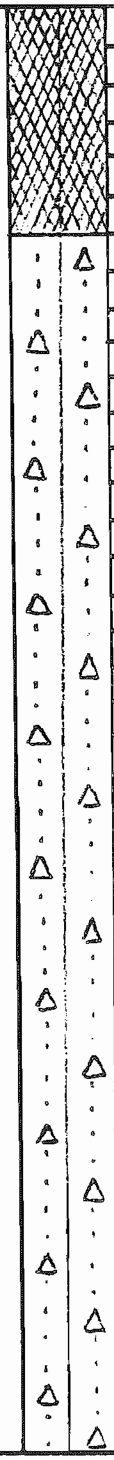
12 %

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING
TASK VC
BORING NO. 9210

LIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
PROJECT NO. 4844.09
ONTRACTOR: J. MATHES ASSOC.
DATE STARTED 11/20/85
COMPLETED 11/23/85
METHOD DRIVE/WASH
CASING SIZE 4.0 IN.
HNU 11.7 10.2
PROTECTION LEVEL D
ROUND EL. 582.4'
SOIL DRILLED 46.2 FT.
TOTAL DEPTH 83.2'
▽ BELOW GROUND NA
LOGGED BY M. MUZZY
CHECKED BY L. Lewis
DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO.	& TYPE # SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
0								TOP SOIL 0.5				582.4
	0.2	S-1	☒	N	N	2.0/1.0	0.2	BROWN TO GRAY CLAY AND SAND, TRACE OF GRAVEL, STIFF TO DENSE,		4-6-8-10		
5	0.2	S-2	☒	N	N	2.0/1.6	5.0	(FILL) 7.0	CL SM	12-21-23-20		577.4
10								REDDISH-BROWN SILTY CLAY, MOIST, SLIGHTLY PLASTIC, STIFF, FRACTURES	CL	4-6-11-15		572.4
	0.2	S-3	☒	N	N	2.0/1.7	N.A.					
15								(LACUSTRINE CLAY)				567.4
	0.1	S-4	☒	N	N	2.0/2.0	0.1		CL	6-13-15-17		
20								21.0				562.4
	0.1	S-5	☒	N	N	2.0/2.0	0.2	REDDISH-GRAY SILTY CLAY, SOFT, WET, PLASTIC	CL	1-1-1-2		
25								(LACUSTRINE CLAY)				557.4
	0.1	S-6	☒	N	N	2.0/2.0	0.1		CL	WOH-WOH-2-3		
30								BROWN SILTY FINE SAND W/TRACE OF GRAVEL, MOIST SLIGHTLY PLASTIC, DENSE, WIDELY GRADED				552.4
	0.1	S-7	☒	N	N	1.3/1.0	0.1		SM ML	40-44-50/0.3		
35								(GLACIAL TILL)				547.4
	0.1	S-8	☒	N	N	1.9/1.0	0.1		SM ML	9-32-33-50		
40												542.4



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING **TASK VC** **BORING NO.** 9210

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION **PROJECT NO.** 4844.09

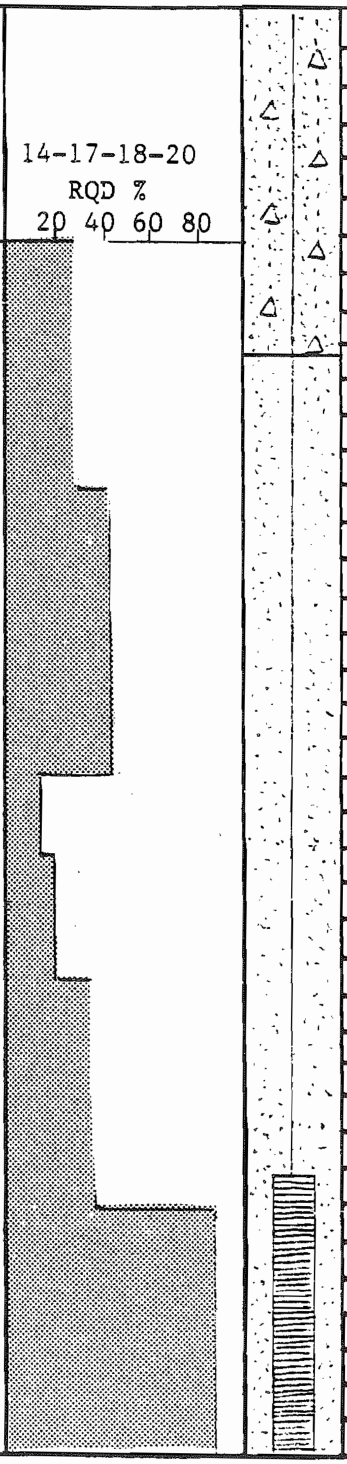
CONTRACTOR: J. MATHES ASSOC. **DATE STARTED** 11/20/85 **COMPLETED** 11/23/85

METHOD DRIVE/WASH **CASING SIZE** 4.0 IN. **HNU** 11.7/10.2 **PROTECTION LEVEL** D

GROUND EL. 582.4' **SOIL DRILLED** 46.2 FT. **TOTAL DEPTH** 83.2 FT. **∇ BELOW GROUND**

LOGGED BY M. MUZZY **CHECKED BY** R. Lewis **DATE** 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	ELEV(FT)
											542.4
	0.1	S-9	☒	N	N	2.0/1.0	0.1	(GLACIAL TILL)	SM ML	14-17-18-20	
45										RQD %	537.4
								46.2		20 40 60 80	
								BEDROCK: GRAY DOLOMITE SEE ROCK LOG FOR DESCRIPTION AND FRACTURES			
		R-1									
50											532.4
55											527.4
		R-2									
60											522.4
		R-3									
		R-4									
65											517.4
		R-5									
70											512.4
75											507.4
		R-6									
80											502.4



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

OVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 9210

LIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844.09

ONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/20/85

COMPLETED 11/23/85

METHOD NX CORE

CASING SIZE 3.0"

HNU 11.7/10.2

PROTECTION LEVEL D

ROUND EL. 582.4'

SOIL DRILLED 46.2 FT.

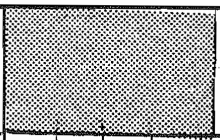
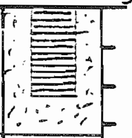
TOTAL DEPTH 83.2

▽ BELOW GROUND

OGGED BY M. MUZZY

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
		R-6					GRAY DOLOMITE				502.4
							BOTTOM OF BORING AT 83.2 FEET		20 40 60 80 RQD %		
85											497.4
90											
95											
100											
105											
110											
115											
120											

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

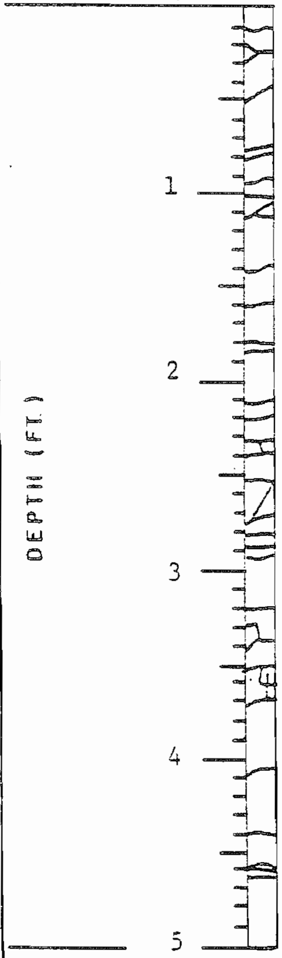
SHEET 1 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 9210
LOGGED BY M. Muzzy	DATE 11-22-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-1	DEPTH 46.2 FT. TO 53.2 FT.
CORE RECOVERY 6.3 FT.	RQD 27 %	CORE QUALITY Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION



GRAY DOLOMITE WITH GYPSUM SEAMS AND CORRAL VUGS

TOTAL 7.0 (FT)

90 %

TOTAL 1.87 (FT)

27 %

ECJORDANCO

VISUAL IDENTIFICATION OF ROCK CORES

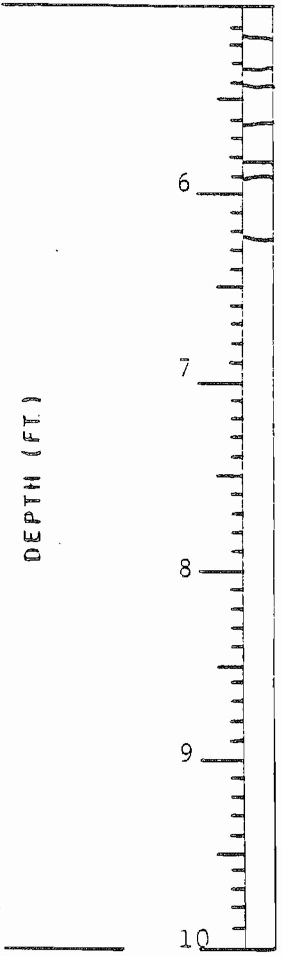
SHEET 2 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 9210
LOGGED BY M. Muzzy	DATE 11-22-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-1	DEPTH 46.2 FT. TO 53.2 FT.
CORE RECOVERY 6.3 FT.	RQD 27 %	CORE QUALITY Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION



- END OF R-1

GRAY DOLOMITE WITH GYPSUM SEAMS AND CORAL VUGS

TOTAL 7.0 (FT)

90 %

TOTAL 1.87 (FT)

27 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

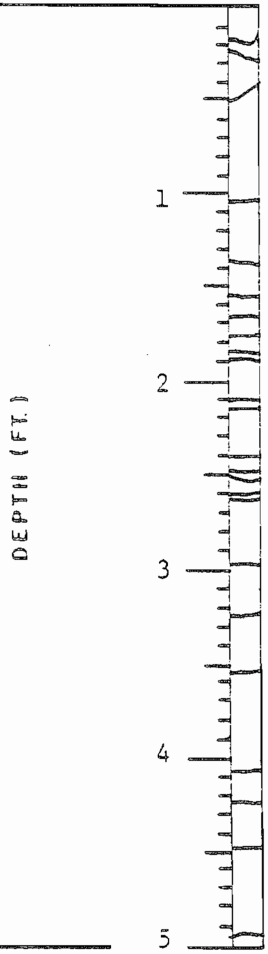
PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 9210
LOGGED BY M. Muzzy	DATE 11-22-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-2	DEPTH 53.2 FT. TO 61.0 FT.
CORE RECOVERY 8.1 FT.	RQD 44 %	CORE QUALITY Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1
LITTLE WATER LOSS



TOTAL 7.8 (FT)

100 %

TOTAL 3.45 (FT)

44 %

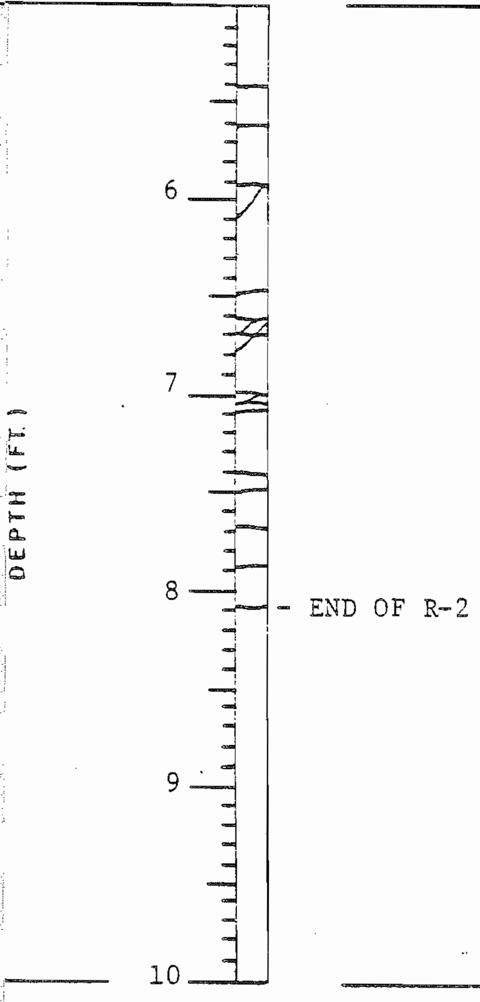
E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

ROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 9210
OGGED BY M. Muzzy	DATE 11-22-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-2	DEPTH 53.2 FT. TO 61.0 FT.
ORE RECOVERY 8.1 FT.	RQD 44 %	CORE QUALITY Poor

CORE RECOVERY (FT.)	.3 FT. CORE RECOVERY	ROCK DESCRIPTION AND IDENTIFICATION
		SIMILAR TO R-1



TOTAL 7.8 (FT)

100 %

TOTAL 3.45 (FT)

44 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 1

OJECT NO. 4844-09

PROJECT NAME Love Canal

BORING NO. 9210

OGGED BY M. Muzzy

DATE 11-22-85

PROTECTION LEVEL D

CORE DIAMETER NX

CORE RUN NO. R-3

DEPTH 61.0 FT. TO 63.2 FT.

ORE RECOVERY 1.2 FT.

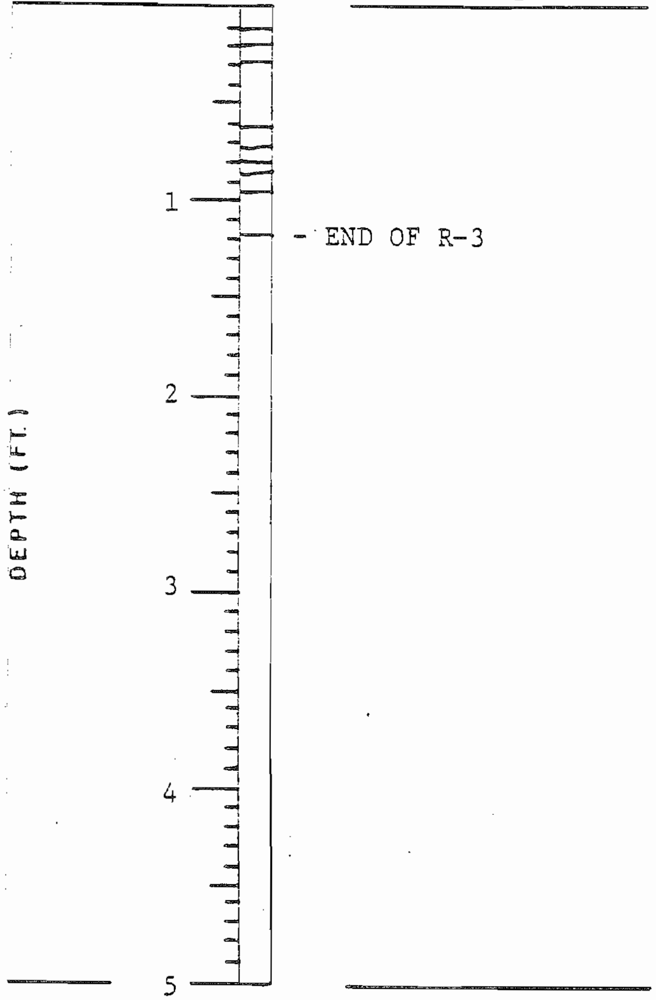
RQD 15 %

CORE QUALITY Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION



SIMILAR TO R-1

BARREL BLOCKED WITH CUTTINGS AT 63.2 FT

TOTAL 2.2 (FT)

54 %

TOTAL .33 (FT)

15 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

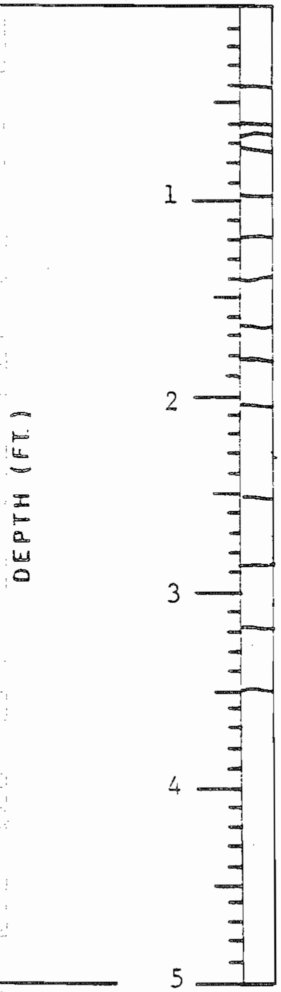
SHEET 1 OF 1

ROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 9210
LOGGED BY M. Muzzy	DATE 11-22-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-4	DEPTH 63.2 FT. TO 67.0 FT.
ORE RECOVERY 3.5 FT.	RQD 21 %	CORE QUALITY Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION



FRACTURED GYPSUM SEAM

- END OF R-4

SIMILAR TO R-1

TOTAL 3.8 (FT)

92 %

TOTAL 0.82 (FT)

21 %

E.C.JORDAN CO.

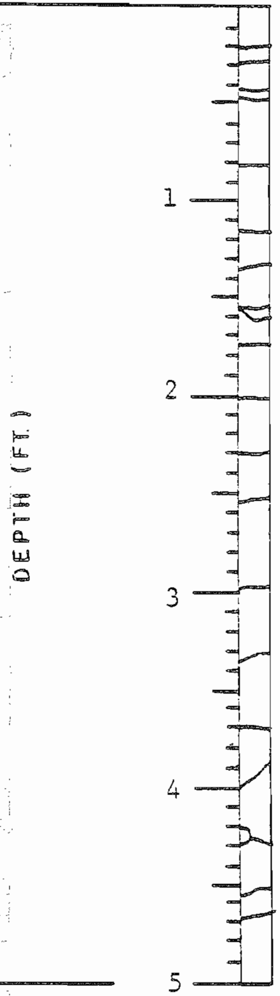
VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

ROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 9210
LOGGED BY M. Muzzy	DATE 11-23-85	PROTECTION LEVEL D

ORE DIAMETER NX	CORE RUN NO. R-5	DEPTH 67.0 FT. TO 73.2 FT.
ORE RECOVERY 6.4 FT.	RQD 36 %	CORE QUALITY Poor

ORE RECOVERY (FT.)	.3 FT. CORE RECOVERY	ROCK DESCRIPTION AND IDENTIFICATION
		SIMILAR TO R-1



TOTAL 6.2 (FT)

100 %

TOTAL 2.29 (FT)

36 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

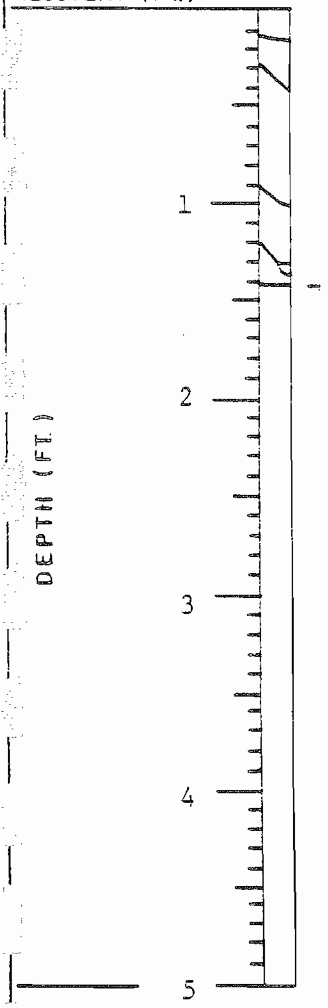
ROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 9210
LOGGED BY M. Muzzy	DATE 11-23-85	PROTECTION LEVEL D
ORE DIAMETER NX	CORE RUN NO. R-5	DEPTH 67.0 FT. TO 73.2 FT.
ORE RECOVERY 6.4 FT.	RQD 36 %	CORE QUALITY Poor

ORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1



END OF R-5

TOTAL 6.2 (FT)

100 %

TOTAL 2.29 (FT)

36 %

E.C. JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

OJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 9210
LOGGED BY M. Muzzy	DATE 11-23-85	PROTECTION LEVEL D

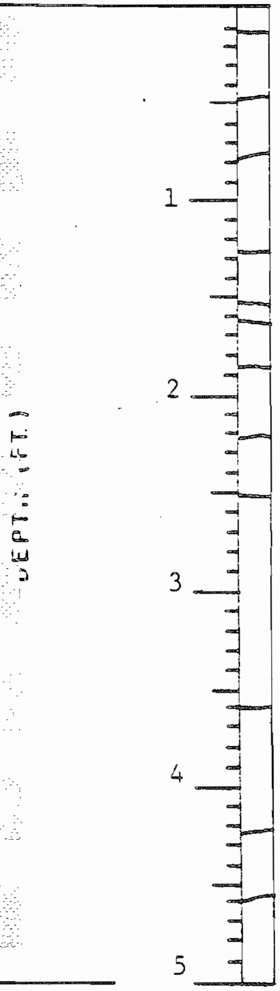
RE DIAMETER NX	CORE RUN NO. R-6	DEPTH 73.2 FT. TO 83.2 FT.
RE RECOVERY 9.9 FT.	RQD 85 %	CORE QUALITY Good

RE
RECOVERY (FT.)

.3 FT.
CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1
OCCASIONAL 1/8" TO 1/4"
PYRITE SEAMS



OTAL 10 (FT)

99 %

TOTAL 8.53 (FT)

85 %

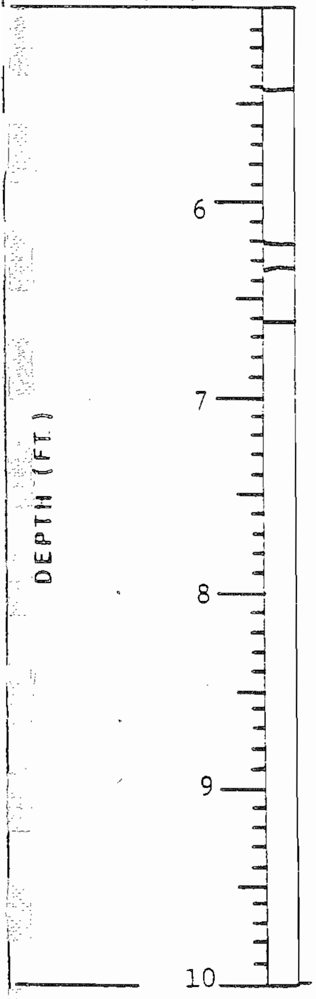
E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

ROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 9210
LOGGED BY M. Muzzy	DATE 11-23-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-6	DEPTH 73.2 FT. TO 83.2 FT.
ORE RECOVERY 9.9 FT.	RQD 85 %	CORE QUALITY Good

CORE RECOVERY (FT.)	.3 FT. CORE RECOVERY	ROCK DESCRIPTION AND IDENTIFICATION
		SIMILAR TO R-1



END OF R-6

TOTAL 10.0 (FT) TOTAL 8.53 (FT)

99 % 85 %

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 10205

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-09

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/27/85

COMPLETED 10/27/85

METHOD DRIVE/WASH

CASING SIZE 4.0"

HNU 11.7/10.2

PROTECTION LEVEL D

GROUND EL. 578.4'

SOIL DRILLED 39.0'

TOTAL DEPTH 55.1'

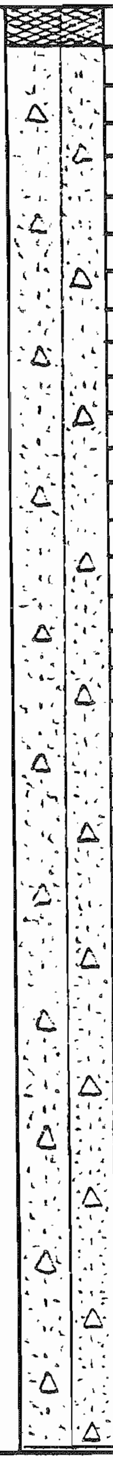
▽ BELOW GROUND NA

LOGGED BY J. Peterson

CHECKED BY R Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
							TOPSOIL 0.3				578.4
		S-1 ☒	N	N	1.5/0.6	0.4	SILTY CLAY WITH SOME SAND AND GRAVEL, MOIST, STIFF, TRACE OF ORGANIC MATTER (FILL) 3.5	ML	2-2-16		
	0.4										
5		S-2 ☒	N	N	2.0/1.2	0.4	REDDISH-BROWN SILTY CLAY, MOIST, SLIGHTLY PLASTIC, STIFF, FRACTURES	CL	6-6-6-8		575.4
	0.4						(LACUSTRINE CLAY)				
10		S-3 ☒	N	N	2.0/1.1	0.5		CL	7-12-16-23		568.4
							13.0				
15	0.4						REDDISH-GRAY SILTY CLAY, WET, PLASTIC, SOFT				563.4
		S-4 ☒	N	N	2.0/2.0	0.4			WOH-WOH-2-6		
20							(LACUSTRINE CLAY)	CL			558.4
		S-5 ☒	N	N	2.0/1.7	0.4		CL	WOH-WOH-2		
25							25.0				553.4
							TRACES OF GRAVEL 27.0				
	0.4	S-6 ☒	N	N	2.0/1.2	0.4	BROWN GRAVELLY SILTY SAND, ABOUT 20% GRAVEL, WET, NON-PLASTIC FINES, WIDELY GRADED, DENSE	SM	16-34-63/0.5		
30											548.4
		S-7 ☒	N	N	2.0/1.6	0.4	(GLACIAL TILL)	SM	12-15-19-50		
35	0.4										543.4
		S-8 ☒	N	N	0.7/0.7	0.4			50-50/0.3'		
							39.0				
40											538.4



*U: THIN WALL TUBE   S: SPLIT SPOON   R: ROCK

E.C. JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 10205

IENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-09

ONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/27/85

COMPLETED 10/27/85

METHOD Nx CORE

CASING SIZE 3.0"

HNU 11.7/10.2

PROTECTION LEVEL D

ROUND EL. 578.4'

SOIL DRILLED 39.0'

TOTAL DEPTH 55.1'

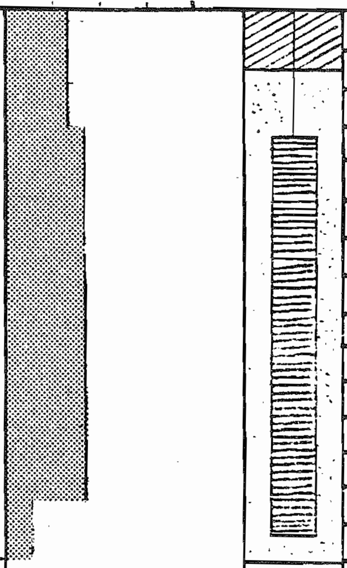
▽ BELOW GROUND

LOGGED BY J. Peterson

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
		R-1					BEDROCK: GRAY DOLOMITE SEE ROCK LOG FOR DESCRIPTIONS AND FRACTURES.				538.4
45		R-2									533.4
50											528.4
		R-3									
55							BOTTOM OF BORING AT 55.1 FEET WOH = WEIGHT OF HAMMER				523.4
60											518.4
65											
70											
75											
80											



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

ECJORDANCO

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 1

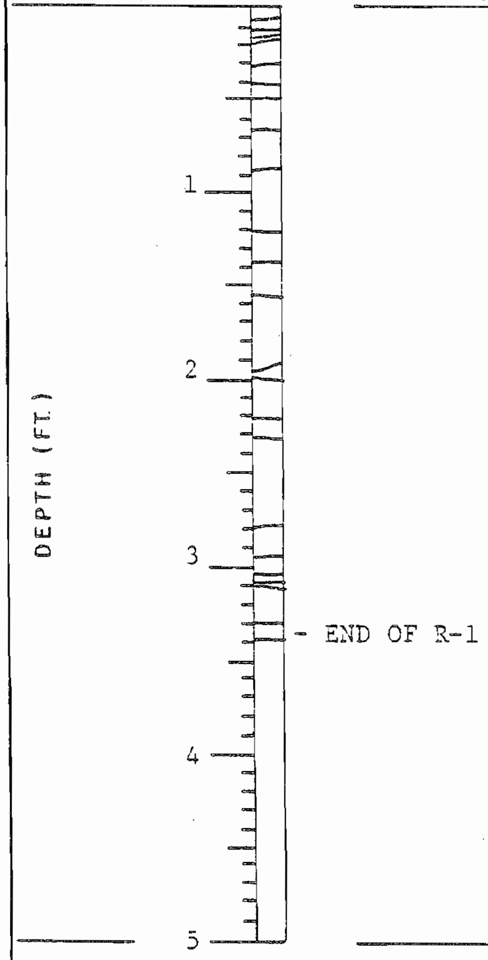
PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10205
LOGGED BY P. Baker	DATE 10-25-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-1	DEPTH 40.0 FT. TO 43.3 FT.
CORE RECOVERY 3.3 FT.	RQD 37 %	CORE QUALITY Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

GRAY DOLOMITE WITH THIN FRACTURES FILLED WITH ANHYDRITE AND GYPSUM



TOTAL 3.3 (FT)

100 %

TOTAL 1.25 (FT)

37 %

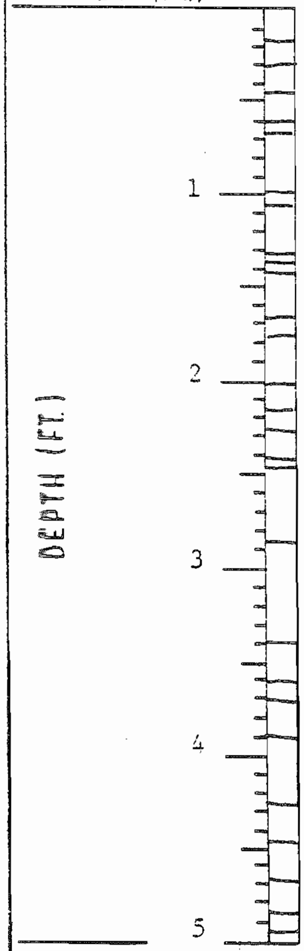
E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10205
LOGGED BY P. Baker	DATE 10-26-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-2	DEPTH 43.3 FT. TO 53.3 FT.
CORE RECOVERY 9.6 FT.	RQD 31 %	CORE QUALITY Poor

CORE RECOVERY (FT.)	.3 FT. CORE RECOVERY	ROCK DESCRIPTION AND IDENTIFICATION
		SIMILAR TO R-1



TOTAL 10.0 (FT)

96 %

TOTAL 3.1 (FT)

31 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

PROJECT NO. 4844-09

PROJECT NAME Love Canal

BORING NO. 10205

LOGGED BY P. Baker

DATE 10-26-85

PROTECTION LEVEL D

CORE DIAMETER NX

CORE RUN NO. R-2

DEPTH 43.3 FT. TO 53.3 FT.

CORE RECOVERY 9.6 FT.

RQD 31 %

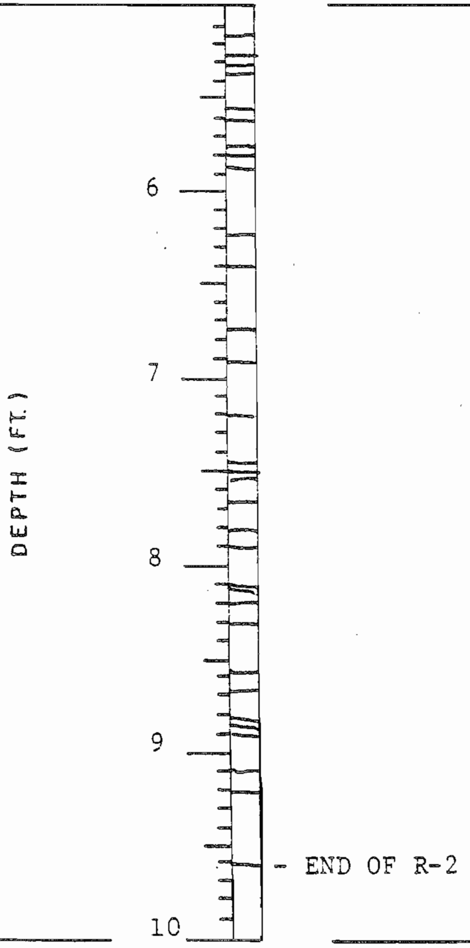
CORE QUALITY Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1



TOTAL 10.0 (FT)

96 %

TOTAL 3.1 (FT)

31 %

EC JORDAN CO

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 1

PROJECT NO. 4844-09

PROJECT NAME Love Canal

BORING NO. 10205

LOGGED BY P. Baker

DATE 10-26-85

PROTECTION LEVEL D

CORE DIAMETER NX

CORE RUN NO. R-3

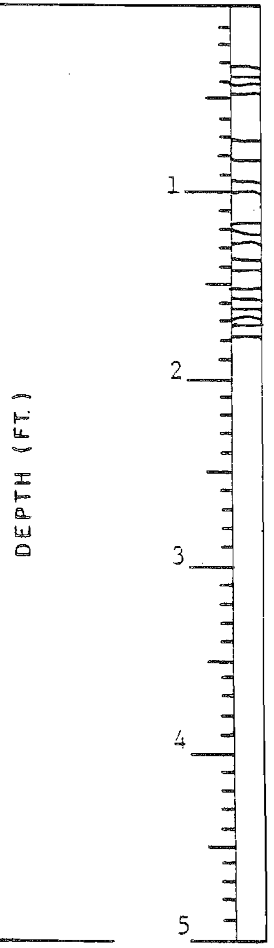
DEPTH 53.3 FT. TO 55.1 FT.

CORE RECOVERY 1.8 FT.

RQD 16 %

CORE QUALITY Very Poor

CORE RECOVERY (FT.)	.3 FT. CORE RECOVERY	ROCK DESCRIPTION AND IDENTIFICATION
		SIMILAR TO R-1



- END OF R-3

TOTAL 1.8 (FT)

100 %

TOTAL 0.3 (FT)

16 %

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 10210

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
PROJECT NO. 4844-09
CONTRACTOR: J. MATHES ASSOC.
DATE STARTED 12/06/85
COMPLETED 12/10/85
METHOD HSA
CASING SIZE 6.25"
HNU 11.7 / (10.2)
PROTECTION LEVEL D
GROUND EL. 577.2'
SOIL DRILLED 38.6'
TOTAL DEPTH 222.3'
▽ BELOW GROUND NA
LOGGED BY J. Snowden
CHECKED BY R. Lewis
DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	ELEV (FT)
	150-200 POSSIBLE MOISTURE	S-1	Y	Y		0.1	BROWN TO BLACK MOTTLED SANDY SILT WITH CLAY AND ORGANIC MATTER, FRACTURED, MOIST, STIFF, PLASTIC, (FILL) 4.5	ML	NO BLOW COUNTS TAKEN USED CONTINUOUS SPLIT SPOON SAMPLER	577.2
5	20-30	S-2	Y	Y		0.1	BROWN SILTY FINE SAND WITH TRACES OF GRAVEL, MOIST, LOOSE, NON-PLASTIC, UNIFORMLY GRADED (ALLUVIAL SAND) 8.5	SP		572.2
10	0-1	S-3	N	N		0-1	REDDISH-BROWN MOTTLED SILTY CLAY VARVED, MOIST, STIFF, FRACTURES SLIGHTLY PLASTIC (LACUSTRINE CLAY) 14.0	CL		567.2
15	0-1	S-4	N	N		0-1	REDDISH-GRAY SILTY CLAY, WET, SOFT, PLASTIC			562.2
20	0-1	S-5	N	N		0-1	(LACUSTRINE CLAY)	CL		557.2
25	0-1	S-6	N	N		0-1	BROWN SILTY SAND WITH GRAVEL, MOIST, DENSE, SLIGHTLY PLASTIC, WIDELY GRADED (GLACIAL TILL) 30.5	SM ML		552.2
30		S-7								547.2
35									RQD% 20 40 60 80	542.2
40		R-1					GRAY DOLOMITE		▨	537.2

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT LONG TERM MONITORING

TASK VC

BORING NO. 10210

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-09

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 12/06/85

COMPLETED 12/10/85

METHOD Nx CORE

CASING SIZE 3.0"

HNU 11.7/(10.2)

PROTECTION LEVEL D

GROUND EL. 577.2'

SOIL DRILLED 38.6'

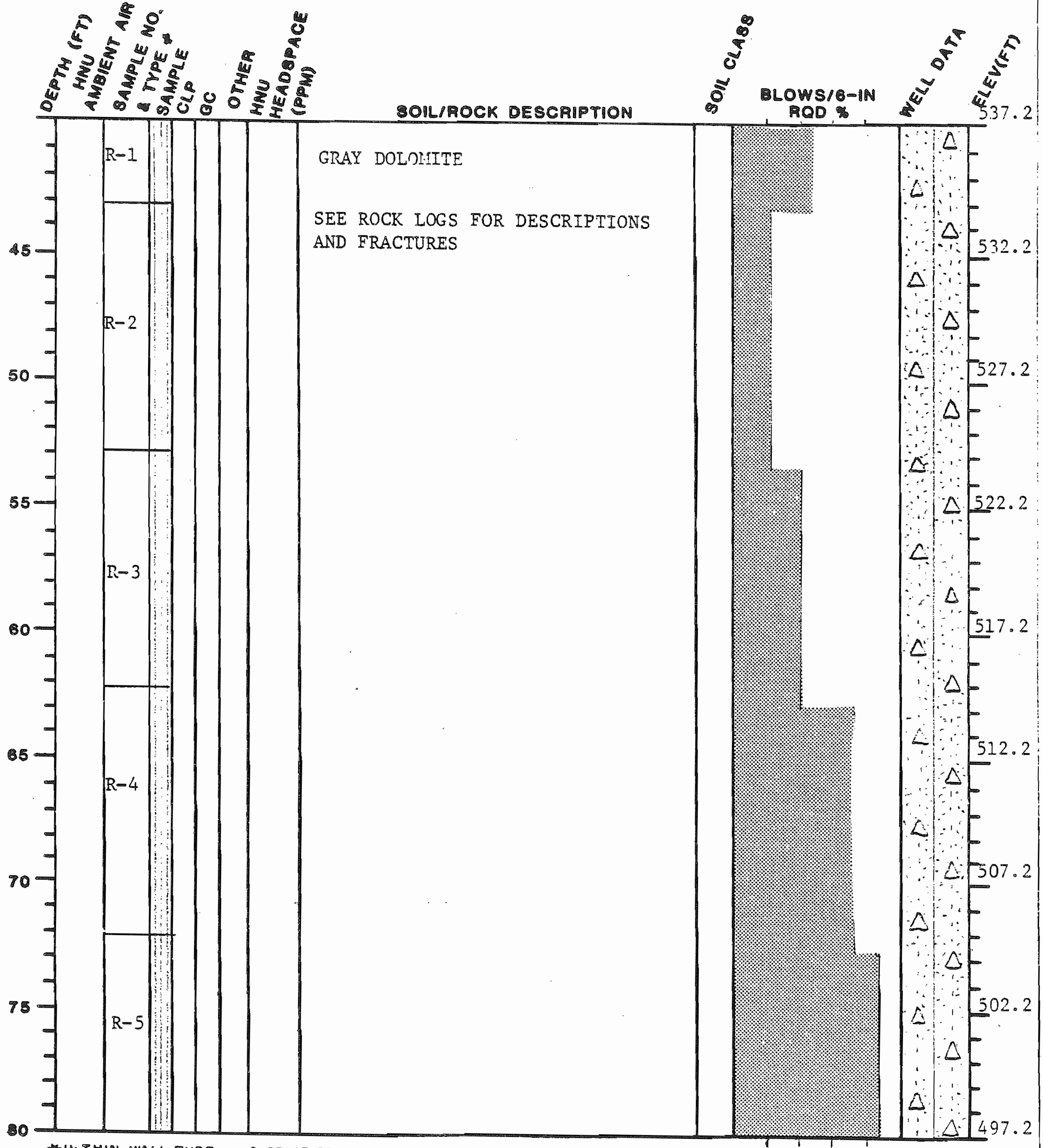
TOTAL DEPTH 222.3'

▽ BELOW GROUND

LOGGED BY J. Snowden

CHECKED BY R. Lewis

DATE 3/24/86



GRAY DOLOMITE

SEE ROCK LOGS FOR DESCRIPTIONS AND FRACTURES

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C. JORDAN CO.

OVE CANAL REMEDIAL PROJECT
ONG TERM MONITORING

TASK VC

BORING NO. 10210

ENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-09

NTRACTOR: J. MATHES ASSOC.

DATE STARTED 12/06/85

COMPLETED 12/10/85

ETHOD Nx CORE

CASING SIZE 3.0"

HNU 11.7 (10.2)

PROTECTION LEVEL D

OUND EL. 577.2'

SOIL DRILLED 38.6'

TOTAL DEPTH 222.3'

▽ BELOW GROUND

OGGED BY J. Snowden

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
		R-5									497.2
							GRAY DOLOMITE				
85		R-6									492.2
90		R-7									487.2
95											482.2
		R-8									
100											477.2
105											472.2
		R-9									
110											467.2
115											462.2
		R-10									
120											457.2

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

OVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 10210

IENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-09

ONTRACTOR: J. MATHES ASSOC.

DATE STARTED 12/06/85

COMPLETED 12/10/85

METHOD Nx CORE

CASING SIZE 3.0"

HNU 11.7/10.2

PROTECTION LEVEL D

OUND EL. 577.2 '

SOIL DRILLED 38.6 '

TOTAL DEPTH 222.3 '

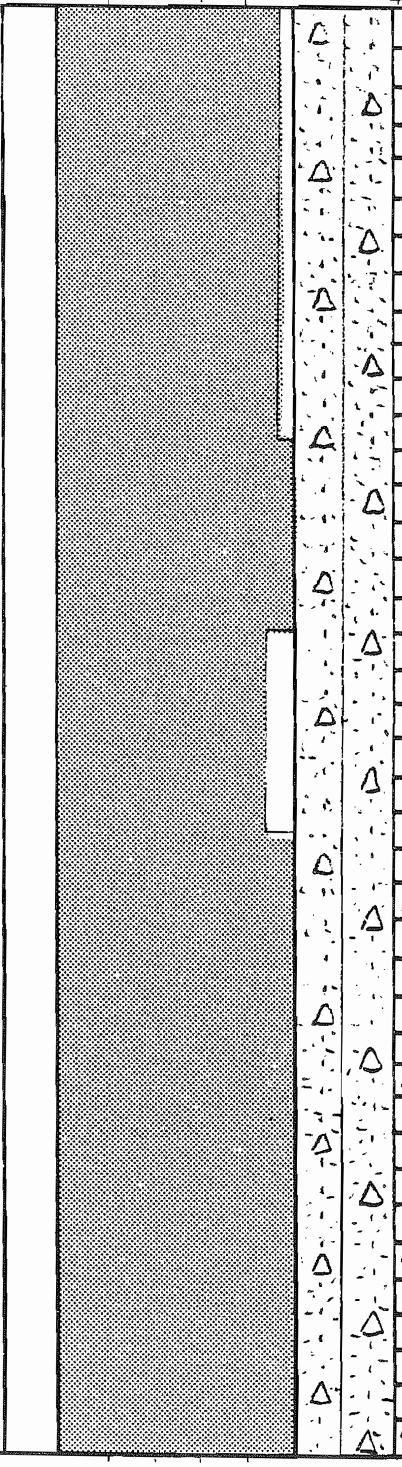
▽ BELOW GROUND

LOGGED BY J. Snowden

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE * SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
		R-10					GRAY DOLOMITE				457.2
125		R-11									452.2
130											447.2
135		R-12									442.2
140		R-13									437.2
145		R-14									432.2
150											427.2
155		R-15									422.2
160											417.2



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT
ONG TERM MONITORING

TASK VC

BORING NO. 10210

IENT NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-09

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 12/06/85

COMPLETED 12/10/85

METHOD Nx CORE

CASING SIZE 3.0"

HNU 11.7/10.2

PROTECTION LEVEL D

OUND EL. 577.2

SOIL DRILLED

TOTAL DEPTH

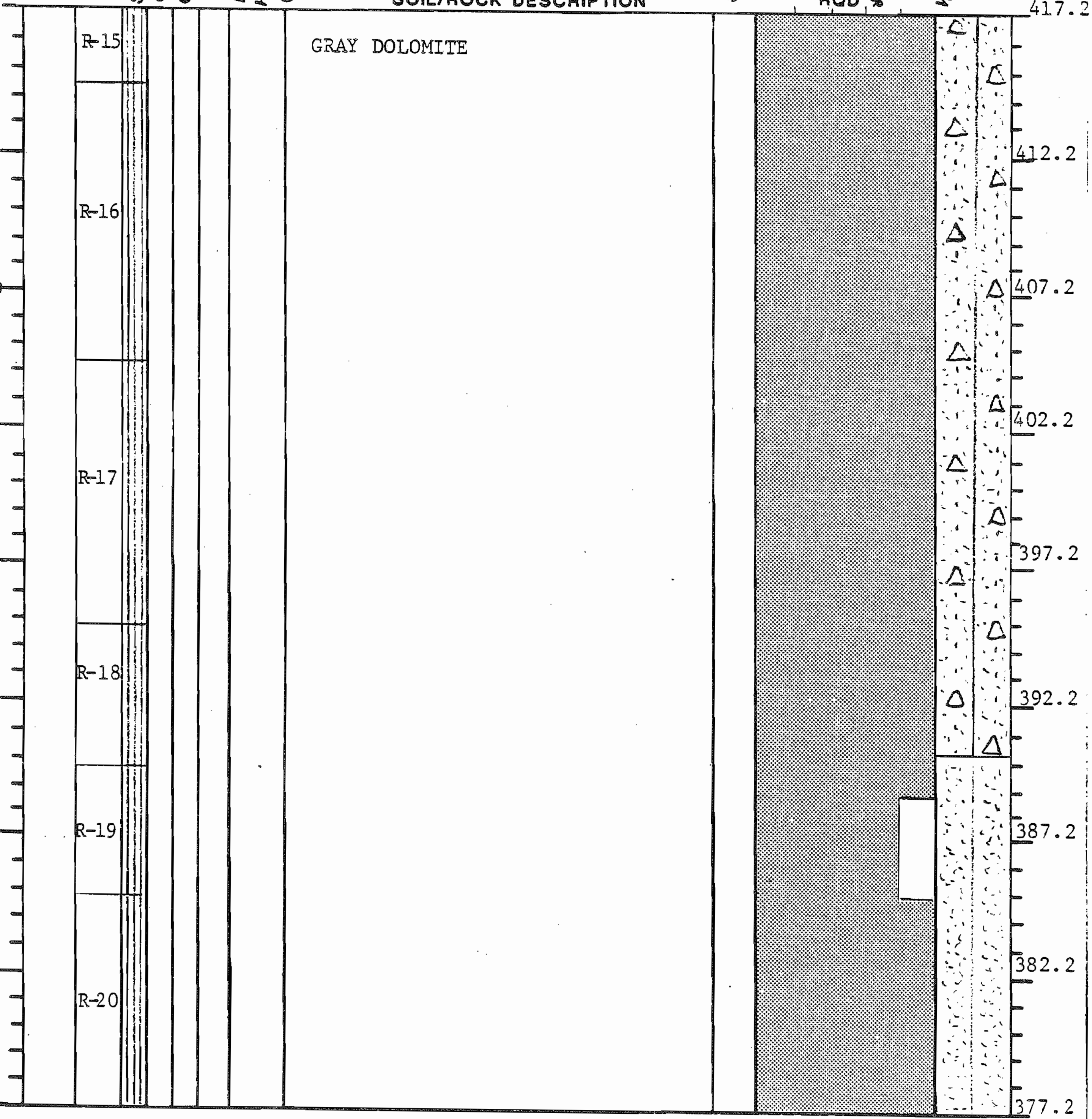
BELOW GROUND

LOGGED BY J. Snowden

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
		R-15						GRAY DOLOMITE				417.2



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
ONG TERM MONITORING

TASK VC

BORING NO. 10210

IENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-09

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 12/06/85

COMPLETED 12/10/85

THOD Nx CORE

CASING SIZE 3.0"

HNU 11.7 (10.2)

PROTECTION LEVEL

OUND EL. 577.2'

SOIL DRILLED 38.6'

TOTAL DEPTH 222.3'

▽ BELOW GROUND

LOGGED BY J. Snowden

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
		R-20					GRAY DOLOMITE				377.2
205		R-21									372.2
210											367.2
							GRAY SHALE				
215											362.2
		R-22									
220											357.2
							BOTTOM OF BORING AT 222.3 FEET				
225											352.2
230											347.2
235											342.2
240											337.2

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

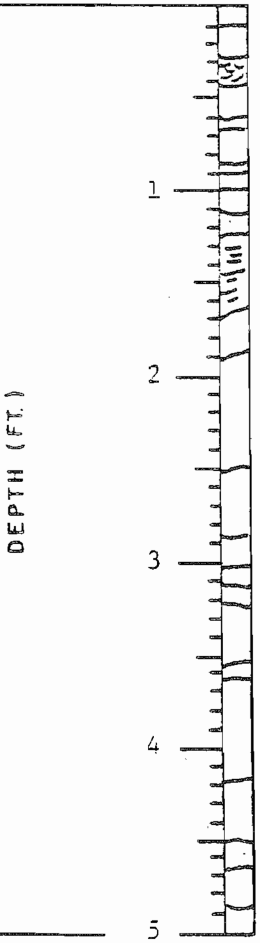
VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

PROJECT NO. 4844-08	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY M. Muzzy	DATE 11-24-85	PROTECTION LEVEL Mod. D

CORE DIAMETER NX	CORE RUN NO. R-1	DEPTH 37.6 FT. TO 43.2 FT.
CORE RECOVERY 5.5 FT.	RQD 48 %	CORE QUALITY Poor

CORE RECOVERY (FT.)	.3 FT. CORE RECOVERY	ROCK DESCRIPTION AND IDENTIFICATION
		DARK GRAY DOLOMITE WITH GYPSUM SEAMS AND CORAL VUGS



TOTAL 5.6 (FT) TOTAL 2.6 (FT)

98 % 48 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

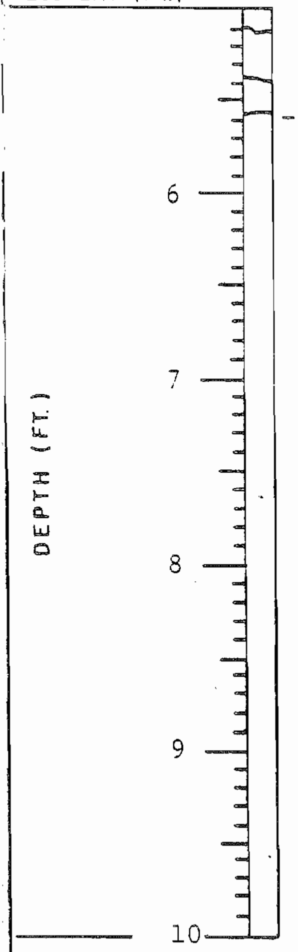
SHEET 2 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY M. Muzzy	DATE 11-24-85	PROTECTION LEVEL Mod. D

CORE DIAMETER NX	CORE RUN NO. R-1	DEPTH 37.6 FT. TO 43.2 FT.
CORE RECOVERY 5.5 FT.	RQD 48 %	CORE QUALITY Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY



ROCK DESCRIPTION AND IDENTIFICATION

DARK GRAY DOLOMITE WITH
GYPSUM AND CORAL VUGS

TOTAL 5.6 (FT)

98 %

TOTAL 2.6 (FT)

48 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

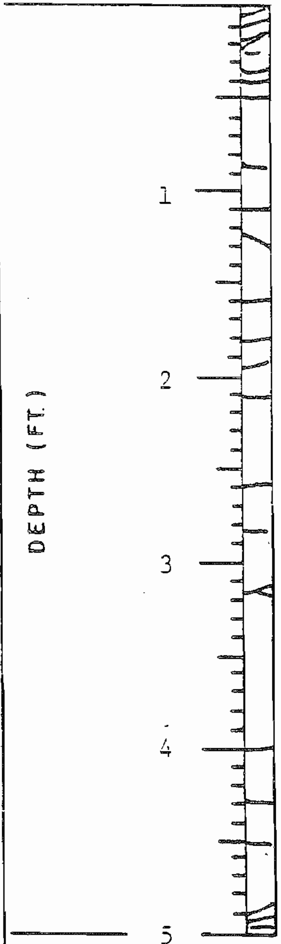
PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY M. Muzzy	DATE 11-24-85	PROTECTION LEVEL Mod. D

CORE DIAMETER NX	CORE RUN NO. R-2	DEPTH 43.2 FT. TO 53.0 FT.
CORE RECOVERY 10.0 FT.	RQD 23 %	CORE QUALITY Very Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION



THINLY BEDDED - PRIMARILY HORIZONTAL

- FRACTURES HEALED WITH GYPSUM

TOTAL 9.8 (FT) TOTAL 2.3 (FT)

+100 % 23 %

DARK GRAY TO GRAY - COARSE GRAINED
DIRTY DOLOMITE
GYPSUM ALONG HEALED FRACTURES
SIMILAR TO R-1

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

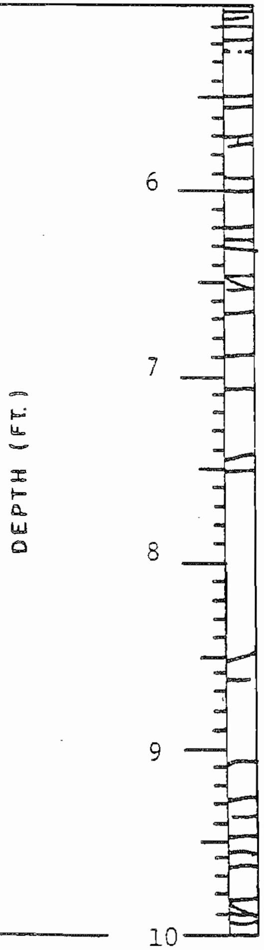
PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY C. White	DATE 11-25-85	PROTECTION LEVEL Mod. D
CORE DIAMETER NX	CORE RUN NO. R-2	DEPTH 43.2 FT. TO 53.0 FT.
CORE RECOVERY 10.0 FT.	RQD 23 %	CORE QUALITY Very Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1



- FRACTURE WITH CALCITE OR GYPSUM

- LOOKS MORE COMPETENT
BREAKING ALONG HEALED FRACTURES

- HIGHLY WX - HEALED FRACTURES
GYPSUM SEAMS

- END OF R-2

TOTAL 9.8 (FT) TOTAL 2.3 (FT)

+100 % 23 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

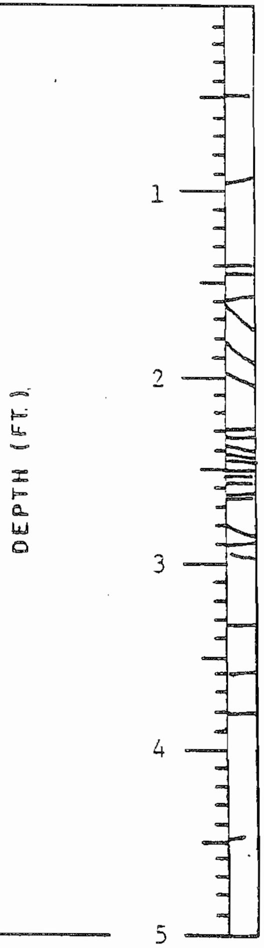
PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY C. White	DATE 11-24-85	PROTECTION LEVEL Mod. D

CORE DIAMETER NX	CORE RUN NO. R-3	DEPTH 53.0 FT. TO 62.3 FT.
CORE RECOVERY 10.0 FT.	RQD 40 %	CORE QUALITY Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION



- HORIZONTAL PARTINGS ALONG LAYERING
- HIGHLY FRACTURED
- GYPSUM FILLING IN CRACKS

SIMILAR TO R-1

TOTAL 9.3 (FT)

+100 %

TOTAL 4.0 (FT)

40 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY C. White	DATE 11-24-85	PROTECTION LEVEL Mod. D

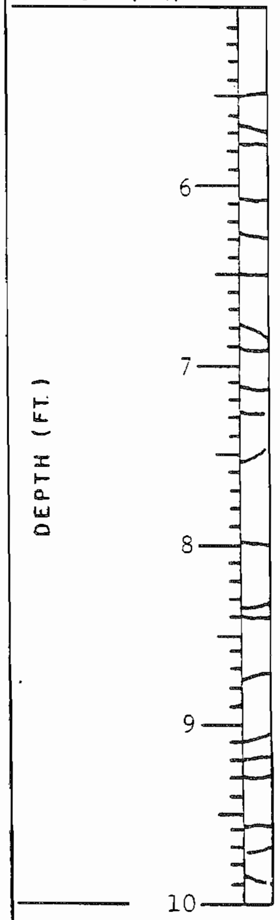
CORE DIAMETER NX	CORE RUN NO. R-3	DEPTH 53.0 FT. TO 62.3 FT.
CORE RECOVERY 10.0 FT.	RQD 40 %	CORE QUALITY Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

DARK GRAY DOLOMITE
THINLY LAMINATED
VERY SHALEY LOOKING



END OF R-3

TOTAL 9.3 (FT)

+100 %

TOTAL 4.0 (FT)

40 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

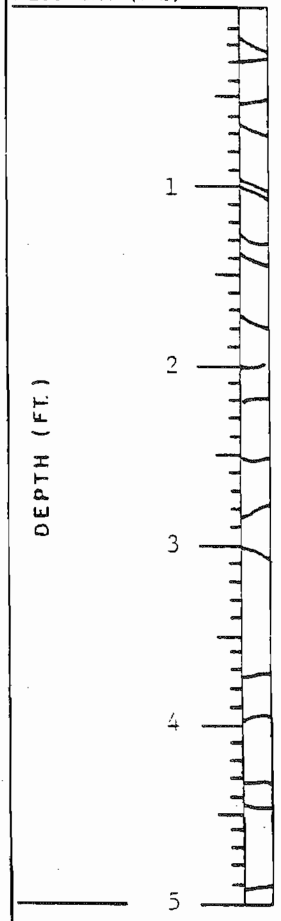
PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY C. White	DATE 11-24-85	PROTECTION LEVEL Mod. D
CORE DIAMETER NX	CORE RUN NO. R-4	DEPTH 62.3 FT. TO 72.3 FT.
CORE RECOVERY 10.0 FT.	RQD 70 %	CORE QUALITY Fair

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

DARK GRAY MEDIUM-GRAINED DOLOMITE



- GYPSUM AND CALCITE FILLING IN FRACTURES

- ROCK BECOMES MORE COMPETENT WITH DEPTH

TOTAL 10.0 (FT)

100 %

TOTAL 7.0 (FT)

70 %

ECJORDANCO

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

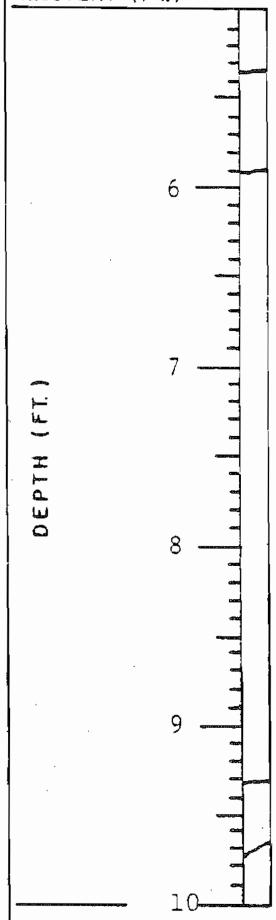
PROJECT NO. 4844-09
PROJECT NAME Love Canal
BORING NO. 10210
LOGGED BY C. White
DATE 11-25-85
PROTECTION LEVEL Mod. D
CORE DIAMETER NX
CORE RUN NO. R-4
DEPTH 62.3 FT. TO 72.3 FT.
CORE RECOVERY 10.0 FT.
RQD 70 %
CORE QUALITY Fair

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

DARK GRAY DOLOMITE WITH
GYPSUM FILLING IN FRACTURES



- DISTORTED LAYERING; HEALED FRACTURES

- END OF R-4

TOTAL 10 (FT) 100 %

TOTAL 7.05 (FT) 70 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

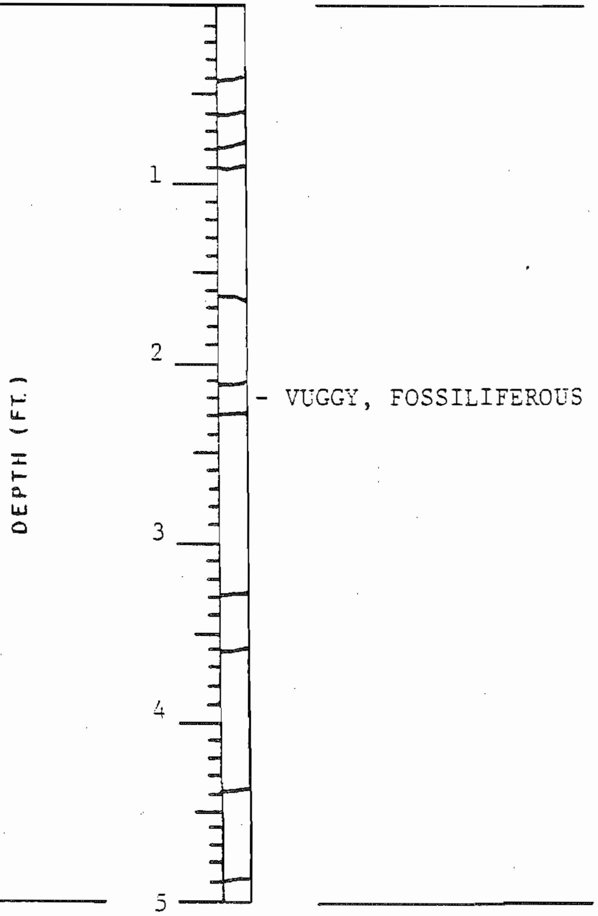
PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY C. White	DATE 11-25-85	PROTECTION LEVEL Mod. D
CORE DIAMETER NX	CORE RUN NO. R-5	DEPTH 72.3 FT. TO 82.3 FT.
CORE RECOVERY 10.0 FT.	RQD 86 %	CORE QUALITY Good

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

DARK GRAY SHALEY DOLOMITE
HORIZONTAL SHALEY LAYERING



TOTAL 10.0 (FT)

100 %

TOTAL 8.6 (FT)

86 %

EC JORDAN CO

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

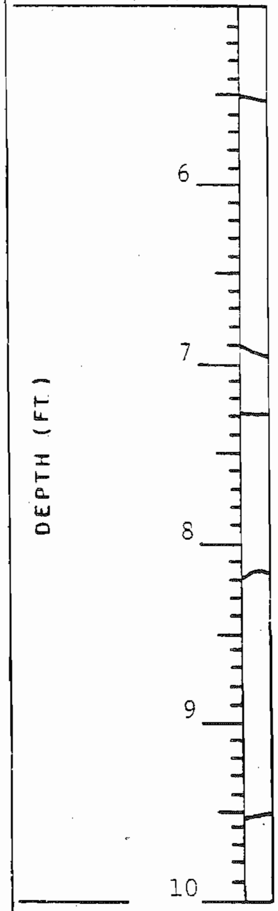
PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY C. White	DATE 11-25-85	PROTECTION LEVEL Mod. D
CORE DIAMETER NX	CORE RUN NO. R-5	DEPTH 72.3 FT. TO 82.3 FT.
CORE RECOVERY 10.0 FT.	RQD 86 %	CORE QUALITY Good

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

DARK GRAY DOLOMITE WITH
GYPSUM AND CORAL VUGS



- VUGGY

- VUGGY - MORE COMPETENT
SHALEY LAYERING - SLIGHTLY DISTORTED

- END OF R-5

TOTAL 10.0 (FT) TOTAL 8.6 (FT)

100 % 86 %

ECJORDANCO

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY C. White	DATE 11-25-86	PROTECTION LEVEL Mod. D
CORE DIAMETER NX	CORE RUN NO. R-6	DEPTH 82.3 FT. TO 87.3 FT.
CORE RECOVERY 5.0 FT.	RQD NA %	CORE QUALITY NA

CORE RECOVERY (FT.)	DEPTH (FT.)	.3 FT. CORE RECOVERY	ROCK DESCRIPTION AND IDENTIFICATION
			DARK GRAY DOLOMITE WITH GYPSUM AND CORAL VUGS
	1		
	2		
	3		
	4		
	5		

TOTAL 5.0 (FT)

100 %

TOTAL NA ( )

NA %

E.C.JORDAN CO.

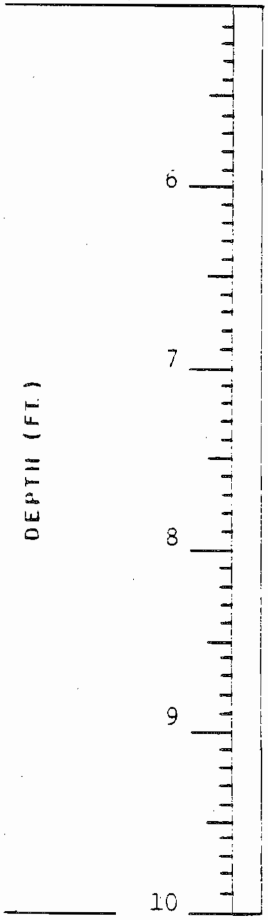
VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY C. White	DATE 11-26-85	PROTECTION LEVEL Mod. D

CORE DIAMETER NX	CORE RUN NO. R-7	DEPTH 87.3 FT. TO 92.3 FT.
CORE RECOVERY 4.9 FT.	RQD NA %	CORE QUALITY NA

CORE RECOVERY (FT.)



.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

DARK GRAY DOLOMITE WITH
GYPSUM AND CORAL VUGS

TOTAL 4.9 (FT)

98 %

TOTAL NA ( )

NA %

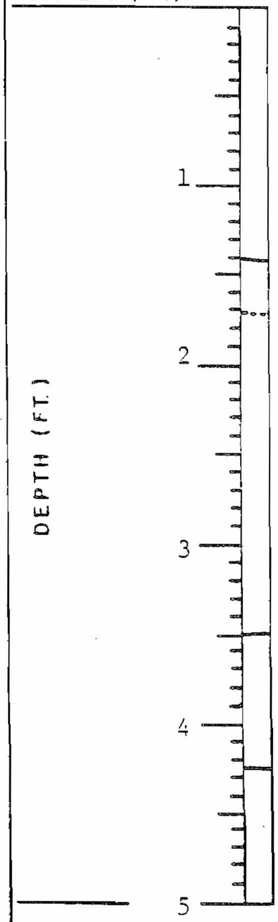
E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY C. White	DATE 11-26-85	PROTECTION LEVEL Mod. D
CORE DIAMETER NX	CORE RUN NO. R-8	DEPTH 92.3 FT. TO 102.2 FT.
CORE RECOVERY 9.9 FT.	RQD 94 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)



.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

GRAY DOLOMITE

TOTAL 10.0 (FT) 99 %

TOTAL 9.3 (FT) 94 %

EC.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

PROJECT NO. 4844-09

PROJECT NAME Love Canal

BORING NO. 10210

LOGGED BY C. White

DATE 11-26-85

PROTECTION LEVEL Mod. D

CORE DIAMETER NX

CORE RUN NO. R-8

DEPTH 92.3 FT. TO 102.2 FT.

CORE RECOVERY 9.9 FT.

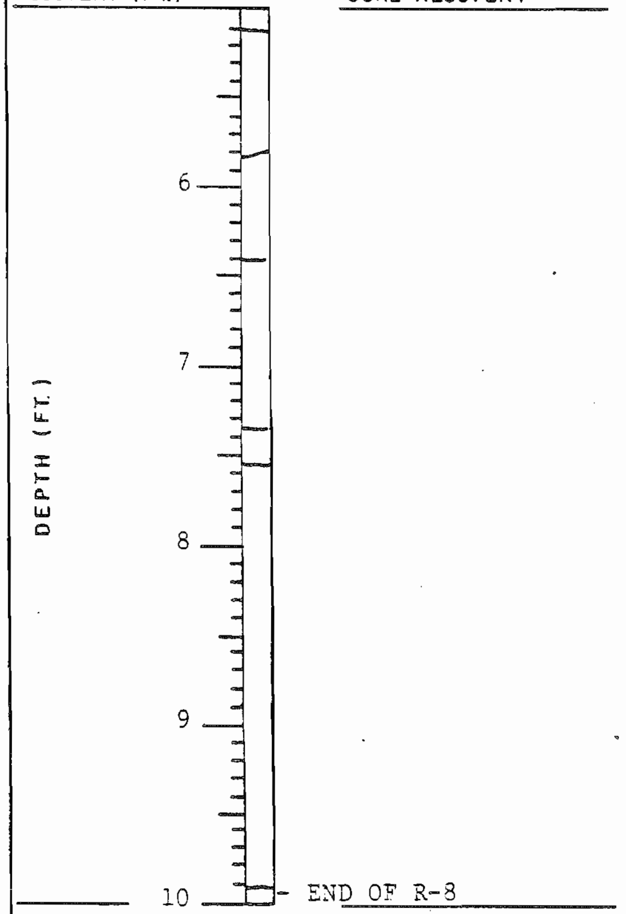
RQD 94 %

CORE QUALITY Excellent

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION



GRAY DOLOMITE

TOTAL 10.0 (FT) TOTAL 9.3 (FT)

99 % 94 %

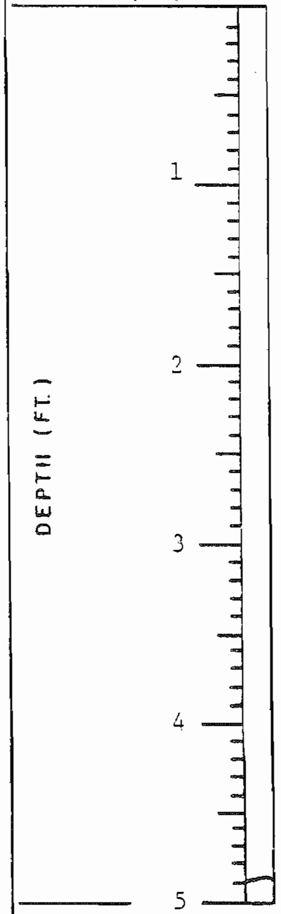
ECJORDANCO

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 1

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY C. White	DATE 11-26-85	PROTECTION LEVEL Mod. D
CORE DIAMETER NX	CORE RUN NO. R-9	DEPTH 102.3 FT. TO 112.3 FT.
CORE RECOVERY 10.1 FT.	RQD 93 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)



.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

GRAY DOLOMITE

TOTAL 10.0 (FT)

101 %

TOTAL 9.4 (FT)

93 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

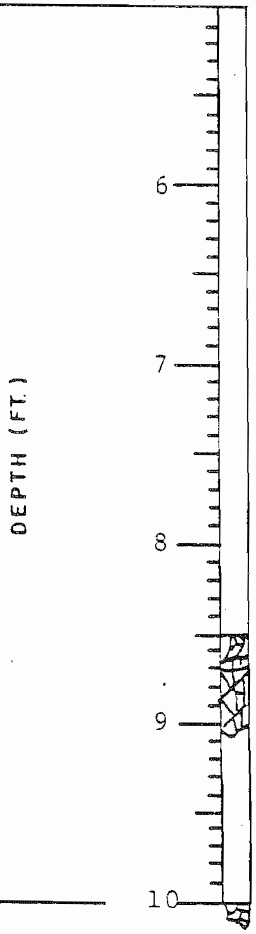
PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY C. White	DATE 11-26-85	PROTECTION LEVEL Mod. D
CORE DIAMETER NX	CORE RUN NO. R-9	DEPTH 102.3 FT. TO 112.3 FT.
CORE RECOVERY 10.1 FT.	RQD 93 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

GRAY DOLOMITE



- END OF R-9

TOTAL 10.0 (FT) TOTAL 9.4 (FT)

101 % 93 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

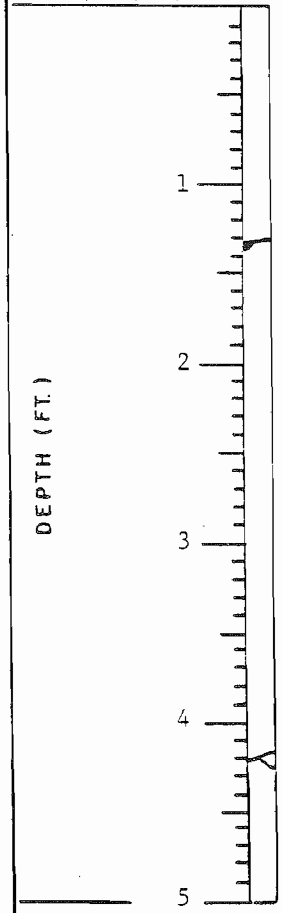
PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY C. White	DATE 11-26-85	PROTECTION LEVEL Mod. D
CORE DIAMETER NX	CORE RUN NO. R-10	DEPTH 112.3 FT. TO 122.3 FT.
CORE RECOVERY 10.0 FT.	RQD 93 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

GRAY DOLOMITE



TOTAL 10.0 (FT)

100 %

TOTAL 9.3 (FT)

93 %

ECJORDANCO

VISUAL IDENTIFICATION OF ROCK CORES

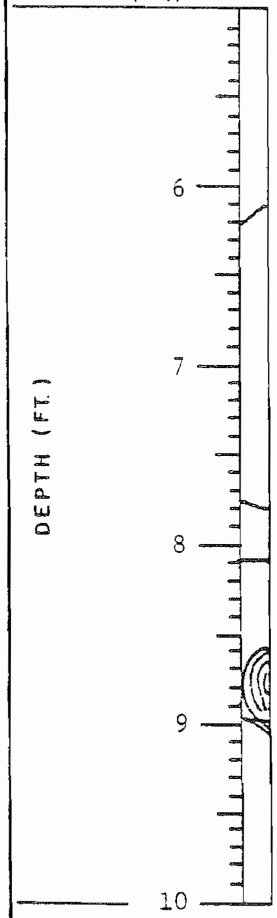
SHEET 2 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY C. White	DATE 11-26-85	PROTECTION LEVEL Mod. D
CORE DIAMETER NX	CORE RUN NO. R-10	DEPTH 112.3 FT. TO 122.3 FT.
CORE RECOVERY 10.0 FT.	RQD 93 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION



END OF R-10

TOTAL 10.0 (FT) TOTAL 9.3 (FT)

100 % 93 %

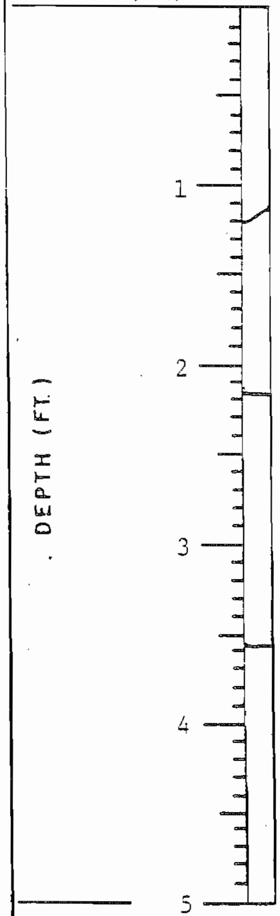
E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY C. White	DATE 11-26-85	PROTECTION LEVEL Mod. D
CORE DIAMETER NX	CORE RUN NO. R-11	DEPTH 122.3FT. TO 132.3FT.
CORE RECOVERY 10.0 FT.	RQD 94 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)



.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

GRAY DOLOMITE

TOTAL 10.0 (FT)

100 %

TOTAL 9.4 (FT)

94 %

ECJORDANCO

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

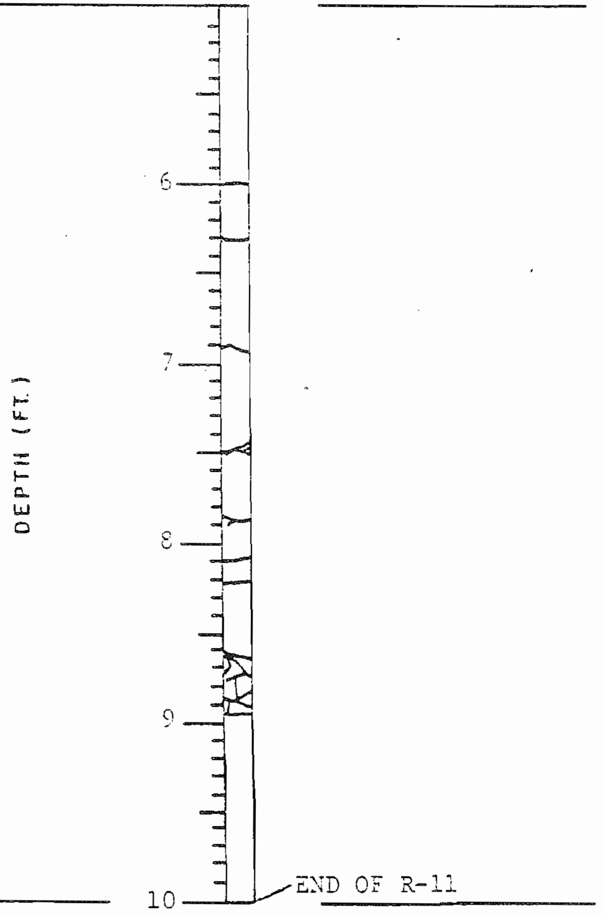
PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY C. White	DATE 11-26-85	PROTECTION LEVEL Mod. D
CORE DIAMETER NX	CORE RUN NO. R-11	DEPTH 122.3 FT. TO 132.3 FT.
CORE RECOVERY 10.0 FT.	RQD 94 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

GRAY DOLOMITE



TOTAL 10.0 (FT) 100 %

TOTAL 9.4 (FT) 94 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 1

PROJECT NO. 4844-09

PROJECT NAME Love Canal

BORING NO. 10210

LOGGED BY C. White

DATE 11-26-85

PROTECTION LEVEL Mod. D

CORE DIAMETER NX

CORE RUN NO. R-12

DEPTH 132.3 FT. TO 137.3 FT.

CORE RECOVERY 5.0 FT.

RQD 100 %

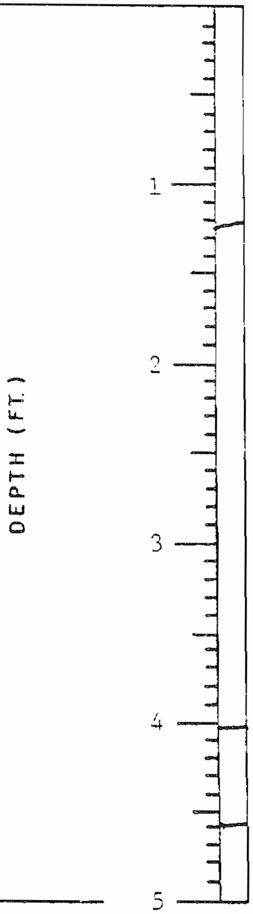
CORE QUALITY Excellent

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

GRAY DOLOMITE



- END OF R-12

TOTAL 5.0 (FT)

100 %

TOTAL 5.0 (FT)

100 %

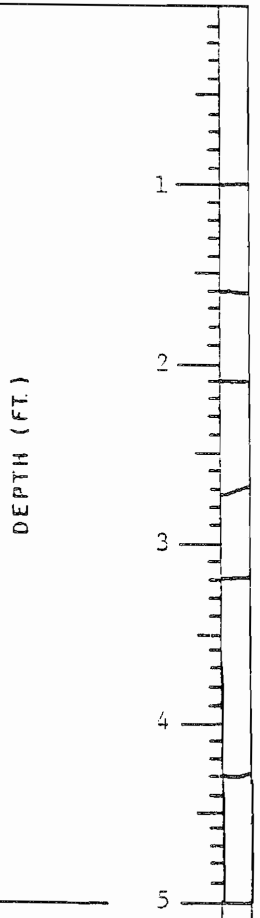
E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 1

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY C. White	DATE 11-26-85	PROTECTION LEVEL Mod. D
CORE DIAMETER 1.875"	CORE RUN NO. R-13	DEPTH 137.3 FT. TO 142.9 FT.
CORE RECOVERY 5.6 FT.	RQD 87 %	CORE QUALITY Good

CORE RECOVERY (FT.)	.3 FT. CORE RECOVERY	ROCK DESCRIPTION AND IDENTIFICATION
		GRAY DOLOMITE



TOTAL 5.6FT( )

100 %

TOTAL 5.0 (FT)

87 %

END OF R-13

ECJORDANCO

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

PROJECT NO. 4344-09

PROJECT NAME Love Canal

BORING NO. 10210

LOGGED BY C. White

DATE 11-26-85

PROTECTION LEVEL Mod. D

CORE DIAMETER 1.875"

CORE RUN NO. R-14

DEPTH 142.9 FT. TO 152.8 FT.

CORE RECOVERY 9.9 FT.

RQD 98 %

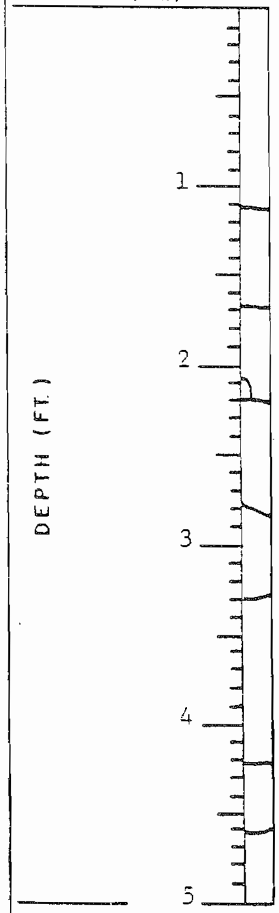
CORE QUALITY Excellent

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

GRAY DOLOMITE



TOTAL 10.0 (FT) 99 %

TOTAL 9.7 (FT) 98 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY C. White	DATE 11-26-85	PROTECTION LEVEL Mod. D

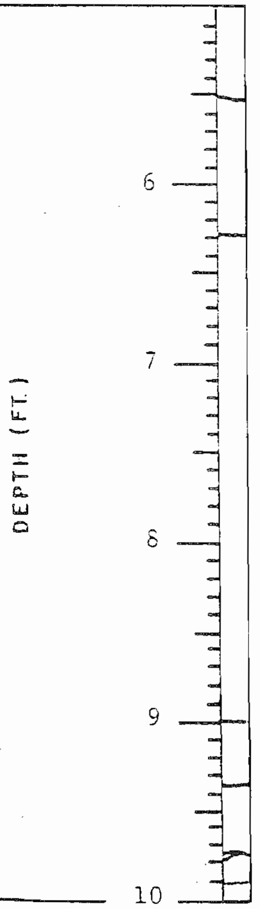
CORE DIAMETER 1.875"	CORE RUN NO. R-14	DEPTH 142.9 FT. TO 152.8 FT.
CORE RECOVERY 9.9 FT.	RQD 98 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

GRAY DOLOMITE



- END OF R-14

TOTAL 10 (FT) TOTAL 9.8 (FT)

99 % 98 %

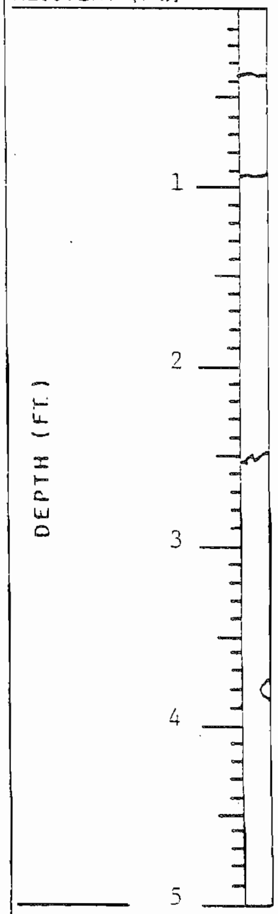
ECJORDANCO

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY M. Muzzy	DATE 11-26-85	PROTECTION LEVEL Mod. D
CORE DIAMETER NX	CORE RUN NO. R-15	DEPTH 152.8 FT. TO 162.8 FT.
CORE RECOVERY 10.0 FT.	RQD 100 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)	.3 FT. CORE RECOVERY	ROCK DESCRIPTION AND IDENTIFICATION
		GRAY DOLOMITE



- GYPSUM CRYSTALS

- QUARTZITE

TOTAL 10 (FT) TOTAL 9.8 (FT)

100 % 100 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY M. Muzzy	DATE 11-26-85	PROTECTION LEVEL Mod. D

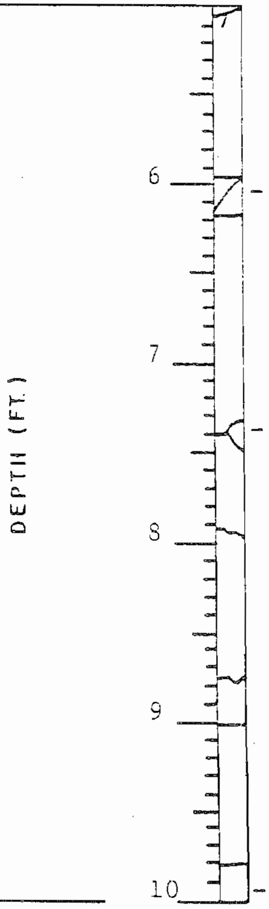
CORE DIAMETER NX	CORE RUN NO. R-15	DEPTH 152.8 FT. TO 162.8 FT.
CORE RECOVERY 10 FT.	RQD 100 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

GRAY DOLOMITE



- MORE COARSE GRAINE
LIGHTER COLOR
GYPSUM CRYSTALS

- MORE COARSE GRAINED
LIGHTER COLOR

- END OF R-15

TOTAL 10.0 (FT)

100 %

TOTAL 9.8 (FT)

100 %

ECJORDANCO

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY M. Muzzy	DATE 11-27-85	PROTECTION LEVEL Mod. D

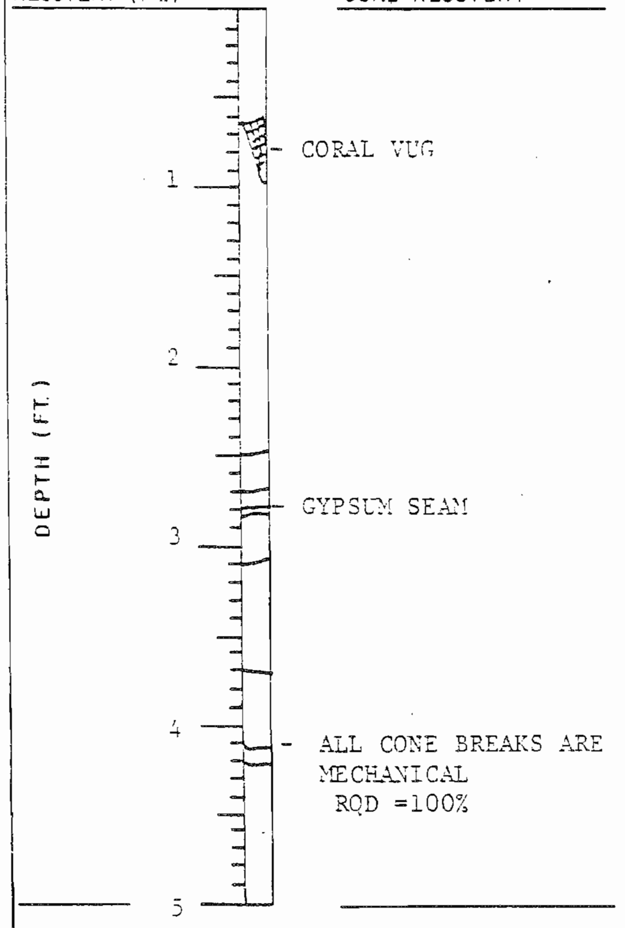
CORE DIAMETER NX	CORE RUN NO. R-16	DEPTH 162.8 FT. TO 172.8 FT.
CORE RECOVERY 10 FT.	RQD 100 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

DOLOMITE



TOTAL 10.0 (FT) TOTAL 10.2 (FT)

100 % 100 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

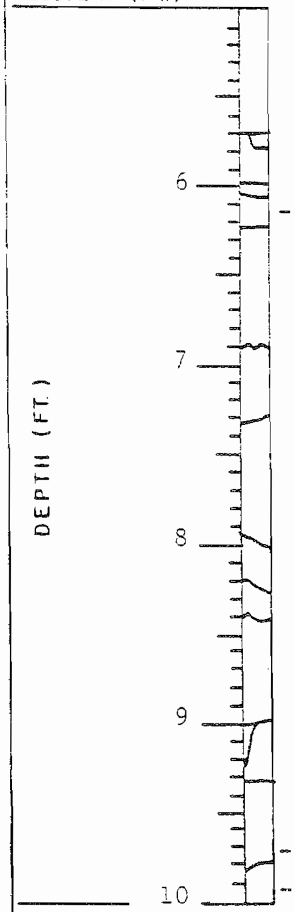
PROJECT NO. 4844-09	PROJECT NAME Love Canal		BORING NO. 10210
LOGGED BY M. Muzzy	DATE 11-29-85		PROTECTION LEVEL Mod. D
CORE DIAMETER NX	CORE RUN NO. R-16	DEPTH 162.8 FT. TO 172.8 FT.	
CORE RECOVERY 10.0 FT.	RQD 100 %	CORE QUALITY Excellent	

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

DARK GRAY DOLOMITE



- OPEN JOINT FULL OF 1/8" CRYSTALS

- MASSIVE GYPSUM CRYSTALS

- END OF R-16

TOTAL 10.0 (FT) TOTAL 10.2 (FT)

100 % 100 %

E.C.JORDAN CO.

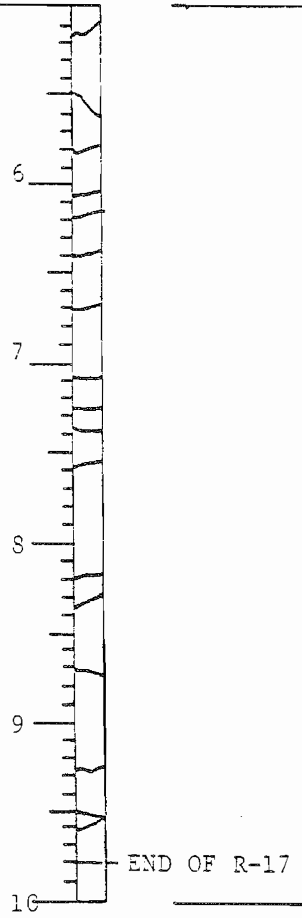
VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY M. Muzzy	DATE 11-24-85	PROTECTION LEVEL Mod. D
CORE DIAMETER NX	CORE RUN NO. R-17	DEPTH 172.8 FT. TO 182.6 FT.
CORE RECOVERY 9.8 FT.	RQD 100 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)	.3 FT. CORE RECOVERY	ROCK DESCRIPTION AND IDENTIFICATION
		DOLOMITE WITH GYPSUM SEAMS

DEPTH (FT.)



TOTAL 9.8 (FT) TOTAL 9.8 (FT)

100 % 100 %

ECJORDANCO

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

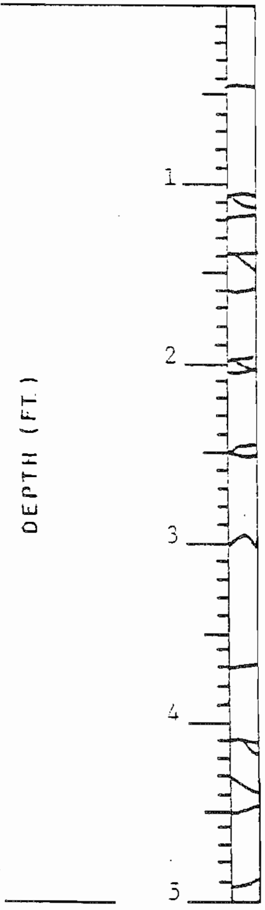
PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY M. Muzzy	DATE 11-27-85	PROTECTION LEVEL Mod. D
CORE DIAMETER NX	CORE RUN NO. R-17	DEPTH 172.8 FT. TO 182.6 FT.
CORE RECOVERY 9.8 FT.	RQD 100 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

DARK GRAY DOLOMITE WITH
GYPSUM SEAMS



- ALL BREAKS ARE
MECHANICAL
RQD = 100%

- HEALED WITH GYPSUM

TOTAL 9.8 (FT) TOTAL 9.8 (FT)

100 % 100 %

ECJORDANCO

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 1

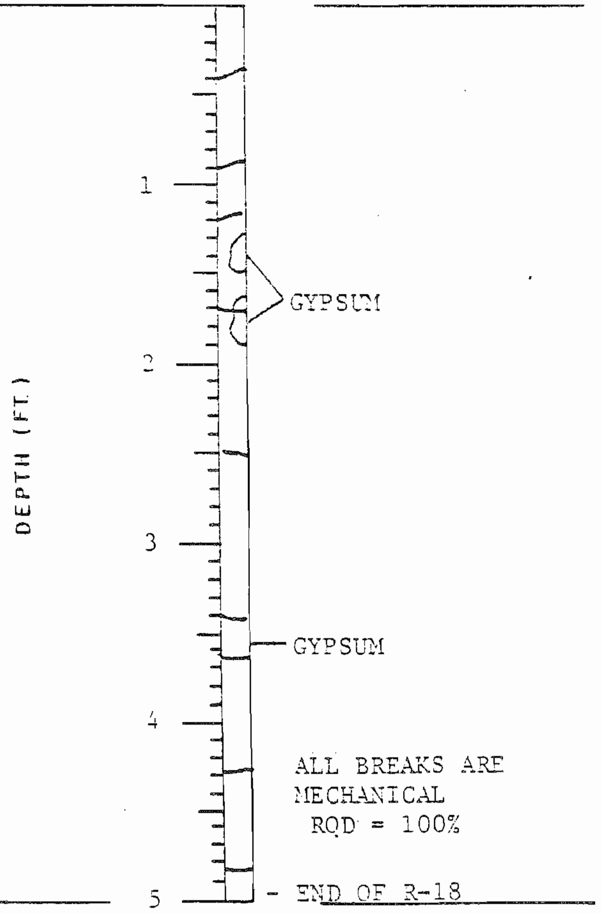
PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY M. Muzzy	DATE 11-27-85	PROTECTION LEVEL Mod. D
CORE DIAMETER NX	CORE RUN NO. R-18	DEPTH 182.6 FT. TO 187.6 FT.
CORE RECOVERY 5.0 FT.	RQD 100 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

DOLOMITE WITH GYPSUM SEAMS



TOTAL 5.0 (FT)

100 %

TOTAL 5.0 (FT)

100 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 1

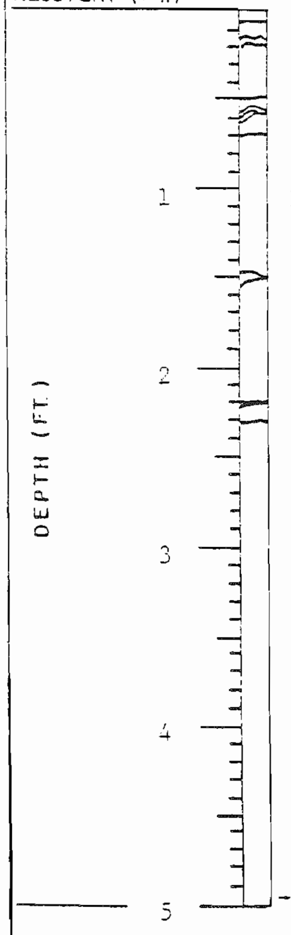
PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY J. Snowden	DATE 12-4-85	PROTECTION LEVEL D
CORE DIAMETER 2"	CORE RUN NO. R-19	DEPTH 137.2 FT. TO 192.6 FT.
CORE RECOVERY 5.2 FT.	RQD 80 %	CORE QUALITY Good

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

- DARK GRAY DOLOMITE
- FRACTURES FILLED WITH GYPSUM



LIGHTER COLOR

VUGGY, FOSSILIFEROUS

LARGE FRACTURE AT BOTTOM OF CORE

- END OF R-19

TOTAL 5.4 (FT) TOTAL 4.2 (FT)

96 % 80 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

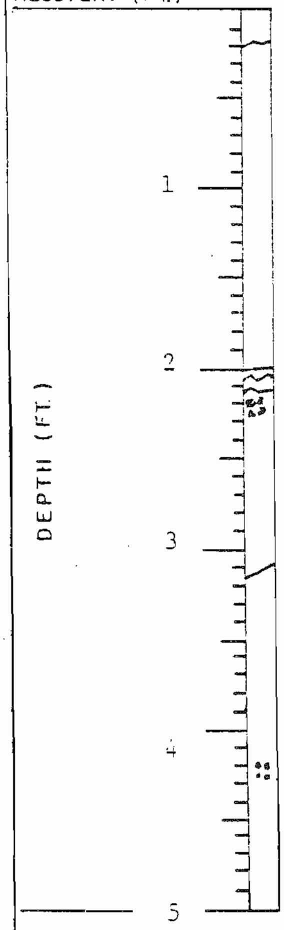
SHEET 1 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal		BORING NO. 10210
LOGGED BY J. Snowden	DATE 12-4-85		PROTECTION LEVEL D
CORE DIAMETER 2"	CORE RUN NO. R-20	DEPTH 192.6 FT. TO 202.4 FT.	
CORE RECOVERY 9.8 FT.	RQD 98 %	CORE QUALITY Good	

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION



GYPSUM LAYER
VUGGY

LIGHT GRAY DOLOMITE WITH
THIN GYPSUM LAYERS

TOTAL 9.8 (FT)

100 %

TOTAL 9.8 (FT)

98 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

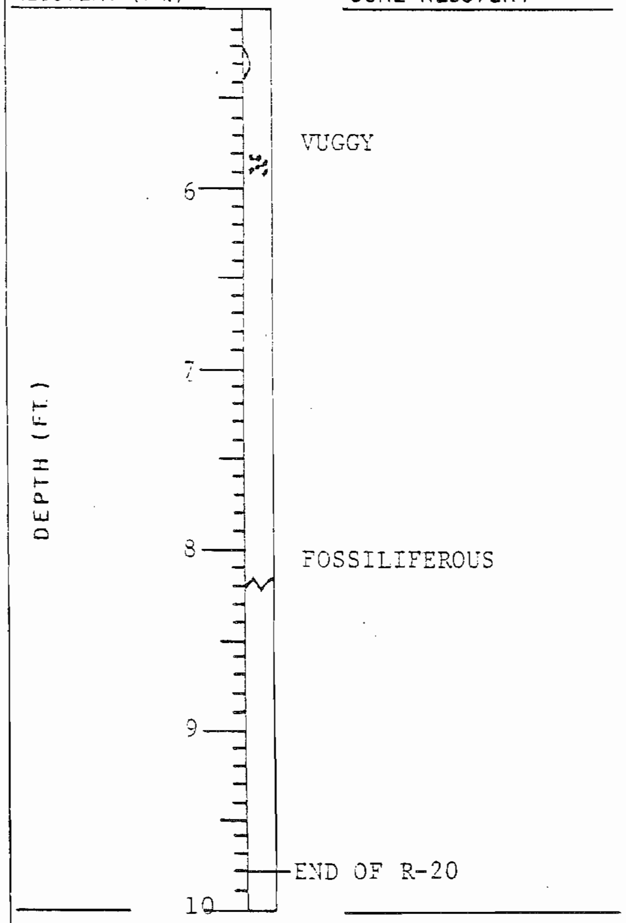
SHEET 2 OF 2

PROJECT NO. 4344-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY J. Snowden	DATE 12-4-85	PROTECTION LEVEL D
CORE DIAMETER 2"	CORE RUN NO. R-20	DEPTH 192.6 FT. TO 202.4 FT.
CORE RECOVERY 9.8 FT.	RQD 98 %	CORE QUALITY Good

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION



LIGHT GRAY DOLOMITE WITH THIN GYPSUM LAYERS

TOTAL 9.8 (FT) TOTAL 9.8 (FT)

100 % 98 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

PROJECT NO. 4844-09

PROJECT NAME Love Canal

BORING NO. 10210

LOGGED BY J. Snowden

DATE 12/5/85

PROTECTION LEVEL D

CORE DIAMETER 2"

CORE RUN NO. R-21

DEPTH 202.4 FT. TO 212.4 FT.

CORE RECOVERY 9.8 FT.

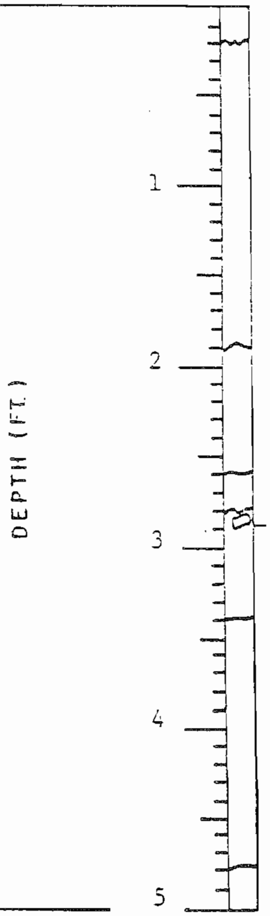
RQD 99 %

CORE QUALITY Good

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION



CRYSTALS IN VUGS

DARK GRAY DOLOMITE WITH CRYSTAL - FILLED VUGS AND FOSSIL FRAGMENTS

TOTAL 9.8 (FT)

98 %

TOTAL 9.7 ( )

99 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10210
LOGGED BY J. Snowden	DATE 12/5/85	PROTECTION LEVEL D

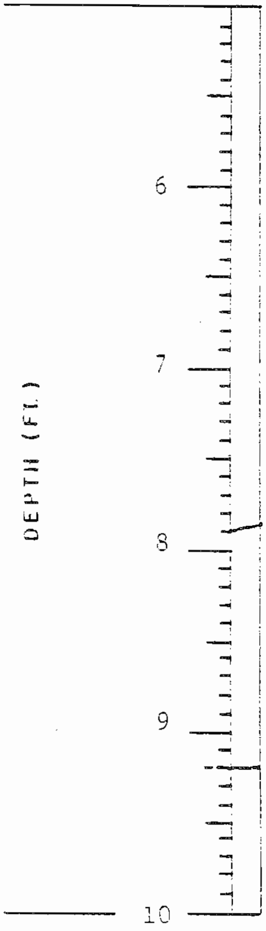
CORE DIAMETER 2"	CORE RUN NO. R-21	DEPTH 202.4 FT. TO 212.4 FT.
CORE RECOVERY 9.8 FT.	RQD 99 %	CORE QUALITY Good

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

GRAY DOLOMITE WITH LIGHT AND DARK LAYERS



- SHARP FRACTURE

DARK GRAY BEDDING
BECOMES MORE DEFINED
(POSSIBLE BEGINNING OF SHALE)

END OF R-21

TOTAL 9.8 (FT)

98 %

TOTAL 9.7 (FT)

99 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

PROJECT NO. 4344-09

PROJECT NAME Love Canal

BORING NO. 10210

LOGGED BY J. Snowden

DATE 12-5-85

PROTECTION LEVEL D

CORE DIAMETER NX

CORE RUN NO. R-22

DEPTH 212.4 FT. TO 222.3 FT.

CORE RECOVERY 9.9 FT.

RQD 98 %

CORE QUALITY Excellent

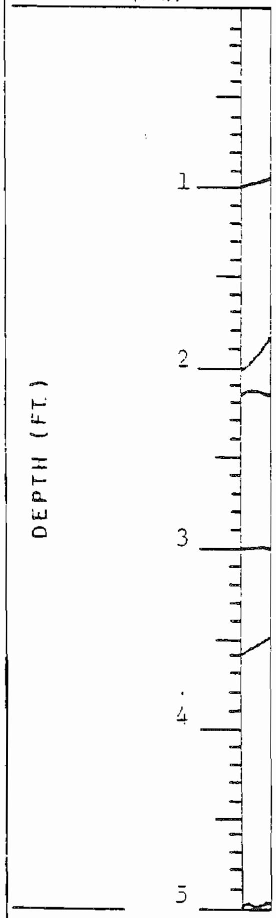
CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

GRAY DOLOMITE

TRANSITION TO GRAY SHALE
WITH WELL-DEFINED BEDDING



GYPSUM CRYSTALS FILLING
IN FRACTURE

ALL CORE BREAKS WERE
MECHANICAL

VUGGY

TOTAL 9.9 (FT)

100 %

TOTAL 9.8 (FT)

98 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

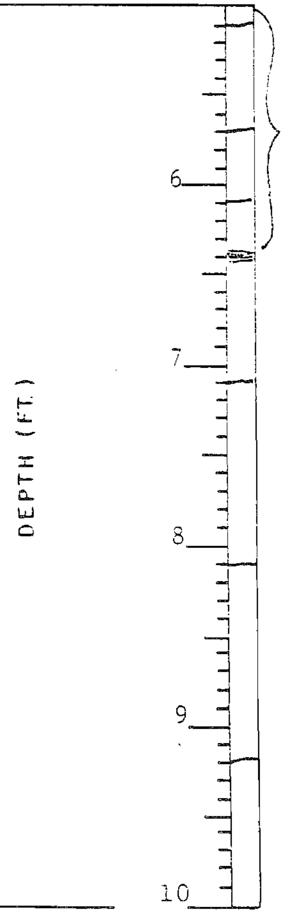
SHEET 2 OF 2

PROJECT NO. 4841-09	PROJECT NAME Love Canal		BORING NO. 10210
LOGGED BY J. Snowden	DATE 12-5-85		PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-22	DEPTH 212.4 FT. TO 222.3 FT.	
CORE RECOVERY 9.9 FT.	RQD 98 %	CORE QUALITY Excellent	

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION



TRANSITION ZONE DOLOMITE TO SHALE

GRAY DOLOMITE CHANGES TO GRAY SHALE

SHALE CONTACT

SHALE BELOW IS SOFTER THAN IN THE TRANSITION ZONE ABOVE

ALL CORE BREAKS WERE MECHANICAL

END OF R-22

TOTAL 9.9 (FT) TOTAL 9.8 (FT)

100 % 98 %

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 10210B

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-23

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 5/2/86

COMPLETED 5/5/86

METHOD H.S.A.

CASING SIZE 6.0

HNU 11.7 / 10.2 10.2 TIP

PROTECTION LEVEL D

GROUND EL. 577.1

SOIL DRILLED 38.0

TOTAL DEPTH 144.0

▽ BELOW GROUND

LOGGED BY C. White

CHECKED BY R. Lewis RL

DATE 6/10/87

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
							Brown to Black Mottled Sandy Silt with Clay and Organic Matter, Fractured, Moist, Stiff, Plastic, (FILL) 4.5	ML	No Soil Samples Taken		
5							Brown Silty Fine Sand with Traces of Gravel, Moist, Loose, Non-Plastic, Uniformly Graded (Alluvial Sand) 8.5	SP			
10							Reddish-Brown Mottled Silty Clay, Varved, Moist, Stiff, Fractures Slightly Plastic (Lacustrine Clay) 14.0	CL			
15							Reddish-Gray Silty Clay, Wet, Soft, Plastic				
20							(Lacustrine Clay)	CL			
25							Brown Silty Sand with Gravel, Moist, Dense, Slightly Plastic, Widely Graded (Glacial Till) 30.5	SM ML			
30											
35											
40							Bedrock: Gray Dolomite				

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 10210B

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-23

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 5/2/86

COMPLETED 5/5/86

METHOD Wash/Rotary

CASING SIZE 6.0"

HNU 11.7 / 10.2

PROTECTION LEVEL D

GROUND EL. 577.1

SOIL DRILLED 38.0

TOTAL DEPTH 144.0

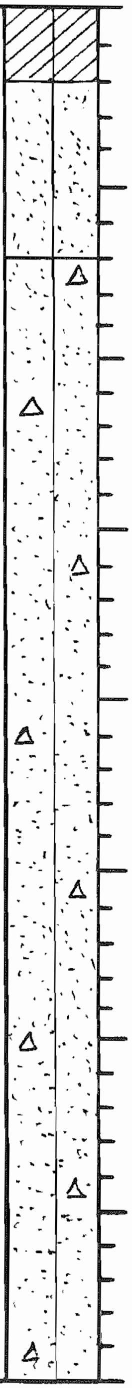
▽ BELOW GROUND

LOGGED BY C. White

CHECKED BY R Lewis

DATE 6/10/87

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
							See Rock Logs for Boring 10210A for detailed descriptions and fractures.				
45											
50											
55											
60											
65											
70											
75											
80											



*U: THIN WALL TUBE   S: SPLIT SPOON   R: ROCK

E.C.JORDAN CO.

**LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING** **TASK VC** **BORING NO.** 10210B

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION **PROJECT NO.** 4844-23

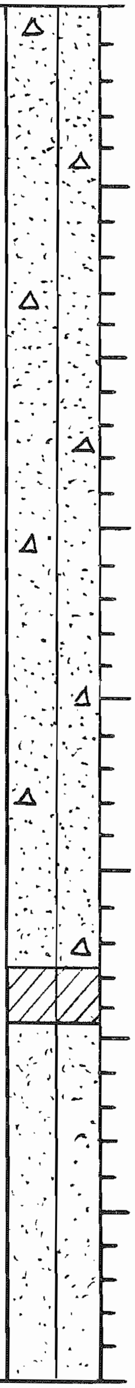
CONTRACTOR: J. MATHES ASSOC. **DATE STARTED** 5/2/86 **COMPLETED** 5/5/86

METHOD Wash/Rotary **CASING SIZE** 6.0" **HNU 11.7 / 10.2** 10.2 **PROTECTION LEVEL** D

GROUND EL. 577.1 **SOIL DRILLED** 38.0' **TOTAL DEPTH** 144.0' **▽ BELOW GROUND**

LOGGED BY C. White **CHECKED BY** R. Lewis **DATE** 6/10/87

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
							Bedrock: Dolomite				
85											
90											
95											
100											
105											
110											
115											
120											



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 10210B

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-23

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 5/2/86

COMPLETED 5/5/86

METHOD Wash/Rotary

CASING SIZE 6.0"

HNU 11.7/10.2 10.2

PROTECTION LEVEL D

GROUND EL. 577.1

SOIL DRILLED 38.0'

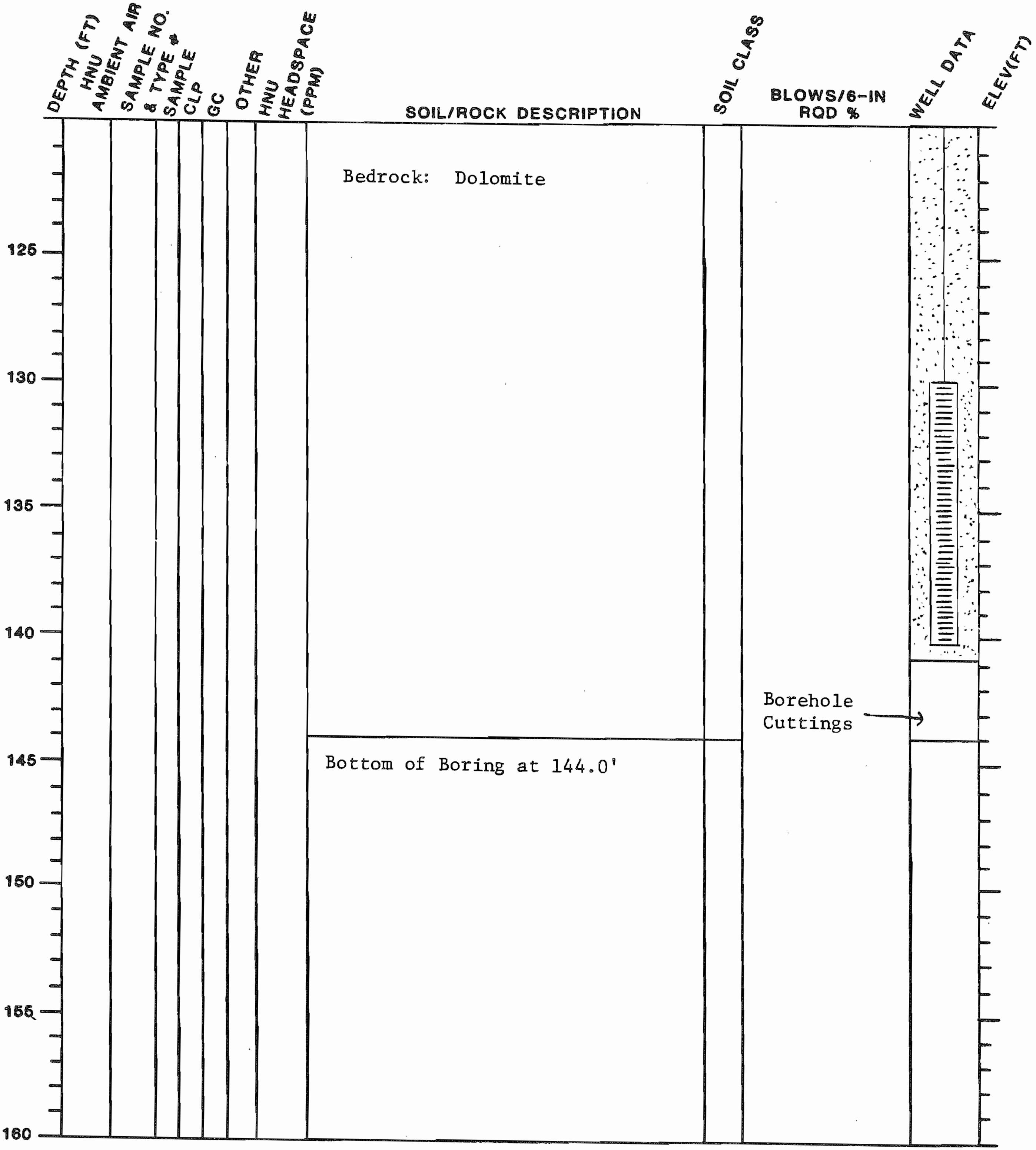
TOTAL DEPTH 144.0'

▽ BELOW GROUND

LOGGED BY C. White

CHECKED BY R. Lewis

DATE 6/10/87



Bedrock: Dolomite

Bottom of Boring at 144.0'

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 10210C

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-23

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 5/6/86

COMPLETED 5/6/86

METHOD H.S.A.

CASING SIZE 6.0"

HNU 11.7/10.2 10.2

PROTECTION LEVEL D

GROUND EL. 577.1

SOIL DRILLED 37.5'

TOTAL DEPTH 86.5'

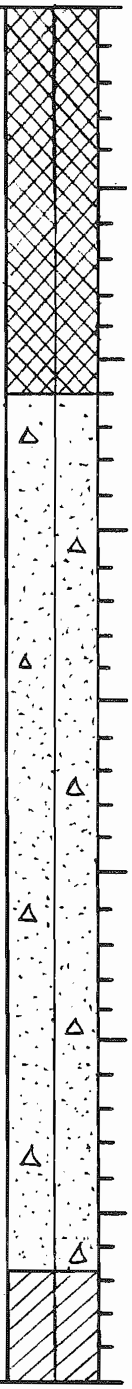
▽ BELOW GROUND

LOGGED BY C. White

CHECKED BY R. Lewis

DATE 6/10/87

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
							Brown to Black Mottled Sandy Silt with Clay and Organic Matter, Fractured, Moist, Stiff, Plastic, (FILL) 4.5	ML	No Soil Samples Taken		
5							Brown Silty Fine Sand with Traces of Gravel, Moist, Loose, Non-Plastic, Uniformly Graded (Alluvial Sand) 8.5	SP			
10							Reddish-Brown Mottled Silty Clay, Varved, Moist, Stiff, Fractures Slightly Plastic (Lacustrine Clay) 14.0	CL			
15 20 25							Reddish-Gray Silty Clay, Wet, Soft, Plastic (Lacustrine Clay)	CL			
30 35							Brown Silty Sand with Gravel, Moist, Dense, Slightly Plastic, Widely Graded (Glacial Till) 30.5	SM ML			
40							Bedrock: Gray Dolomite				



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 10210C

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO.

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 5/6/86

COMPLETED 5/6/86

METHOD Wash/Rotary

CASING SIZE 6.0"

HNU 11.7 / 10.2 10.2

PROTECTION LEVEL D

GROUND EL. 577.1

SOIL DRILLED 37.5

TOTAL DEPTH 86.5

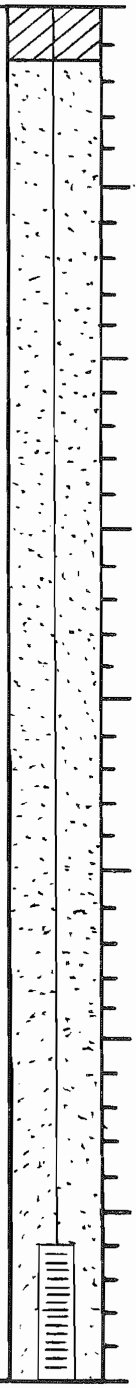
▽ BELOW GROUND

LOGGED BY C. White

CHECKED BY R. Lewis

DATE 6/10/87

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
							See Rock Logs for Boring 10210A for descriptions and fractures. Hole reamed with 3 7/8-inch bit to 86.5 feet.				
45											
50											
55											
60											
65											
70											
75											
80											



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 10210C

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-23

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 5/6/86

COMPLETED 5/6/86

METHOD Wash/Rotary

CASING SIZE 6.0"

HNU 11.7 / 10.2 10.2

PROTECTION LEVEL D

GROUND EL. 577.1

SOIL DRILLED 37.5'

TOTAL DEPTH 86.5'

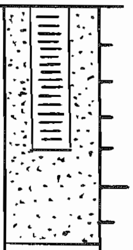
▽ BELOW GROUND

LOGGED BY C. White

CHECKED BY R. Lewis

DATE 6/10/87

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
85							Dolomite				
90							Bottom of Boring at 86.5'				
95											
100											
105											
110											
115											
120											



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT LONG TERM MONITORING

TASK VC

BORING NO. 10215

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-09

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/23/85

COMPLETED 10/24/85

METHOD DRIVE/WASH

CASING SIZE 4.0"

HNU 11.7/10.2

PROTECTION LEVEL D

GROUND EL. 578.2'

SOIL DRILLED 45.5'

TOTAL DEPTH 61.0'

▽ BELOW GROUND NA

LOGGED BY P. Baker

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
								TOPSOIL 0.4				578.2
	0.6	S-1	☒	N	N	2.0 1.0	0.6	SAND, SILT, CLAY WITH TRACE OF GRAVEL, MOIST, SLIGHTLY PLASTIC TRACE OF ORGANICS		4-7-19-21		
5	0.6	S-2	☒	N	N	2.0 1.4	0.6	(FILL)	SM	5-8-9-11		573.2
								8.5				
10	0.6	S-3	☒	N	N	2.0 1.4	0.6	REDDISH-BROWN SILTY CLAY, MOIST, SLIGHTLY PLASTIC, STIFF FRACTURES	CL	8-24-40-51		568.2
	0.6	S-4	☒	N	N	2.0 1.9	0.6	(LACUSTRINE CLAY) 14.0		6-13-19-13		
15								REDDISH-GRAY SILTY CLAY, WET, SOFT, PLASTIC	CL			563.2
	0.6	S-5	☒	N	N	2.0 2.0	0.6	(LACUSTRINE CLAY)	CL	WOH-WOH-WOH 2		
20												558.2
	0.6	S-6	☒	N	N	2.0 2.0	0.6		CL	WOR-WOR-WOR WOR		
25												553.2
	0.6	S-7	☒	N	N	2.0 2.0	0.6		CL	WOH-WOH-WOH WOH		
30								31.0				548.2
	0.6	S-8	☒	N	N	2.0 1.3	0.6	BROWN GRAVELLY SILTY SAND WITH TRACE OF CLAY, MOIST, SLIGHTLY PLASTIC, WIDELY GRADED, DENSE, ABOUT 20% GRAVEL	SM ML	13-17-14-34		
35								(GLACIAL TILL)				543.2
	0.6	S-9	☒	N	N	0.9 0.8	0.6		ML SM	36-62		
40												538.2

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 10215

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-09

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/23/85

COMPLETED 10/24/85

METHOD DRIVE/WASH

CASING SIZE 4.0"

HNU 11.7 / 10.2

PROTECTION LEVEL D

GROUND EL. 578.2'

SOIL DRILLED 45.5'

TOTAL DEPTH 61.0'

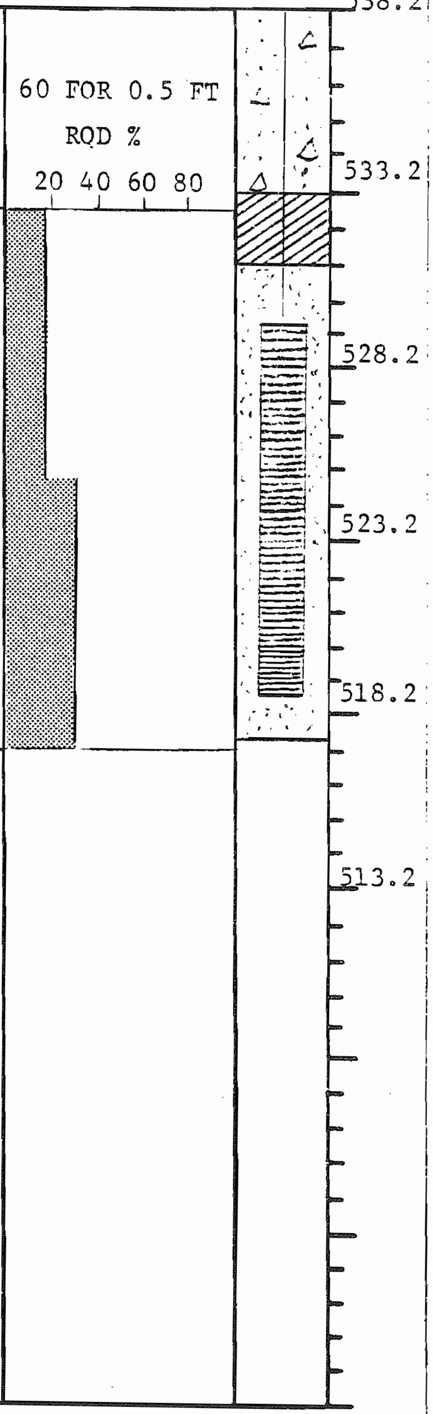
▽ BELOW GROUND NA

LOGGED BY P. Baker

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE & SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %
	0.6	S-10 ☒	N	N		0.6	GRAVELLY SILTY SAND WITH TRACE OF CLAY, WIDELY GRADED, DENSE (GLACIAL TILL) 45.5	SM ML	60 FOR 0.5 FT
45									RQD % 20 40 60 80
50		R-1					BEDROCK: GRAY DOLOMITE SEE ROCK LOG FOR DESCRIPTIONS AND FRACTURES BOTTOM OF BORING AT 61.0 FEET WOH = WEIGHT OF HAMMER WOR = WEIGHT OF RODS		
55		R-2							
60							BOTTOM OF BORING AT 61.0 FT		
65									
70									
75									
80									



U: THIN WALL TUBE   S: SPLIT SPOON   R: ROCK

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

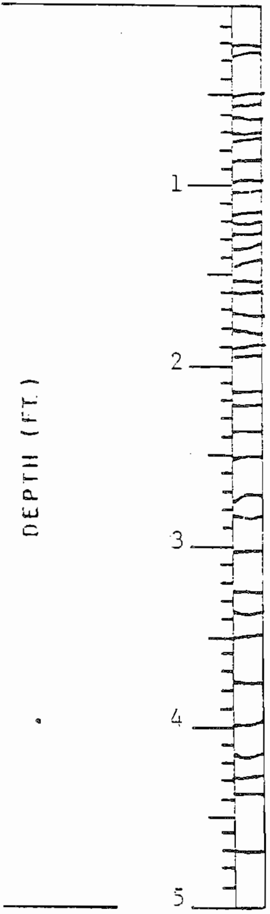
PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10215
LOGGED BY P. Baker	DATE 10-23-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-1	DEPTH 44.5 FT. TO 53.8 FT.
CORE RECOVERY 8.2 FT.	RQD 16 %	CORE QUALITY Very Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

GRAY DOLOMITE WITH THIN FRACTURES FILLED WITH ANHYDRITE AND GYPSUM



TOTAL 9.3 (FT)

88 %

TOTAL 1.5 (FT)

16 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

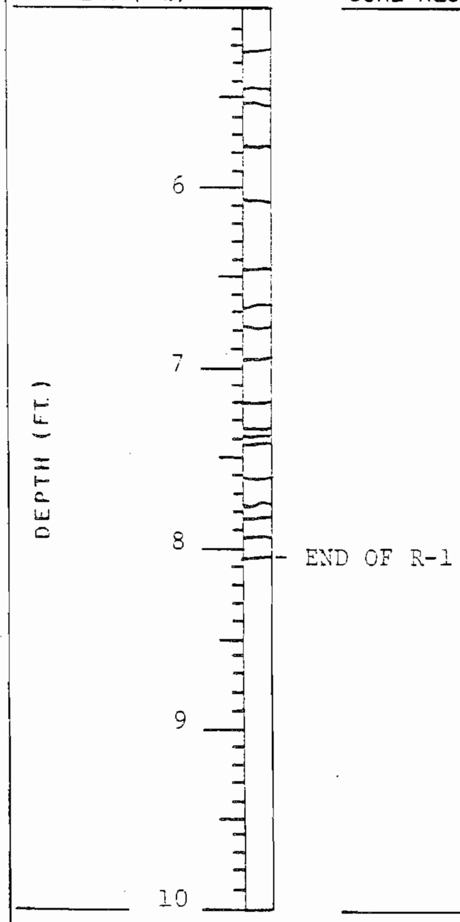
PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10215
LOGGED BY P. Baker	DATE 10-23-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-1	DEPTH 44.5 FT. TO 53.8 FT.
CORE RECOVERY 8.2 FT.	RQD 16 %	CORE QUALITY Very Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

GRAY DOLOMITE WITH THIN FRACTURES FILLED WITH ANHYDRITE AND GYPSUM



TOTAL 9.3 (FT)

88 %

TOTAL 1.5 (FT)

16 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10215
LOGGED BY P. Baker	DATE 10-24-85	PROTECTION LEVEL D

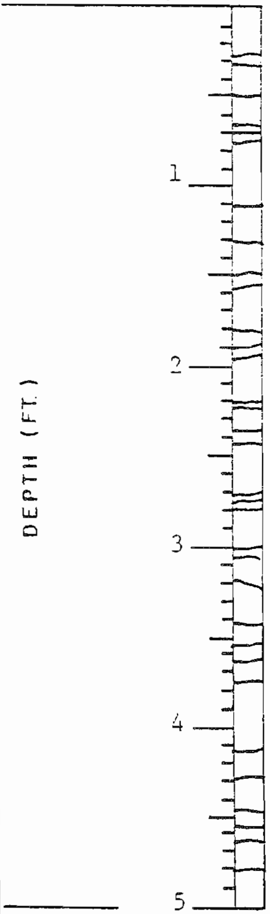
CORE DIAMETER NX	CORE RUN NO. R-2	DEPTH 53.8 FT. TO 61.0 FT.
CORE RECOVERY 7.2 FT.	RQD 34 %	CORE QUALITY Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1



TOTAL 7.2 (FT)

100 %

TOTAL 2.5 (FT)

34 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

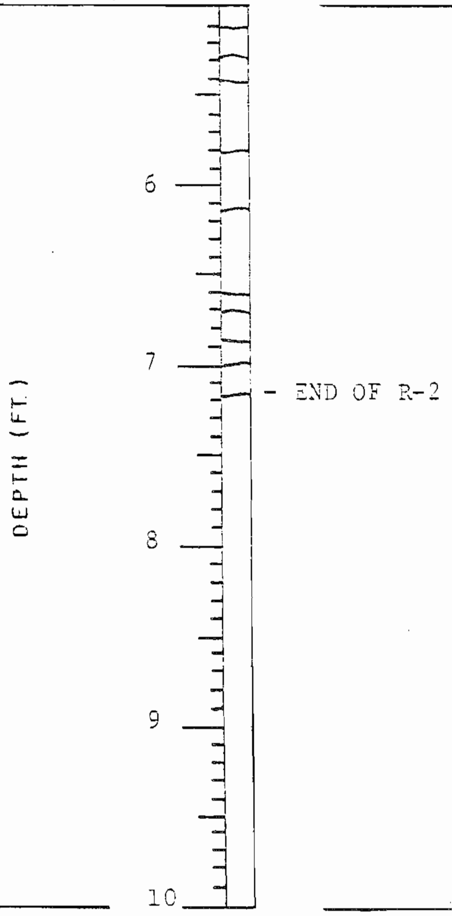
PROJECT NO. 4344-09	PROJECT NAME Love Canal	BORING NO. 10215
LOGGED BY P. Baker	DATE 10-24-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-2	DEPTH 53.8 FT. TO 61.0 FT.
CORE RECOVERY 7.2 FT.	RQD 34 %	CORE QUALITY Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1



TOTAL 7.2 (FT)

100 %

TOTAL 2.5 (FT)

34 %

ECJORDANCO

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 10225A

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-09

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/15/85

COMPLETED 11/14/85

METHOD DRIVE/WASH

CASING SIZE 4.0"

HNU 11.7/(10.2)

PROTECTION LEVEL C/D

GROUND EL. 574.5'

SOIL DRILLED 32.4'

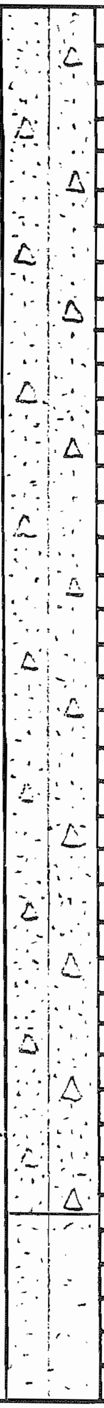
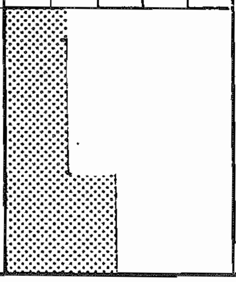
TOTAL DEPTH 213.7'

▽ **BELOW GROUND**

LOGGED BY T. Nowack

CHECKED BY

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
							TOPSOIL 0.5				574.5
	0.3	S-1	N	N	2.0 1.0	0.0	BROWN TO BLACK SANDY SILT, TRACE OF GRAVEL AND CLAY, DRY, MEDIUM DENSE (FILL) 4.1	ML	6-12-11-12		
5	0.3	S-2	N	N	2.0 1.3	0.0	REDDISH-BROWN SILTY CLAY, MOIST, STIFF, SLIGHTLY PLASTIC, FRACTURES	CL	9-9-12-23		569.5
10	0.3	S-3	N	N	2.0 0.3	0.0	(LACUSTRINE CLAY) 12.0	CL	6-11-11-11		564.5
	0.0	S-4	N	N	2.0 1.8	0.0	REDDISH-GRAY SILTY CLAY, WET, PLASTIC, SOFT	CL	2-2-2-1		
15											559.5
	0.0	S-5	N	N	2.0 2.0	0.0	(LACUSTRINE CLAY)	CL	WOH-WOH-2-1		
20											554.5
	0.0	S-6	N	N	2.0 2.0	0.0		CL	WOH-WOH-2-2		
25							27.0				549.5
	0.0	S-7	N	N	2.0 1.9	0.0	SILTY SAND WITH SOME GRAVEL, TRACE OF CLAY, WIDELY GRADED, DENSE, WET	SM ML	23-37-21-48		
30							(GLACIAL TILL) 32.4		RQD% 20 40 60 80		544.5
		R-1					BEDROCK: GRAY DOLOMITE, SEE ROCK LOGS FOR DESCRIPTIONS AND FRACTURES.				
35		R-2									539.5
		R-3					WOH = WEIGHT OF HAMMER				
40											534.5

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING
TASK VC
BORING NO. 10225A

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
PROJECT NO. 4844-09
CONTRACTOR: J. MATHES ASSOC.
DATE STARTED 10/15/85
COMPLETED 11/14/85
METHOD Nx CORE
CASING SIZE 3.0"
HNU 11.7 (10.2)
PROTECTION LEVEL C/D
GROUND EL. 574.5'
SOIL DRILLED 32.4'
TOTAL DEPTH 213.7'
▽ BELOW GROUND
LOGGED BY T. Nowack
CHECKED BY R. Lewis
DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
		R-3					GRAY DOLOMITE				534.5
45		R-4									529.5
50		R-5									524.5
55		R-6									519.5
60		R-7									514.5
65		R-8									509.5
70											504.5
75		R-9									499.5
80											494.5

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT LONG TERM MONITORING

TASK VC

BORING NO. 10225A

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-09

CONTRACTOR: J. MATHES ASSOC

DATE STARTED 10/15/85

COMPLETED 11/14/85

METHOD Nx CORE

CASING SIZE 3.0"

HNU 11.7 (10.2)

PROTECTION LEVEL C/D

GROUND EL. 574.5'

SOIL DRILLED 32.4'

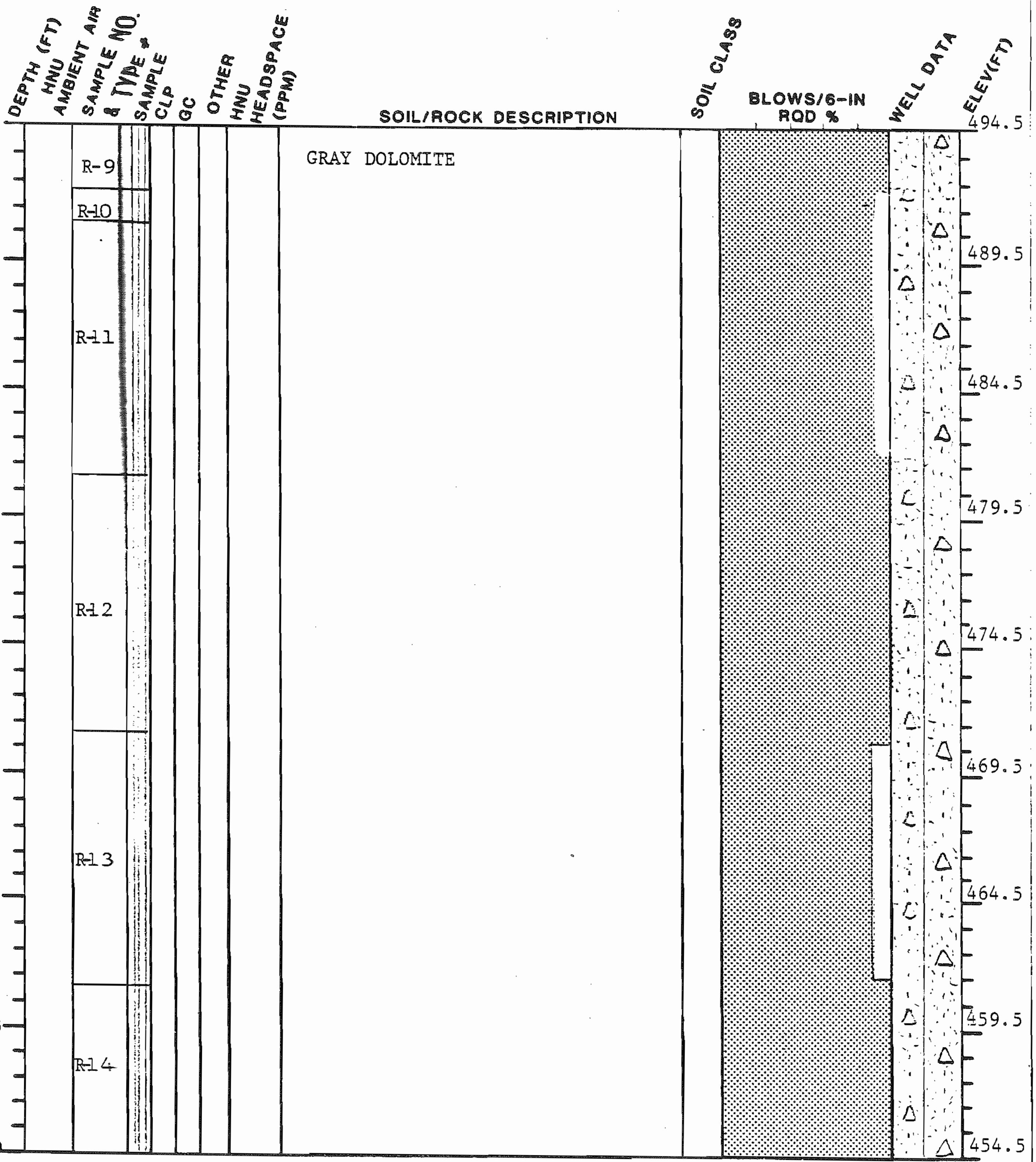
TOTAL DEPTH 213.7'

▽ BELOW GROUND

LOGGED BY T. Nowack

CHECKED BY K. Lewis

DATE 3/24/86



GRAY DOLOMITE

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C. JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 10225A

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO 4844-09

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/15/85

COMPLETED 11/14/85

METHOD Nx CORE

CASING SIZE 3.0"

HNU 11.7 ∧ 10.2

PROTECTION LEVEL C/D

GROUND EL. 574.5'

SOIL DRILLED 32.4'

TOTAL DEPTH 213.7'

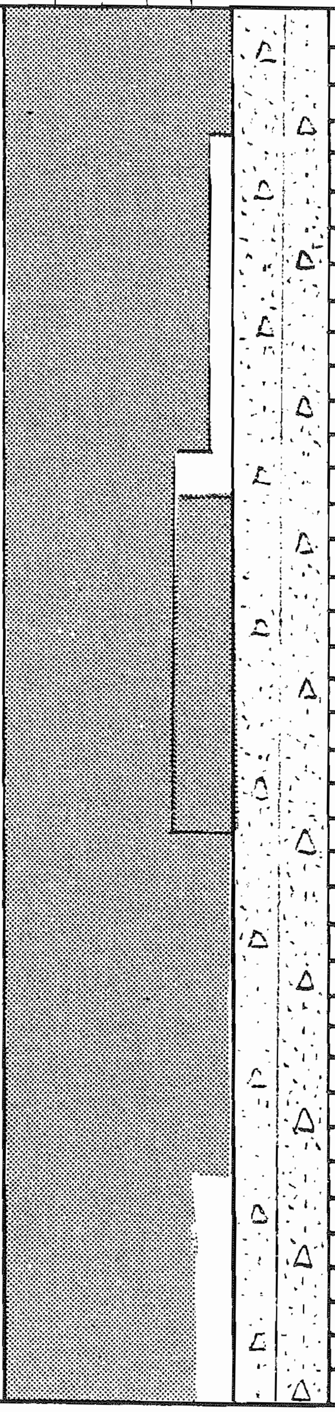
▽ BELOW GROUND

LOGGED BY T. Nowack

CHECKED BY Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
		R-14					GRAY DOLOMITE				454.5
125											449.5
		R-15									
130											444.5
		R-16									
135											439.5
		R-17									
140											434.5
145											429.5
		R-18									
150											424.5
155											419.5
		R-19									
160											414.5



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 10225A

CLIENT NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-09

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/15/85

COMPLETED 11/14/85

METHOD Nx CORE

CASING SIZE 3.0"

HNU 11.7/(10.2)

PROTECTION LEVEL C/D

GROUND EL. 574.5'

SOIL DRILLED 32.4'

TOTAL DEPTH 213.7'

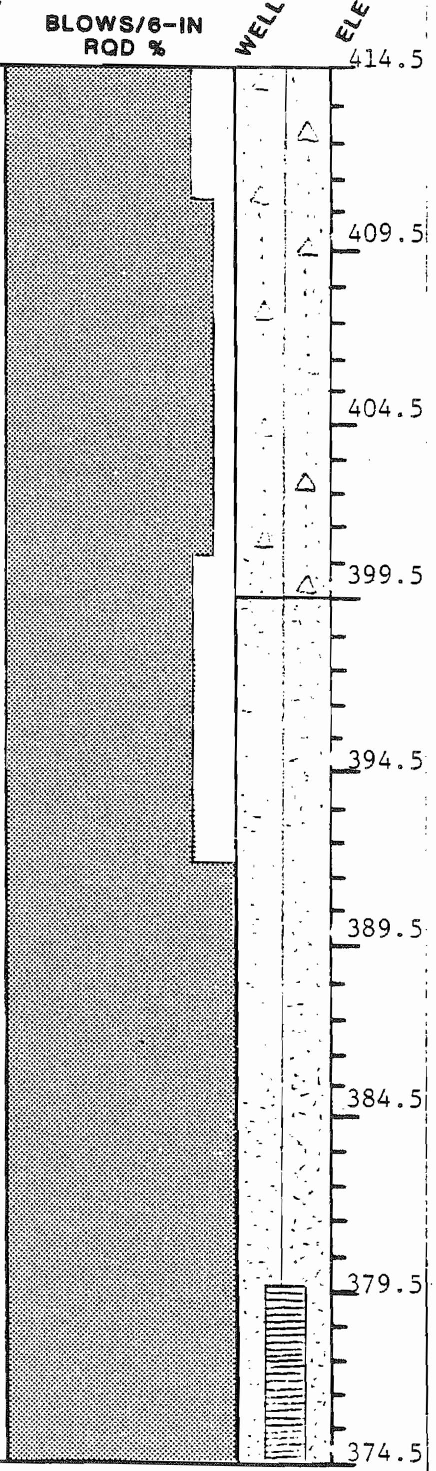
▽ BELOW GROUND

LOGGED BY T. Nowack

CHECKED BY A. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE*	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS
		R-19					GRAY DOLOMITE	
165								
		R-20						
170								
175								
		R-21						
180								
		R-22						
185								
		R-23						
190								
195								
		R-24						
200								



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C. JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 10225A

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-09

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 10/15/85

COMPLETED 11/14/85

METHOD Nx CORE

CASING SIZE 3.0"

HNU 11.7/10.2

PROTECTION LEVEL C/D

GROUND EL. 574.5'

SOIL DRILLED 32.4'

TOTAL DEPTH 213.7'

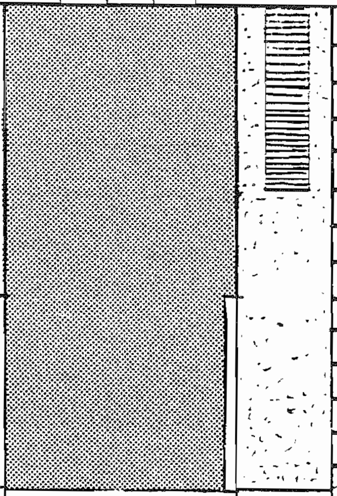
▽ BELOW GROUND

LOGGED BY T. Nowack

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE #	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
		R-24					GRAY DOLOMITE				374.5
205		R-25									369.5
210		R-26					GRAY DOLOMITIC SHALE				364.5
215							BOTTOM OF BORING AT 213.7 FEET				359.5
220											
225											
230											
235											
240											



#U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

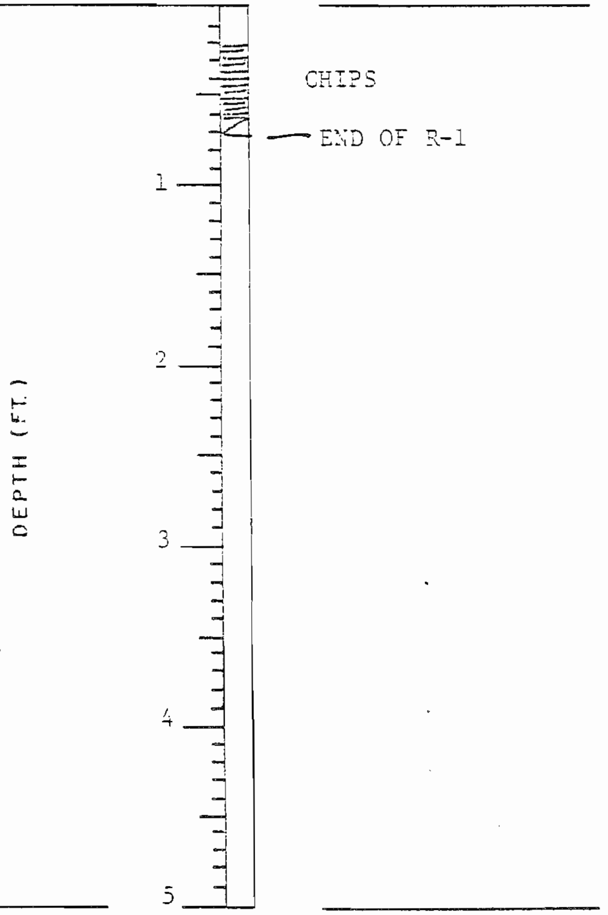
SHEET 1 OF 1

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY T. Nowack	DATE 10-15-85	PROTECTION LEVEL C/D
CORE DIAMETER NX	CORE RUN NO. R-2	DEPTH 32.4 FT. TO 33.4 FT.
CORE RECOVERY 0.7 FT.	RQD 0 %	CORE QUALITY Very Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION



GRAY DOLOMITE WITH GYPSUM FILLED VUGS

TOTAL 1.0 (FT)

70 %

TOTAL 0 (   )

0 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 1

PROJECT NO. 4844-09

PROJECT NAME Love Canal

BORING NO. 10225

LOGGED BY T. Nowack

DATE 10-15-85

PROTECTION LEVEL C/D

CORE DIAMETER NX

CORE RUN NO. R-2

DEPTH 33.4 FT. TO 37.4 FT.

CORE RECOVERY 3.9 FT.

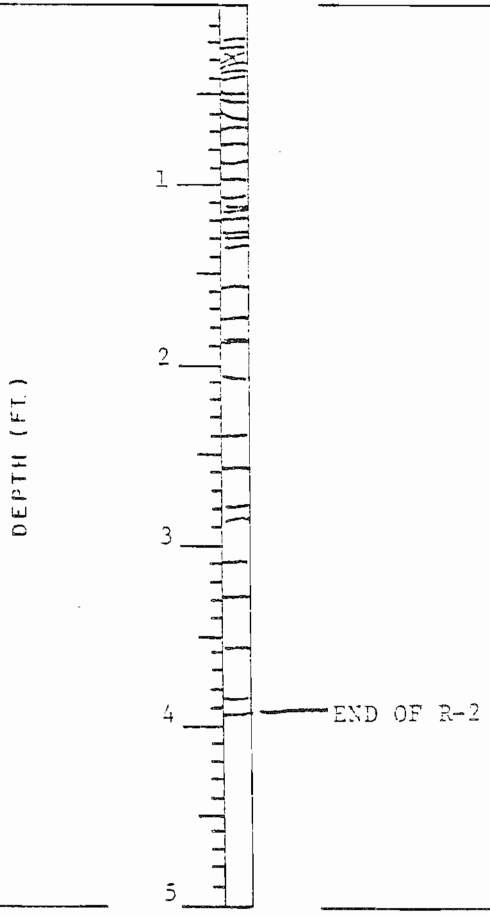
RQD 23 %

CORE QUALITY Very Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION



TOTAL 4.0 (FT)

98 %

TOTAL 0.9 (FT)

23 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET ____ OF ____

PROJECT NO. 4341-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY T. Nowack	DATE 10-15-85	PROTECTION LEVEL C/D

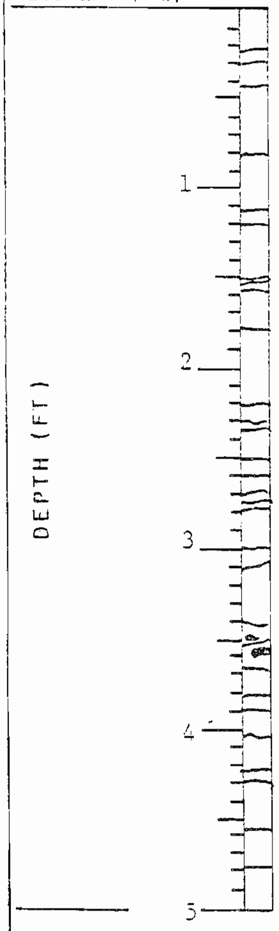
CORE DIAMETER NX	CORE RUN NO. R-3	DEPTH 37.4 FT. TO 43.4 FT.
CORE RECOVERY 5.7 FT.	RQD 27 %	CORE QUALITY Very Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1



ANHYDRITE FILLED VUGS

TOTAL 6.0 (FT)

95 %

TOTAL 1.7 (FT)

27 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

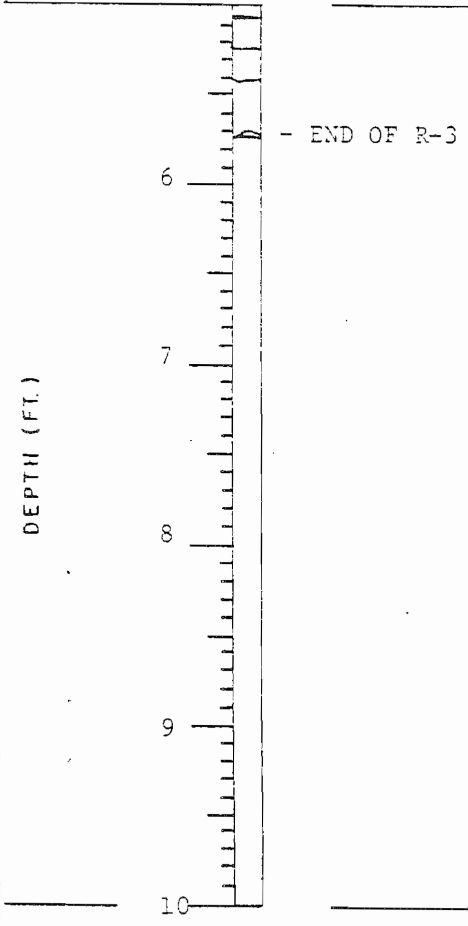
PROJECT NO. 46-4-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY T. Nowack	DATE 10-15-85	PROTECTION LEVEL C/D
CORE DIAMETER NX	CORE RUN NO. R-3	DEPTH 42.4 FT. TO 43.4 FT.
CORE RECOVERY 5.7 FT.	RQD 27 %	CORE QUALITY Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1



TOTAL 6.0 (FT)

95 %

TOTAL 1.7 (FT)

27 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

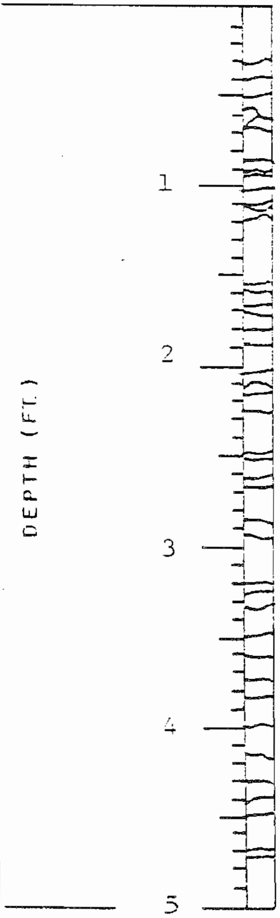
PROJECT NO 4844-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY T. Nowack	DATE 10-15-85	PROTECTION LEVEL C/D
CORE DIAMETER NX	CORE RUN NO. R-4	DEPTH 43.4 FT. TO 50.2 FT.
CORE RECOVERY 5.7 FT.	RQD 25 %	CORE QUALITY Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1



GYPSUM FILLED FRACTURES

TOTAL 6.8 (FT)

84 %

TOTAL 1.7 (FT)

25 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

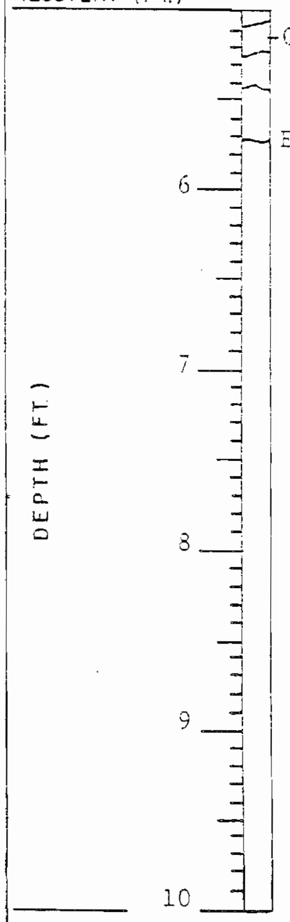
SHEET 2 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal		BORING NO. 10225
LOGGED BY T. Nowack	DATE 10-15-85		PROTECTION LEVEL C/D
CORE DIAMETER NX	CORE RUN NO. R-4	DEPTH 43.4 FT. TO 50.2 FT.	
CORE RECOVERY 5.7 FT.	RQD 25 %	CORE QUALITY Poor	

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION



0.25" GYPSUM SEAM

END OF R-4

PIECE LOST DOWN THE HOLE, RECOVERED IN R-5

SIMILAR TO R-1

TOTAL 6.8 (FT)

84 %

TOTAL 1.7 (FT)

25 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET ____ OF ____

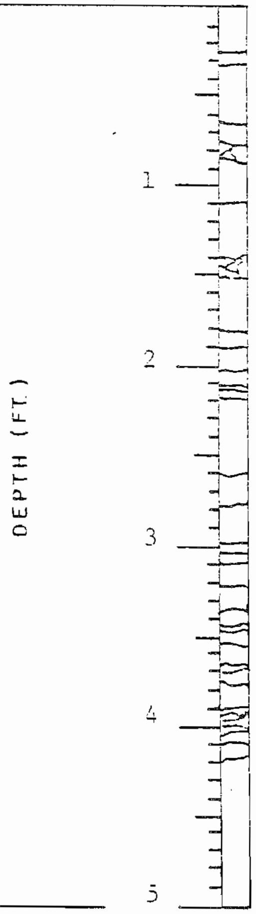
PROJECT NO. 4344-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY T. Nowack	DATE 10-15-85	PROTECTION LEVEL C/D

CORE DIAMETER NX	CORE RUN NO. R-5	DEPTH 50.2 FT. TO 53.2 FT.
CORE RECOVERY 4.2 FT.	RQD 38 %	CORE QUALITY Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION



LOST PIECE FROM R-4

- END OF R-5

SIMILAR TO R-1

- RUN INCLUDES LOST SECTION OF R-4

TOTAL 3.0 (FT)

* 100+ %

TOTAL 1.6 (FT)

38 %

* - EXCESS CORE DUE TO RECOVERY OF LOST PIECE FROM R-4.

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET ____ OF ____

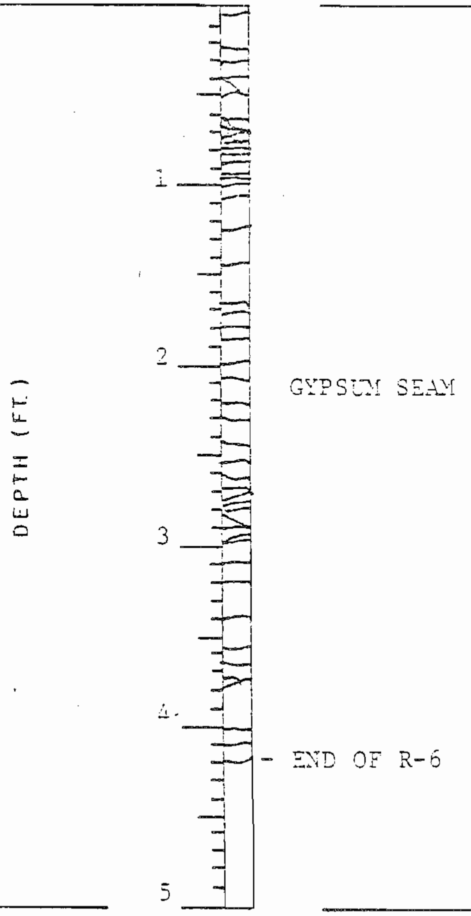
PROJECT NO. 4344-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY T. Nowack	DATE 10-15-85	PROTECTION LEVEL C/D
CORE DIAMETER NX	CORE RUN NO. R-6	DEPTH 53.4 FT. TO 57.6 FT.
CORE RECOVERY 4.2 FT.	RQD 0 %	CORE QUALITY Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1



TOTAL 4.2 (FT)

100 %

TOTAL 0 (FT)

0 %

ECJORDANCO

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 1

PROJECT NO 4844-09

PROJECT NAME Love Canal

BORING NO. 10225

LOGGED BY T. Nowack

DATE 10-16-85

PROTECTION LEVEL C/D

CORE DIAMETER NX

CORE RUN NO. R-7

DEPTH 57.6 FT. TO 63.4 FT.

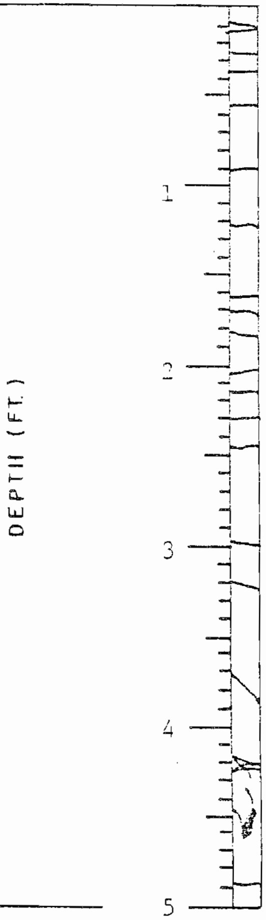
CORE RECOVERY 5.6 FT.

RQD 46 %

CORE QUALITY Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY



TOTAL 5.8 (FT)

96 %

TOTAL 2.7 (FT)

46 %

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1

- ROCK BECOMING MORE COMPETENT WITH DEPTH

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET [illegible] OF [illegible]

PROJECT NO. 4 344-09

PROJECT NAME Love Canal

BORING NO. 10225

LOGGED BY T. Nowack

DATE 10-16-85

PROTECTION LEVEL C/D

CORE DIAMETER NX

CORE RUN NO. R-7

DEPTH 57.6 FT. TO 63.4 FT.

CORE RECOVERY 5.6 FT.

RQD 46 %

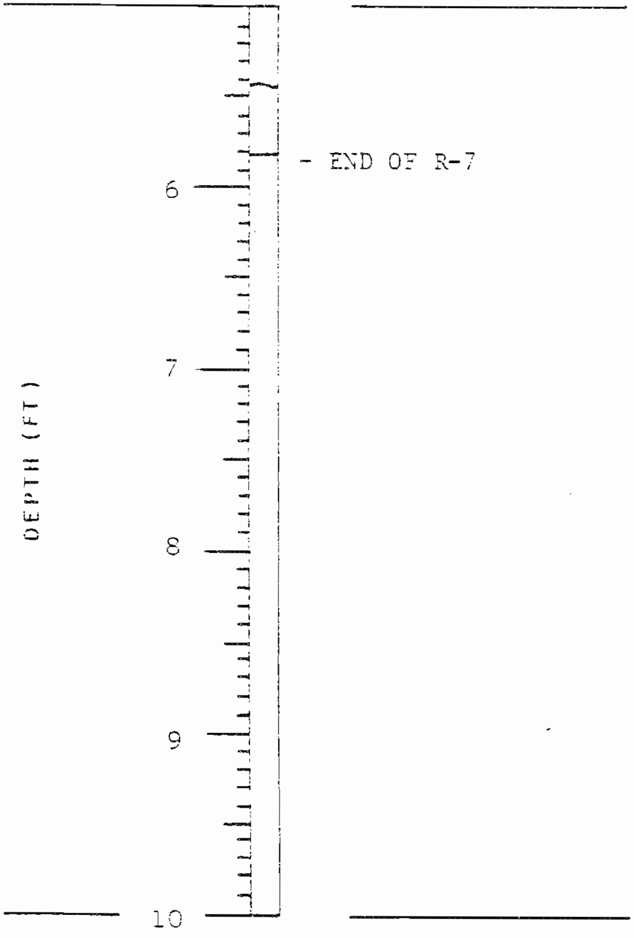
CORE QUALITY Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1



TOTAL 5.8 (FT)

96 %

TOTAL 2.7 (FT)

46 %

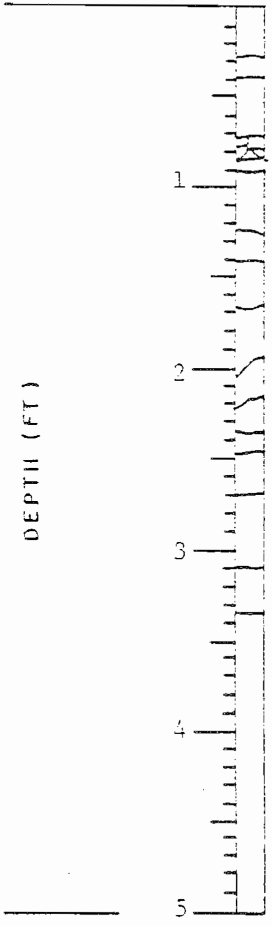
ECJORDANCO

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10223
LOGGED BY T. Nowack	DATE 10-16-85	PROTECTION LEVEL C/D
CORE DIAMETER NX	CORE RUN NO. R-8	DEPTH 63.4 FT. TO 73.4 FT.
CORE RECOVERY 10.0 FT.	RQD 80 %	CORE QUALITY Good

CORE RECOVERY (FT.)	.3 FT. CORE RECOVERY	ROCK DESCRIPTION AND IDENTIFICATION
		SIMILAR TO R-1



MECHANICAL BREAK

TOTAL 10.0 (FT)

100 %

TOTAL 8.0 (FT)

80 %

E.C.JORDAN CO.

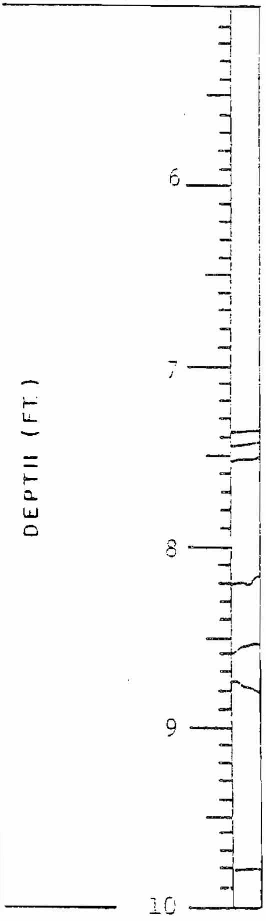
VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

PROJECT NO. 4344-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY T. Nowack	DATE 10-16-85	PROTECTION LEVEL C/D

CORE DIAMETER NX	CORE RUN NO. R-8	DEPTH 63.4 FT. TO 73.4 FT.
CORE RECOVERY 10.0 FT.	RQD 80 %	CORE QUALITY Good

CORE RECOVERY (FT.)



.3 FT. CORE RECOVERY

SHALEY ZONE

END OF R-8

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1

TOTAL 10.0 (FT)

100 %

TOTAL 8.0 (FT)

80 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

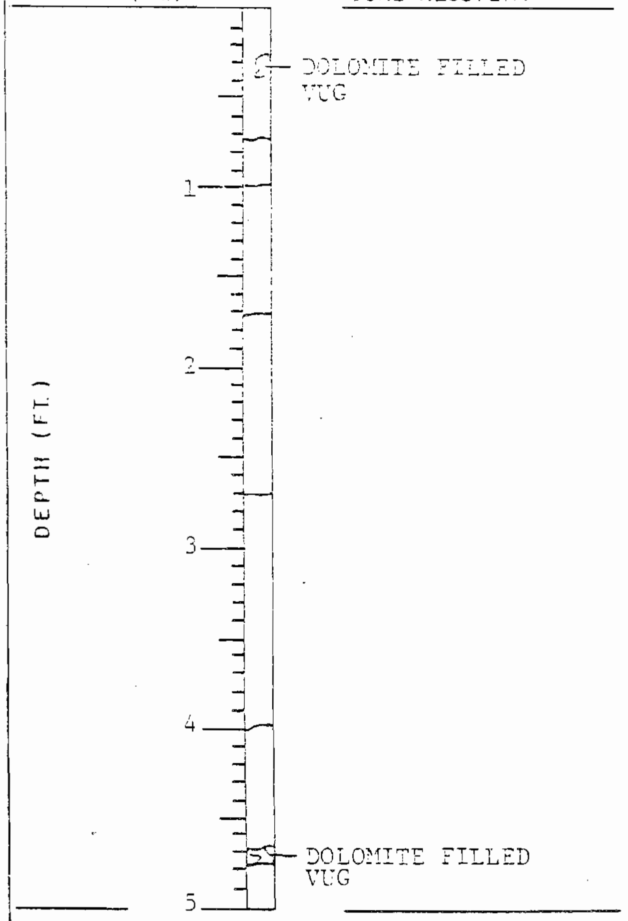
PROJECT NO. -844-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY T. Nowack	DATE 10-16-85	PROTECTION LEVEL C/D
CORE DIAMETER NX	CORE RUN NO. R-9	DEPTH 73.4 FT. TO 82.4 FT.
CORE RECOVERY 9.0 FT.	RQD 100 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1



TOTAL 9.0 (FT)

100 %

TOTAL 9.0 (FT)

100 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

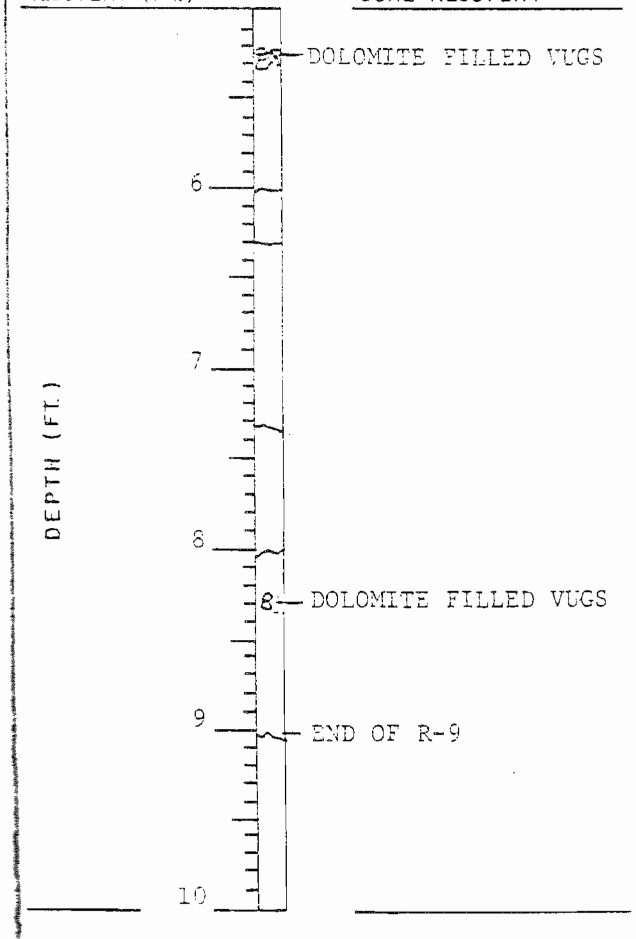
SHEET 2 OF 2

PROJECT NO. 4344-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY T. Nowack	DATE 10-16-85	PROTECTION LEVEL C/D
CORE DIAMETER NX	CORE RUN NO. R-9	DEPTH 73.4 FT. TO 82.4 FT.
CORE RECOVERY 9.0 FT.	RQD 100 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION



SIMILAR TO R-1

TOTAL 9.0 (FT)

100 %

TOTAL 9.0 (FT)

100 %

E.C.JORDAN CO.

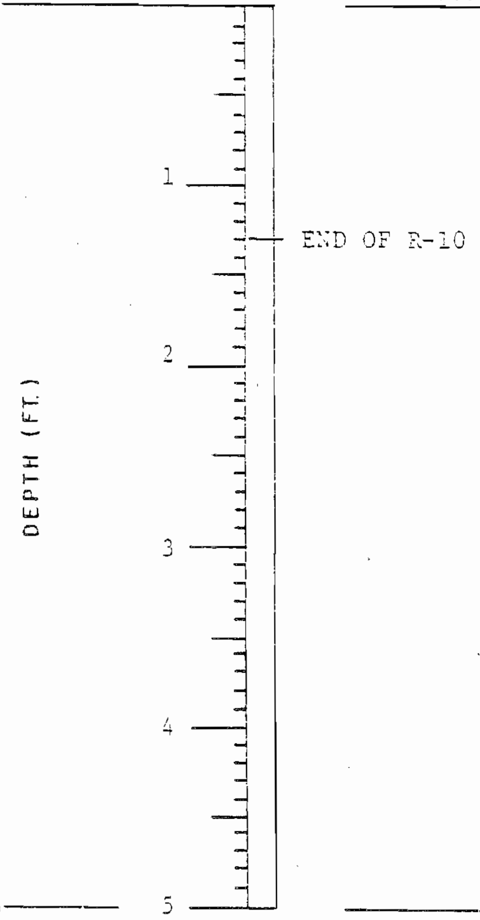
VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 1

PROJECT NO. 48 11-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY I. Nowack	DATE 10-31-85	PROTECTION LEVEL D

CORE DIAMETER NX	CORE RUN NO. R-10	DEPTH 82.4 FT. TO 83.7 FT.
CORE RECOVERY 1.3 FT.	RQD 100 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)	.3 FT. CORE RECOVERY	ROCK DESCRIPTION AND IDENTIFICATION
		SIMILAR TO R-1



TOTAL 1.3 (FT) TOTAL 1.3 (FT)

100 % 100 %

E.C.JORDAN CO.

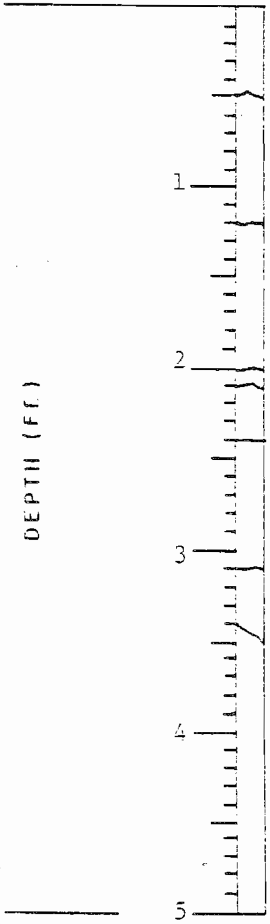
VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

PROJECT NO. 4341-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY P. Baker	DATE 10-31-85	PROTECTION LEVEL D

CORE DIAMETER NX	CORE RUN NO. R-11	DEPTH 83.7 FT. TO 93.7 FT.
CORE RECOVERY 10.0 FT.	RQD 92 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)	.3 FT. CORE RECOVERY	ROCK DESCRIPTION AND IDENTIFICATION
		SIMILAR TO R-1



TOTAL 10.0 (FT) TOTAL 9.2 (FT)

100 % 92 %

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

PROJECT NO. 4344-09	PROJECT NAME Love Canal		BORING NO. 10225
LOGGED BY P. Baker	DATE 10-31-85		PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-11	DEPTH 83.7 FT. TO 93.7 FT.	
CORE RECOVERY 10.0 FT.	RQD 92 %	CORE QUALITY Excellent	

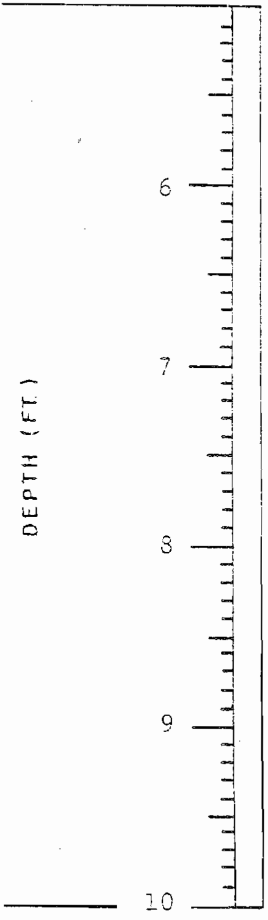
CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1

- SOLID 5 FT RUN



END OF R-11

TOTAL 10.0 (FT) TOTAL 9.2 (FT)

100 % 92 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

PROJECT NO. 4344-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY P. Baker	DATE 10-31-85	PROTECTION LEVEL D

CORE DIAMETER NX	CORE RUN NO. R-12	DEPTH 93.7 FT. TO 103.7 FT.
CORE RECOVERY 9.9 FT.	RQD 99 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)	.3 FT. CORE RECOVERY	ROCK DESCRIPTION AND IDENTIFICATION
DEPTH (FT.) 1 2 3 4 5		SIMILAR TO R-1 - SOLID 5 FT RUN

TOTAL 9.9 (FT) TOTAL 9.9 (FT)

99 % 99 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

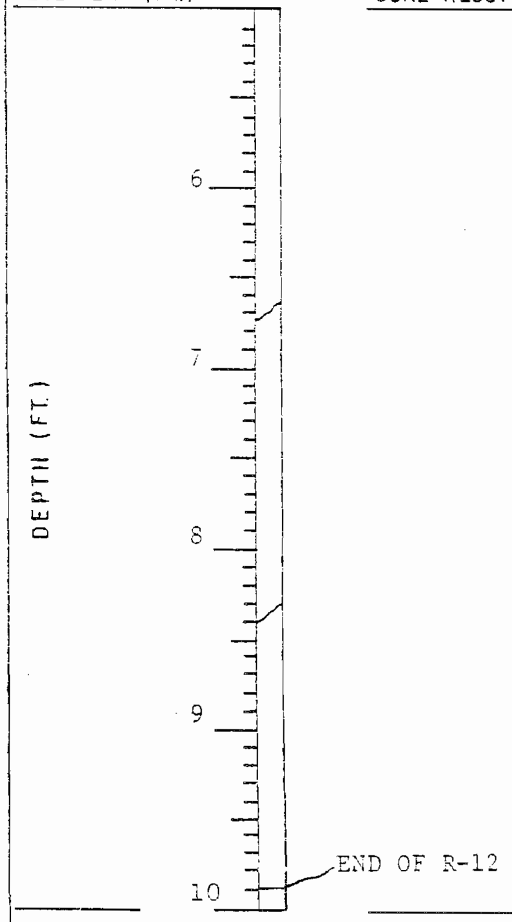
SHEET 2 OF 2

PROJECT NO. 4841-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY P. Baker	DATE 10-31-85	PROTECTION LEVEL D

CORE DIAMETER NX	CORE RUN NO. R-12	DEPTH 93.7 FT. TO 103.7 FT.
CORE RECOVERY 9.9 FT.	RQD 99 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY



ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1

- OCCURANCE OF CORAL FOSSILS INCREASING WITH DEPTH

TOTAL 10.0 (FT)

99 %

TOTAL 9.9 (FT)

99 %

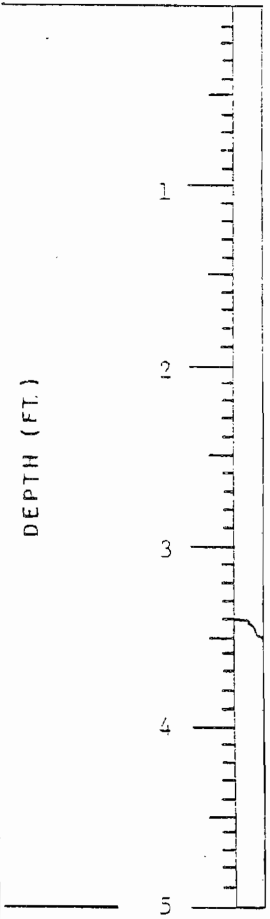
E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 1

PROJECT NO. 4844-09	PROJECT NAME Love Canal		BORING NO. 10225
LOGGED BY P. Baker	DATE 10-31-85		PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-13	DEPTH 103.7 FT. TO 113.7 FT.	
CORE RECOVERY 9.8 FT.	RQD 89 %	CORE QUALITY Good	

CORE RECOVERY (FT.)



TOTAL 9.8 (FT)

98 %

.3 FT. CORE RECOVERY

TOTAL 8.9 (FT)

89 %

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1

- BECOMING SHALEY WITH DEPTH

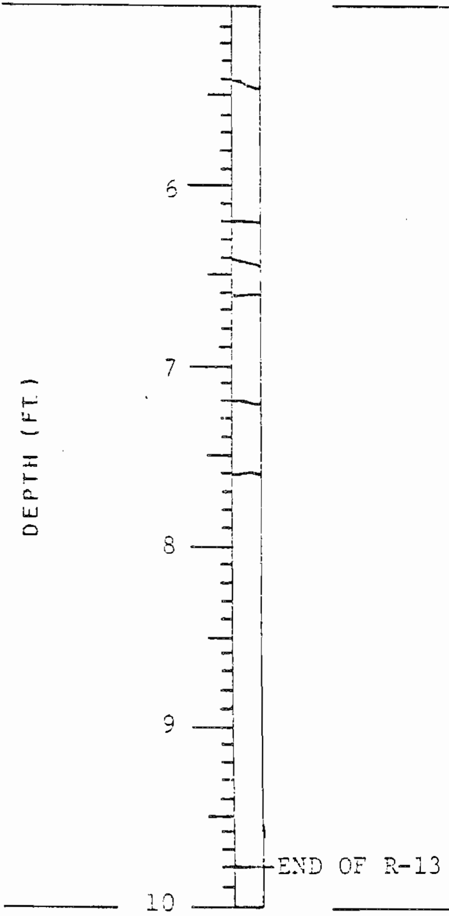
E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

PROJECT NO. 1344-09	PROJECT NAME Love Canal		BORING NO. 10225
LOGGED BY P. Baker	DATE 10-31-85		PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-13	DEPTH 103.7 FT. TO 113.7 FT.	
CORE RECOVERY 9.8 FT.	RQD 89 %	CORE QUALITY Good	

CORE RECOVERY (FT.)	.3 FT. CORE RECOVERY	ROCK DESCRIPTION AND IDENTIFICATION
		SIMILAR TO R-1



TOTAL 10.0 (FT)

98 %

TOTAL 8.9 (FT)

89 %

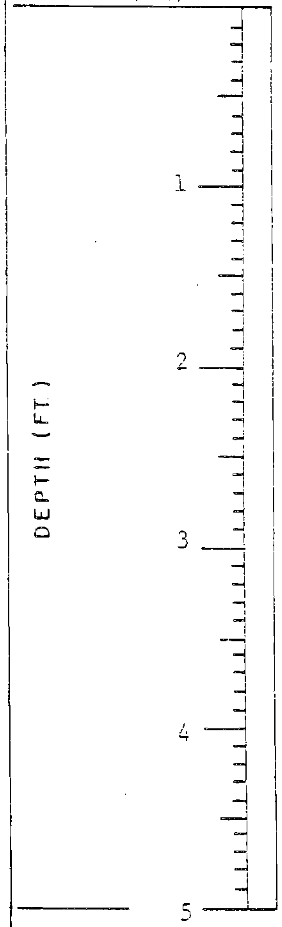
ECJORDANCO

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

PROJECT NO 4844-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY P. Baker	DATE 10-31-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-14	DEPTH 113.7 FT. TO 123.7 FT.
CORE RECOVERY 10.0 FT.	RQD 100 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)



TOTAL 10.0 (FT)

100 %

.3 FT. CORE RECOVERY

TOTAL 10.0 (FT)

100 %

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1

- SOLID 5 FT RUN

E.C. JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

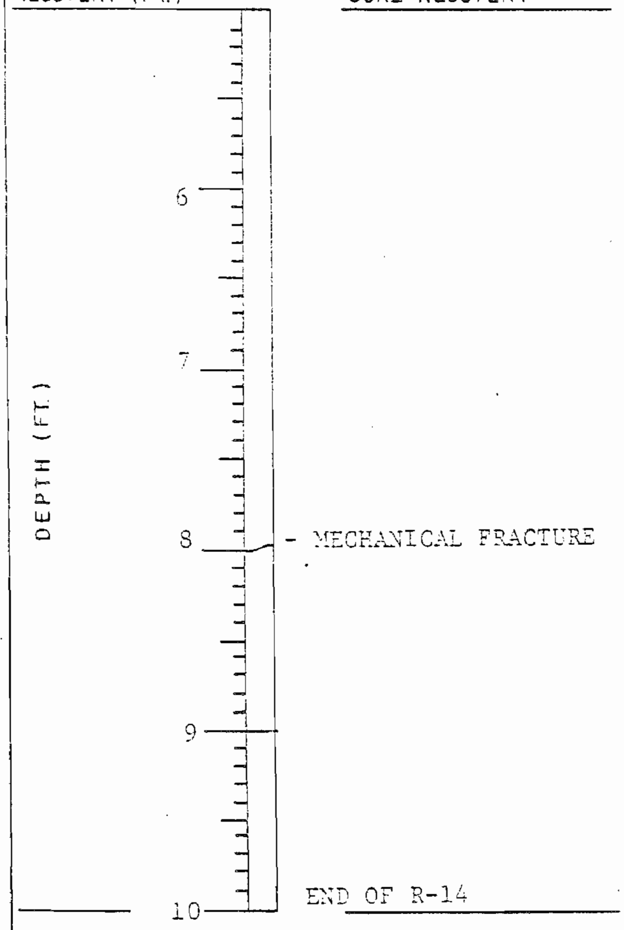
SHEET 2 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY P. Baker	DATE 10-31-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-14	DEPTH 113.7 FT. TO 123.7 FT.
CORE RECOVERY 10.0 FT.	RQD 100 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION



SIMILAR TO R-1

VUGS AND CORAL INCREASING WITH DEPTH

TOTAL 10.0 (FT)

100 %

TOTAL 10.0 (FT)

100 %

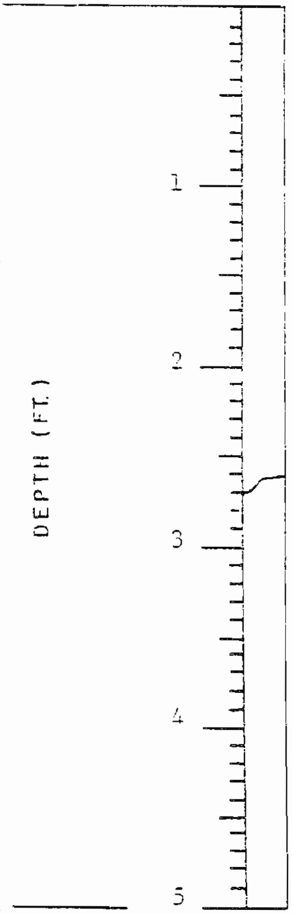
E.C.JORDAN CO

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 1

PROJECT NO. 1344-03	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY P. Baker	DATE 10-31-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-15	DEPTH 123.7 FT. TO 132.7 FT.
CORE RECOVERY 9.0 FT.	RQD 84 %	CORE QUALITY Good

CORE RECOVERY (FT.)



TOTAL 9.0 (FT)

+100 %

.3 FT. CORE RECOVERY

TOTAL 8.4 (FT)

84 %

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1

INTERBEDDED SHALE INCREASING IN FREQUENCY WITH DEPTH

VISUAL IDENTIFICATION OF ROCK CORES

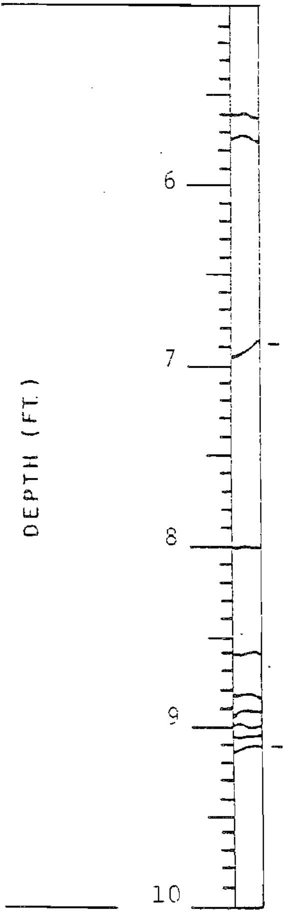
SHEET [illegible] OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY P. Baker	DATE 10-31-85	PROTECTION LEVEL D

CORE DIAMETER NX	CORE RUN NO. R-15	DEPTH 123.7 FT. TO 132.7 FT.
CORE RECOVERY 9.2 FT.	RQD 84 %	CORE QUALITY Good

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY



- MECHANICAL FRACTURE

- END OF R-15

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1

TOTAL 9.0 (FT) +100 %

TOTAL 8.4 (FT) 84 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 1

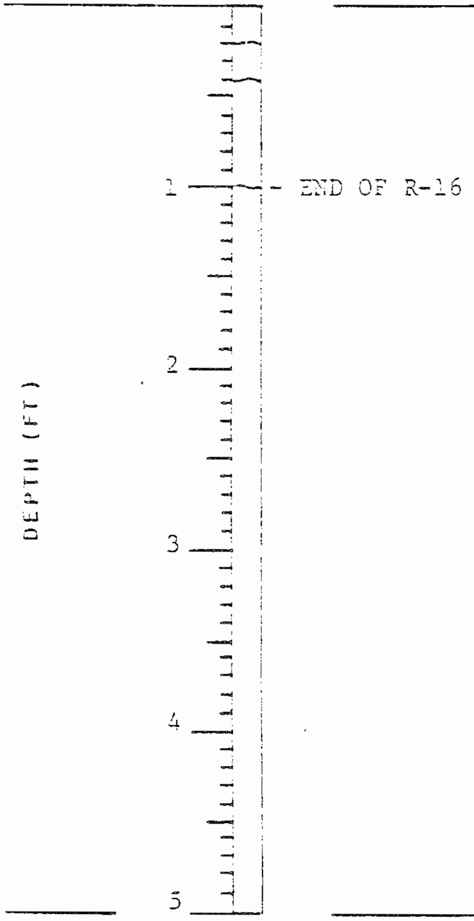
PROJECT NO. 1844-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY P. Baker	DATE 11-6-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-16	DEPTH 132.7 FT. TO 133.7 FT.
CORE RECOVERY 1.0 FT.	RQD 75 %	CORE QUALITY

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1



TOTAL 1.0 (FT)

100 %

TOTAL .75 (FT)

75 %

ECJORDANCO

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 1

PROJECT NO. 1844-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY P. Baker	DATE 11-6-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-17	DEPTH 133.7 FT. TO 143.7 FT.
CORE RECOVERY 10.0 FT.	RQD 99 %	CORE QUALITY Excellent

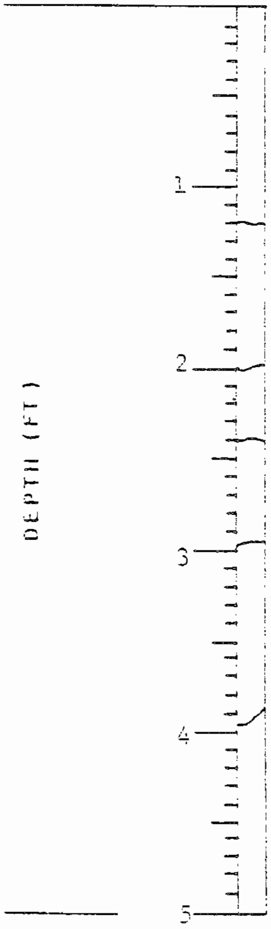
CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1

- INTERBEDDED SHALE LAYERS INCREASING WITH DEPTH



TOTAL 10.0 (FT)

100 %

TOTAL 9.9 (FT)

99 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

PROJECT NO. 4841-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY P. Baker	DATE 11-6-85	PROTECTION LEVEL D

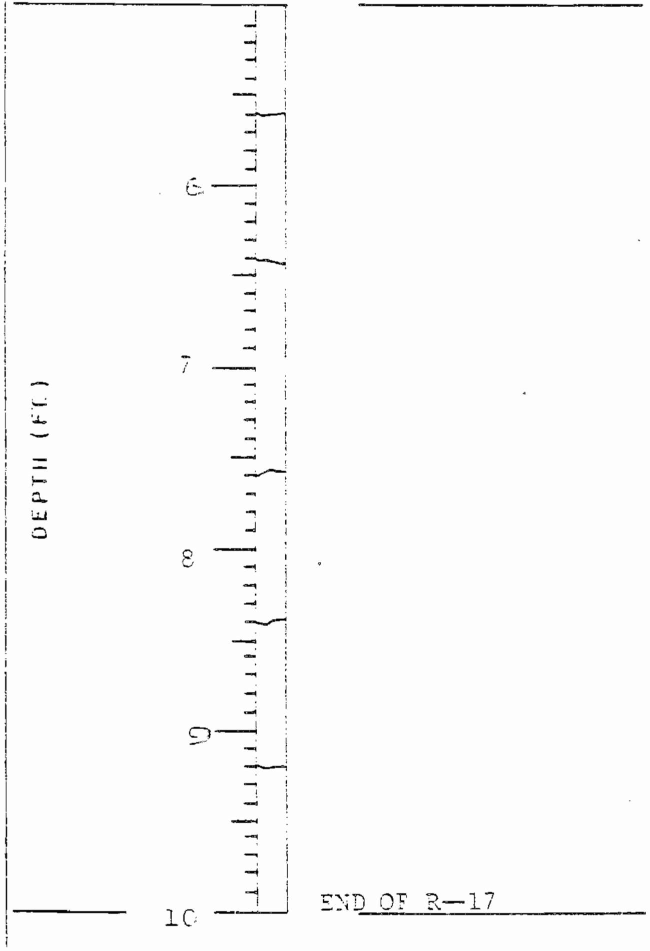
CORE DIAMETER NX	CORE RUN NO. R-17	DEPTH 133.7 FT. TO 143.7 FT.
CORE RECOVERY 10.0 FT.	RQ D 99 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1



END OF R—17

TOTAL 10.0 (FT) TOTAL 9.9 (FT)

100 % 99 %

ECJORDANCO

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 1

PROJECT NO 4344-09

PROJECT NAME Love Canal

BORING NO. 10225

LOGGED BY P. Baker

DATE 11-6-85

PROTECTION LEVEL D

CORE DIAMETER NX

CORE RUN NO. R-18

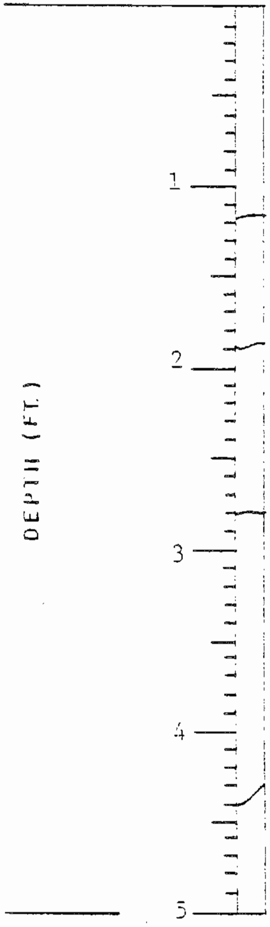
DEPTH 143.7 FT. TO 153.7 FT.

CORE RECOVERY 10.0 FT.

RQD 96 %

CORE QUALITY Excellent

CORE RECOVERY (FT.)	.3 FT. CORE RECOVERY	ROCK DESCRIPTION AND IDENTIFICATION
		SIMILAR TO R-1 SOME LIGHT GRAY CLASTS OF CARBONATE ROCKS AND GYPSUM CRYSTALS ARE PRESENT



TOTAL 10.0 (FT)

100 %

TOTAL 9.6 (FT)

96 %

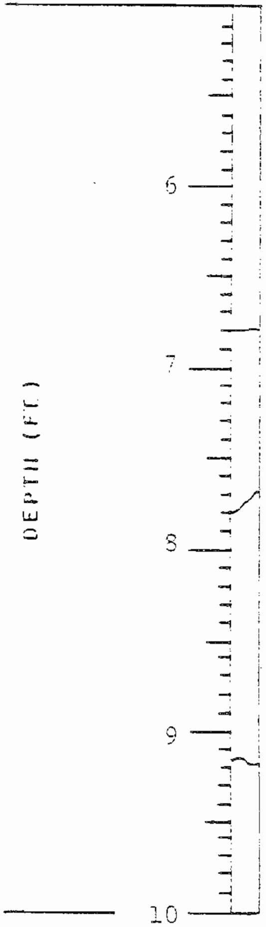
ECJORDANCO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET [illegible] OF [illegible]

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY P. Baker	DATE 11-6-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-18	DEPTH 143.7 FT. TO 153.7 FT.
CORE RECOVERY 10.0 FT.	RQD 96 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)



.3 FT. CORE RECOVERY

END OF R-18

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1

TOTAL 10.0 (FT)

100 %

TOTAL 9.6 (FT)

96 %

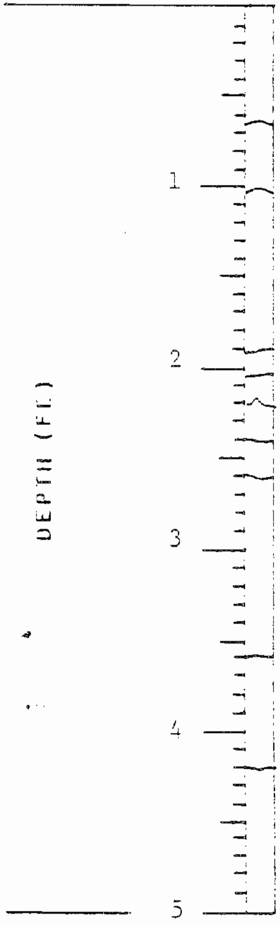
ECJORDANCO

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY P. Baker	DATE 11-6-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-19	DEPTH 153.7 FT. TO 163.7 FT.
CORE RECOVERY 10.0 FT.	RQD 91 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)



.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1

AT ROUGHLY 158' COLOR CHANGE TO LIGHT GRAY. THEN AT ROUGHLY 162' COLOR CHANGE BACK TO DARK GRAY.

TOTAL 10.0 (FT)

100 %

TOTAL 9.1 (FT)

91 %

ECJORDANCO

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

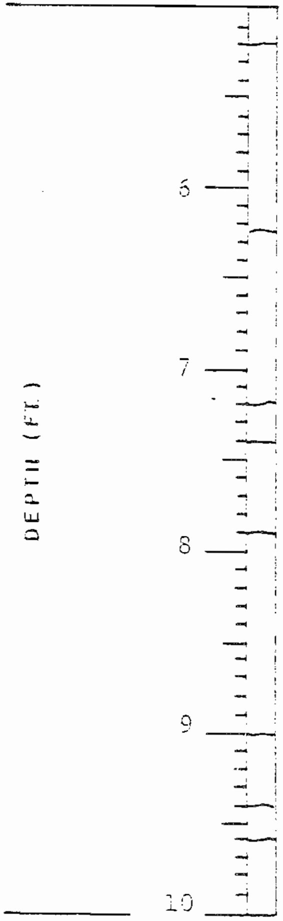
PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY P. Baker	DATE 11-6-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-19	DEPTH 153.7 FT. TO 163.7 FT.
CORE RECOVERY 10.0 FT.	RQD 91 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1



END OF R-19

TOTAL 10.0 (FT.)

100 %

TOTAL 9.1 (FT.)

91 %

ECJORDANCO

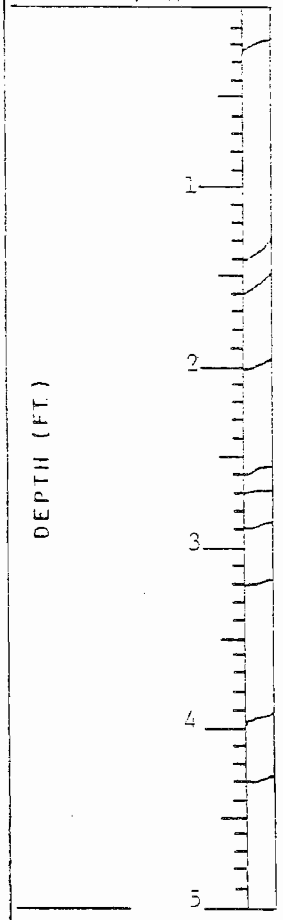
VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 1

PROJECT NO. 1841-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY P. Baker	DATE 11-6-85	PROTECTION LEVEL D

CORE DIAMETER NX	CORE RUN NO. R-20	DEPTH 163.7 FT. TO 173.7 FT.
CORE RECOVERY 10.0 FT.	RQD 82 %	CORE QUALITY Good

CORE RECOVERY (FT.)



TOTAL 10.0 (FT)

100 %

.3 FT. CORE RECOVERY

TOTAL 8.2 (FT)

82 %

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1

E.C. JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

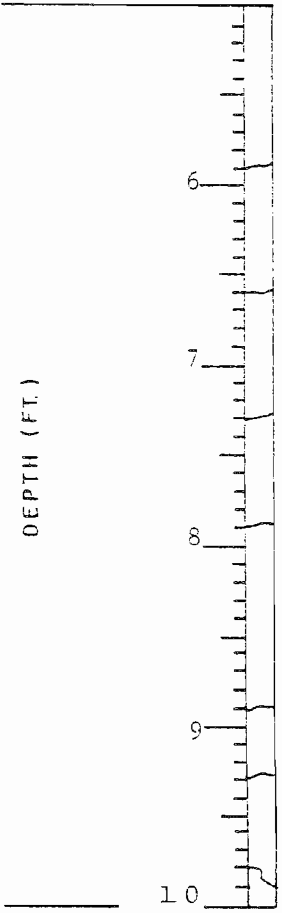
PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY P. Baker	DATE 11-6-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-20	DEPTH 163.7 FT. TO 173.7 FT.
CORE RECOVERY 10.0 FT.	RQD 82 %	CORE QUALITY Good

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1



END OF R-20

TOTAL 10.0 (FT)

100 %

TOTAL 8.2 (FT)

82 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

PROJECT NO. 18-1-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY P. Baker	DATE 11-6-85	PROTECTION LEVEL D

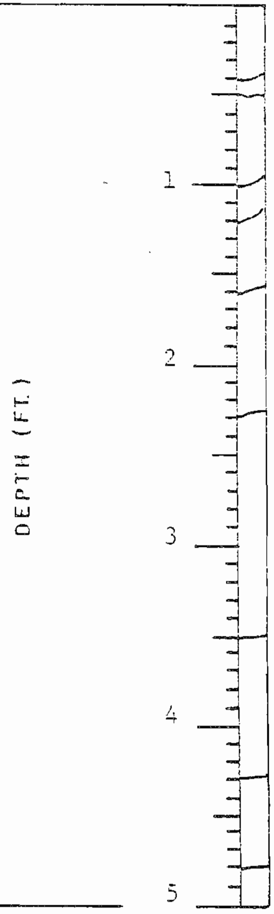
CORE DIAMETER NX	CORE RUN NO. R-21	DEPTH 173.7 FT. TO 182.7 FT.
CORE RECOVERY 9.0 FT.	RQD 82 %	CORE QUALITY Good

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1



TOTAL 9.0 (FT)

100 %

TOTAL 7.4 (FT)

82 %

E.C. JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

PROJECT NO. 4644-09

PROJECT NAME Love Canal

BORING NO. 10225

LOGGED BY P. Baker

DATE 11-6-85

PROTECTION LEVEL D

CORE DIAMETER NX

CORE RUN NO. R-21

DEPTH 173.7 FT. TO 182.7 FT.

CORE RECOVERY 9.0 FT.

RQD 82 %

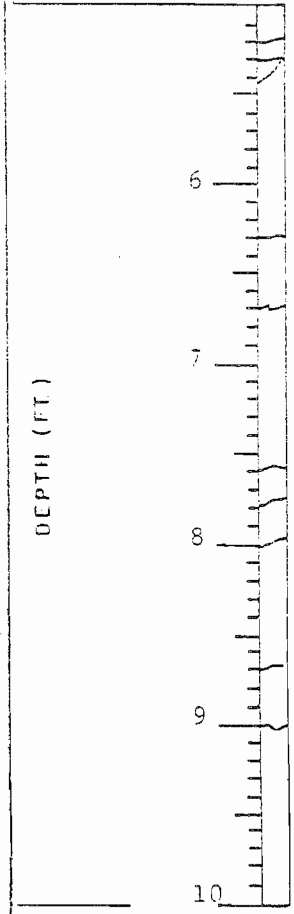
CORE QUALITY Good

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1



TOTAL 9.0 (FT)

100 %

TOTAL 7.4 (FT)

82 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 1

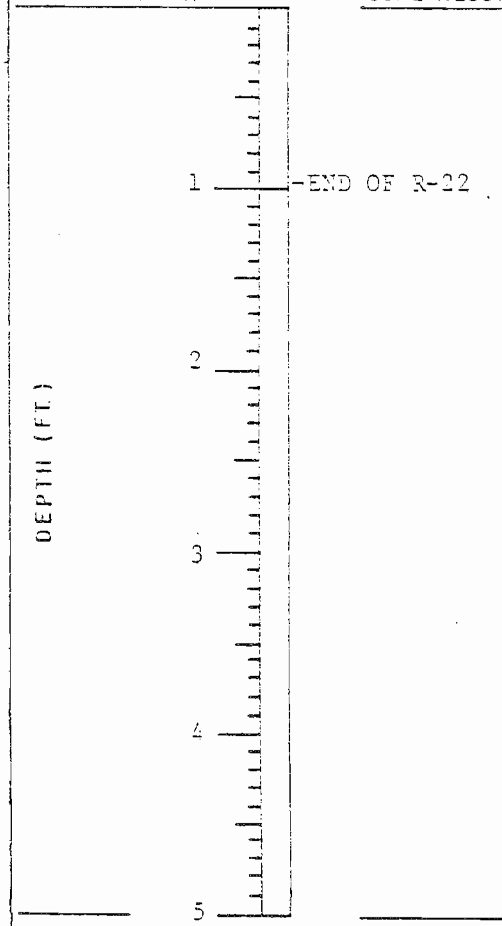
PROJECT NO. 4814-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY P. Baker	DATE 11-6-85	PROTECTION LEVEL D

CORE DIAMETER NX	CORE RUN NO. R-22	DEPTH 182.7 FT. TO 183.7 FT.
CORE RECOVERY 1.0 FT.	RQD 99 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION



SIMILAR TO R-1

TOTAL 1.0 (FT) 100 %

TOTAL .99 (FT) 99 %

ECJORDANCO

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 1

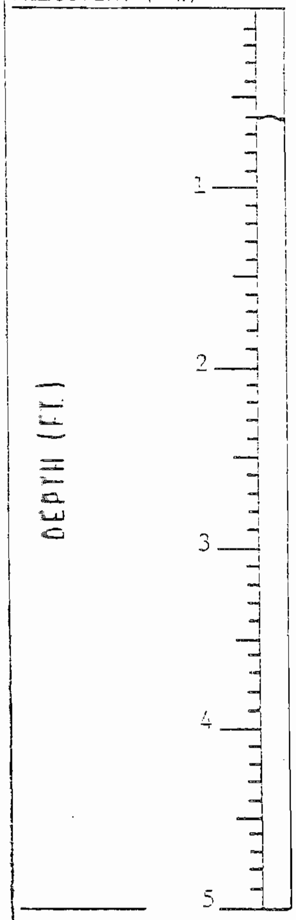
PROJECT NO. 4341-09	PROJECT NAME Love Canal		BORING NO. 10225
LOGGED BY P. Baker	DATE 11-6-85		PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-23	DEPTH 183.7 FT. TO 193.7 FT.	
CORE RECOVERY 10.0 FT.	RQD 100 %	CORE QUALITY Excellent	

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1



TOTAL 10.0 (FT)

100 %

TOTAL 10.0 (FT)

100 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 1

PROJECT NO. 4811-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY P. Baker	DATE 11-6-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-23	DEPTH 183.7 FT. TO 193.7 FT.
CORE RECOVERY 10.0 FT.	RQD 100 %	CORE QUALITY Excellent

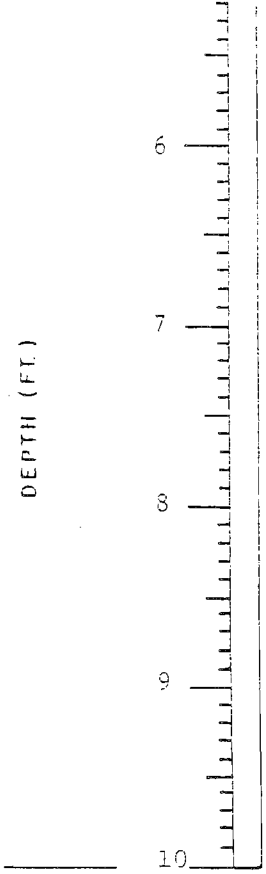
CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1

SOLID 5 FT RUN



END OF R-23

TOTAL 10.0 (FT) TOTAL 10.0 (FT)

100 % 100 %

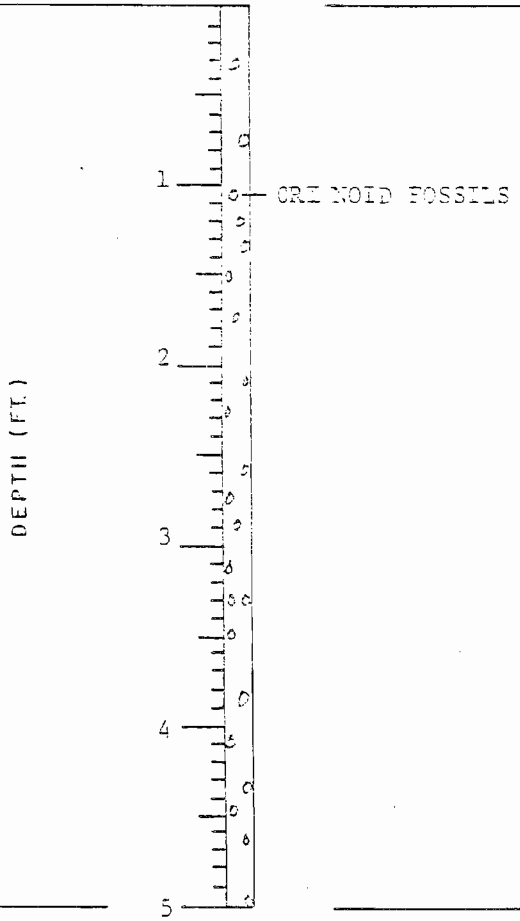
E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

PROJECT NO. 4844-09	PROJECT NAME Love Canal		BORING NO. 10225
LOGGED BY P. Baker	DATE 11-6-85		PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-24	DEPTH 193.7 FT. TO 203.7 FT.	
CORE RECOVERY 10.0 FT.	RQD 100 %	CORE QUALITY Excellent	

CORE RECOVERY (FT.)	.3 FT. CORE RECOVERY	ROCK DESCRIPTION AND IDENTIFICATION
		DOLOMITE LIMESTONE CONTAINING FOSSILS



TOTAL 10.0 (FT) TOTAL 10.0 (FT)

100 % 100 %

ECJORDANCO

VISUAL IDENTIFICATION OF ROCK CORES

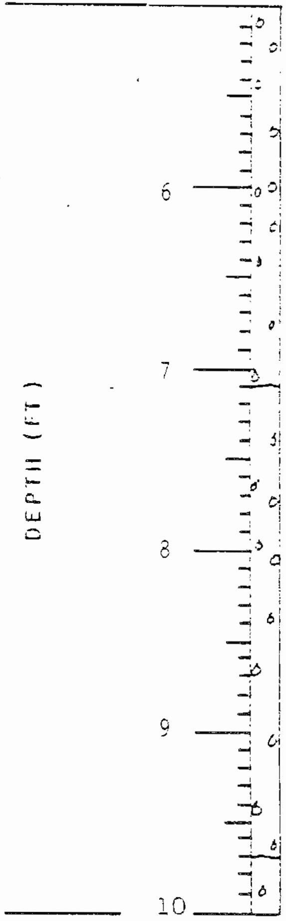
SHEET 2 OF 2

PROJECT NO. 4 344-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY P. Baker	DATE 11-6-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-24	DEPTH 193.7 FT. TO 203.7 FT.
CORE RECOVERY 10.0 FT.	RQD 100 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION



AT ROUGHLY 200' CORE APPEARS TO CHANGE TO A SHALEY DOLOMITE.

AT ROUGHLY 203' CORE APPEARS TO CHANGE TO SHALE STRATA. DARK BLACKISH-GRAY IN COLOR.

END OF R-24

TOTAL 10.0 (FT) TOTAL 10.0 (FT)

100 % 100 %

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 1

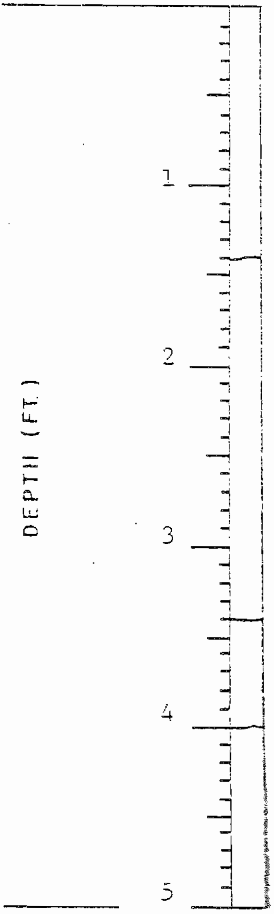
PROJECT NO. 4344-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY P. Baker	DATE 11-6-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-25	DEPTH 203.7 FT. TO 208.7 FT.
CORE RECOVERY 5.0 FT.	RQD 100 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1



END OF R-25

TOTAL 5.0 (FT) 100 %

TOTAL 5.0 (FT) 100 %

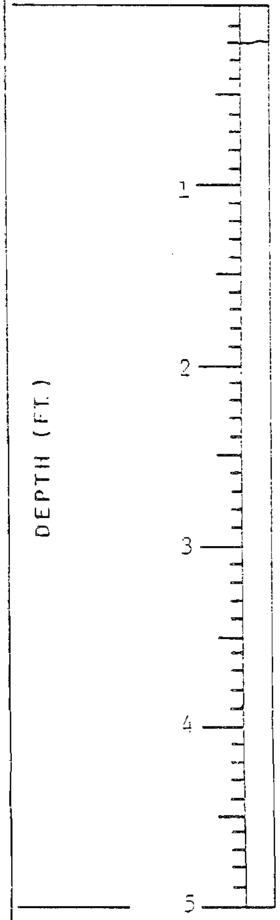
ECJORDANCO

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 1

PROJECT NO. 4844-09	PROJECT NAME Love Canal	BORING NO. 10225
LOGGED BY P. Baker	DATE 11-7-85	PROTECTION LEVEL D
CORE DIAMETER NX	CORE RUN NO. R-26	DEPTH 203.7 FT. TO 213.7 FT.
CORE RECOVERY 5.0 FT.	RQD 96 %	CORE QUALITY Excellent

CORE RECOVERY (FT.)	.3 FT. CORE RECOVERY	ROCK DESCRIPTION AND IDENTIFICATION
		SIMILAR TO R-1
	END OF R-26	



TOTAL 5.0 (FT)

100 %

TOTAL 4.8 (FT)

96 %

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 10225B

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-09

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/10/85

COMPLETED 11/12/85

METHOD DRIVE/WASH

CASING SIZE 4.0"

HNU 11.7/10.2

PROTECTION LEVEL D

GROUND EL. 574.4'

SOIL DRILLED 32.4'

TOTAL DEPTH 138.6'

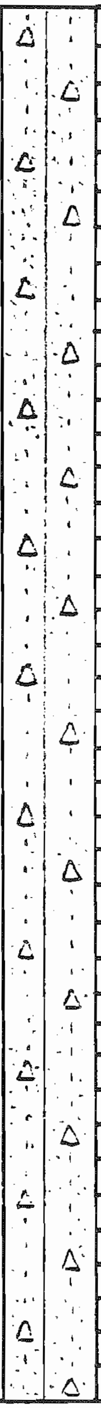
▽ BELOW GROUND NA

LOGGED BY S. Waite

CHECKED BY F. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	ELEV (FT)
								TOPSOIL 0.5			574.5
	0.3	S-1	X	N	N	2.0 1.0	0.0	BROWN TO BLACK SANDY SILT, TRACE OF GRAVEL AND CLAY, DRY, MEDIUM DENSE (FILL) 4.1	ML	6-12-11-12	
5	0.3	S-2	X	N	N	2.0 1.3	0.0	REDDISH-BROWN SILTY CLAY, MOIST, STIFF, SLIGHTLY PLASTIC, FRACTURES	CL	9-9-12-23	569.5
10	0.3	S-3	X	N	N	2.0 0.3	0.0	(LACUSTRINE CLAY) 12.0	CL	6-11-11-11	564.5
	0.0	S-4	X	N	N	2.0 1.8	0.0	REDDISH-GRAY SILTY CLAY, WET, PLASTIC, SOFT	CL	2-2-2-1	
15											559.5
	0.0	S-5	X	N	N	2.0 2.0	0.0	(LACUSTRINE CLAY)	CL	WOH-WOH-2-1	
20											554.5
	0.0	S-6	X	N	N	2.0 2.0	0.0		CL	WOH-WOH-2-2	
25								27.0			549.5
	0.0	S-7	X	N	N	2.0 1.9	0.0	SILTY SAND WITH SOME GRAVEL, TRACE OF CLAY, WIDELY GRADED, DENSE, WET	SM ML	23-37-21-48	
30								(GLACIAL TILL) 32.4			544.5
		R-1						BEDROCK: GRAY DOLOMITE, SEE ROCK LOGS FOR BORING NO. 10225A FOR DESCRIPTIONS AND FRACTURES.			
35		R-2									539.5
		R-3						WOH = WEIGHT OF HAMMER			
40											534.5



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 10225B

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-09

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/10/85

COMPLETED 11/12/85

METHOD DRIVE/WASH

CASING SIZE 4.0"

HNU 11.7/10.2

PROTECTION LEVEL D

GROUND EL. 574.5'

SOIL DRILLED 32.4'

TOTAL DEPTH 138.6'

▽ BELOW GROUND NA

LOGGED BY S. Waite

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
							GRAY DOLOMITE				534.5
		R-3									
45											529.5
		R-4									
50											524.5
		R-5									
55											519.5
		R-6									
60		R-7									514.5
65											509.5
		R-8									
70											504.5
75		R-9									499.5
80											494.5

U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

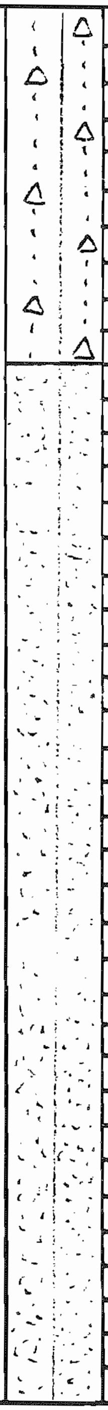
E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 10225B

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION			**PROJECT NO.** 4844-09
CONTRACTOR: J. MATHES ASSOC.	**DATE STARTED** 11/10/85		**COMPLETED** 11/12/85
METHOD DRIVE/WASH	**CASING SIZE** 4.0"	**HNU** 11.7 / 10.2	**PROTECTION LEVEL** D
GROUND EL. 574.4'	**SOIL DRILLED** 32.4'	**TOTAL DEPTH** 138.6'	∇ **BELOW GROUND** NA
LOGGED BY S. Waite	**CHECKED BY** R. Lewis	**DATE** 3/24/86	



DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
		R-9					GRAY DOLOMITE				494.5
		R-10									
85											489.5
		R-11									
90											484.5
95											479.5
		R-12									
100											474.5
105											469.5
		R-13									
110											464.5
115											459.5
		R-14									
120											454.5

*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 10225B

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-09

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/10/85

COMPLETED 11/12/85

METHOD DRIVE/WASH

CASING SIZE 4.0"

HNU 11.7 / 10.2

PROTECTION LEVEL D

GROUND EL. 574.4'

SOIL DRILLED 32.4'

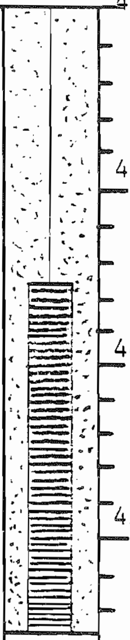
TOTAL DEPTH 138.6'

▽ BELOW GROUND NA

LOGGED BY S. Waite

CHECKED BY Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE #	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	WELL DATA	ELEV(FT)
											454.5
		R-14					GRAY DOLOMITE				
125											449.5
		R-15									
130											444.5
		R-16									
135											439.5
		R-17									
							BOTTOM OF BORING AT 138.6 FEET				
140											434.5
145											429.5
150											424.5
155											419.5
160											414.5

#U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 10225C

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-09

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/14/85

COMPLETED 11/20/85

METHOD DRIVE/WASH

CASING SIZE 4.0"

HNU 11.7/(10.2)

PROTECTION LEVEL D

GROUND EL. 575.2'

SOIL DRILLED 35.1'

TOTAL DEPTH 63.2'

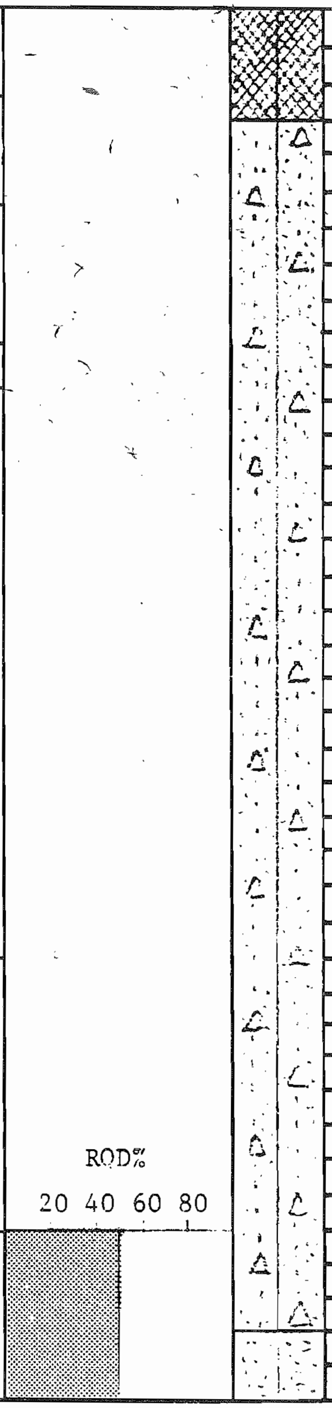
▽ BELOW GROUND NA

LOGGED BY M. Muzzy

CHECKED BY R. Lewis

DATE 3/24/86

DEPTH (FT)	HNU AMBIENT AIR	SAMPLE NO. & TYPE *	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (PPM)	SOIL/ROCK DESCRIPTION	SOIL CLASS	BLOWS/6-IN RQD %	ELEV(FT)
0							BROWN MOTTLED GRAVELLY SANDY SILT, DRY, LOOSE, ORGANICS (FILL) 2.4	GM		575.2
							BROWN SILTY SAND, FINE, MOIST, WELL COMPACTED 5.4	SM		
5										570.2
							BROWN MOTTLED SILTY CLAY WITH TRACE SAND, DRY, STIFF, FRACTURED VARVED (LACUSTRINE CLAY) 9.4	CL		
10							BROWN TO GRAY MOTTLED SILTY CLAY, MOIST-WET, SOFT, PLASTIC, VARVED	CH-CL		565.2
15										560.2
20										555.2
							24.4			
25							GRAYISH-BROWN CLAY WITH SAND: WITH TRACE GRAVEL, SOFT, MOIST (TRANSITIONAL TILL) 27.0			550.2
							REDDISH-BROWN SILTY SAND WITH CLAY AND GRAVEL, DRY-MOIST, STIFF (GLACIAL TILL) 35.0			
30										545.2
35		R-1					GRAY DOLOMITE		RQD% 20 40 60 80	540.2
40										535.2



*U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C.JORDAN CO.

LOVE CANAL REMEDIAL PROJECT
LONG TERM MONITORING

TASK VC

BORING NO. 10225C

CLIENT: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 4844-09

CONTRACTOR: J. MATHES ASSOC.

DATE STARTED 11/14/85

COMPLETED 11/20/85

METHOD Nx CORE

CASING SIZE 3.0"

HNU 11.7/(10.2)

PROTECTION LEVEL D

GROUND EL. 575.2'

SOIL DRILLED 35.1'

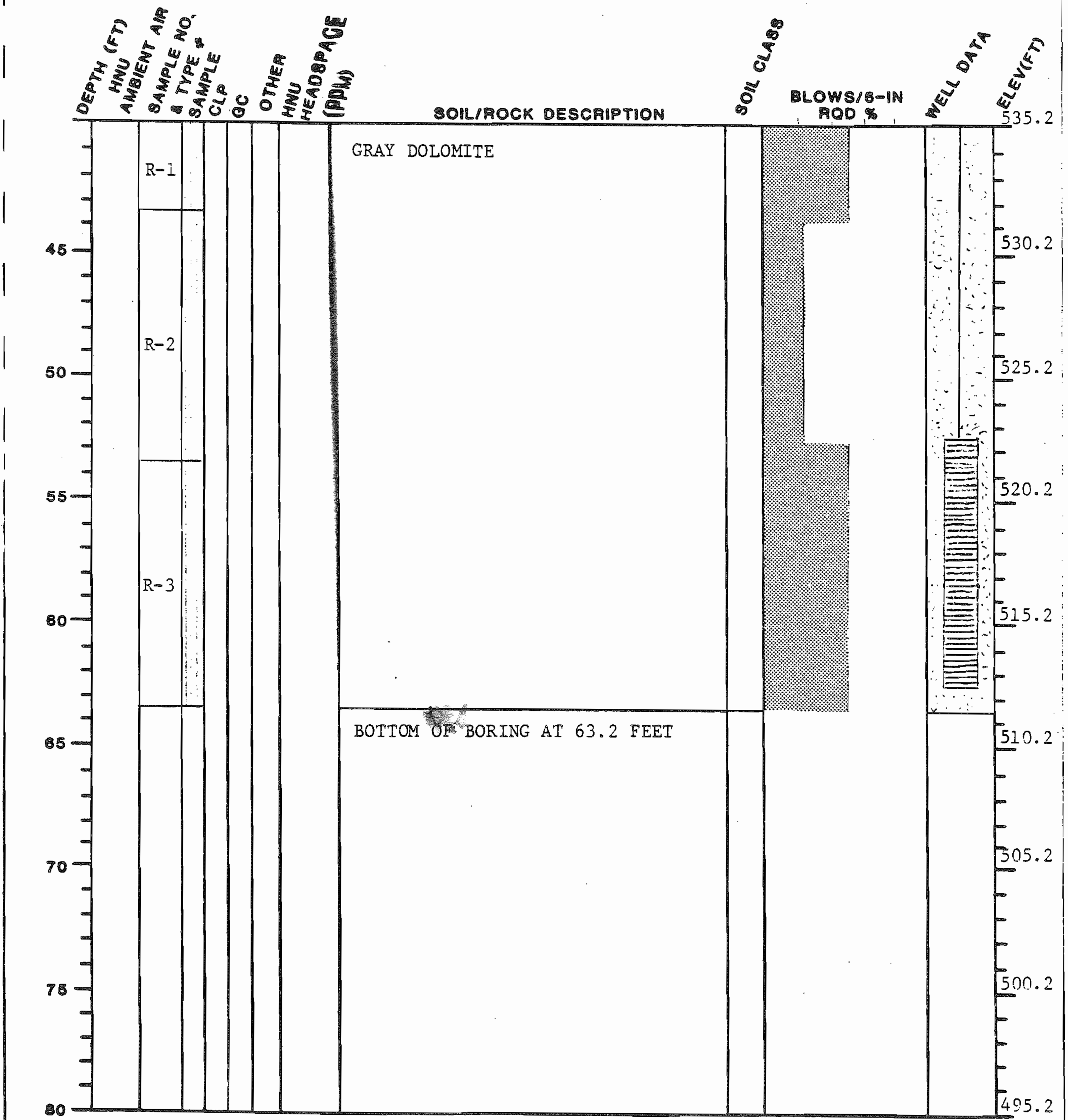
TOTAL DEPTH 63.2'

▽ BELOW GROUND

LOGGED BY M. Muzzy

CHECKED BY R. Lewis

DATE 3/24/86



GRAY DOLOMITE

BOTTOM OF BORING AT 63.2 FEET

U: THIN WALL TUBE S: SPLIT SPOON R: ROCK

E.C. JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 1

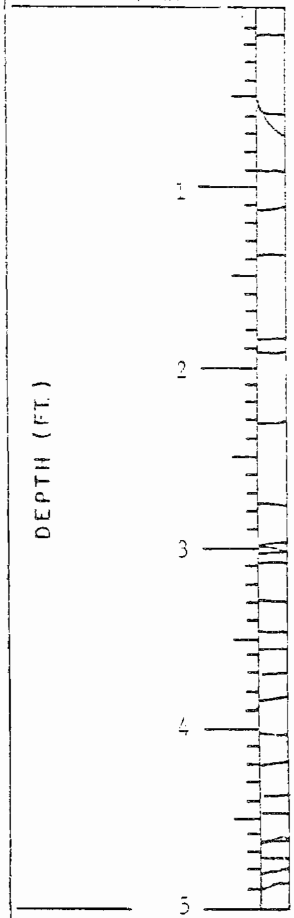
PROJECT NO 484-4-09	PROJECT NAME Love Canal	BORING NO. 10225-C
LOGGED BY M. Muzzy	DATE 11-19-85	PROTECTION LEVEL D

CORE DIAMETER NQ	CORE RUN NO. R-1	DEPTH 35.1 FT. TO 43.5 FT.
CORE RECOVERY 7.95 FT.	RQD 47 %	CORE QUALITY Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION



GRAY DOLOMITE WITH CORAL AND VUGS AS WELL AS GYPSUM FILLED FRACTURES

TOTAL 7.9 (FT)

94 %

TOTAL 3.9 (FT)

47 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

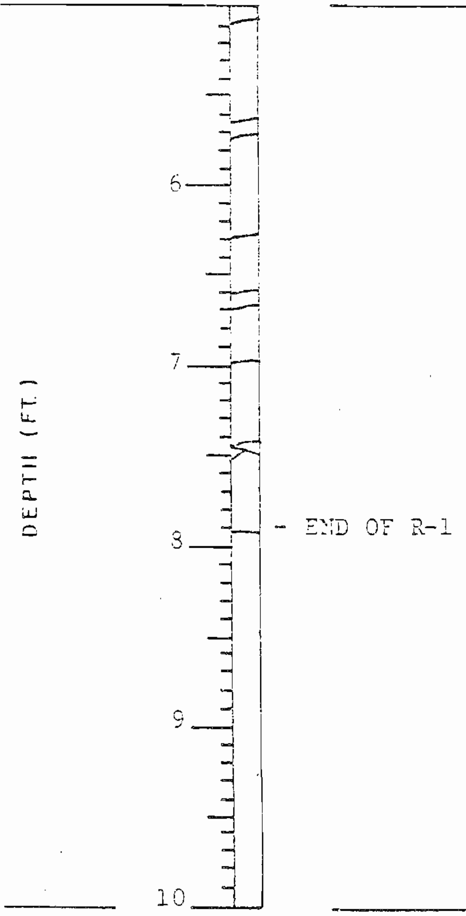
PROJECT NO. 1544-09	PROJECT NAME Love Canal	BORING NO. 10215-C
LOGGED BY M. Muzzy	DATE 11-19-85	PROTECTION LEVEL D
CORE DIAMETER NQ	CORE RUN NO. R-1	DEPTH 35.1 FT. TO 43.5 FT.
CORE RECOVERY 7.95 FT.	RQD 47 %	CORE QUALITY Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

GRAY DOLOMITE WITH CORAL AND VUGS AS WELL AS GYPSUM FILLED FRACTURES



TOTAL 7.9 (FT)

94 %

TOTAL 3.9 (FT)

47 %

E.C.JORDAN CO.

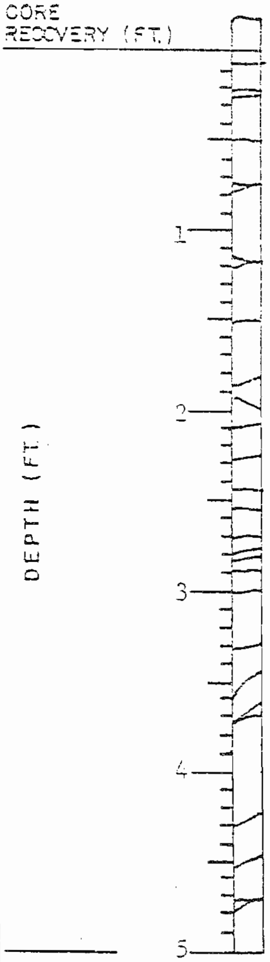
VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 2

PROJECT NO. 1344-09	PROJECT NAME Love Canal	BORING NO. 10225-C
LOGGED BY M. Muzzy	DATE 11-19-85	PROTECTION LEVEL D

CORE DIAMETER NQ	CORE RUN NO. R-2	DEPTH 43.5 FT. TO 53.5 FT.
CORE RECOVERY 10.3 FT.	RQD 24 %	CORE QUALITY Very Poor

CORE RECOVERY (FT.)	.3 FT. CORE RECOVERY	ROCK DESCRIPTION AND IDENTIFICATION
	RECOVERED 0.3 FT FROM R-1	SIMILAR TO R-1



TOTAL 10.0 (FT) TOTAL 2.4 (FT)

+100 % 24 %

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

PROJECT NO. -844-09	PROJECT NAME Love Canal	BORING NO. 10225-C
LOGGED BY M. Muzzy	DATE 11-19-85	PROTECTION LEVEL D

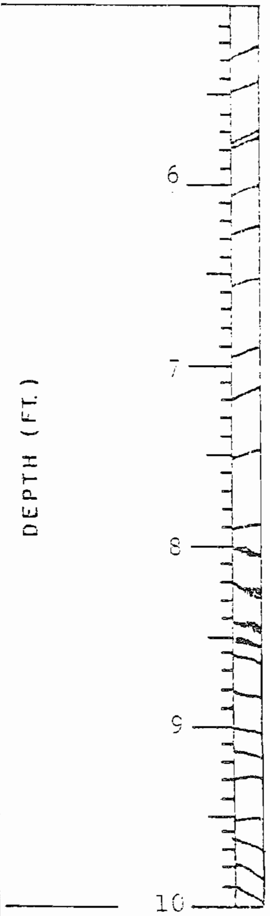
CORE DIAMETER NQ	CORE RUN NO. R-2	DEPTH 43.5 FT. TO 53.5 FT.
CORE RECOVERY 10.3 FT.	RQD 24 %	CORE QUALITY Very Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1



END OF R-2

TOTAL 10.0 (FT)

+100 %

TOTAL 2.4 (FT)

24 %

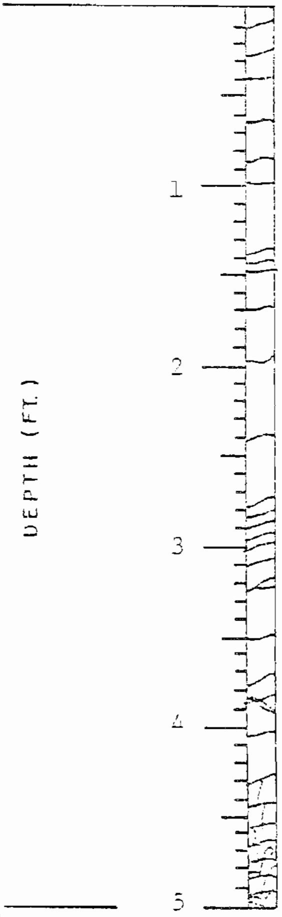
ECJORDANCO

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 1 OF 1

PROJECT NO. 45-1-09	PROJECT NAME Love Canal	BORING NO. 10225-C
LOGGED BY M. Muzzy	DATE 11-20-85	PROTECTION LEVEL D
CORE DIAMETER NQ	CORE RUN NO. R-3	DEPTH 53.5 FT. TO 63.2 FT.
CORE RECOVERY 10.2 FT.	RQD 48 %	CORE QUALITY Poor

CORE RECOVERY (FT.)



.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1

TOTAL 9.71 (FT) TOTAL 4.86 (FT)

100 % 48 %

EXCESS CORE RECOVERY DUE TO EXPANSION OF CORE WHEN PLACED IN CORE BOX.

E.C.JORDAN CO.

VISUAL IDENTIFICATION OF ROCK CORES

SHEET 2 OF 2

PROJECT NO. 4611-09	PROJECT NAME Love Canal	BORING NO. 10225-C
LOGGED BY [illegible]	DATE 11-20-85	PROTECTION LEVEL D

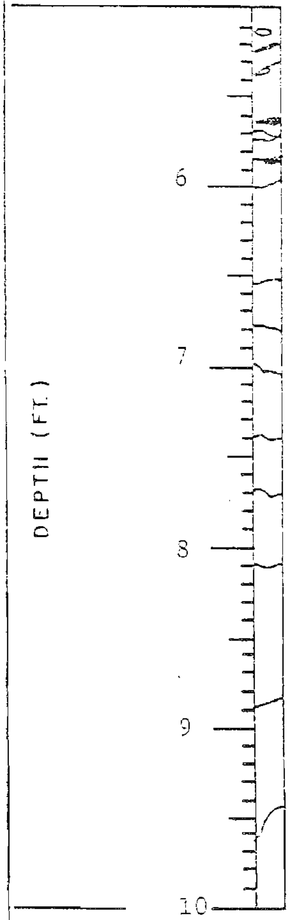
CORE DIAMETER NQ	CORE RUN NO. R-3	DEPTH 53.5 FT. TO 63.2 FT.
CORE RECOVERY 10.2 FT.	RQD 48 %	CORE QUALITY Poor

CORE RECOVERY (FT.)

.3 FT. CORE RECOVERY

ROCK DESCRIPTION AND IDENTIFICATION

SIMILAR TO R-1



BOTTOM OF BORING AT 63.2'

TOTAL 9.7 (FT) TOTAL 4.86 (FT)

+100 % 48 %

EXCESS CORE RECOVERY DUE TO EXPANSION OF CORE WHEN PLACED IN CORE BOX.

E.C.JORDAN CO.

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: LOVE CANAL
PROJECT NUMBER: 009954
CLIENT: GLENN SPRINGS HOLDINGS
LOCATION: NIAGARA FALLS, NEW YORK
LOCATION DESCRIPTION: COLVIN BLVD AND 96TH ST

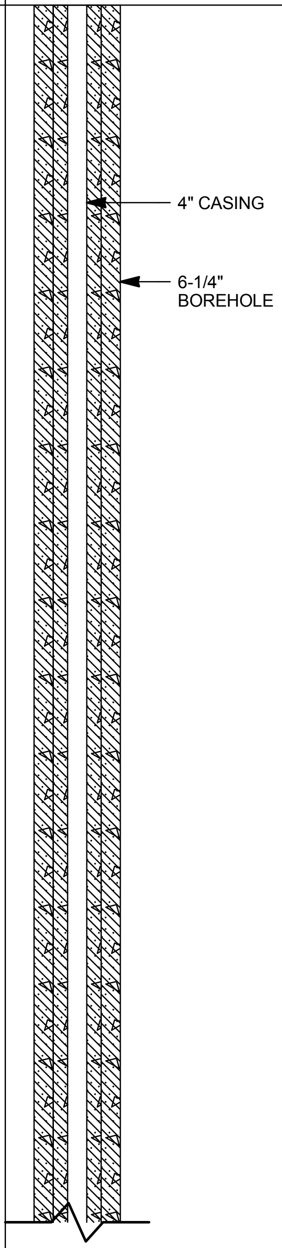
HOLE DESIGNATION: MW-01
DATE COMPLETED: June 29, 2011
DRILLING METHOD: HSA
FIELD PERSONNEL: S. MCEVOY

NORTHING: 1124218
EASTING: 1049984

	ELEV. ft
TOP OF CASING	571.98
GROUND SURFACE	571.97
TOP OF RISER	571.55

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft
	GP-GRAVEL, stones	571.47
	CL/ML-SILTY CLAY, with coarse gravel, stiff, low plasticity, olive gray, dry	570.47
2	CL-CLAY, medium stiff, light brown, dry, no odor - stiff, light gray at 2.0ft BGS	
4	CL/ML-CLAY TO SILTY CLAY, low plasticity, stiff, light brown/light gray, dry, no odor	567.97
6	CL/ML-SILTY CLAY, stiff, medium plasticity, olive gray, dry, no odor - medium stiff, light brown/light gray at 9.0ft BGS - soft, high plasticity, light brown/light gray at 10.5ft BGS - moist at 11.0ft BGS	565.97
14	CL-CLAY, with small amount of fine gravel, very soft, high plasticity, light brown/light gray, moist to wet - large rock, no odor at 17.0ft BGS	557.97
18	CL-CLAY, some fine gravel, soft, high plasticity, light brown/light gray, moist, no odor	553.97
	CL/ML-SILTY CLAY, with coarse gravel, medium stiff, medium plasticity, light brown/light gray, no odor with rock fragments and coarse gravel layered, low plasticity, limestone fragments	552.47
22	CL-CLAY, with coarse gravel, limestone fragments, stiff, brittle, light gray, no odor, - moist at 24.0ft BGS	549.97
	SM-SILTY SAND, fine sand, loose, light gray/light brown, moist, no odor	546.47
	CL/ML-SILTY CLAY, coarse sand, medium stiff, light gray, moist, no odor	545.47
28	SP-SAND, fine grained, with fine gravel, medium dense, light gray, wet, no odor - rock fragments, fractured limestone, some fine sand, dark gray, wet, no odor at 29.0ft BGS	543.97
	BEDROCK END OF OVERBURDEN HOLE @ 30.8ft BGS	541.22

MONITORING WELL



SAMPLE

NUMBER	INTERVAL	REC (%)	BLOW COUNTS	PID (ppm)
1HSA		63	12	0.0
2HSA		83	17	0.0
3HSA		92	23	0.0
4HSA		92	26	0.0
5HSA		100	11	0.0
6HSA		100	5	0.0
7HSA		100	3	0.0
8HSA		100	4	0.0
9HSA		67	5	0.0
10HSA		75	10	0.0
11HSA		100	40	0.0
12HSA		100	42	0.0
13HSA		100	65	0.0
14HSA		75	25	0.0
15HSA		100	31	0.0
16HSA		67	100/ 2"	0.0

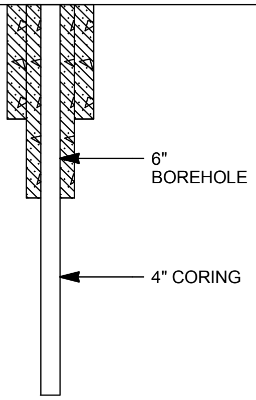
NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

STRATIGRAPHIC AND INSTRUMENTATION LOG
(BEDROCK)

PROJECT NAME: LOVE CANAL
PROJECT NUMBER: 009954
CLIENT: GLENN SPRINGS HOLDINGS
LOCATION: NIAGARA FALLS, NEW YORK
LOCATION DESCRIPTION: COLVIN BLVD AND 96TH ST

HOLE DESIGNATION: MW-01
DATE COMPLETED: June 29, 2011
DRILLING METHOD: HSA
FIELD PERSONNEL: S. MCEVOY

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	MONITORING WELL	RUN NUMBER	CORE RECOVERY %	RQD %
30	SP-SAND, fine grained, with fine gravel, medium dense, light gray, wet, no odor - rock fragments, fractured limestone, some fine sand, dark gray, wet, no odor at 29.0ft BGS	543.97				
32 34 36	BEDROCK - very fractured, no solid core bigger than 0.15" from 33.1 to 34.1ft at 33.1ft BGS - horizontal fractures at 34.2, 34.5, 34.6, 35.1, 35.3, 36.4, 36.5 and 37.1ft at 34.2ft BGS	541.22				35
38 40 42 44 46 48 50 52 54 56 58 60 62	END OF BOREHOLE @ 37.9ft BGS NOTE: WATER LOSS = 15%	534.07				



NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: LOVE CANAL
PROJECT NUMBER: 009954
CLIENT: GLENN SPRINGS HOLDINGS
LOCATION: NIAGARA FALLS, NEW YORK
LOCATION DESCRIPTION: COLVIN BLVD AND 96TH ST

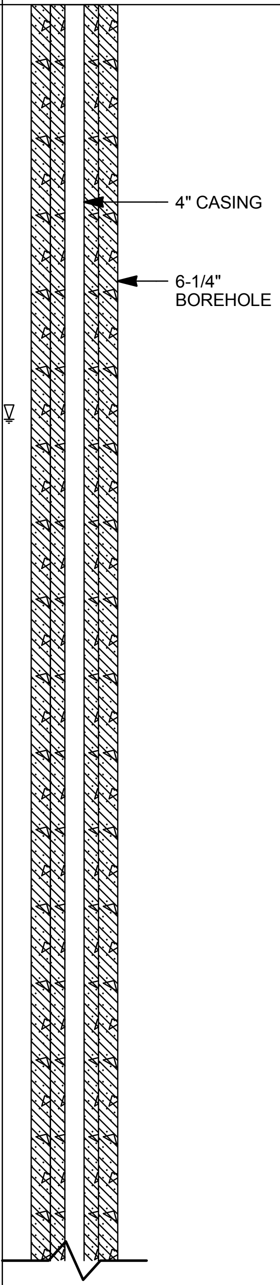
HOLE DESIGNATION: MW-02
DATE COMPLETED: June 27, 2011
DRILLING METHOD: HSA
FIELD PERSONNEL: J. POLOVICH

NORTHING: 1124279
EASTING: 1049879

	ELEV. ft
GROUND SURFACE	571.39
TOP OF CASING	571.24
TOP OF RISER	571.10

STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft
TOPSOIL, with brown organics	
SC-SAND/SILTY CLAY, some organics, medium brown, dry, no odor	570.69
CL/ML-SILTY CLAY, medium stiff, olive gray, dry, no odor - hard, brittle, low plasticity at 4.0ft BGS - slightly plastic, light gray/brown at 7.0ft BGS - soft, high plasticity, light gray/brown at 9.5ft BGS	569.39
CL-CLAY, soft, high plasticity, light gray/light brown, moist, no odor - minor rock fragments at 13.0ft BGS	560.89 ⊻
CL/ML-SILTY CLAY, very soft, light gray/light brown, moist, no odor	557.39
CLS-SANDY CLAY, mixed with pebbles/stones, very soft, high plasticity, moist to wet	554.39
- rock fragments, limestone, crystalline structure, layered, gray at 20.9ft BGS	550.39
CL-CLAY, with rock fragments, high sand content, dense, angular limestone fragments, brown	
- rock fragments at 23.0ft BGS	547.39
AUGER REFUSAL	
CL-CLAY, with rock fragments, soft, gray, moist, no odor	545.89
SP-SAND, medium grained, minor black grains, gray, saturated, no odor	544.89
- rock fragments at 28.4ft BGS	
SP-SAND, running sand, probably sluff, gray	542.89
TILL MATERIAL, clay, hard, mixed with running sand, rocks, light brown/light gray	539.89
END OF OVERBURDEN HOLE @ 31.8ft BGS	

MONITORING WELL



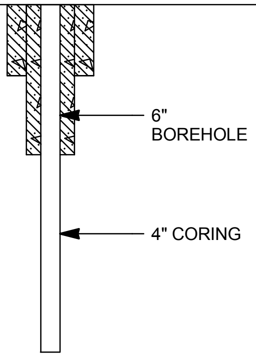
SAMPLE

NUMBER	INTERVAL	REC (%)	BLOW COUNTS	PID (ppm)
1HSA		50	5	0.0
2HSA		54	13	0.0
3HSA		75	18	0.0
4HSA		75	10	0.0
5HSA		100	11	0.0
6HSA		100	4	0.0
7HSA		100	1	0.0
8HSA		100	1	0.0
9HSA		100		0.0
10HSA		100	5	0.0
11HSA		79	48	0.0
12HSA		100	93	0.0
13HSA		8		0.0
14HSA		83	50	0.0
15HSA		33	75	0.0
16HSA		88	100/ 3"	0.0
17HSA		100		0.0

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ⊻

STRATIGRAPHIC AND INSTRUMENTATION LOG
(BEDROCK)

PROJECT NAME: LOVE CANAL
HOLE DESIGNATION: MW-02
PROJECT NUMBER: 009954
DATE COMPLETED: June 27, 2011
CLIENT: GLENN SPRINGS HOLDINGS
DRILLING METHOD: HSA
LOCATION: NIAGARA FALLS, NEW YORK
FIELD PERSONNEL: J. POLOVICH
LOCATION DESCRIPTION: COLVIN BLVD AND 96TH ST

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	MONITORING WELL	RUN NUMBER	CORE RECOVERY %	RQD %
32	TILL MATERIAL, clay, hard, mixed with running sand, rocks, light brown/light gray	539.89 539.59				
	BEDROCK					
34	- horizontal fractures at 34.2, 34.5, 34.7, 34.9, 35.4, 35.6, 36.1, 36.2, 36.6, 37.3, 37.4, 37.5, 37.6, 37.7 and 37.8ft at 34.2ft BGS					
36						22
38						
	END OF BOREHOLE @ 38.8ft BGS	532.59				
40	NOTE: WATER LOSS = ~50%					
42						
44						
46						
48						
50						
52						
54						
56						
58						
60						
62						
64						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ⊻

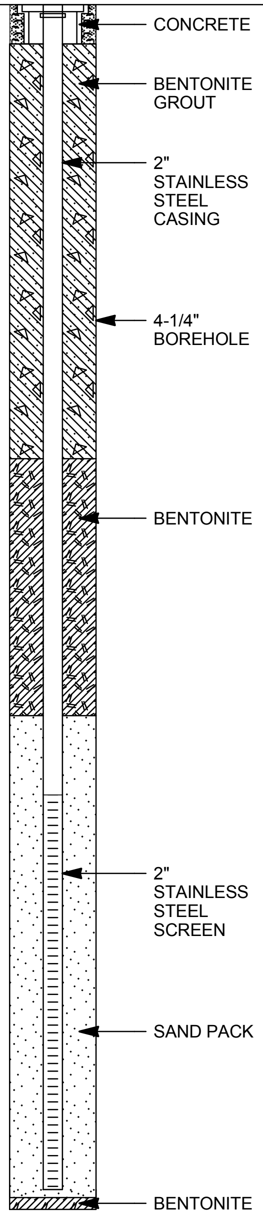
STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

Page 1 of 2

PROJECT NAME: LOVE CANAL
PROJECT NUMBER: 009954
CLIENT: GLENN SPRINGS HOLDINGS
LOCATION: NIAGARA FALLS, NEW YORK
LOCATION DESCRIPTION: COLVIN BLVD AND 96TH ST

HOLE DESIGNATION: MW-03
DATE COMPLETED: July 1, 2011
DRILLING METHOD: HSA
FIELD PERSONNEL: S. MCEVOY

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE BLOW COUNTS
	NORTHING: 1124252 EASTING: 1049936 TOP OF CASING GROUND SURFACE TOP OF RISER	571.05 571.03 570.71					
0	FILL						
30.5	END OF BOREHOLE @ 30.5ft BGS	540.53					



WELL DETAILS
Screened interval:
551.03 to 541.03ft
20.00 to 30.00ft BGS
Length: 10ft
Diameter: 2in
Slot Size: 0.010

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: LOVE CANAL
PROJECT NUMBER: 009954
CLIENT: GLENN SPRINGS HOLDINGS
LOCATION: NIAGARA FALLS, NEW YORK
LOCATION DESCRIPTION: COLVIN BLVD AND 96TH ST

HOLE DESIGNATION: MW-03
DATE COMPLETED: July 1, 2011
DRILLING METHOD: HSA
FIELD PERSONNEL: S. MCEVOY

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft	MONITORING WELL	SAMPLE			
				NUMBER	INTERVAL	REC (%)	BLOW COUNTS
36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68			Material: STAINLESS STEEL Seal: 559.53 to 553.03ft 11.50 to 18.00ft BGS Material: BENTONITE Sand Pack: 553.03 to 540.83ft 18.00 to 30.20ft BGS Material: SAND				

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

APPENDIX B

QUALITY ASSURANCE PROJECT PLAN

TABLE OF CONTENTS

LIST OF TABLES
(Following Text)

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) is Site-specific and has been prepared for the Remedial Action of the Love Canal Site, located in the southeast corner of the City of Niagara Falls, New York, bounded by Colvin Boulevard on the north, 99th and 100th Streets to the east, 95th and 97th Streets to the west; and Frontier Avenue to the south.

This QAPP provides comprehensive information regarding the project personnel responsibilities and sets forth specific procedures to be used during the analysis of groundwater samples.

2.0 PROJECT BACKGROUND

A detailed description of the history and background information for the Site is presented in the Love Canal Sampling Manual, June 2013.

2.1 GENERAL

This QAPP provides quality assurance/quality control (QA/QC) criteria for work efforts associated with sample analyses of groundwater. Methods for sample analyses have been selected to provide results which characterize the samples, such that the sampling objectives can be met.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITY

A brief description of the duties of the key project personnel is presented below.

Project Manager – John Pentilchuk/Dennis Hoyt
i) Provides day-to-day project management
ii) Provides managerial guidance to the QA/QC Officer - Sampling and Analytical Activities
iii) Prepares and reviews reports
iv) Conducts preliminary chemical data interpretation and assessment
v) Responsible for overall project completion in accordance with the approved design

QA/QC Officer - Sampling and Analytical Activities – Susan Scrocchi
i) Oversees and reviews laboratory activities
ii) Determines laboratory data corrective action
iii) Performs analytical data validation and assessment
iv) Reviews laboratory QA/QC
v) Assists in preparation and review of final report
vi) Provides technical representation for analytical activities
vii) Provides managerial and technical guidance to the Field Sampling Supervisor

Field Sampling Supervisor
i) Provides immediate supervision of all on-Site activities
ii) Provides field management of sample collection and field QA/QC
iii) Provides technical representation for field activities
iv) Is responsible for maintenance of the field equipment

Laboratory - Project Manager, Analytical Contractor
i) Ensures resources of laboratory are available on an as-required basis
ii) Coordinates laboratory analyses
iii) Supervises laboratory's in-house chain of custody
iv) Schedules analyses of samples
v) Oversees review of data

vi) Oversees preparation of analytical reports

vii) Approves final analytical reports

Laboratory - QA/QC Officer, Analytical Contractor

i) Overviews laboratory QA/QC

ii) Overviews QA/QC documentation

iii) Conducts detailed data review

iv) Decides laboratory corrective actions, if required

v) Provides technical representation for laboratory QA/QC procedures

Laboratory - Sample Custodian, Analytical Contractor

i) Receives and inspects the sample containers

ii) Records the condition of the sample containers

iii) Signs appropriate documents

iv) Verifies chain of custody and their correctness

v) Notifies Laboratory Project Manager and Laboratory QA/QC Officer of sample receipt and inspection

vi) Assigns a unique laboratory identification number correlated to the field sample identification number and enters each into the sample receiving log

vii) Initiates transfer of samples to the appropriate lab sections with assistance from the Laboratory Project Manager

viii) Controls and monitors access to and storage of samples and extracts

The analytical laboratory selected to perform the environmental analyses is TestAmerica Laboratories, Inc. (TA), located in Pittsburgh, Pennsylvania. TA is a New York State Department of Health (NYSDOH) approved laboratory certified under the National Environmental Laboratory Approval Program (NELAP).

4.0 PROJECT OBJECTIVES

4.1 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective is to develop and implement procedures for sample collection and analyses which will provide data with an acceptable level of accuracy and precision.

Quality assurance measures for this project will begin with sample containers. Sample containers for waters will be purchased from a certified manufacturer and will be pre-cleaned (I-Chem Series 200 or equivalent).

4.2 LABORATORY QUALITY ASSURANCE

The following subsections define the QA goals required to meet the Data Quality Objectives (DQOs) of the project.

4.2.1 ACCURACY, PRECISION, AND SENSITIVITY OF ANALYSES

The fundamental QA objective with respect to the accuracy, precision, and sensitivity of analytical data is to meet the QC acceptance criteria of each analytical protocol. Analytical methods and targeted quantitation limits listed have been specified to meet the groundwater quality standards.

A summary of the targeted quantitation limits is provided in Table 4.1. It should be noted that these limits are targeted quantitation limits only; limits are highly matrix dependent and may not always be achieved.

The method accuracy (percent recovery) will be determined by spiking selected samples (matrix spikes [MS]) with the method recommended spiking compounds. Accuracy will be reported as the percent recovery of the spiking compound(s) and will compare with the criteria given in the appropriate methods, as identified in Section 7.0.

The method(s) precision (reproducibility between duplicate analyses) will be determined based on the duplicate analysis of matrix spike samples. Precision will be reported as Relative Percent Differences (RPDs) between duplicate analyses; acceptance criteria will be as specified in the appropriate methods identified in Section 7.0.

4.2.2 COMPLETENESS, REPRESENTATIVENESS AND COMPARABILITY

A completeness requirement of 90 percent will be targeted for the program (see Section 13.1.3 for definition of completeness).

The quantity of samples to be collected has been estimated in an effort to effectively represent the population being studied. A summary of the sampling and analysis programs is presented in Table 4.2.

5.0 SAMPLING PROCEDURES

The sample collection procedures are described in the Love Canal Sampling Manual, June 2013.

The sample container, preservation, shipping, and packaging requirements are identified in Table 5.1 and Section 6.3.

6.0 SAMPLE CUSTODY AND DOCUMENT CONTROL

The following documentation procedures will be used during sampling and analysis to provide chain of custody control during transfer of samples from collection through storage. Recordkeeping documentation will include use of the following:

i) Field logbooks (bound with numbered pages) to document sampling activities in the field
ii) Labels to identify individual samples
iii) Chain of custody record sheet to document analyses to be performed
iv) Laboratory sample custody logbook

6.1 FIELD LOGBOOK

The field team may use bound notebooks, sample collection logs, or electronic journals to record daily logs, sampling events, and field observations. Regardless of the media, entries should be dated and signed (or initialed) by the person making the entry. Entries on paper should be made with waterproof ink. The type of information to be recorded in the field includes:

i) Date
ii) Time
iii) Field calibrations performed during the sampling
iv) Location and Sample ID
v) Pertinent health and safety concerns
vi) Up/downgradient or clean/contaminated designation
vii) Physical condition of well
viii) Depth of well (both installed and measured)
ix) Weather conditions (temperature, cloud cover, humidity, wind, etc.)
x) Sample crew and/or agency names
xi) Work progress
xii) Measuring point elevation
xiii) Depth to water
xiv) Purge volume

xv) Purge time (start/stop)

xvi) Recharge time

xvii) Time of sample collection

xviii) Important field observations regarding purge or sample water or conditions related to sample integrity

xix) QA/QC samples

xx) Name of laboratory(ies) performing analysis

xxi) Delays

xxii) Comments (e.g., unusual situations, well damage, departure from established QA/QC field procedures, instrument problems, accidents, etc.)

6.2 SAMPLE NUMBERING

A sample numbering system will be used to uniquely identify each collected sample. This system will provide a tracking number to allow retrieval and cross-referencing of sample information. An example sample numbering system is described as follows:

Example: WG-9954-081012–AA–XXX
Where: WG - Designates sample type
(WG=Groundwater)
9954: Project number
081012: Date of collection (mm/dd/yy)
AA: Sampler initials
XXX: Unique sample number or location ID

QC samples will also be numbered with a unique well ID, with the exception of matrix spikes and matrix spike duplicates.

Sample labels shall be affixed to each sample container (not the caps). The labels shall be completed in waterproof ink. All labels (except weatherproof labels) should be taped to the sample containers with clear package sealing tape. The labels will include the following information:

i) Sample number/identification code

ii) Name/initials of sampler

iii) Date and time of sample collection

iv) Site name
v) Project number
vi) Required analysis
vii) Type of preservation (if applicable)

6.3 CHAIN OF CUSTODY RECORDS

Chain of custody forms will be completed for all samples collected during the program.

The chain of custody form will document the transfer of sample containers. Custody seals will be placed on each cooler. The cooler will then be sealed with packing tape. Sample container labels will include sample number, place of collection, and date and time of collection. All samples will be refrigerated using wet ice at <6°C and delivered to the analytical laboratory within 24 to 48 hours of collection. All samples will be delivered to the laboratory by commercial courier or Contractor personnel. All samples will be stored at <6°C at the laboratory.

The chain of custody record, completed at the time of sampling, will contain, but not be limited to, the sample number, date and time of sampling, and the name of the sampler. The chain of custody document will be signed, timed, and dated by the sampler when transferring the samples.

Each sample cooler being shipped to the laboratory will contain a chain of custody form. The chain of custody form will consist of two originals which will be distributed as follows:

i) The shipper will maintain one original while the other will be enclosed in a waterproof envelope within the cooler with the samples
ii) The cooler will then be sealed properly for shipment
iii) The laboratory, upon receiving the samples, will complete the original and make copies
iv) The laboratory will maintain a copy for their records
v) One copy will be returned to the Laboratory QA/QC Officer upon receipt of the samples by the laboratory
vi) The laboratory original will be returned to the Data Management Consultant with the data deliverables package

6.4 SAMPLE DOCUMENTATION IN THE LABORATORY

Upon receipt of the cooler at the laboratory, the shipping cooler and the custody seal will be inspected by the Sample Custodian. The condition of the cooler and the custody seal will be noted on the chain of custody record sheet by the Sample Custodian. The Sample Custodian will record the temperature of one sample (or temperature blank) from each cooler, and the temperature will be noted on the chain of custody. If the shipping cooler seal is intact, the sample containers will be accepted for analyses. The Sample Custodian will document the date and time of receipt of the container and sign the form.

If damage or discrepancies are noticed (including sample temperature exceedances), they will be recorded in the remarks column of the record sheet, dated and signed. Any damage or discrepancies will be reported to the Laboratory Project Manager and Laboratory QA/QC Officer before samples are processed.

Each sample or group of samples shipped to the laboratory for analysis will be given a unique identification number. The Sample Custodian will record the client name, number of samples, and date of receipt of samples in the Sample Control Logbook. Samples removed from storage for analyses will be documented in the Sample Control Logbook.

The laboratory will be responsible for maintaining analytical logbooks and laboratory data as well as a sample (on hand) inventory for submittal to Glenn Springs Holdings, Inc. (GSH) on an "as required" basis. Raw laboratory data produced from the analysis of samples submitted for this program will be inventoried and maintained by the laboratory for a period of 5 years; at which time, GSH will advise the laboratory regarding the need for additional storage.

6.5 STORAGE OF SAMPLES

After the Sample Custodian has completed the chain of custody forms and the incoming sample log, the chain of custody will be checked to ensure that all samples are stored in the appropriate locations. All samples will be stored within an access controlled custody room and will be maintained at <6°C until all analytical work is complete.

7.0 ANALYTICAL PROCEDURES FOR CHEMICAL ANALYSES

Samples collected for laboratory chemical analyses will be analyzed for the parameters listed in Table 4.1, using the methods cited in Table 4.2. These methods have been selected to meet the DQOs for each sampling activity.

Data deliverables for this program will include final results for the investigative samples and corresponding QC parameters as specified in Section 9.2.

All sample results will be calculated using external standards with the exception of the samples analyzed by gas chromatograph/mass spectrometer (GC/MS); these methods employ the use of internal standards or isotopic dilution for analyte quantitation. The specific procedures for target analyte quantitation are detailed in the appropriate analytical methods.

8.0 CALIBRATION PROCEDURES AND FREQUENCY

Calibration of instrumentation is required to ensure that the analytical system is operating correctly and functioning at the proper sensitivity to meet established reporting limits. Each instrument is calibrated with standard solutions appropriate to the type of instrument and the linear range established for the analytical method. The frequency of calibration and the concentration of calibration standards are determined by the manufacturer's guidelines, the analytical method, or the requirements of special contracts.

A bound notebook will be kept with each instrument requiring calibration in which the activities associated with QA monitoring and repairs program will be recorded. These records will be checked during periodic equipment review and internal and external QA/QC audits.

8.1 GAS CHROMATOGRAPHY/MASS SPECTROMETRY

It is necessary to establish that a given GC/MS meets the standard mass spectral abundance criteria prior to initiating any ongoing data collection. This is accomplished through the analyses of tuning compounds as specified in the analytical methods.

Calibration of the GC/MS system will be performed daily at the beginning of the day or with each 12 hours of instrument operating time. All method-specified calibration criteria must be met prior to sample analyses. All calibrations must be performed using either average response factors or first-order linear regression (with a correlation coefficient requirement of ≥0.995). Higher order fits will not be allowed.

8.2 GAS CHROMATOGRAPHY

Quantification of samples that are analyzed by GC with element selective detectors shall be performed by external standard calibration. Standards containing the compounds of interest will be analyzed at a minimum of five concentrations to establish the linear range of the detector. Single point calibration will be performed at the beginning of each day and at every tenth injection. The response factors from the single point calibration will be checked against the average response factors from multi-level calibration. If deviations in response factors are greater than those allowed by the analytical method protocols, then system recalibration will be performed. Alternatively, fresh calibration standards will be prepared and analyzed to verify instrument calibration.

All method-specified calibration criteria must be met prior to sample analyses. All calibrations must be performed using either average response factors or first-order linear regression (with a correlation coefficient requirement of ≥0.995). Higher order fits will not be allowed.

9.0 DATA REDUCTION, VALIDATION ASSESSMENT, AND REPORTING

9.1 GENERAL

The contract laboratory will perform analytical data reduction and validation in-house under the direction of the Laboratory QA/QC Officer. The Laboratory QA/QC Officer will be responsible for assessing data quality and advising of any data which were rated "preliminary" or "unacceptable" or other qualifications based on the QC criteria outlined in the relevant methods, which would caution the data user of possible unreliability. Data reduction, validation, and reporting by the laboratory will be conducted as detailed in the following:

i) Raw data produced and checked by the responsible analysts are turned over for independent review by another analyst
ii) The area supervisor reviews the data for attainment of quality control criteria presented in the referenced analytical methods
iii) Upon completion of all reviews and acceptance of the raw data by the laboratory operations manager, a computerized report will be generated and sent to the Laboratory QA/QC Officer
iv) The Laboratory QA/QC Officer will complete a thorough inspection of all reports
v) The Laboratory QA/QC Officer and area supervisor will decide whether any sample reanalysis is required
vi) Upon acceptance of the preliminary reports by the Laboratory QA/QC Officer, final reports will be generated and signed by the Laboratory Project Manager

Validation of the analytical data will be performed by the QA/QC Officer - Sampling and Analytical Activities. The data validation will be performed in accordance with the document "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review," United States Environmental Protection Agency (USEPA) 540/R-99/008, October 1999.

Assessment of analytical data will include the following checks:

1. Ensure that the data package is complete
2. Check all holding times against the requirements in Table 5.1
3. Check all QC data fall within the required limits and specifications

4. Confirm that the proper methods were utilized
5. Compare raw data to summary sheets
6. Confirm the proper data qualifiers were used

Assessment of the data will include checks on data consistency by looking for comparability of duplicate analyses, comparability to previous data from the same sampling location (if available), adherence to accuracy and precision control criteria detailed in this QAPP, and anomalously high or low parameter values.

The results of these data validations will be reported to the Project Manager and the contract laboratory, noting any discrepancies and their effect upon acceptability of the data.

Raw data from field measurements and sample collection activities that are used in project reports will be appropriately identified and appended to the report. Where data have been reduced or summarized, the method of reduction will be documented in the report. Field data will be audited for anomalously high or low values that may appear to be inconsistent with other data.

9.2 LABORATORY REPORTING, DATA, PRESENTATION AND FINAL REPORT

Reporting and deliverables shall include, but not limited to, all items listed in Table 9.1.

All sample data and corresponding QA/QC data as specified in the analytical methods shall be maintained accessible either in hard copy or on magnetic tape or disk (computer data files).

The laboratory will submit one copy of the final analytical report within 15 business days of receipt of the final sample included in the sample delivery group (SDG). An electronic copy of the results and QC in EQuIS format will also be required with the disc copy.

9.3 DOCUMENT CONTROL SYSTEM

A document control system ensures that all documents are accounted for when the project is complete.

A project number will be assigned to the project. This number will appear on sample identification tags, logbooks, data sheets, control charts, project memos and analytical reports, document control logs, corrective action forms and logs, QA plans, and other project analytical records.

9.4 QC CHECK POINTS AND DATA FLOW

The following specific QC check points will be common to all GC and GC/MS analyses. They are presented with the decision points.

Chemist - Bench Level Checks:

- Systems check: Sensitivity, linearity, and reproducibility within specified limits
- Duplicate analyses within control limits
- Matrix spike results within control limits
- Surrogate spike results within control limits
- Calculation/data reduction checks: Calculations cross-checked, any discrepancies between forms and results evident, results tabulated sequentially on the correct forms

Laboratory Project Manager:

- Systems operating within limits
- Data transcription correct
- Data complete
- Data acceptable

Sample Control:

- Samples returned to sample control following analysis

Laboratory QA/QC Officer:

- QA objectives met
- QC checks are completed
- Final data and report package is complete

10.0 INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY

10.1 QC FOR LABORATORY ANALYSES

Specific procedures related to internal laboratory QC samples are described in the following subsections.

10.1.1 REAGENT BLANKS

A reagent blank will be analyzed by the laboratory at a frequency of one blank per analytical batch. The reagent blank, an aliquot of analyte-free water or solvent, will be carried through the entire analytical procedure.

10.1.2 MATRIX SPIKE/MATRIX SPIKE DUPLICATE ANALYSES

A matrix spike/matrix spike duplicate (MS/MSD) sample will be analyzed for all parameters at a minimum frequency of one per analytical batch. Acceptable criteria and analytes that will be used for MS are identified in the methods. Where method specified limits were not available, general control limits were used. Percent spike recoveries will be used to evaluate analytical accuracy while percent relative standard deviation or the RPD between duplicate analyses will be used to assess analytical precision.

10.1.3 SURROGATE ANALYSES

Surrogates are organic compounds which are similar to the analytes of interest, but which are not normally found in environmental samples. Surrogates are added to samples to monitor the effect of the matrix on the accuracy of the analysis. Every blank, standard, and environmental sample analyzed by GC or GC/MS, including MS/MSD samples, will be spiked with surrogate compounds prior to sample preparation.

The compounds that will be used as surrogates, and the levels of recommended spiking are specified in the methods. Surrogate spike recoveries must fall within the control limits specified in the methods. If surrogate recoveries are excessively low (<10 percent), the laboratory will contact the QA/QC Officer - Sampling and Analytical Activities for further instructions. Dilution of samples to bring the analyte concentration into the linear range of calibration may dilute the surrogates out of the quantification limit. Reanalysis of these samples is not required. Assessment of analytical quality in these cases will be based on the MS/MSD sample analysis results.

10.2 QC FOR FIELD SAMPLING

To assess the quality of data resulting from the field sampling program, field duplicate and field blank samples will be collected (where appropriate) and submitted to the analytical laboratory as samples.

10.2.1 FIELD (RINSE) BLANKS

When well-dedicated equipment is not used and/or on the first sampling event in which non-certified clean equipment is used, field blanks will be used during the sampling programs to detect contamination introduced through sample collection procedures and equipment, external field conditions, sample transport, sample container preparation, sample storage, and/or the analytical process.

10.2.2 TRIP BLANKS

Trip blanks for volatile analyses will be prepared by the laboratory using analyte-free water and submitted with the sample collection containers. Trip blanks will be kept unopened in the field with sample bottles. Trip blanks will be transported to the laboratory on a daily basis with each batch of aqueous volatile samples. The laboratory will analyze trip blanks as samples.

10.2.3 FIELD DUPLICATE SAMPLES

Field duplicate samples will be collected and used to assess the aggregate precision of sampling techniques and laboratory analysis. For every 20 investigative samples, a field duplicate sample will be collected using standard sampling procedures. This duplicate will be packed and shipped to the laboratory for analysis.

11.0 PERFORMANCE AND SYSTEM AUDITS

For the purpose of external evaluation, performance evaluation check samples are analyzed periodically by the laboratory. Internally, the evaluation of data from these samples is done on a continuing basis over the duration of a given project.

The QA/QC Officer - Sampling and Analytical Activities may carry out performance and/or systems audits to insure that data of known and defensible quality are consistently produced during this program.

Systems audits are qualitative evaluations of all components of field and laboratory quality control measurement systems. They determine if the measurement systems are being used appropriately. The audits may be carried out before all systems are operational, during the program, or after completion of the program. Such audits typically involve a comparison of the activities given in the QA/QC Plan described herein, with activities actually scheduled or performed. A special type of systems audit is the data management audit. This audit addresses only data collection and management activities.

The performance audit is a quantitative evaluation of the measurement systems used for a monitoring program. It requires testing the measurement systems with samples of known composition or behavior to quantitatively evaluate precision and accuracy. A performance audit may be carried out by or under the auspices of the QA/QC Officer - Sampling and Analytical Activities without the knowledge of the analyst during each sampling event for this program.

It should be noted, however, that any additional external QA audits will only be performed if deemed necessary.

12.0 PREVENTATIVE MAINTENANCE

This section applies to both field and laboratory equipment. Specific preventive maintenance procedures for field equipment will be consistent with the manufacturer's guidelines. Specific preventive maintenance protocols for laboratory equipment will be consistent with the contract laboratory's Standard Operating Procedures (SOPs).

All analytical instruments to be used in this project will be serviced by laboratory personnel at regularly scheduled intervals in accordance with the manufacturers' recommendations. Instruments may also be serviced at other times due to failure. Requisite servicing beyond the abilities of laboratory personnel will be performed by the equipment manufacturer or their designated representative.

Routine maintenance of the instruments will be performed as per manufacturers' recommendations. The Laboratory Project Manager is responsible for the preventive maintenance of the instruments.

13.0 SPECIFIC ROUTINE PROCEDURES USES TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

13.1 QA MEASUREMENT QUALITY INDICATORS

13.1.1 PRECISION

Precision will be assessed by comparing the analytical results between duplicate spike analyses. Precision as percent relative difference will be calculated as follows for values significantly greater than the associated quantitation limit:

$$\text{Precision} = \frac{(D_2 - D_1)}{(D_1 + D_2)/2} \times 100$$

- D_1 = matrix spike recovery
- D_2 = matrix spike duplicate spike recovery

For results near the associated quantitation limits, precision will be assessed based on the following criteria:

Precision = Original result - duplicate result <CRDL[1]

13.1.2 ACCURACY

Accuracy will be assessed by comparing a set of analytical results to the accepted or "true" values that would be expected. In general, MS/MSD and check sample recoveries will be used to assess accuracy. Accuracy as percent recovery will be calculated as follows:

$$\text{Accuracy} = \frac{A - B}{C} \times 100$$

- A = The analyte determined experimentally from the spike sample
- B = The background level determined by a separate analysis of the unspiked sample
- C = The amount of spike added

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[1] CRDL - Contract Required Detection Limit.

In some cases, MS and/or MSD recoveries may not be available due to elevated levels of the spiked analyte in the investigative sample. In such cases, accuracy will be assessed based on surrogate spike recoveries and/or laboratory control samples.

13.1.3 COMPLETENESS

Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount that was expected to be obtained under normal conditions.

To be considered complete, the data set must contain all QC check analyses verifying precision and accuracy for the analytical protocol. In addition, all data are reviewed in terms of stated goals in order to determine if the database is sufficient.

When possible, the percent completeness for each set of samples will be calculated as follows:

$$\text{Completeness} = \frac{\text{usable data obtained}}{\text{total data planned}} \text{ x 100 percent}$$

13.1.4 QC EXCEEDANCES

Procedures discussed previously will be followed for documenting deviations. In the event that a result deviates significantly from method established control limits, this deviation will be noted and its effect on the quality of the remaining data assessed and documented.

14.0 CORRECTIVE ACTION

The need for corrective action may be identified by system or performance audits or by standard QC procedures. The essential steps in the corrective actions system will be:

i) Checking the predetermined limits for data acceptability beyond which corrective action is required
ii) Identifying and defining problems
iii) Assigning responsibility for investigating the problem
iv) Investigating and determining the cause of the problem
v) Determination of a corrective action to eliminate the problem (this may include reanalysis or resampling and analyses)
vi) Assigning and accepting responsibility for implementing the corrective action
vii) Implementing the corrective action and evaluating the effectiveness
viii) Verifying that the corrective action has eliminated the problem
ix) Documenting the corrective action taken

For each measurement system, the Laboratory QA/QC Officer will be responsible for initiating the corrective action and the Laboratory Project Manager will be responsible for implementing the corrective action.

TABLES

TABLE B.4.1

ANALYTICAL PARAMETERS
LONG-TERM GROUNDWATER MONITORING PROGRAM
LOVE CANAL SITE
NIAGARA FALLS, NEW YORK

	CAS Number	*Groundwater Quantitation Limits µg/L*
Volatile Organic Compounds		
1,1,2,2-Tetrachloroethane	79-34-5	10
1,1,2-Trichloroethane	79-00-5	10
1,1-Dichloroethane	75-34-3	10
1,1-Dichloroethylene	75-35-4	10
1,2-Dichloroethane	107-06-2	10
1,2-Dichloropropane	78-87-5	10
Bromodichloromethane	75-27-4	10
Bromoform	75-25-2	10
Carbon tetrachloride	56-23-5	10
Chlorobenzene	108-90-7	10
Chloroethane	75-00-3	10
Chloroform	67-66-3	10
cis-1,3-Dichloropropene	10061-01-5	10
Dibromochloromethane	124-48-1	10
Bromomethane	74-83-9	10
Chloromethane	74-87-3	10
Methylene chloride	75-09-2	10
Tetrachloroethylene	127-18-4	10
trans-1,2-Dichloroethylene	156-60-5	10
trans-1,3-Dichloropropene	10061-02-6	10
Trichloroethylene	79-01-6	10
Vinyl chloride	75-01-4	10
4-Methyl-2-pentanone	108-10-1	10
2-Butanone	78-93-3	10
Benzene	71-43-2	10
Ethylbenzene	100-41-4	10
Styrene	100-42-5	10
Toluene	108-88-3	10
Xylene(total)	1330-20-7	10
1,1,1-Trichloroethane	71-55-6	10
2-Hexanone	591-78-6	10
Acetone	67-64-1	10
Carbon disulfide	75-15-0	10
cis-1,2-Dichloroethene	156-59-2	10
Vinyl acetate	108-08-4	10
Semi-Volatile Organic Compounds		
1,2,4-Trichlorobenzene	120-82-1	10
1,2-Dichlorobenzene	95-50-1	10
1,3-Dichlorobenzene	541-73-1	10
1,4-Dichlorobenzene	106-46-7	10
2,4,5-Trichlorophenol	95-95-4	25
2,4,6-Trichlorophenol	88-06-2	10
2,4-Dichlorophenol	120-83-2	10

TABLE B.4.1

ANALYTICAL PARAMETERS
LONG-TERM GROUNDWATER MONITORING PROGRAM
LOVE CANAL SITE
NIAGARA FALLS, NEW YORK

	CAS Number	*Groundwater Quantitation Limits μg/L*
Semi-Volatile Organic Compounds - Continued		
2,4-Dimethylphenol	105-67-9	10
2,4-Dinitrophenol	51-28-5	25
2,4-Dinitrotoluene	121-14-2	10
2,6-Dinitrotoluene	606-20-2	10
2-Chloronaphthalene	91-58-7	10
2-Chlorophenol	95-57-8	10
2-Methylnaphthalene	91-57-6	10
2-Methylphenol	95-48-7	10
2-Nitroaniline	88-74-4	25
2-Nitrophenol	88-75-5	10
3,3'-Dichlorobenzidine	91-94-1	10
3-Nitroaniline	99-09-2	25
4,6-Dinitro-2-methylphenol	534-52-1	25
4-Bromophenylphenylether	101-55-3	10
4-Chloro-3-methylphenol	59-50-7	10
4-Chloroaniline	106-47-8	10
4-Chlorophenylphenylether	7005-72-3	10
4-Methylphenol	106-44-5	10
4-Nitroaniline	100-01-6	25
4-Nitrophenol	100-02-7	25
Acenaphthene	83-32-9	10
Acenaphthylene	208-96-8	10
Anthracene	120-12-7	10
Benzo(a)anthracene	56-55-3	10
Benzo(a)pyrene	50-32-8	10
Benzo(b)fluoranthene	205-99-2	10
Benzo(g,h,i)perylene	191-24-2	10
Benzo(k)fluoranthene	207-08-9	10
Benzoic acid	65-85-0	25
Benzyl alcohol	100-51-6	10
Bis(2-chloroethoxy)methane	111-91-1	10
Bis(2-chloroethyl)ether	111-44-4	10
Bis(2-chloroisopropyl)ether	108-60-1	10
Bis(2-ethylhexyl)phthalate	117-81-7	10
Butyl benzyl phthalate	85-68-7	10
Chrysene	218-01-9	10
Dibenzo(a,h)anthracene	53-70-3	10
Dibenzofuran	132-64-9	10
Diethylphthalate	84-66-2	10
Dimethylphthalate	131-11-3	10
Di-n-butylphthalate	84-74-2	10

TABLE B.4.1

ANALYTICAL PARAMETERS
LONG-TERM GROUNDWATER MONITORING PROGRAM
LOVE CANAL SITE
NIAGARA FALLS, NEW YORK

	CAS Number	*Groundwater Quantitation Limits µg/L*
Semi-Volatile Organic Compounds - Continued		
Di-n-octylphthalate	117-84-0	10
Fluoranthene	206-44-0	10
Fluorene	86-73-7	10
Hexachlorobenzene	118-74-1	10
Hexachlorobutadiene	87-68-3	10
Hexachlorocyclopentadiene	77-47-4	10
Hexachloroethane	67-72-1	10
Indeno(1,2,3-c,d)pyrene	193-39-5	10
Isophorone	78-59-1	10
Naphthalene	91-20-3	10
Nitrobenzene	98-95-3	10
n-Nitrosodi-n-propylamine	621-64-7	10
n-Nitrosodiphenylamine	86-30-6	10
Pentachlorophenol	87-86-5	25
Phenanthrene	85-01-8	10
Phenol	108-95-2	10
Pyrene	129-00-0	10
Pesticides		
4,4'-DDD	72-54-8	0.10
4,4'-DDE	72-55-9	0.10
4,4'-DDT	50-29-3	0.10
Aldrin	309-00-2	0.05
alpha-BHC	319-84-6	0.05
beta-BHC	319-85-7	0.05
delta-BHC	319-86-8	0.05
Dieldrin	60-57-1	0.10
Endosulfan I	959-98-8	0.05
Endosulfan II	33213-65-9	0.10
Endosulfan sulfate	1031-07-8	0.10
Endrin	72-20-8	0.10
Endrin ketone	53494-70-5	0.10
gamma-BHC	58-89-9	0.05
Heptachlor	76-44-8	0.05
Heptachlor epoxide	1024-57-3	0.05
Methoxychlor	72-43-5	0.50
Toxaphene	8001-35-2	5.0
alpha-Chlordane	5103-71-9	0.05
gamma-Chlordane	5103-74-2	0.05
Polychlorinated Biphenyls		
Aroclor-1016	12674-11-2	1.0
Aroclor-1221	11104-28-2	1.0
Aroclor-1232	11141-16-5	1.0
Aroclor-1242	53469-21-9	1.0
Aroclor-1248	12672-29-6	1.0
Aroclor-1254	11097-69-1	1.0
Aroclor-1260	11096-82-5	1.0

TABLE B.4.2

SAMPLING AND ANALYSIS SUMMARY
LONG-TERM GROUNDWATER MONITORING PROGRAM
LOVE CANAL SITE
NIAGARA FALLS, NEW YORK

Analytical Parameter	*Matrix*	*Analytical Method*	*Estimated Number of Samples/Event*	*Field Duplicates*	*Trip Blanks*	*MS/MSD*
Even Years						
Volatile Organic Compounds	Groundwater	SW-846-8260(1)	32	2	1 per day	2/2
Semi-Volatile Organic Compounds	Groundwater	SW-846-8270(1)	32	2	-	2/2
Pesticides	Groundwater	SW-846-8081(1)	32	2	-	2/2
Polychlorinated Biphenyls	Groundwater	SW-846-8082(1)	32	2	-	2/2
Odd Years						
Volatile Organic Compounds	Groundwater	SW-846-8260(1)	41	3	1 per day	3/3
Semi-Volatile Organic Compounds	Groundwater	SW-846-8270(1)	41	3	-	3/3
Pesticides	Groundwater	SW-846-8081(1)	41	3	-	3/3
Polychlorinated Biphenyls	Groundwater	SW-846-8082(1)	41	3	-	3/3

Notes:

(1)	"Test Methods for Solid Waste/Physical Chemical Methods," SW-846, 3rd Edition, September 1986 (with all subsequent revisions).
-	Not applicable.
MS	Matrix Spike.
MSD	Matrix Spike Duplicate.

TABLE B.5.1

SAMPLE CONTAINER, PRESERVATION, AND HOLDING TIME PERIODS
LONG-TERM GROUNDWATER MONITORING PROGRAM
LOVE CANAL SITE
NIAGARA FALLS, NEW YORK

Analyses	*Samples Containers*	*Preservation*	*Maximum Holding Time*	*Notes*
Groundwater				
Volatile Organic Compounds	Three 40-mL glass vials Teflon-lined septum	Cool <6°C pH<2 HCl	14 days from collection to analysis	Fill completely with no head space
Semi-Volatile Organic Compounds	2-L Amber	Cool <6°C	7 days from collection to extraction 40 days from extraction to analysis	Fill completely
Pesticides	2-L Amber	Cool <6°C	7 days from collection to extraction 40 days from extraction to analysis	Fill completely
Polychlorinated Biphenyls	2-L Amber	Cool <6°C	7 days from collection to extraction 40 days from extraction to analysis	Fill completely

TABLE B.9.1

LABORATORY REPORTING DELIVERABLES - FULL
LONG-TERM GROUNDWATER MONITORING PROGRAM
LOVE CANAL SITE
NIAGARA FALLS, NEW YORK

A detailed report narrative should accompany each submission, summarizing the contents and results.

A. Chain of Custody Documentation and Detailed Narrative (1)

B. Sample Information
  1. Date collected
  2. Date extracted or digested
  3. Date analyzed
  4. Analytical method and reference

C. Data (including all raw data and CLP-like summary forms)
  1. Samples
  2. Laboratory duplicates (2)
  3. Method blanks
  4. Spikes, spike duplicates (2) (3)
  5. Surrogate recoveries (2)
  6. Internal standard recoveries
  7. Calibration
  8. Any other applicable quality control (QC) data (i.e., serial dilution)
  9. Tentatively identified compounds (TICs) (if applicable)

D. Miscellaneous
  1. Method detection limits and/or instrument detection limits
  2. Percent solids (where applicable)
  3. Metals run logs
  4. Standard preparation logs
  5. Sample preparation logs

All sample data and its corresponding quality assurance/quality control (QA/QC) data shall be maintained accessible to CRA either in hard copy or on magnetic tape or disc (computer data files). All solid sample results must be reported on a dry-weight basis.

Notes:

(1) Any QC outliers must be addressed and corrective action taken must be specified.

(2) Laboratory must specify applicable control limits for all QC sample results.

(3) A blank spike must be prepared and analyzed with each sample batch.

(4) Tentatively Identified Compounds (TICs).

APPENDIX C

FIELD PROCEDURES

APPENDIX C

FIELD PROCEDURES

FP-01A: WASTE MANAGEMENT

Disposables (Personal Protective Equipment [PPE], Towels, Tubing, etc.)

All field disposables will be placed in 55-gallon waste disposal drums at the Love Canal Treatment Facility (LCTF) for management as Hazardous Solid Waste.

Purge Water

All purge water generated from sampling activities will be disposed of at the LCTF.

Decontamination Liquids

Alconox® Wash: All decontamination wash is disposed of in the same manner as purged groundwater.

Solvents: Minimal volumes of solvents are used. Small quantities of solvents (Citri-Clean and Halso 99) that are spilled during decontamination may be washed into the decontamination containment area.

FP-02A: GROUNDWATER LEVEL MEASUREMENT

Equipment

1. PPE (according to Site Health and Safety Plan [HASP])
2. Keys to the wells
3. Water level indicator
4. Low phosphate soap (Alconox® or equivalent)
5. Decontamination solvents (Site-specific)
6. Distilled water
7. Paper towels or cotton rags
8. Buckets
9. Water level measurement form or field logbook
10. Pens with waterproof ink
11. Trash bags
12. Site map
13. A table of well depths and previous water level(s)

Pre-Field Activities

1. All personnel making depth to water measurements are required to have reviewed the Site-Specific Health and Safety Plan for the Glenn Springs Holdings, Inc. (GSH) Western New York, have up-to-date Occupational Safety and Health Administration (OSHA) Health and Safety Training, have up-to-date medical monitoring, and have reviewed the field procedure within 1 year of performing this task.
2. Collect equipment.
3. Using a glass of water, check that the water level indicator is functioning. Measure the distance from the reference point on the indicator probe to the 2-foot mark on the tape – this should be 2 feet.
4. Decontaminate the water level indicator. Wash the probe and entire length of tape with a low phosphate soap solution followed by a tap water rinse. Dry with a clean cloth or paper towel. If the tape or probe has been in contact with non-aqueous phase liquid (NAPL), remove NAPL with a rag soaked in Citri-Clean, followed by the soap wash described above and a water rinse. Any liquid wastes will be contained and disposed of as described below.

Field Procedures

1. Check well identification. If there is any uncertainty that the correct well is being measured, measure the total depth of the well using a separate tape with a solid weight. Compare the measured depth of the well with the reported depth of the well.
2. Check the condition of the protective casing, cement, etc., and make notes as necessary. (Serious problems regarding the well condition should be communicated to the project coordinator; i.e., the protective casing has been broken into). Problems that require general maintenance should be documented and added to the Well Maintenance List.
3. Remove the cap from the well. If there is a sound of air entering or escaping, make a note of this, and check to see if there is a vent hole in the cap. Should this occur, it may be necessary to wait several minutes for the water level to equilibrate to the ambient conditions.
4. Check for the measuring point mark on the well riser and for any sharp edges, which may damage the water level indicator tape.
5. Slowly lower the water level indicator probe until contact with the water surface is indicated, either by audible alarm or by light. To the extent possible, avoid dragging the indicator cable on the top edge of the well casing; this can damage the cable and potentially introduce shavings from the cable into the well.
6. Read the depth to water at the measuring point and record the measurement to the nearest 0.01 foot.
7. Retract the tape by winding onto the spool, holding a clean paper towel to remove water and/or debris.
8. For newly installed wells and wells with known contamination, decontaminate the probe and tape between wells with soap and water wash. Rinse with distilled or deionized water. If necessary, decontamination solvents may be used to remove heavy contamination.
9. Replace the well cap, and relock the well.

Note: Whenever possible, water level measurements should be collected from least to most contaminated wells.

Decontamination of Water Level Indicator

At the end of each day of use, decontaminate the water level indicator as described under Pre-Field Preparation, above.

Disposal of Wastes

All solid waste materials from monitoring will be placed in a plastic garbage bag. At the end of each day, these wastes will be placed in an approved/labeled 55-gallon waste disposal drum at the LCTF for management as Hazardous Solid Waste.

Reporting

Field data will be entered into the field database management system or an Excel spreadsheet. The CRA project coordinator will specify formats and procedure.

FP-04B: GROUNDWATER SAMPLING – MONITORING WELLS

Equipment

1. PPE.
2. Purging equipment: Water level indicator, pumps (Grundfos, peristaltic pumps, hand bailers, or bladder pumps), generator, and air compressor. Water storage tank for purged water.
3. Field parameter monitoring instruments: Multi-parameter (pH, specific conductance, and temperature) flow-though cell.
4. Decontamination equipment: Plastic sheeting, low phosphate soap (Alconox®), distilled water, paper towels, and buckets.
5. Groundwater sampling forms or field logbook and a Site map.

Pre-Field Activities

1. At least 1 week prior to the sampling event, complete appropriate sampling forms, and submit to the CRA laboratory coordinator.
2. Contact laboratory to acquire sample bottles.
3. Prepare bottle labels (list of wells to sample is in the Site Sampling and Analysis Plan).
4. Complete chain of custody form.
5. Print field log/data recording sheets (preprinted with location IDs).
6. Calibrate pH, specific conductance, and turbidimeter instruments; record calibration results.
7. For peristaltic pumps, decontamination is replacement of used tubing with new tubing cleaned by the manufacturer. For inertial pumps (WaTerra), decontaminate the check valves and replace the tubing. The following procedure is for any submersible pumps. Wearing appropriate PPE:
    - Remove all visible sediment/soil by hand brush scrubbing or power washing.
    - Remove drain plug from pump and drain trapped water. Refill pump with DI water. Replace the drain plug.
    - Submerge pump in a 5-gallon bucket of low-phosphate soap water, and recirculate soap solution for 5 minutes.

- Remove drain plug from pump and drain trapped water. Refill pump with DI water. Replace the drain plug.
- Submerge pump in a 5-gallon bucket of tap water, and recirculate water for 5 minutes.
- Rinse equipment with tap water.
- An equipment blank may be required. The equipment blank is collected by pumping 1 gallon of deionized water through the clean pump. Equipment blanks should be managed consistent with water samples as described below.

Note: If the pump is contaminated with NAPL, the pump will be cleaned outside with Citri-Clean, pressure washed outside, the drain plug removed to drain residual water, refill the pump with DI water and replace plug, run through a 5-minute recirculation with a Citri-Clean solution, and then pressure washed. Following this aggressive cleaning, the procedure defined above will be completed.

Field Procedures

1. Measure the water level and record on the field log. Determine the volume of water to be purged according to the diameter of the well and the formulas provided on the sample collection forms.
2. Install pump into well for purging. Lower pump deep enough that the well does not go dry during purging. It is necessary to place the pump at a point in the water column such that all standing water above the pump is removed during the purge. This ensures that the bailer is not lowered into "stale" casing water, but "new" aquifer water when sampling. If it is determined that water remains above the pump at the conclusion of purging, the pump should be raised very slowly while still running to remove the stale casing water.
    - Purge tubing is dedicated to each well and remains in the well between sampling events. A decontaminated pump will be used for each well purging. The dedicated tubing is pulled from the well and connected to the decontaminated pump.
    - Care must be taken to ensure that the dedicated tubing is not contaminated when it is removed from the well and that no debris is introduced into the well when the pump is lowered.
    - Pumps are not field decontaminated. Pumps are decontaminated nightly at the LCTF.

3. Start pump and purge as follows:

   - Start pump and adjust flow rate to a rate sustainable by the well. The goal of the sampling is to purge and sample without exceeding the groundwater recharge rate of the well.
   - Monitor field parameters (pH, specific conductance, and temperature), water level, and pumping rate, and record on the field log including the time of the measurements. One set of readings will be taken at the start of purging and an additional set of readings will be taken after the removal of each standing well volume.
   - If the well goes dry, purge on 3 consecutive days to dryness and then sample. Full recovery is not necessary. Sampling can commence on the third day if water is available and can be conducted over the next 4 days if required to fill the sample bottles.
   - If the well goes dry, a sustainable pumping rate should be determined for future sampling events. Contact the CRA project coordinator regarding adjustment of pumping rates.

4. Samples shall be collected using a pre-cleaned stainless steel or Teflon bailer:

   - If possible, sampling in the rain should be avoided to avoid cross-contamination from airborne contaminants picked up in the precipitation.
   - Wells should be sampled beginning with the lowest concentration wells, progressing to the highest concentration wells. This minimizes the potential for cross-contamination.

5. Securely pack samples in ice-filled coolers for shipment to the appropriate laboratory. Coolers must:

   - Have chain of custody forms in a zip-lock bag in the cooler.
   - Be securely taped closed with security seals across the cooler opening.

6. Remove pump and disconnect from purge tubing. Purge tubing should be returned to the well:

   - Care must be taken to ensure that the dedicated tubing is not contaminated when it is removed from the well and that no debris is introduced to the well when the tubing is lowered into the well.

7. Manage purge water and sampling disposables as described below.

Disposal of Wastes

All solid waste materials from sampling will be placed in a plastic garbage bag. At the end of each day, these wastes will be placed in an approved/labeled 55-gallon waste disposal drum at the LCTF. Purge water and decontamination liquids will be collected. Solid and liquid waste will be managed according to Field Procedure (FP)-01a.

Reporting

Field data will be entered into the field database management system or an Excel spreadsheet. The CRA project coordinator will specify formats and procedures.

A copy of the chain of custody forms must be sent to the Laboratory Coordinator.

FP-06A: DECONTAMINATION CLEANERS

The following cleaners/solvents are used for decontamination. A short summary of the use and precautions to follow when using these solvents is presented for each cleaner. These summaries are not complete; the manufacturer's guidelines and Material Safety Data Sheets (MSDS) should be read and understood before using any of these cleaners.

Low-Phosphate Soap: Alconox® or Equivalent

Alconox® is formulated to be "free rinsing" (i.e., easily rinsed off with running tap or distilled water) with virtually no redeposition of removed (and unwanted) materials, all of which translates to virtually a complete absence of residues.

Use Alconox® at a 1-percent solution, which is equivalent to approximately 2½ tablespoons (1¼ ounces [oz.]) per gallon of cold, warm, or hot water. Alconox® is not formulated for spray machines since it will foam. For critical cleaning, do final or all rinsing with distilled, deionized, or purified water.

Alconox® has a shelf life of 2 years after the date of manufacture.

Citri-Clean

Protective gloves and goggles should be worn when using Citri-Clean. Do not use near fire, flame, spark, or any ignition source. It is harmful if swallowed.

Heavily caked grease/NAPL areas should be scraped before application.

The standard solution for Citri-Clean is 15 percent (20 oz. of Citri-Clean concentrate in 1 gallon of water). Citri-Clean may be used at up to 100 percent concentrate to remove heavy contamination. Citri-Clean can be applied with sprayer or other conventional means. Following application, allow the materials to stand for 2-10 minutes. After allowing the materials to stand, scrub the contaminated area, and flush with water to remove loose particles. Reapply to areas where stains remain or where heavy accumulations of oil, grease, or other contaminants have occurred.

Halso 99

Halso 99 should be used only to remove NAPL. Halso 99 is the Occidental Chemical Corporation (OxyChem) trade name for the chlorinated solvent, monochlorotoluene. It should be handled with care. It should not be used on equipment that will be used for sampling wells that are not impacted by NAPL. Monochlorotoluene is a potential groundwater contaminant, and the use of Halso 99 could create low concentrations of monochlorotoluene in groundwater samples.

From the MSDS sheet:

> "*Avoid breathing vapor, use with adequate ventilation. Wear NIOSH/MSHA approved respiratory protection if there is potential for exposure above the exposure limits. Do not get in eyes, on skin or clothing. Wear personal protective equipment as described in Exposure Controls/Personal Protection (Section 8) of the MSDS. Wash thoroughly with soap and water after handling. Keep away from heat, sparks, pilot lights, welding operations, and open flame. Do not eat, drink, or smoke in areas where this material is used. Ground all equipment.*
>
> *Vapors are heavier than air and will tend to collect in low areas. Avoid use in confined spaces. Areas of poor ventilation could contain concentrations high enough to cause unconsciousness and death. Use approved supplied air respirator following manufacturer's recommendations where vapors may be generated. Do not reuse containers.*
>
> *Avoid contact with oxidizing agents. [Examples of common oxidizing agents are: sodium hypochlorite (bleach), hydrogen peroxide, potassium permanganate.]*"

FP-06B: DECONTAMINATION PROCEDURES

This procedure describes the methodology for cleaning of non-dedicated field and sampling equipment. The purpose of describing this procedure is to avoid or limit potential for cross-contamination due to reuse of dirty equipment.

Equipment

1. PPE
2. Non-phosphate soap
3. Deionized water
4. Tap water
5. Scrub brush
6. Abrasive pads (sponge-type pads)
7. Paper towels or cotton rags
8. Aluminum foil
9. Plastic bags
10. Equipment to be cleaned
11. Squirt bottles

Procedures

The general cleaning procedure for cleaning all groundwater sampling equipment is:

1. Mix up soap/water wash.
2. Disassemble all equipment if appropriate.
3. Removal all visible sediment/soil by scrubbing by hand.
4. Wet equipment with tap water.
5. Wash equipment with soapy water using scrub brush, or abrasive pad/sponge to remove all sediment/soil and discoloration.
6. Rinse equipment with tap water.
7. Rinse equipment with deionized water two times.
8. Allow equipment to air dry.
9. When dry - reassemble equipment and place in plastic bag to avoid re-contaminating equipment.

10. A rinse blank is required as part of the Long-Term Monitoring Program (LTMP) as a check on the adequacy of the cleaning process. This rinse blank is collected by pouring deionized water over the item of cleaned equipment and catching the water in an appropriate set of sample containers.
11. Decontamination wash water should be collected for proper disposal at the LCTF.

FP-09A: WELL PURGING

This operating procedure describes acceptable methodologies for purging standing water in monitoring wells so that representative groundwater samples can be collected. The purpose of describing this procedure is to create uniform purging procedures between field personnel, provide groundwater representative of the aquifer from which it came, and maintain proper quality control practices.

Equipment

1. PPE
2. Disposable gloves
3. Water level tape
4. Photoionization Detection (PID)
5. Compressors
6. Generator
7. Field forms and field logbook
8. Plastic garbage bags
9. Cotton string
10. Appropriate purge pump or bailer
11. Discharge tubing
12. pH meter
13. Conductivity meter
14. Temperature meter
15. Turbidity meter
16. Clear glass sample jars
17. Well keys

Procedures

1. Locate and identify the monitoring well to be purged.
2. Unlock protective casing and remove well cap.
3. Use masonry trays or tubs to collect spillage. Don clean disposable gloves.
4. Position PID at well head to detect organic vapors for selection of appropriate level of PPE. Record PID readings of well riser headspace and background.

5. Measure depth to water and total depth of well. Do not use the water level indicator to sound the bottom of the wells to prevent damage to the water level indicator. A separate tape with a solid weight should be used. Record information on appropriate field logs. Compare the total depth of the well to the previously recorded depth shown to ensure that the correct well is being monitored. This measurement also provides an indication regarding "silting up" of the well (i.e., sand and/or silt from the formation has migrated into the well). If the well has significantly silted up (i.e., 50 percent or more of the screened interval), then the well will be need to be redeveloped prior to sample collection).

6. Calculate the volume of water initially in the well by subtracting the water level from the total depth and multiplying by:

   - 0.163 gallons/foot for a 2-inch diameter well.
   - 0.367 gallons/foot for a 3-inch diameter well.
   - 0.653 gallons/foot for a 4-inch diameter well.

7. Prepare the appropriate purge pump for well purging by attaching the appropriate type of discharge tubing to the pump.

8. Lower the pump or discharge tubing into the well to the depth where water is encountered. As the discharge tubing is lowered, wipe it with paper towels dampened with deionized water to remove any debris which may be adhering to its surface.

9. Connect the pump to the appropriate power source (generator or compressor) and turn pump on. Be sure that the discharge from the pump is directed into a proper storage container.

10. Lower the pump or discharge tubing, while it is pumping, to the midpoint region of the saturated level of an open borehole or to the mid-screen point in screened monitoring wells.

11. Mark time when pumping began in field book and on sampling log.

12. Take pH, specific conductance, temperature, and turbidity readings during the evacuation process and record the readings obtained on appropriate sampling logs. The meters used to measure the field parameters should be calibrated each morning or as required during purging and sampling. Field parameter readings are to be taken at the start of purging and after each calculated well volume has been removed.

13. Continue to take indicator measurements for each well volume removed for the duration of time required to evacuate a minimum of three well volumes.

14. Once three well volumes of groundwater have been removed from the well and pH, specific conductance, and temperature have stabilized, slowly remove the

pump from the saturated zone. The well will be considered stabilized when two successive measures of pH are within 0.5 unit, temperature within 1.0°C, and specific conductance is within 10 percent. If stability is not obtained, pump a maximum of five calculated well volumes.

15. If the pump is not to be used for sample collection, then, when the standing water has been purged from the well, remove the pump from the well while still running. Turn off the pump.

16. Disconnect discharge tubing from the pump and properly dispose of or store the tubing. Tubing not being stored for reuse should be disposed of in conjunction with used PPE. Tubing that requires disposal is tubing that cannot be stored within the well between monitoring events. If tubing must be removed from the well to facilitate sampling, either new tubing must be utilized for the next event or the removed tubing must be thoroughly cleaned prior to placement back into the well. If tubing is going to be stored within the well, it should be tied off to the well itself.

17. If the pump is to be used to collect samples at completion of purging, proceed right into collection of groundwater samples.

FP-10: PH METER CALIBRATION

This procedure describes the calibration of a standard pH meter and the determination of pH in an aqueous media.

The purpose of this procedure is to provide a uniform basis for calibration of field pH meters and ensure continuity between field personnel. Additionally, the method provides quality control steps necessary for obtaining reliable and representative pH readings.

Equipment

1. pH meter
2. Buffers
3. Polypropylene beakers
4. Paper towels
5. Calibration logs
6. Field logs
7. Distilled water
8. Thermometer
9. Extra batteries

Calibration Procedures

1. Check to make sure batteries are fully charged.
2. Turn meter on and allow it to stabilize for 3 to 5 minutes.
3. Select pH buffers, 7, 4, and 10 and check temperatures of each. Record pertinent information on field calibration logs.
4. Fill the calibration cup about ¾ full with desired pH buffer.
5. Place meter into the buffer, while in calibration mode, and allow it to stabilize.
6. Record the "before" reading.
7. Using the up/down arrows, adjust the meter to reflect the actual pH buffer, then hit the enter button.
8. Return to measurement mode and record the "after" reading.
9. Remove probe and clean with distilled water.

10. Place probe in second calibration buffer and repeat calibration process.
11. Remove probe, rinse with distilled water, and check reading in the pH 7.00 buffer. If reading is off by more than 0.05 pH unit, recalibrate as described above.
12. Rinse probe and insert in groundwater sample. Record result on field logs.
13. This calibration procedure should be performed:
    - When meter reads erratically or varies from historic readings for that well.
    - At the beginning of sampling day.

Note: Some meters also have an Autocalibration Mode. See specific calibration information for specific details.

FP-11: SPECIFIC CONDUCTIVITY METER CALIBRATION

This procedure describes the calibration of a portable field specific conductivity meter for obtaining measurements in aqueous media. The purpose of this procedure is to provide a uniform means for calibration and operation of portable field specific conductance meters between field personnel. Additionally, the method provides quality control steps necessary for obtaining reliable and representative readings.

Equipment

1. Conductivity meter
2. Reference solutions
3. Distilled water

Calibration Procedures

1. Check to make sure batteries are fully charged
2. Fill the calibration cup approximately ¾ full with conductivity reference solution
3. While in calibration mode, place the meter into the reference solution and allow the reading to stabilize
4. Record the "before" reading
5. Using the up/down arrows, adjust the meter to reflect the actual conductivity of the reference solution, then hit the enter button
6. Return to the measurement mode and record the "after" reading
7. Remove the meter and rinse with the DI water
8. Discard used reference solution

Meter Usage

1. Fill sample cup to just below the top edge with the aqueous sample
2. Place meter in the cup and allow it to stabilize
3. Record sample number, date, time, project, and resulting conductivity value on appropriate field logs

4. This calibration procedure should be repeated:
    - When the meter reads erratically or varies from historic readings for that well
    - At the beginning of the sampling day

Note: Specific calibration may be required for specific meters. Check manual for specific product details.

FP-12: TURBIDIMETER CALIBRATION

This procedure describes the calibration of a portable field turbidity meter for obtaining measurements in aqueous media. The purpose of this procedure is to provide a uniform means for calibration and operation of portable turbidity meter between field personnel. Additionally, the method provides quality control steps necessary for obtaining reliable and representative readings.

Equipment

1. Turbidity meter
2. Reference Gelex standards
3. Field data record form

Calibration

A. Primary and Secondary Standards

Standards are solutions with a known turbidity which are used for calibrating the turbidimeter. Note: Do not allow standards to freeze.

Primary standards are standards which are acceptable to the Environmental Protection Agency (EPA) for calibrating turbidimeters.

There are only two:

1. Formazin
2. Styrene divinylbenzene polymer beads

The same glass cuvette must be used when calibrating the turbidimeter with the primary standards and when measuring the unknown sample.

Secondary standards are defined by the EPA as Sealed Standards. Secondary Standards can be used for calibrating turbidimeters if the secondary standards are first calibrated with primary standards. The use of secondary standards can save time and money.

B. Calibrating with Primary Standards

Procedure

1. Turn on the turbidimeter
2. Record the actual nephelometric turbidity units (NTU) of Low (0-10) Gelex standard on the record form, and then place the standard in the receptacle and close the light shield
3. Press the read button and record the result
4. Repeat the above procedure with the medium (0-100) and high (0-1000) Gelex standards

Appendix D

Operation and Maintenance Manual

Operation and Maintenance Manual

Love Canal Site
Niagara Falls, New York

Glenn Springs Holdings, Inc.

GHD | 2055 Niagara Falls Boulevard Niagara Falls New York 14304 USA | 009954 | Report No 16 | March 4 2019

Table of Contents

Table of Contents

Table of Contents

Figure Index

Table Index

Appendix Index

1. Introduction

This Operations and Maintenance Manual (O&M Manual) was prepared for Glenn Springs Holdings, Inc. (GSH) by GHD Services, Inc. (GHD), formerly Conestoga-Rovers & Associates (CRA), for the Love Canal Leachate Treatment Facility (LCTF). The LCTF is located adjacent to the Love Canal Landfill (Site).

This is an update of the October 2002 O&M Manual, which replaced the original O&M Manual written by CRA in 1984 for the New York State Department of Environmental Conservation (NYSDEC), revised by the NYSDEC in 1988 and 1994, and revised by CRA most recently in March 2015. That Manual consisted of three separate volumes:

Volume I	Operations and Maintenance Manual
Volume II	Equipment Lists and Operation/Maintenance Manuals
Volume III	Operation and Maintenance Procedures

Volume II was a compilation of individual manuals and has been integrated into the GSH maintenance system; it no longer exists as a separate volume but can be found in the administrative building. Volume III consisted of O&M procedures for specific unit operations. These procedures have been reviewed and incorporated as LCTF operating procedures. These procedures augment this O&M Manual but are no longer included as a separate volume.

The LCTF is located in the southeast corner of the City of Niagara Falls, New York, and is approximately one-quarter mile north of the Niagara River. Operations at the Site involve collecting and treating of leachate, sediment, and non-aqueous phase liquids (NAPL) collected from the landfill for subsequent disposal.

Operation of the Site was transferred from the NYSDEC to Occidental Chemical Corporation (OCC) in April 1995. Effective July 1, 1998, Site responsibility was assigned by OCC to GSH, an affiliate of OCC. Beginning October 1, 2008, GSH contracted CRA, now GHD, to perform operation, maintenance, monitoring, and reporting activities for the Site under direct management of GSH. A list of Site contacts for management activities of the Leachate Treatment Facility at the Site is provided in Table 1.1. An updated contact list will be provided to the NYSDEC following any management changes for insertion into the current O&M Manual.

1.1 Purpose and Scope of O&M Manual

The purpose of this O&M Manual is to provide operating personnel with:

- A description of the collection system
- A description of the leachate treatment system
- An understanding of the unit operations and control parameters inherent in system operation
- The location of system start-up, normal operating, and shutdown procedures
- The operator actions required in the event of alarm notifications

The Love Canal collection and treatment systems operate under the substantive provisions of New York State Department of Environmental Conservation (NYSDEC) Hazardous Waste Management Facilities (6 NYCRR Subpart 373). Within these regulations, the Site meets the criteria for two exemption categories:

373-1.1(d)(1)(iii)	Storage of hazardous waste that is generated on Site in containers or tanks for a period not exceeding 90 days, other than the storage of liquid hazardous wastes.
373-1.1(d)(1)(xii)	Elementary neutralization units or wastewater treatment unit.

These exemptions require compliance with the following sections of NYCRR 373:

- Personnel Training (373-3.2(g))
- Preparedness and Prevention (373-3.3)
- Contingency Plans and Emergency Procedures (373-3.4)
- Use and Management of Containers (373-3.9)
- Tank Systems (373-3.10)

and:

- A label or sign stating "Hazardous Waste" must identify all areas, tanks, and containers used to accumulate hazardous waste. Furthermore, tanks and containers must be marked with additional labeling to identify their contents.
- Each container must be properly labeled and marked in accordance with Sections 372.2(a)(5) and 372.2(a)(6) of this Title.
- Full containers must be clearly labeled with the date, visible for inspection, on the day that they were completely filled.

Additionally, GSH complies with other applicable laws governing the identification and handling of hazardous wastes including but not limited to:

6NYCRR 370	Hazardous Waste Management System: General
6NYCRR 371	Identification and Listing of Hazardous Wastes
6NYCRR 372	Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities
6NYCRR 376	Land Disposal Restrictions

These regulations are referenced in the appropriate sections of this O&M Manual.

Equipment operating procedures and manuals provided by the manufacturers or suppliers are maintained in the File Room in the Administration Building. As-built drawings for Site systems are also stored in the File Room.

A thorough review and understanding of this O&M Manual and other designated reports is essential for safe, environmentally sound, efficient operation of the facility. Designated reports consist of the following:

- Love Canal Site Operations and Maintenance Manual (this OM&M Manual)
- Functional Process Description, Control System Upgrade
- Sampling Manual, Love Canal Site, Long-Term Groundwater Monitoring Program
- Site-Specific Health and Safety Plan, GSH Western New York Sites (HASP)
- Integrated Contingency Plan to comply with 6 NYCRR 373-3.3 and 3.4
- Waste Management Plan to comply with applicable New York State waste regulations

This O&M Manual will be updated as significant modifications are made to the system and reviewed on an annual basis. A formal internal review of the Love Canal Collection and Leachate Treatment System will be performed at a minimum every 5 years. Revisions of the O&M Manual will be distributed to the Site and appropriate operating personnel. Additionally, an updated O&M Manual will be submitted to the NYSDEC following any significant modifications to the system and after the completion of every 5-year review. In the event of a management change, the contact list will be updated and submitted to the NYSDEC for insertion into the most current manual.

1.2 Definitions

A brief description of the terms used in this Manual follows:

APL	Aqueous phase liquid
cfm	Cubic feet per minute
CRA	Conestoga-Rovers & Associates
DCF	Dewatering Containment Facility
FRP	Fiberglass reinforced plastic
GPM	Gallons per minute
GSH	Glenn Springs Holdings, Inc.
HASP	Health and Safety Plan
HMI	Human Machine Interface
hp	Horsepower
LCTF	Love Canal Leachate Treatment Facility
MCC	Motor Control Center
MH	Manhole
NAPL	Non-aqueous phase liquid
NFWB	Niagara Falls Water Board
NYSDEC	New York State Department of Environmental Conservation

OCC	Occidental Chemical Corporation
O&M	Operation and Maintenance
PC	Pump Chamber
PID	Proportional-Integral-Derivative
PLC	Programmable Logic Controller
P&ID	Piping and instrumentation diagram
psi	Pounds per square inch
RCRA	Resource Conservation and Recovery Act
ROD	Record of decision
rpm	Rotations per minute
SIU	Significant industrial user
TDH	Total dynamic head
VFD	Variable frequency drive
VOC	Volatile organic compound
WAN	Wide-area network

1.3 Building and Equipment Nomenclature

The equipment and buildings associated with the Site are listed below.

1.3.1 Buildings

A list of the buildings is as follows:

- Administration Building
- Treatment Building
- Drum Storage Facility

1.3.2 Spill Containment Areas

A list of the spill containment areas is as follows:

- Treatment Building
- Loading Pads
    - East Adjacent LCTF (Carbon Loading)
    - South Adjacent LCTF (Former Sludge Loading)
- Drum Storage Facility
- Storage pad north of the Administration Building (not used)

1.3.3 Vessels

A list of vessels is as follows:

- Raw Water Tank (LC-106)
- Filter Feed Tank (LC-107)
- Sludge Holding Tank (LC-105)
- Southern Sector Collection System Storage Tank (PC-3) (LC-201)
- Northern/Central Sector Collection System Storage Tank (six chambers) (PC-3A) (LC-211)
- Clarifier (LC-101)
- Bag Filter No. 1A (LC-102A)
- Bag Filter No. 1B (LC-102B)
- Bag Filter No. 2A (LC-103A)
- Bag Filter No. 2B (LC-103B)
- Carbon Tank V-1 (LC-131)
- Carbon Tank V-2 (LC-132)
- Carbon Transfer Tank V-3 (LC-133)
- DCF Storage Tank (LC-220)

2. Site Description

2.1 History

The Love Canal was initially designed to provide inexpensive hydroelectric power for industrial development around the turn of the 20th century, but was abandoned shortly after construction commenced. Between 1942 and 1952, Hooker Chemical and Plastics Corporation (now OCC) disposed of over 21,000 tons of various chemicals into the Love Canal. The solid and liquid wastes deposited into the Canal included acids, chlorides, mercaptans, phenols, toluenes, pesticides, chlorophenols, chlorobenzenes, and sulfides.

The remedial program at Love Canal has been extensive. Construction was initiated in 1978 for a project designed to contain leachate migration from the Canal. A permanent treatment plant has been in operation since December 7, 1979. A 3-foot thick clay cap was installed in 1980. A 40-mil high density polyethylene (HDPE) liner covered by 18 inches of clean soil and vegetation was installed over the initial clay cap area in 1985 to decrease infiltration over the Canal and to enhance inward migration of groundwater from the surrounding area.

In October 1994, a Consent Judgment between OCC and the State of New York was approved by the court. This judgment required operation and maintenance activities for the Love Canal Site. On January 12, 1995, the NYSDEC reclassified the Site to a Class 4 Site. Operation of the Love Canal Site (Site) was transferred from the NYSDEC to OCC in April 1995. Effective July 1, 1998, Site responsibility was assigned by OCC to GSH, an affiliate of OCC. Beginning October 1, 2008, GSH contracted GHD, formerly CRA,, to perform operation, maintenance, monitoring, and reporting activities for the Site under direct management of GSH.

2.2 Site Background

2.2.1 Site Description

The Site occupies approximately 70 acres in the southeast corner of the City of Niagara Falls and is located approximately 1/4 mile north of the Niagara River. The location of the Site is shown on Figure 2.1, and the layout of the Site is shown on Figure 2.2. The Site is bounded by Colvin Boulevard to the north, 95th Street to the west, Frontier Avenue to the south, and 100th Street to the east.

2.2.2 Site Geology

The geology of the Site, with increasing depth below ground surface, is as follows:

- Fill (1.8 to 2.5 feet thick outside of the Canal and 10 to possibly 35 feet within the Canal), overlying
- Alluvium (1.5 to 3.7 feet thick), overlying
- Clay (13.5 to 23.0 feet thick), overlying
- Till (at depth of 19 to 27 feet), overlying
- Lockport Formation Bedrock

The Site geological column is shown on Figure 2.3.

The first bedrock unit in this area is the Lockport Formation, ranging in thickness from 160 to 180 feet from the north to south. The Lockport Formation is a dolomitic rock grouping consisting of several discrete rock units, with the uppermost and largest being the Oak Orchard Member. The Eramosa, Goat Island, Gasport, and Decew Members directly underlie the Oak Orchard Member.

The Clinton Formation lies beneath the Lockport Formation and is primarily a limestone rock grouping with a general thickness of about 100 feet. The major rock unit within the Clinton Formation is the Rochester Shale Member, which has a general thickness of approximately 60 feet. The Rochester Shale creates a vertical barrier which extends across the region.

The Irondequoit and Reynales members are lower portions of the Clinton Formation that lie directly beneath the Rochester Shale Unit.

2.2.3 Site Hydrogeology

Due to the primarily clayey nature of the subsurface soils at and surrounding the Love Canal, there is very little overburden groundwater movement. The clays act as an aquitard and restrict vertical and horizontal groundwater migration. The measured hydraulic conductivity of the clay layer is on the order of 1×10^{-8} centimeters per second (cm/sec). There is a perched water table in the thin alluvium layer overlying the clay. However, this layer is very shallow and would be expected to respond to seasonal variations fairly quickly (i.e., wet during rainy periods and drier in hot dry weather). The hydraulic conductivity of the alluvium layer is estimated to be on the order of 1 x 10^{-4} cm/sec.

The clay/till layers beneath the Canal act as an aquitard and have prevented chemicals from seeping from the Canal into the underlying bedrock. This is evident from the ongoing hydraulic and chemical monitoring performed at the Site.

The bedrock hydrogeologic description was obtained from the results of investigative activities performed at the 102nd Street Landfill Site, located immediately south of the Canal.

The bedrock is comprised of several bedrock stratigraphic units. The uppermost bedrock formation encountered is the dolomite of the Oak Orchard Formation, which is massive and dense. Although some porosity and permeability is present within the rock mass, the majority of the porosity and permeability occurs along fracture surfaces, bedding planes, partings, and joints. Distribution of these features is irregular and unpredictable. The nature of the bedrock is also evidenced by the wide range of hydraulic conductivities determined by the in situ response tests. These values vary between 6.9 x 10^{-6} and 9.4 x 10^{-2} cm/sec. The geometric mean hydraulic conductivity is 1.0 x 10^{-3} cm/sec.

The groundwater flow is toward the Niagara River with a very shallow gradient.

Water bearing zones exist only within the upper portion of the Oak Orchard Formation. No water bearing zones were found at depth. In fact, no water bearing intervals were found below a depth of 75 feet into the bedrock.

2.2.4 Site Access

The entire Site is secured by a 8-foot chain link fence. Access to the Site is controlled through a main automatic gate located on 805 97th Street, and locked except to allow entry to and exit from the Site. Additional gates are located around the perimeter of the Site; however, these gates are always kept locked and used only when required by special activities. Entry to and exit from the Site is controlled by individuals who possess gate keys or a transmitter for the automatic gate.

3. Collection Systems

Operation of remedial systems to prevent the off-Site migration of chemical contaminants from the Site began in October 1978 with the installation of a barrier drain along the east and west sides of the Southern Sector of the Canal. The barrier drain was later extended to completely encompass the entire area of disposed waste within the Central and Northern Sectors of the Canal. The locations of the barrier drain and associated collection system are shown on Figure 3.1.

The remedial collection systems for the Site are the systems defined in the 1987 Record of Decision (ROD) and the Consent Judgment from 1994. These systems have been periodically modified to attain the objectives of the ROD. Presently, the remedial collection system is composed of the following components:

- Barrier Drain System (Section 3.1)
- Collection System (Pump Chambers) (Section 3.2)

In addition, installation of a 22-acre clay cap over the entire former Canal area was completed in October 1980 following completion of the barrier drain collection system. The purpose of the cap is to reduce infiltration of precipitation. The thickness of the clay cap is a minimum of 3 feet. In 1985, a second (40-acre) cap was installed over the initial clay cap area. The newer cap consists of a 40-mil HDPE liner covered by 18 inches of clean soil and vegetation.

In March 1999, the adjacent 102nd Street Landfill Site leachate collection system was connected to the Love Canal Site to facilitate the transfer of leachate from the 102nd Street Landfill into Love Canal's pump chamber PC-3 for treatment at the LCTF.

The remedial program for Love Canal was executed in a phased approach and divided into two segments: the Southern Sector and the Central/Northern sectors. These segments were designed and constructed as discrete systems and interface only at certain points.

The objectives and current components of the programs are discussed below.

3.1 Barrier Drain System

The barrier drain, designed to intercept the shallow overburden lateral groundwater flow, consists of a trench approximately 4 feet wide that varies in depth from approximately 12 to 25 feet depending on location at the Site. Installed within the trench is a perforated vitrified clay tile pipe. The pipe is 6-inch diameter in the Central and Northern Sectors and both 6-inch and 8-inch diameter in the Southern Sector. The pipe is centered in a minimum of 2 feet of uniformly sized gravel, which is overlain with coarse sand extending to the existing ground surface present at the time of construction. Thirty-two lateral trenches, approximately 12 to 19 feet deep, filled with a minimum of 2 feet of gravel and overlain with sand similar to the barrier drain, were dug perpendicular to the barrier drain in the direction of the Canal. The majority of these laterals extend into the disposed waste. The entire barrier drain system consists of 6,800 feet of trench and perforated vitrified clay tile pipe and an additional 2,100 feet of lateral trenches.

The barrier drain is graded from two highpoints, one in the southeast corner and the other in the northeast corner, toward a series of manholes which drain to four pump chambers (PC-1A/PC-2A in the Northern/Central Sector and PC-1/PC-2 in the Southern Sector) where the leachate is collected. The leachate is pumped from the pump chambers to two other pump chambers connected to underground holding tanks (PC-3A in the Northern/Central Sector and PC-3 in the Southern Sector) where it is temporarily stored. The leachate is then pumped to the LCTF where it is treated and discharged to the Niagara Falls Water Board (NFWB) sanitary sewer system under the Site's Significant Industrial User (SIU) Permit #44.

A typical cross-section of the barrier drain system, depicting the general location of the waste materials, the caps, and the barrier drain system is shown on Figure 3.2.

3.2 Collection System (Pump Chambers)

3.2.1 Process Description

The collection system consists of two sectors, the Northern/Central and the Southern Collection Systems. The pump chambers in the Southern Collection System were originally designed to utilize a wet well (manhole) providing leachate storage capacity with an adjacent dry well containing a self-priming horizontal end suction lift pump. GSH replaced all the suction lift pumps with submersible pumps, and the dry wells are no longer utilized.

In both the Northern/Central and the Southern Collection System, the leachate flows by gravity from the Barrier Drain System to the Pump Chambers. The leachate is then pumped to the two underground holding tanks where it is pumped to the process Raw Water Tank on demand.

A typical pump chamber layout is provided on Figure 3.3. For details on specific pump chambers, see the drawings on file in the Administration Building file room. The collection systems are shown schematically in the Process Flow Diagram (PFD) and the Process and Instrumentation Diagrams (P&IDs) located in Appendix A.

3.2.1.1 Southern Collection System

The barrier drain is graded for gravity flow toward two pump chambers (manholes) where the leachate is collected. Manhole 7 (MH-7), which is Pump Chamber 1 (PC-1), is located on the east side of the barrier drain and MH-8, which is PC-2, is located on the west side of the barrier drain. Manholes MH-7 and MH-8 each have a leachate storage capacity of approximately 2,200 gallons. The leachate is pumped from the manholes through a 4-inch diameter furan-coated steel forcemain to an underground holding tank adjacent to PC-3. PC-3 is located on the west side of the Canal where leachate is held prior to being pumped on demand (through a 4-inch diameter furan-coated steel force main) to the LCTF. PC-3 also accepts water pumped via forcemain from the 102nd Street Landfill. PC-3 and the underground holding tank are vented to the atmosphere through a vapor phase carbon drum to remove volatile organic compound (VOC) emissions.

3.2.1.2 Northern/Central Collection System

The barrier drain is graded for gravity flow toward two pump chambers where the leachate is collected. PC-1A is located on the east side of the barrier drain and PC-2A on the west side of the barrier drain. Each pump chamber has an approximate 1,100-gallon leachate storage capacity. The leachate from PC-1A is pumped across the Canal through a 4-inch diameter furan-coated steel forcemain to PC-2A where it discharges into an 8-inch diameter vitrified clay pipe. The leachate from PC-2A is also pumped from the well into the 8-inch diameter vitrified clay pipe. The leachate in this pipe gravity flows to an underground holding tank system located adjacent to PC-3A, where it is held prior to being pumped through PC-3A to the LCTF. PC-3A also accepts water from the former dewatering containment facility (DCF), the sump in the drum storage facility, the floor drains within the treatment facility, and the two loading pads adjacent to the LCTF (the former sludge storage tank loading area and the carbon trailer loading pad). PC-3A is vented to the atmosphere through a vapor phase carbon drum to remove VOC emissions.

3.2.2 Equipment Description

The Northern/Central Collection Holding Tank system is comprised of six individual approximate 4,300-gallon concrete underground tanks connected by furan-coated steel pipe. The total capacity of the holding tank system is 25,850 gallons. Each individual concrete holding tank is 8 feet wide, 12 feet long, and 6 feet deep. PC-3A is connected to the storage tank system by three 4-inch diameter furan-coated steel pipes and has the same liquid level as the tank. PC-3A is designed to overflow to PC-2 in the Southern Sector (via manholes MH-2, MH-4, and MH-6 of the west manhole collection system) where the leachate will be contained if the capacity in PC-3A is exceeded.

The Southern Collection Holding Tank is constructed of furan-coated steel with a 25,380-gallon capacity. This cylindrical tank (former rail tank car) has an 11-foot diameter and a 34-foot length. PC- 3 is located south of and adjacent to the storage tank.

In the Northern/Central Collection System, the three pump chambers (PC-1A, PC-2A, and PC-3A) each contain two Gorman-Rupp pumps (Model S2B65-E2). These pumps are rated at 50 gallons per minute (GPM) @ 35 feet of total dynamic head (TDH). The pumps operate on an as needed basis (individually or simultaneously).

In the Southern Collection System, PC-1 (MH-7) and PC-2 (MH-8) each contain one Gorman-Rupp pump (Model S2B65-E2). These pumps are rated at 100 GPM @ 40 feet TDH. Pump Chamber 3 contains two Gorman-Rupp pumps (Model S2B65-E2). These pumps are each rated at 50 GPM @ 50 feet TDH. The pumps operate on an as-needed basis (individually or simultaneously).

There are two pump stations associated with the DCF. Water collected from the DCF drains to DCF pump chamber 3 (MH-6B). From there, the water is pumped via a 2-inch diameter HDPE forcemain to a 10,000-gallon underground storage tank (UST) (DCF pump chamber 4). The pump in DCF pump chamber 3 is a Flygt pump (Model 3085.092, 2.2 hp, 460 volt, 1,750 rpm). The pump in DCF pump chamber 4 is a Gorman-Rupp stainless steel vertical sump pump (Model S2B65-E2, 2 horsepower [hp], 115 volt, 3,450 rotations per minute [rpm]). Water from pump chamber 4 is pumped to PC-3A via a 6-inch diameter HDPE forcemain.

Water is also collected in a grated trench surrounding the drum storage facility. A trench also runs through the middle of the drum storage facility. These trenches empty into a sump outside and adjacent to the drum storage facility. The sump houses duplex Gorman-Rupp stainless steel submersible pumps (Model S2B65-E2 with 2 hp, 115 volt, and 3,450 rpm). These units pump the water to PC-3A, via a 4-inch diameter HDPE forcemain.

3.2.3 Instrument/Control Overview

All pump chamber pumps may be operated in either automatic or manual mode. For manual control, the remote switch at the pump must be set in the HAND position. For automatic control, this switch must be set to AUTO.

Automatic operation also requires that the pump be set to AUTO at the Human-Machine Interface (HMI). When the remote switch is in AUTO and the HMI control is set to AUTO, the pump will be controlled directly through the Programmable Logic Controller (PLC). When the water level reaches a pump start (high level) permissive elevation, the pump chamber pump energizes and begins operation. The pump will shut down when the pump stop (low level) permissive elevation is reached.

In addition to the start/stop elevation control, the PLC also monitors downstream levels in the system to prevent system overflows. For example, both PC-1A and PC-2A pump into PC-3A. There are set level permissives at the HMI, which allow the pumps in PC-1A, PC-2A, and DCF PC-4 to operate only if the level in PC-3A is not above the selected setpoint. This same level permissive requirement is required for the pumping of MH-7 and MH-8 (PC-1 and PC-2) and wet wells at the 102nd Street Landfill to PC-3 and the pumping of PC-3A and PC-3 to the process Raw Water Tank.

PC-2, PC-3 and the Southern Collection Holding Tank each have a high-high level switch that will disable the pumps in MH-7 and MH-8 if the level exceeds the selected setpoint. The pumps will remain disabled until the condition is cleared.

The two pumps in the DCF run off of two level switches in each pump chamber. The pump starts at the high level permissive switch and pumps down to the low level permissive switch. The pump in DCF PC-3 will only operate if the level in DCF PC-4 is not above a selected setpoint. The flow from the DCF is measured with an magnetic flow meter, which is displayed on the HMI. The pump status for the pump and high level alarms from high level switches in DCF PC-3 and DCF PC-4 are also displayed on the HMI.

DCF PC-4 has a high-high level switch that will disable the pump in DCF PC 3 if the level exceeds the selected setpoint. The pump will remain disabled until the condition is cleared.

The two pumps in the drum storage facility run off of three level switches in the sump. The pumps stop at the low level permissive switch, which is at the lowest point in the sump. As the water rises to the high level permissive switch, the primary pump will turn on. If the level continues to rise to the next level switch (second pump level permissive), the second pump will turn on. The pumps will continue to run until the level reaches the low level permissive. At this point, the pumps will alternate, and the primary pump will become the secondary pump for the next cycle. A sump high level alarm from a fourth level switch in the sump is displayed with an audio and visual alarm on the local control panel. The two switches for the pumps at the panel must both be in the ON position in order for the pumps to operate.

Normal operating permissive levels for the pumps in the collection system are listed in Appendix B.

4. Leachate Treatment System

The treatment process, shown schematically in the PFD and the P&IDs (located in Appendix A), consists of several process steps for the removal of various constituents prior to discharge into the NFWB sanitary sewer system. The primary steps in the treatment process include the process feed, clarification, filtration, and carbon treatment (Figure 4.1).

The Raw Water Feed Pump pumps leachate to the Clarifier from the Raw Water Tank for the first stage of solids removal. Leachate overflows from the Clarifier to the Filter Feed Tank and is then pumped to the series of bag filters.

After solids removal using the clarifier and the bag filters, the flow stream enters a train of two carbon beds in series. The carbon system is utilized to reduce the concentration of organic contaminants to below the required discharge limits. After passing through the carbon beds, the water is directed to the NFWB sanitary sewer system and ultimately the NFWB Publicly Owned Treatment Works (POTW) (see Appendix C for a copy of the Discharge Permit).

To bring the treatment system online, the SEQ ENABLE button Start GWT must be selected on the HMI screen. This will enable both treatment system pumps (Raw Water Feed Pump and Filter Feed Tank Discharge Pump). The discharge valve (FCV-107) is opened automatically when the SEQ ENABLE button is pressed. This can also be done manually at the valve. Treatment system pumps may be operated manually by placing the Auto/Hand switch to Hand.

The facility contains a solids handling system to handle solids generated during settling in the clarifier. Solids removed in the clarifier are removed using a vacuum truck or can be transferred to the Sludge Holding Tank. Solids removed from the Sludge Holding Tank are disposed of off Site.

The treatment facility also has a vapor carbon adsorption system for the treatment of vent gases from process equipment.

Start-up and shutdown procedures for the treatment system are maintained in the LCTF operating procedures.

4.1 Raw Water Tank

4.1.1 Process Description

The Raw Water Tank, located within the Treatment Building, collects leachate through a 4-inch diameter force main from PC-3A and PC-3. The Tank is vented through a vapor carbon drum to prevent any organic vapors (VOCs) from escaping into the Treatment Building. Leachate is then transferred from the Raw Water Tank to the Clarifier via the Raw Water Tank Discharge Pump.

4.1.2 Equipment Description

The Raw Water Tank is constructed of fiberglass with a diameter of 12 feet and a height of 7 feet. The tank has a capacity of 6,000 gallons.

The Raw Water Feed Pump, which pumps from the Raw Water Tank to the Clarifier, is a Goulds 3196 Model 2x3-6 STX capable of pumping 150 GPM @ 115 feet TDH. The pump is controlled with a Variable Frequency Drive (VFD).

4.1.3 Instrument/Control Overview

The influent flow to the treatment system is monitored with a flow indicator and transmitter. This flow is monitored using flow transmitter FIT-106 and is displayed both locally and on the HMI screen. The flow transmitter is also used to control the flow rate into the treatment system using flow control valve FV-106. The system flow rate is controlled by the manual position of the flow control valve.

The Raw Water Tank is equipped with a level indicator and transmitter (LIT-106), which monitors the depth of liquid within the tank. This level is displayed both locally and on the HMI screen. The level transmitter is also used to control the level in the tank using the Raw Water Feed Pump's VFD. Using a level setpoint of 50 percent, the signal from the level transmitter and a proportional-integral-derivative (PID) control block, the PLC continuously adjusts the frequency of the pump to maintain the level setpoint. If flow to the process Raw Water Tank stops and the tank level reaches 40 percent, the PLC will shut down the pump to prevent any damage. The pump will also shut down if the downstream level in the Filter Feed Tank (overflow from the Clarifier) rises above 70 percent. The pump will automatically restart when the Raw Water Tank level reaches 50 percent and the level in the Filter Feed Tank is below 60 percent. At this point, the PID block will adjust the pump frequency to maintain the 50-percent setpoint. This level control is only available if the process Raw Water Feed Pump selector switch is turned to AUTO. If the switch is turned to OFF, the pump can only be controlled manually using the variable frequency drive control, which is located in the motor control center (MCC) room, across from the control room. Manual control from the drive will also override any automatic controls, even if the switch is in AUTO. To switch from automated control (via the HMI screen and the PLC) to a manual control of the pump, toggle the F2 button on the VFD control pad located in the MCC room. The manual control mode will enable the pump to be turned on and off along with the ability to set the speed (0-60 hertz) at which the pump is to be operated. At 0 hertz, the pump will be stopped, and at 60 hertz, the pump will operate at maximum capacity.

PID loops control the treatment pumps (Raw Water and Filter Feed Pumps). Each piece of equipment is controlled by a different process variable. The position of the valve is set manually, and the pump speeds are based on the level in their respective tanks. The pumps will stop if permissives in the system require them to do so, but the loops are independent from each other. However, if the flow into the system increases, the pump PID loops will compensate by increasing the frequency on the variable frequency drives. This will maintain the level in the tanks and will compensate for the increased flow.

Level permissives and status are displayed on the HMI screen to inform the operator if the level in the tank exceeds the high setpoint, or the PLC receives a bad quality signal from the transmitter for an extended period of time. A bad quality signal alarm occurs when the 4-20 milliamp (mA) signal from the transmitter is out of range.

The Raw Water Feed Pump is followed by a pressure gauge (remote read only). This gauge can be used to monitor pump performance and aid in troubleshooting any pump problems.

The Raw Water Tank has a high-high level switch that will disable the pumps in PC-3 and PC-3A if the level exceeds the selected setpoint. The pumps will remain disabled until the condition is cleared.

4.2 Clarifier

4.2.1 Process Description

Leachate from the Raw Water Tank is pumped via the Raw Water Feed Pump to the Clarifier. The Clarifier is designed to facilitate the settling and the removal of solids, sludge, and chemical precipitates from the leachate stream. The design retention time of the leachate stream is approximately 2 hours. Leachate flows over a weir and falls by gravity from the Clarifier to the Filter Feed Tank.

Solids are collected at the bottom of the Clarifier. The solids are then raked into sludge hoppers at the influent end of the tank by redwood collector flights driven by a one-quarter HP motor. The solids/NAPL sludge is transferred with the use of air from the treatment plant air compressor to a vacuum truck or the Sludge Holding Tank.

4.2.2 Equipment Description

The Clarifier is constructed of epoxy-coated steel with a 15,633-gallon capacity as manufactured by Pure Stream, Inc.

4.2.3 Instrument/Control Description

Sludge is transferred from the Clarifier to the Sludge Holding Tank at the operator's control using air from the air compressor. The operator can enable the sequence at the HMI screen to start the transfer of sludge.

4.3 Filter Feed Tank

4.3.1 Process Description

Leachate gravity flows from the Clarifier to the Filter Feed Tank. The Filter Feed Tank may also collect water from the Sludge Holding Tank based on system valve setting. From the Filter Feed Tank, water is pumped into the Bag Filters using the Filter Feed Tank Discharge Pump.

4.3.2 Equipment Description

The Filter Feed Tank is constructed of Fiberglass with a 9-foot diameter, a height of 6.5 feet, and a capacity of 3,000 gallons.

The Filter Feed Tank Discharge Pump is a Goulds 3196 Model 2x3-6 STX capable of pumping 150 GPM @ 115 feet TDH. The pump is controlled with a VFD.

4.3.3 Instrument/Control Overview

The Filter Feed Tank is equipped with a level indicator and transmitter (LIT-107), which monitors the depth of liquid within the tank. This level is displayed both locally and on the HMI screen. The level transmitter is also used to control the level in the tank using the Filter Feed Tank Discharge Pump's variable frequency drive. Using a level setpoint of 50 percent, the signal from the level transmitter, and a PID control block, the PLC continuously adjusts the frequency of the pump to maintain the level setpoint. If flow to the Filter Feed Tank stops and the tank level reaches 40 percent, the PLC will shut down the pump to prevent any damage. The pump will automatically restart when the tank level reaches 50 percent. At this point, the PID block will adjust the pump frequency to maintain the 50 percent setpoint. This level control is only available if the Filter Feed Tank Discharge Pump switch is turned to AUTO. If the switch is turned to OFF, the pump can only be controlled manually using the variable frequency drive control, which is located in the MCC room, across from the control room. Manual control from the drive will also override any automatic controls, even if the switch is in AUTO. To switch from automated control via the HMI screen and the PLC to a manual control of the pump, toggle the F2 button on the VFD control pad located in the MCC room. The manual control mode will enable the pump to be turned on and off along with the ability to set the speed (0-60 hertz) at which the pump is to be operated. At 0 hertz, the pump will be stopped, and at 60 hertz, the pump will operate at maximum capacity.

Level permissives and status are displayed on the HMI screen to inform the operator if the level in the tank exceeds the high setpoint or the PLC receives a bad quality signal from the transmitter for an extended period of time. A bad quality signal alarm occurs when the 4-20 mA signal from the transmitter is out of range.

The Filter Feed Tank Discharge Pump is followed by a pressure gauge (remote read only). This gauge can be used to monitor pump performance and aid in troubleshooting any pump problems.

The Filter Feed Tank has a high-high level switch that will disable the Raw Water Feed Pump if the level exceeds the selected setpoint. The pump will remain disabled until the condition is cleared.

4.4 Bag Filters

4.4.1 Process Description

The Filter Feed Tank Discharge Pump transfers water from the Filter Feed Tank to two sets of Bag Filters. Each set has two filters. One or both sets can be used. The Bag Filters are designed to capture any particles that were not removed from the leachate in the Clarifier, thus protecting the carbon bed. Particle loading in the carbon vessels will decrease the efficiency of the carbon to adsorb organic contaminants. From the Bag Filters, the leachate flows directly into the carbon beds.

4.4.2 Equipment Description

The Bag Filtration System consists of two parallel trains of GAF stainless steel bag filtration units. Each train has two bag filter housings piped in series. Each unit holds a polypropylene bag filter rated at 50 microns.

4.4.3 Instrument/Control Overview

Differential pressure transmitters are located around each train of bag filters. The differential pressure is displayed on the HMI screen. A high differential pressure drop across a running filter train of greater than 15.0 pounds per square inch (psi) indicates the filter elements are plugging. This indicates that the operator is required to manually switch between the bag filter trains. The used filters are then drummed for disposal, and new filters are placed in the housings.

Pressure gauges are also located at the inlet and outlet to each of the bag filter trains. This allows for local indication of the differential pressure.

4.5 Liquid Phase Carbon Adsorption

4.5.1 Process Description

Leachate, now free of any solids, passes through a series of Carbon Beds. The Carbon Beds are designed to remove organic compounds from the leachate. The system consists of two carbon adsorbers in series, designated the lead and polish beds. The leachate enters the top of the first or lead adsorber and flows downward through the carbon bed; the surface area of the activated carbon adsorbs the organic chemicals in the leachate stream. The interstage water is collected in the bottom of the lead adsorber by an internal header system and conveyed to the top of the second or polish adsorber.

The quality of leachate after the lead bed is monitored for VOCs at a minimum frequency of quarterly. A carbon change is required when the leachate sample shows evidence of significant breakthrough after the first interstage. The carbon bed monitoring sampling program is detailed in Section 6.3.1.

When breakthrough occurs, the spent carbon in the lead bed is replaced with fresh carbon, and the lead bed is then placed in service as the polish bed. The former polish bed becomes the lead bed. A third vessel, the Transfer Tank V-3, is maintained empty until a carbon change is required. This allows fresh carbon delivery to occur independently of the removal of the spent carbon. The spent carbon from the lead bed is either drummed or transferred to a 30-cubic yard container lined with a geo mesh membrane. The container is equipped with drain plugs for dewatering. The spent carbon is then shipped off Site and incinerated.

Treated leachate drains from the Carbon Adsorption System to the NFWB sanitary sewer through an automatic effluent valve and analog and digital flow meters.

The SEQ ENABLE switch can be set to Stop GWT System, which will close the automatic effluent valve when the flow from FIT-107 is zero. This procedure also turns both the VFDs for the Raw Water Feed and Filter Feed Pumps, which shuts down the treatment system.

4.5.2 Equipment Description

The Carbon Adsorption System, as manufactured by Calgon, consists of three epoxy-lined carbon steel vessels designated V1, V2, and V3 (transfer storage). Each 7,600-gallon vessel has a capacity to hold 20,000 pounds of activated carbon.

4.5.3 Instrument/Control Overview

To prevent over-pressurization, all vessels have a rupture disc with a pressure rating of 75 psi. All vessels also have remote pressure gauges to allow the operator to troubleshoot the process. A sight glass is available at all beds to aid the operator when transferring carbon.

The effluent valve will automatically open when the SEQ ENABLE Start GWT is selected on the HMI, and will close when the SEQ ENABLE Stop GWT button is selected and the flow through FIT-107 is zero. The influent and effluent flows are displayed locally and on the HMI.

4.6 Solids Handling

4.6.1 Process Description

Due to the minimal amount of sludge accumulated, the sludge is generally removed directly from the clarifier sludge hopper via vacuum truck. Sludge also can be transferred to the Sludge Holding Tank from the Clarifier using compressed air at the discretion of the Operator.

Sludge disposal is scheduled as needed by the Operator based on clarifier effluent quality. The operator determines that the clarifier effluent quality is deteriorating when the duration between bag filter changeouts decreases. The frequent changing of the bag filters is a direct indication that the sludge in the clarifier needs to be transferred.

The sludge, after it has been transferred to the vacuum truck from the clarifier or the Sludge Holding Tank, will be allowed to settle. Any water will then be decanted off of the top of the sludge and recycled through the system for retreatment. The sludge is drummed after dewatering for off-Site disposal. The quantity of sludge/NAPL shipped off Site and the manifests are maintained at the Site and in the CRA Niagara Falls office. The quantity of sludge/NAPL generated each year will be reported in the annual Period Review Report (PRR). Procedures detailing the sludge transfer process are available in the LCTF Operating Procedures.

4.6.2 Equipment Description

The Sludge Holding Tank is a fiberglass reinforced plastic (FRP) 1,600-gallon tank. The tank has a 7-foot diameter and a height of 6 feet.

4.6.3 Instrument/Control Overview

The level in the Sludge Holding Tank is monitored using level transmitter LIT-105. This level is displayed both locally and on the HMI screens.

4.7 Vapor Phase Carbon Adsorbers

4.7.1 Process Description

Vapor phase carbon adsorption is used for the removal of any volatile organics stripped from the leachate during tank breathing.

There are 13 vapor phase adsorption canisters currently in use at the Site. The LCTF has four canisters. These canisters contain activated carbon and are attached inline to the indoor process vessels. The Raw Water Tank and the Clarifier both vent to a canister. The Clarifier has a second vent, which discharges to a pair of canisters in parallel. The Filter Feed Tank and the Sludge Holding Tank vent to a canister in an accumulator.

The other nine canisters are utilized as part of the Barrier Drain Collection System and the Secondary Containment Systems. The adsorbers are located at PC-3 (2), PC-2 (2), PC-1 (2), PC-3A (1), DCF pump chamber 4 (1), and the Floor/Decon Pad Manhole.

The carbon is replaced as necessary based on volatile organic monitoring (see Section 6.1.2). Spent vapor carbon is drummed in preparation for off-Site regeneration.

4.8 Waste Disposal

4.8.1 Sludge Disposal

Sludge collected either from the Clarifier or the Sludge Holding Tank is sent off Site for incineration. This is accomplished by transferring the sludge to a vacuum truck, dewatering, and drumming the sludge.

4.8.2 Bag Filter Disposal

Spent bag filters are drummed and coded as such, and then shipped off Site for incineration.

4.8.3 Main Carbon

Spent carbon from the main adsorbers is drummed and/or bulk loaded into a 30-yard container and sent off Site for incineration. Procedures detailing the carbon transfer process are available in the LCTF Operating Procedures. An adsorber sequencing schematic is provided as Figure 4.2.

4.8.4 Vapor Carbon Drums

Spent vapor carbon drums are sent off Site for regeneration.

5. Control Systems

Love Canal Collection and Treatment Systems involve a variety of manual and automatic controls. As discussed in this Section, automatic controls turn on and off pumps, close valves, and act to provide safe, efficient operation of the collection and treatment systems. In addition, the control system initiates alarms and notifies personnel in the event of critical situations. The alarms are shown on the HMI screen. Notification to personnel is done via an autodialer and automated email distribution.

5.1 Control Components

5.1.1 Programmable Logic Controller

A PLC is used as the primary control device. The PLC receives a series of digital inputs and analog inputs and interprets them based on a written program. The PLC then sends a series of digital outputs and analog outputs to control pumps, valves, and a variety of other equipment. The PLC program is designed to operate the collection and treatment systems in a fail-safe manner. The PLC also serves to trigger alarms for the process.

The PLC that controls the collection and treatment system at the Love Canal Site is an Allen-Bradley Control Logix Processor. Remote locations (PC-1, PC-2, PC-3, PC-1A, PC-2A, and PC-3A) are controlled by Allen-Bradley Point IO hardware. The remote Point IO hardware controls the equipment and monitors the conditions at their respective pump chambers. Data is passed from the remote Point IO to the master PLC and vice versa. The main PLC is connected to the HMI.

The 102nd Street system is also controlled by Allen Bradley Point IO hardware is tied into the Love Canal system at the PC-3 via fiber optics.

System setpoints for the PLC program are detailed in Appendix B.

The above control components reflect upgrades that were implemented in 2013.

5.1.2 Human Machine Interface

The PLC is tied in to an HMI software package that allows the operator to view the collection and treatment process from a computer screen. This system offers flexibility in process control and allows the operator efficient management of the collection and treatment processes. Alarms that are triggered by the PLC are displayed on the HMI screen.

In addition, the interface setpoints are hard coded and allow the operator to enable/disable well pumps from the control room. System setpoints for the PLC program are detailed in Appendix B.

The operator is provided with all critical process information through the PLC/HMI interface. The HMI screen printouts are included in Appendix D.

The HMI produces a daily report detailing pumping volume for each well, average water level for each well, and process tank levels. In addition, a real time well summary is available on the HMI.

5.2 Alarms

Alarms are set to advise the operator when conditions are not within the normal limits. The alarms are displayed on the HMI.

Appendix E provides a list of alarm messages for the collection and treatment systems. These are the messages that will be displayed on the HMI alarm screen.

Potential operating problems and troubleshooting guides are detailed in Appendix F. (Control sequences described in Section 5.3 are meant to complement the troubleshooting section).

5.3 Operational Controls and Sequences

The automated control of each piece of equipment is a combination of operational controls and sequences.

5.3.1 Operational Controls

Operational controls manage parameters that change within selected ranges during routine operation of a piece of equipment. These controls are typically used as part of the normal automated operation of the equipment. As an example, the level in a well is used to routinely start and stop a pump. In the Collection System, the pump chamber pumps are designed to operate in a routine manner without impacting critical alarms. Alarms are set to advise the operator when conditions are not within the normal limits.

The operator is provided with all critical process information in the control room. Equipment can be started and shut down from the control room through the HMI. The pump chambers demonstrate a type of operational control as follows.

5.3.1.1 Pump Chambers

The pump chambers all operate in a similar fashion. Each chamber is equipped with a variety of instrumentation to monitor and control operation of the pump.

The pump chambers are equipped with fixed level probes. If the HAND-OFF-AUTO switch local to the pump is in AUTO, the pump is enabled at the HMI, downstream levels permit pumping, and the level is above the high level setpoint, the pump will start. The pump will continue to operate until the level drops below the low level setpoint. The pump will also stop if the local switch is switched OFF; it is disabled through the HMI/PLC or levels downstream are too high. The pump will continue to cycle on and off as the level in the pump chamber changes.

Float switches in addition to level transmitters are located in PC-3, PC-3A, and DCF PC-4 to alarm in high-high level conditions. A high-high level condition will disable any upstream pumping until the high-high level condition is cleared.

A more detailed description of the operational controls can be found in the Collection System and Leachate Treatment System sections above.

5.3.2 Sequences

Sequences can be broken down into two types of sequences: routine and shutdown sequences.

Shutdown sequences are designed to provide failsafe operation of the treatment plant. Shutdown sequences are parameters or a series of parameters that indicate that equipment is operating out of normal limits or may be contributing to an undesirable condition. A shutdown sequence triggers an alarm and locks out the designated equipment without operator intervention. The equipment cannot be restarted until an operator resets the shutdown sequence alarm.

When any of the shutdown sequences are tripped, an alarm statement will be posted on the HMI computer screen and specific automated control actions will occur.

Routine sequences are normal operating parameters or a series of parameters that define the normal operation of equipment. No alarms are associated with routine sequences.

Full shutdown and routine sequence descriptions are included in Appendix G. The system sequences are listed in the following two sections.

5.3.2.1 Shutdown Sequences

Shutdown Treatment Plant: When the level in the floor drain is above the high level switch, the Treatment System will shut down. The pumps that will be inhibited from running include the Raw Water Feed Pump and the Filter Feed Pump. The above pumps will be enabled for normal operation when all applicable levels and conditions are cleared.

5.3.2.2 Routine Sequences

- Shutdown Treatment Plant
- Inhibit MH-7 Pump From Running
- Inhibit MH-8 Pump From Running
- Inhibit PC-3 Pump A From Running
- Inhibit PC-3 Pump B From Running
- Inhibit 102nd Street Well Pumps From Running
- Inhibit PC-1A Pump A From Running
- Inhibit PC-1A Pump B From Running
- Inhibit PC-2A Pump A From Running
- Inhibit PC-2A Pump B From Running
- Inhibit PC-3A Pump A From Running
- Inhibit PC-3A Pump B From Running
- Inhibit Raw Water Feed Pump From Running
- Inhibit Filter Feed Pump From Running

- Inhibit DCF Pump Chamber 4 Pump From Running
- Inhibit DCF Pump Chamber 3 Pump From Running

5.3.3 Sequence Override

The control system is not designed to permit a shutdown sequence override. If necessary, the system must be run in manual until the condition is corrected.

5.4 Remote Access

The HMI system is part of a wide-area network (WAN) that connects several GSH Sites. This network allows for full control and alarming capabilities of the Collection System and the LCTF from any of the other connected GSH Sites (Durez North Tonawanda, Hyde Park Landfill, S-Area Landfill and Niagara Plant [F-Area Treatment System]).

6. Monitoring

The operator is responsible for day-to-day operations of the facility including system monitoring, record keeping (records are maintained in the control room), and ensuring that potential problems are addressed through necessary maintenance. Monitoring requirements are described in general as follows.

6.1 Routine Operations Inspection/Monitoring

The operator is responsible for day-to-day operations of the facility including system routine, preventive, and required maintenance. These maintenance and monitoring procedures are designed to maintain compliance with the 6NYCRR 373-3.9 - Use and Management of Containers and 373-3.10 - Tank Systems. Maintenance of the collection and treatment system components will be performed in accordance with the manufacturer's recommendations. Monitoring requirements and intervals are described subsequently in general terms.

6.1.1 Daily Inspection/Monitoring

An inspection of system operation will be made on a 7-day per week basis. This will consist of the following during the weekdays:

- Site inspection
- HMI data review

The Site inspection will verify the operation of each component of the Collection and Treatment System. Specifically, the inspection will include the following:

- A visual check: walk through the entire treatment building and drum storage facility; check for leaks from tanks/piping, overflows, malfunctioning equipment, or signs of vandalism. Document visual check and findings on daily inspection sheet.

- Visual check of drum warehouse fuel oil storage tank and dike for leaks. Visual check of stored drums for corrosion/leakage. Visual check of sump levels. Any leaks or damage must be noted and addressed immediately to ensure the continued proper operation of the treatment system.
- Check communication systems for proper operation.
- Visual check for fence integrity from appropriate locations within the Site to ensure that no obvious breaches are present that may allow trespassers into the Site.

The weekend inspections will consist of a modified version of the components listed above All findings and/or issues will be documented on the Daily Inspection Sheet presented in Appendix H. Repairs and/or replacements will be performed as necessary.

6.1.2 Monthly Inspection/Monitoring

The following will be performed on a monthly basis:

- Inspection of first aid kits
- Inspection of safety showers/eye wash stations
- Inspection of fire extinguishers
- Check for breakthrough of carbon vent sorb drums (with photoionization detector)
- Inspection of ladders
- Inspection of portable electrical equipment
- Inspection of autodialer - low battery light
- Inspection of exits - free of obstruction
- Inspection of exit/emergency lights
- Inspection of process vessels and tanks for corrosion or leaks
- Inspection of perimeter fence (cursory visual from a distance)
- Inspection of dielectric matting - free from damage, holes, cuts, or deterioration or imbedded objects that may affect its insulating properties

Repairs and/or replacements will be performed as necessary. The monthly inspections will be documented on the Monthly Inspection Sheet presented in Appendix H.

6.1.3 Quarterly Inspections/Monitoring

The calibration of the effluent flow meter will be checked on a quarterly basis. The results of the check will be indicated by a label placed on the equipment and/or recorded on a sheet filed at the Site.

6.1.4 Semi-annual Inspection/Monitoring

6.1.4.1 Barrier System/Pump Chamber Inspections

An inspection of each pump chamber and manhole will be conducted semiannually (spring and fall). This inspection will include:

- Visual inspection of chamber piping
- Verification of level transducer reading
- Inspection of pump chamber and manhole integrity
- Inspection of pump chamber security
- Visual inspection of manhole bottom from ground surface to insure manholes are free of debris and that leachate is flowing freely

The semiannual inspections will be recorded on the semiannual inspection sheets provided in Appendix H.

6.1.4.2 Landfill Cap and Fence

An inspection of landfill cap and fence will be conducted semiannually (spring and fall). This inspection will include:

- Detailed inspection of the fence to ensure that no breaches are present that may allow trespassers into the Site
- Detailed inspection of all access gates to ensure they are secure
- Inspection of landfill cap to determine condition of vegetated cover and for signs of erosion or subsidence

The semiannual inspections will be recorded on the semiannual inspection sheet provided in Appendix H.

6.1.5 Annual Inspection/Monitoring/Maintenance

6.1.5.1 Back Flow Preventer Inspection

An inspection of the backflow preventers will be conducted annually by a certified third party. The third party will submit the completed inspection forms to the NFWB and the operator. The backflow preventers will be repaired or replaced as needed.

6.1.5.2 Level Switch Operation

An inspection of key level switches will be conducted on an annual basis. The inspection will involve activating each switch to ensure that the desired control action will occur. The key level switches that will be inspected are the high-high level switches in the treatment building and the high-high level switches in the tanks at PC-3, PC-3A, and DCF PC-4.

These inspections will be documented on the Annual Level Switch Inspection Sheet presented in Appendix H.

6.1.5.3 Barrier System/Pump Chamber System Cleanout

The pump chambers, collection system USTs, and clarifier will be cleaned out of NAPL and sediment on an annual basis. If cleanout of any manholes is required based on semiannual inspections, the cleanout will occur concurrently with the above NAPL cleanout.

6.1.5.4 Signage

Signs and labels on buildings and tanks will be inspected annually. Any signs or labels that have become illegible due to weathering or deterioration will be replaced.

6.2 Environmental Monitoring

Every day an operator is required to verify operation of the components of the collection system. This is intended to verify that the well systems are providing adequate drawdown to provide containment. This may be accomplished through either a visit to the Site or examination of the HMI data through the WAN or dialup.

A Long-Term Groundwater Monitoring Program has been implemented to verify proper operation of the collection system. The program involves hydraulic monitoring (measurement of water levels in monitoring wells on a quarterly basis), and chemical monitoring (sampling of monitoring wells for chemistry on an annual basis). Details of the program are presented in the document entitled "Sampling Manual, Love Canal Site, Long-Term Groundwater Monitoring Program," dated June 2013 (prepared by CRA).

6.3 Treatment Performance Monitoring

A performance log is distributed electronically via email to the Operator every morning.

6.3.1 Carbon Treatment Performance Monitoring

To ensure that organics are being removed by the Carbon Beds, samples are collected at a minimum of quarterly between and after the beds. The samples are analyzed for VOCs. The following indicator parameter data are reviewed and used to determine the necessity of a carbon change, as summarized below. These indicator parameters reviewed are as per the NFWB SIU Permit #44, Section E, Item 2.

Item/Indicator	Criteria	Response
Interstage: chlorobenzenes (mono-, tri-, and tetra-), chloroethylene (tri- and tetra-), monochlorotoluene, hexachlorocyclohexanes, and hexachlorobenzene	>10 µg/L	Commence Process for carbon change
Effluent: chlorobenzenes (mono-, tri-, and tetra-), ethylene (tri- and tetra-), monochlorotoluene, hexachlorocyclohexanes, and hexachlorobenzene	>10 µg/L	Schedule immediate carbon change
Note: µg/L micrograms per liter		

6.4 Analytical Program

The effluent discharge criteria for the LCTF have been established in accordance with the Official Compilation of Codes, Rules and Regulations of the State of New York, Title 6, Chapter 4 of the NFWB Regulations (September 2006) and the NFWB SIU Permit No. 44 for the Site, valid from January 9, 2015 to January 9, 2020. Periodic testing of the effluent discharge is required as summarized in the following section. In addition, GSH and the NFWB have agreed to cease discharge to the NFWB sewer during high rain conditions to avoid overloading the system. The letter outlining this agreement is included in Appendix C.

6.4.1 Sampling Schedule

Sampling and process monitoring is summarized as a process schematic presented as Figure 6.1.

6.4.2 Required Effluent Quality

The effluent limitations specified in the Site's discharge permit (#44) from the NFWB are as follows:

Parameter	Annual Avg. Limit	Daily Max Limit	Units
Flow	0.3	0.3	MGD
TSS	25	50	lbs/day
Soluble Organic Carbon	50	75	lbs/day

Note:
TSS total suspended solids
MGD million gallons per day
lbs/day pounds per day

In addition, treatment levels of 10 µg/L shall be achieved for the following compounds: trichloroethylene, tetrachloroethylene, monochlorotoluene, monochlorobenzenes, trichlorobenzenes, tetrachlorobenzenes, hexachlorocyclohexanes, and hexachlorobenzene.

7. System Utilities

7.1 Emergency Shutdown

This process is designed to automatically shut down in a safe manner in the event of an electrical utility failure. In the event of a power failure, all process equipment will shut down. The operating ranges for the treatment plant are set to accommodate any gravity drain that would occur on system shutdown.

7.2 Utilities

7.2.1 Electrical Systems

Treatment Plant

The power supply to the electrical room in the Treatment Plant is a 400-amp, 480 volt, 3 phase, 4 wire service from National Grid on 95th Street. Electricity to all or parts of the treatment building can be shut off in the electrical room across from the control room in the treatment building. The treatment building floor plan is shown on Figure 7.1. The electrical room includes the following equipment:

1. Main disconnect enclosure
2. 400A/600V (3 phase, 4 wire) SN safety switch
3. 400A/600V power panel
4. 75 kilovolt amp (KVA) transformer (480V primary, 120/208V secondary)
5. 120/240V lighting panel
6. High level interlock system fuse panel for process tanks
7. 120/208V (3 phase, 4 wire) 225A main circuit breaker (Power Panel-A)
8. Clarifier motor disconnect and starter
9. Dewatering Containment Facility Pump Station No. 3 (MH-6B) disconnect and starter
10. Dewatering Containment Facility Pump Station No. 4 disconnect and starter
11. Security/Fire Logic Control Panel
12. Variable Frequency Drives

Northern, Central, and Southern Sectors

The Northern, Central, and Southern Sectors have power supplies that originate from the Treatment Facility's Electrical Room. A main distribution panel (277/480V) feeds a 75-KVA Transformer (480V primary – 120/208V secondary). From there, a 3-inch diameter, 4-wire cable feeds Power Panel-A (PP-A). PP-A, located in the Electrical Room, has a 120/208-volt, 225 amp main circuit breaker. PP-A feeds the multiple disk centrifugal pump (MDCP) pump logic controller, PP-N1 located at PC-2A, PP-N2 located at PC-1A, PP-C located at PC-3A behind the Treatment Facility, PP-S1 located at Pump Chamber 2, and PP-S2 located at PC-1.

7.2.2 City Water

City water enters the facility at the south end of the treatment building and also on a separate line into the drum storage facility. A shut-off valve is located on the riser at this location. The water is supplied by a 4-inch diameter connection to the 8-inch diameter City main in 97th Street, and is used for carbon transfers, compressor cooling, personal hygiene, and safety. A backflow preventer has been installed in this line.

This City water system has an 80-psi service rating and is connected to the following by copper lines:

1. Two stationary air compressors (one is out-of-service)
2. Electric water heater
3. Washroom facilities; shower, sink, toilet and urinal
4. Three emergency shower and eyewash stations

5. Hose used for washdowns
6. Carbon service module
7. Two main back-flow preventers

Schematic diagrams of the service module and water lines are provided on P&IDs in Appendix A.

City water, supplied to the service module by a 3-inch diameter copper line, is flow and pressure regulated as detailed on P&IDs in Appendix A. Water from the module is used for the following carbon transfer operations:

1. Water rinsing of the spent carbon
2. Preparing a carbon slurry in the hopper trailer
3. Introducing water cushions to the carbon vessels
4. Washing down the carbon heel from the adsorber and transfer and delivery tanks

7.2.2.1 Safety Shower System

The emergency shower system is comprised of the three emergency shower and eyewash systems. The emergency shower and eyewash systems are fed by the City water lines. The following is a summary of the safety shower and eyewash station locations.

Station	Location
1	Treatment Building, northeast of the clarifier
2	Treatment Building, south of the clarifier
3	Drum Storage Facility

7.2.3 Natural Gas

Natural gas enters the administration building at the southeast corner of the building and enters the treatment facility in the compressor room. A meter and a shut-off valve are located at both points and are inspected annually by the gas company.

7.2.4 Compressed Air System

The compressed air system consists of two stationary Worthington compressors, a Model RS-25-100 and a Model Rollair 40-100, which are located in the compressor room next to the MCC room in the treatment building. The Model RS-25-100 compressor is out-of-service as it is no longer needed for the process. The compressors provide air required to transfer sludge from the Clarifier to the Sludge Holding Tank (two vacuum air-lift sludge lines) and for carbon changeouts. A Van Air refrigerated air dryer system dries the air prior to use in the system.

Because of the infrequent use, the compressed air system requires manual starting. Pressure gauges, switches, and temperature gauges function internally to protect the unit from overpressurization.

Air is supplied on demand for the sludge transfer by copper lines pressurized to 100 psi. The pressure in the air lines for carbon transfer is regulated by control valves and gauges on the service module.

The air module schematic and compressed air schematic are detailed on the P&IDs in Appendix A.

7.2.5 HVAC

The electrical and mechanical rooms are heated by 500- and 1,750-watt wall baseboard heaters, respectively. Ventilating in the electrical and mechanical rooms is provided by a Penn Dome BB45 roof exhaust fan. A Penn Dome XQ60 roof exhaust fan provides ventilation for the washroom.

The treatment building is heated by a Dravo Hastings LU-215 gas roof top unit. Temperature adjustment is accomplished by rotating a burner flame control at the unit. There is also a switch in the control room to change between summer and winter mode. The same area is ventilated by two floor level exhaust fans located on the east and west walls of the bay area (each fan is rated at 1,185 rpm at 4,100 cubic feet per minute [cfm]). In addition, there are six roof top fans. Three of the fans (rated at 1,650 rpm and 795 cfm each) are connected to the raw tank, the clarifier/filter feed tank, and sludge holding tank. These are two speed fans. The remaining three fans are located on the roof at the south end, middle, and southeast ends of the plant. These fans are rated at 475 rpm/9,035 cfm, 945 rpm/4,070 cfm, and 945 rpm/4,070 cfm, respectively. Exhaust fan and roof fan controls are located on the west wall of the air compressor room. Operation of fans during plant operations are detailed in the LCTF operating procedures.

8. Reports

8.1 Quarterly/Annual Reports

The quarterly reports summarize the effluent sewer sampling that occurs. The quarterly reports are submitted to the NFWB in accordance with the NFWB SIU Permit #44. Copies of the report are provided to NYSDEC.

Pursuant to Section 2.C. of Appendix B of the Consent Judgment between OCC and the State of New York, effective October 7, 1994, a Love Canal Operations and Monitoring Report is issued annually to the NYSDEC to summarize the activities that occurred at the Site over the past year. Per the NYSDEC's request, the Operations and Monitoring Report was change to the "Site Management Periodic Review Report" beginning in 2010. This report includes:

- Operations of the barrier drain and well collection systems
- Groundwater treatment including the treatment system, the effluent discharge, sampling, the annual precipitation, and the quantity of sludge removed and sent off Site to a permitted facility (noting location) for incineration
- Groundwater monitoring including groundwater quality, chemical monitoring, and hydraulic containment
- Process and non-process activities
- Community outreach including beautification, tours, and communications
- Evaluation of overall performance and chemical containment
- Institutional and engineering certification

A separate Love Canal annual report is submitted to the NYSDEC pursuant to Section 4 of Appendix B of the Consent Judgment between OCC and the State of New York. It is a condensed version of the Operations and Monitoring Report and covers those developments and activities that occurred throughout the calendar year. As per Section 4 of Appendix B of the Consent Judgment, GSH makes the annual report available to the public at a location accessible to local residents. The annual report is also mailed to individuals on a regular short mailing list (not to exceed 50 copies). This list is maintained by GSH.

Any other necessary recipients of the above reports are also maintained on the GSH mailing list.

9. Personnel

9.1 Staffing Requirements

The Love Canal Collection and Treatment System is designed to operate with minimal staffing. The Site is designed to operate automatically (unmanned) with the exception of routine inspections and maintenance activities. According to the consent order and due to the historically high visibility of operations at the Site, GSH requires one operator to be on Site while the Treatment System is in operation.

9.2 Training

9.2.1 Detailed Job Training

The on-the-job training required for a Love Canal Operator includes:

1. Review of other environmental and safety regulations applicable to operation of the Collection and APL Treatment Facility
2. Detailed study and understanding of the "Love Canal Landfill Collection and Aqueous Phase Liquid (APL) Treatment System Operation and Maintenance Manual"
3. Satisfactory performance of all required record keeping
4. Demonstration of proficiency with Love Canal operating procedures

9.2.2 Training Documentation

Upon completion of training to operate the facility, -the Operator will be required to complete a test to document their understanding of Site operations. Successful completion of the test is required. Completed tests will be kept on file at the Site.

10. Records

10.1 Operating Inspection

Inspection sheets are filed in the Love Canal Control Room. These inspection sheets will be scanned monthly and saved electronically (e.g., as Adobe® Acrobat® files) at CRA's Niagara Falls office. Operations logbooks are used to record activities performed while on Site. Active logbooks are stored at the Site. Maintenance activities performed while on Site are recorded in a maintenance computer program database.

10.2 Maintenance/Calibration

Maintenance and calibration records for each piece of equipment are recorded and kept on file at the Site, as applicable. Calibration labels are placed on equipment indicating the last date of calibration if applicable.

11. References

11.1 Love Canal Documents

11.1.1 Consent Orders

- Partial Consent Decree – 1989
- Consent Judgment – 1994

The above Consent Orders (Civil Action No. 79-990C) were drawn up between the United States of America, the State of New York, and UDC - Love Canal, Inc. (Plaintiffs), and Occidental Chemical Corporation, City of Niagara Falls, New York, and the Board of Education of the City of Niagara Falls (Defendants).

In 1995, OCC assumed responsibility for the O&M requirements set forth in the above Consent Orders.

11.1.2 Manuals

The following Manuals can be found in the Love Canal office building:

- Love Canal Landfill Collection and Aqueous Phase Liquid (APL) Treatment System Operation and Maintenance Manual
- Functional Process Description, Control System Upgrade
- Sampling Manual, Love Canal Site, Long-Term Groundwater Monitoring Program
- Waste Management Plan, GSH Western New York Sites

11.1.3 Health and Safety

The following plans can be found in the Love Canal office building:

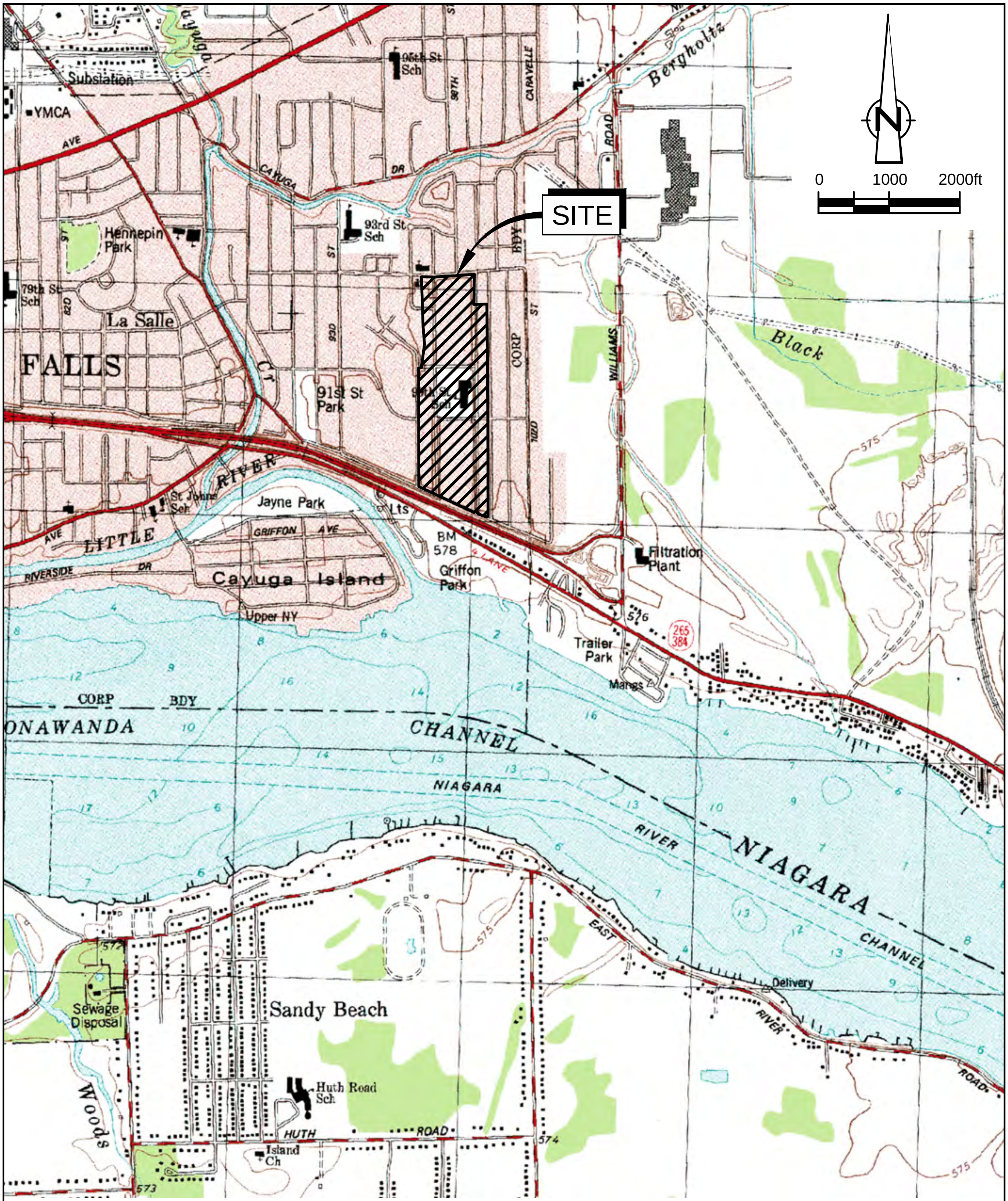
- Site-Specific HASP, GSH Western New York Sites
- Integrated Contingency Plan

11.2 Drawings

PFDs and P&IDs together for the Collection and Treatment System are attached as Appendix A. Significant equipment, instrumentation, and process lines are depicted on these drawings as a reference for operating personnel.

11.3 Equipment Vendor Manuals

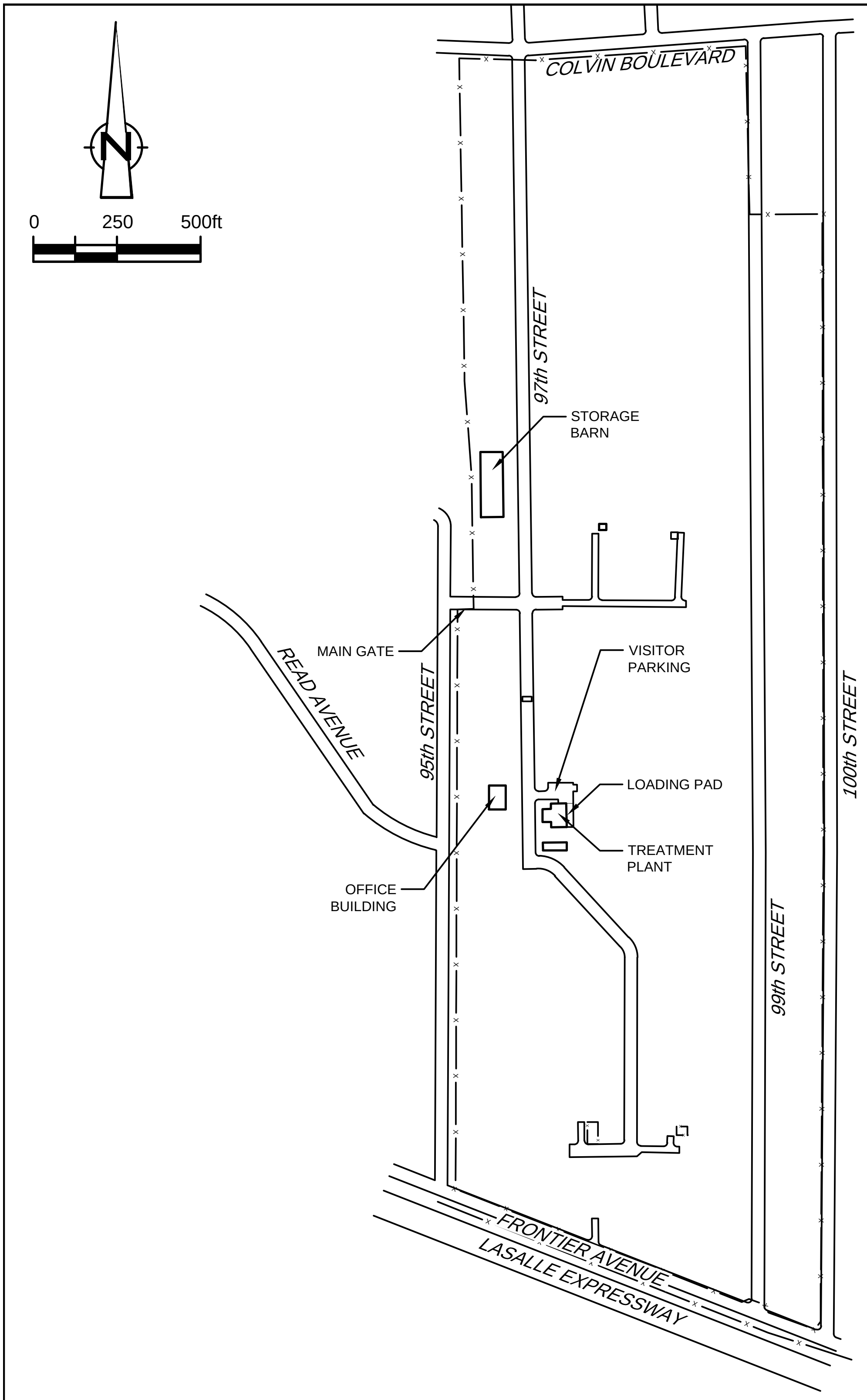
Manuals for individual equipment are stored in the Love Canal file room.



SOURCE: USGS QUADRANGLE MAP;
TONAWANDA WEST, NEW YORK, 1980

figure 2.1

SITE LOCATION
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
Niagara Falls, New York



LEGEND

—x— FENCELINE

figure 2.2

SITE PLAN
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
Niagara Falls, New York

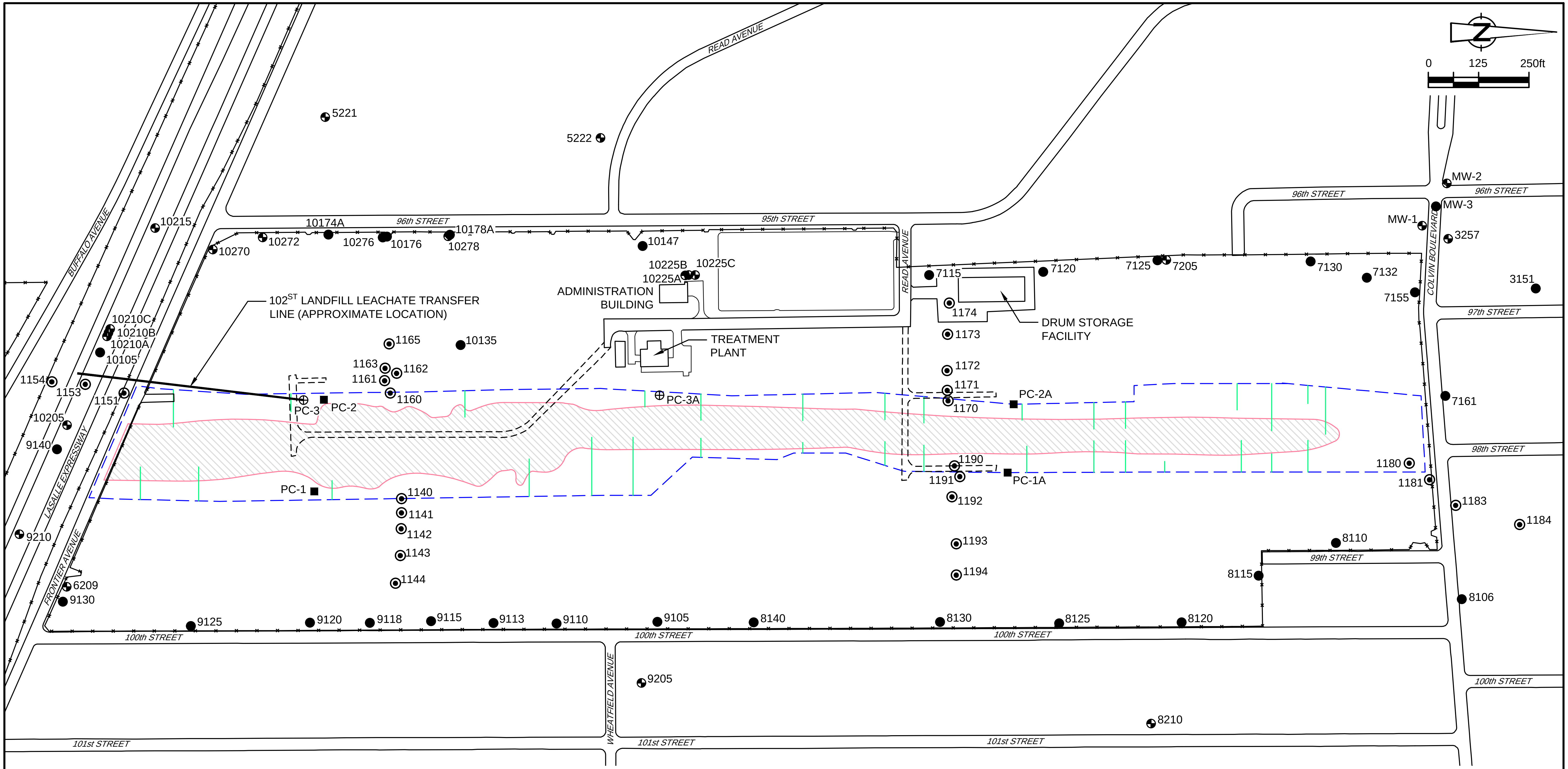
GHD

FORMATION	COLUMNAR SECTION	THICKNESS IN FEET	CHARACTER
FILL		0.1-3	LOCAL SOIL MATERIAL, INDUSTRIAL WASTE, CONSTRUCTION RUBBLE
GLACIOLACUSTRINE CLAY		6-29	REDDISH BROWN TO GRAY, SILTY, VARVED, IN UPPER PART GRADING TO VERY PLASTIC, MOIST TO WET, IN LOWER PART
TILL		1-25	REDDISH BROWN SILTY TO SANDY CLAY, GRAVEL AND COBBLES, SANDY ZONES, FIRM, MOIST
BEDROCK		160-180	LOCKPORT DOLOMITE
BEDROCK		~60	ROCHESTER SHALE

figure 2.3

SITE GEOLOGICAL COLUMN
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
Niagara Falls, New York

GHD



LEGEND

-x-x- FENCE LINE

BARRIER DRAIN

LATERAL TRENCH

⊙ 7105 PIEZOMETER

● 9120 OVERBURDEN OBSERVATION WELL

◕ 10270 BEDROCK OBSERVATION WELL

■ PC-1 PUMP CHAMBER FOR LEACHATE COLLECTION

⊕ PC-3 PUMP CHAMBER / UNDERGROUND LEACHATE STORAGE TANK FOR LEACHATE COLLECTION AND TRANSFER

▨ APPROXIMATE LIMITS OF DISPOSED WASTE

NOTE:
WELL 3151 IS UNABLE TO BE LOCATED
(ASSUMED TO BE PAVED OVER)

figure 3.1

BARRIER DRAIN, COLLECTION SYSTEM AND MONITORING WELLS
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
Niagara Falls, New York

09954-D23101(016)GN-WA004 NOV 22, 2018

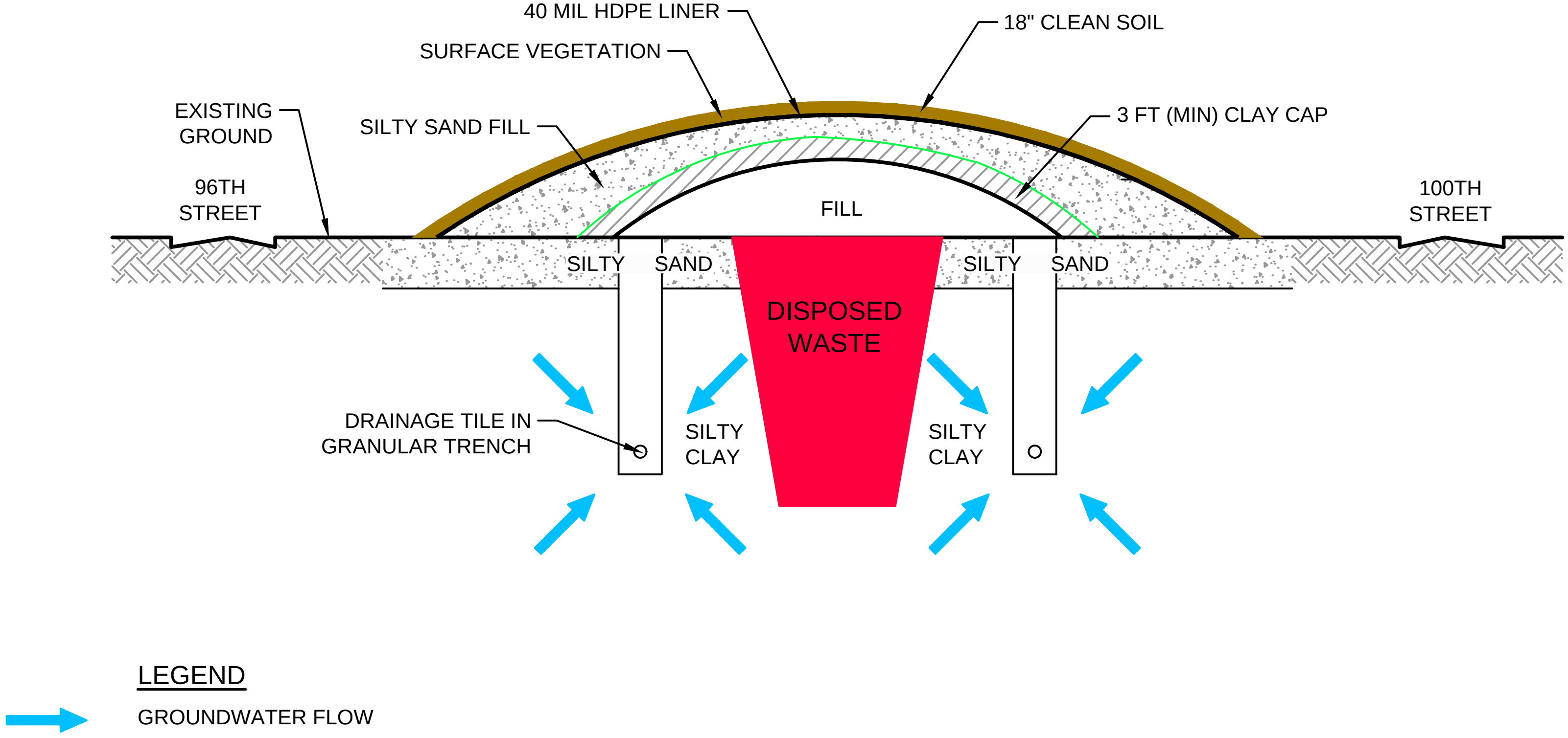
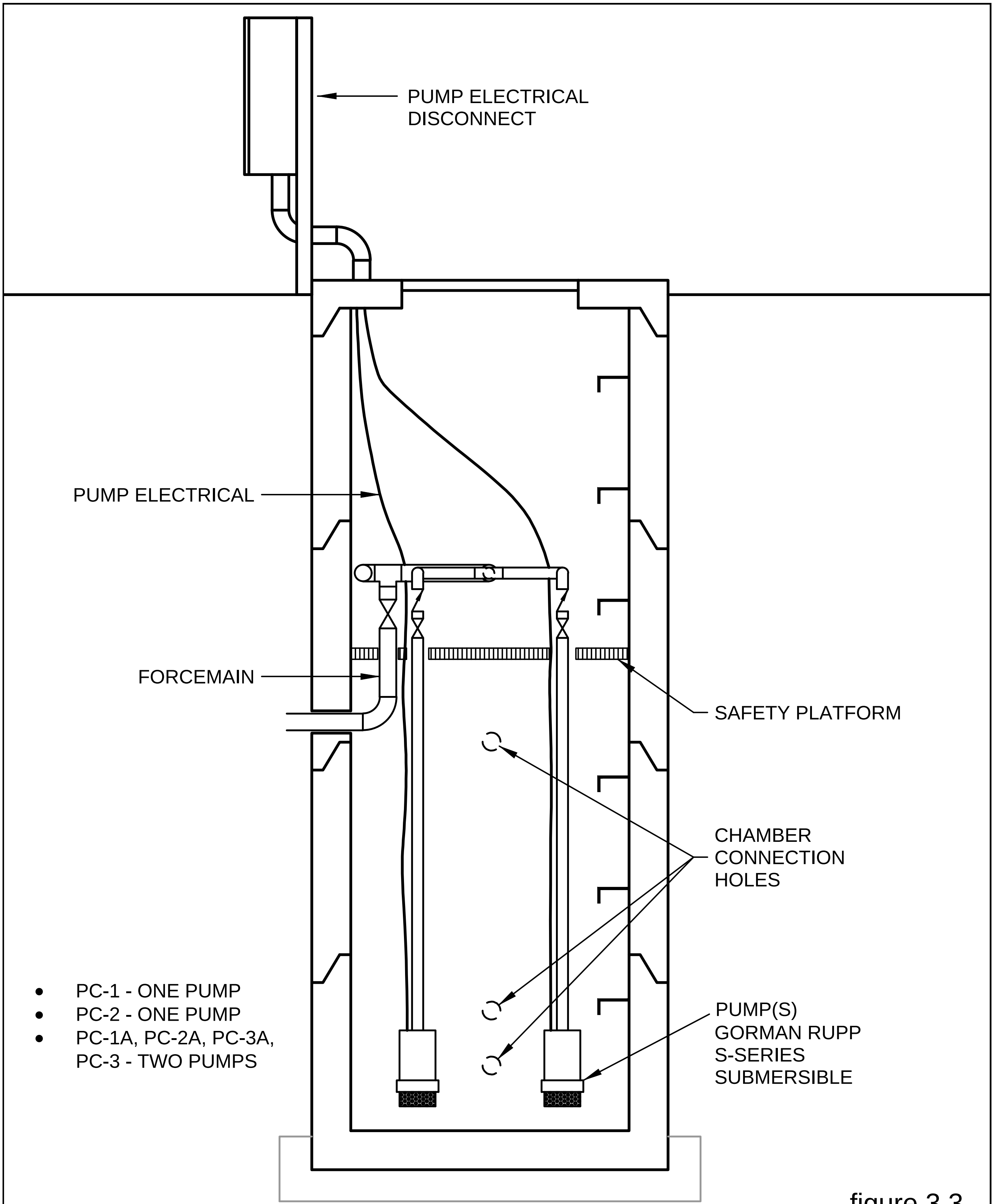


figure 3.2

TYPICAL BARRIER COLLECTION SYSTEM CROSS-SECTION
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
Niagara Falls, New York



- PC-1 - ONE PUMP
- PC-2 - ONE PUMP
- PC-1A, PC-2A, PC-3A, PC-3 - TWO PUMPS

figure 3.3

TYPICAL PUMP CHAMBER
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
Niagara Falls, New York

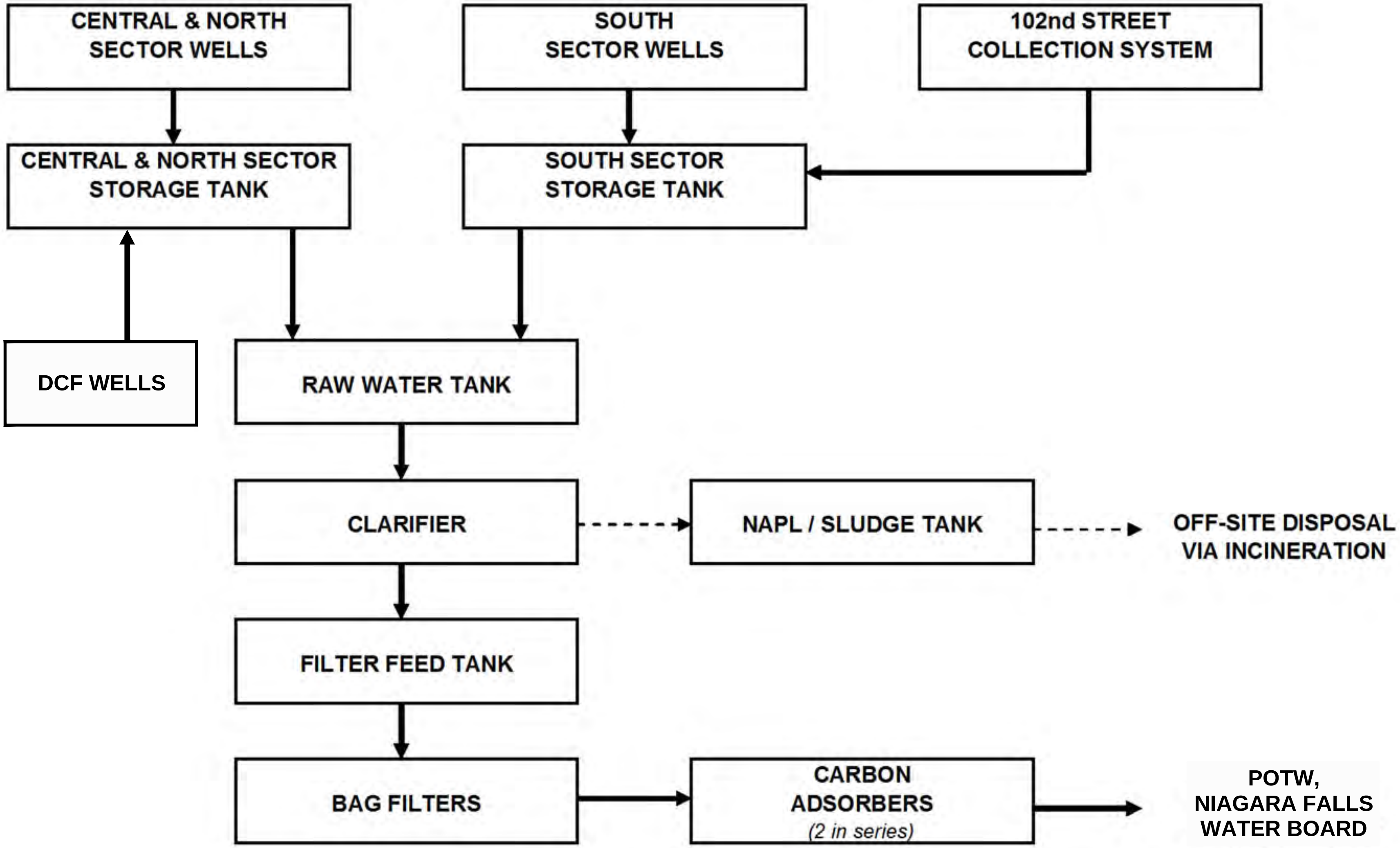


figure 4.1

PROCESS SCHEMATIC
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
Niagara Falls, New York

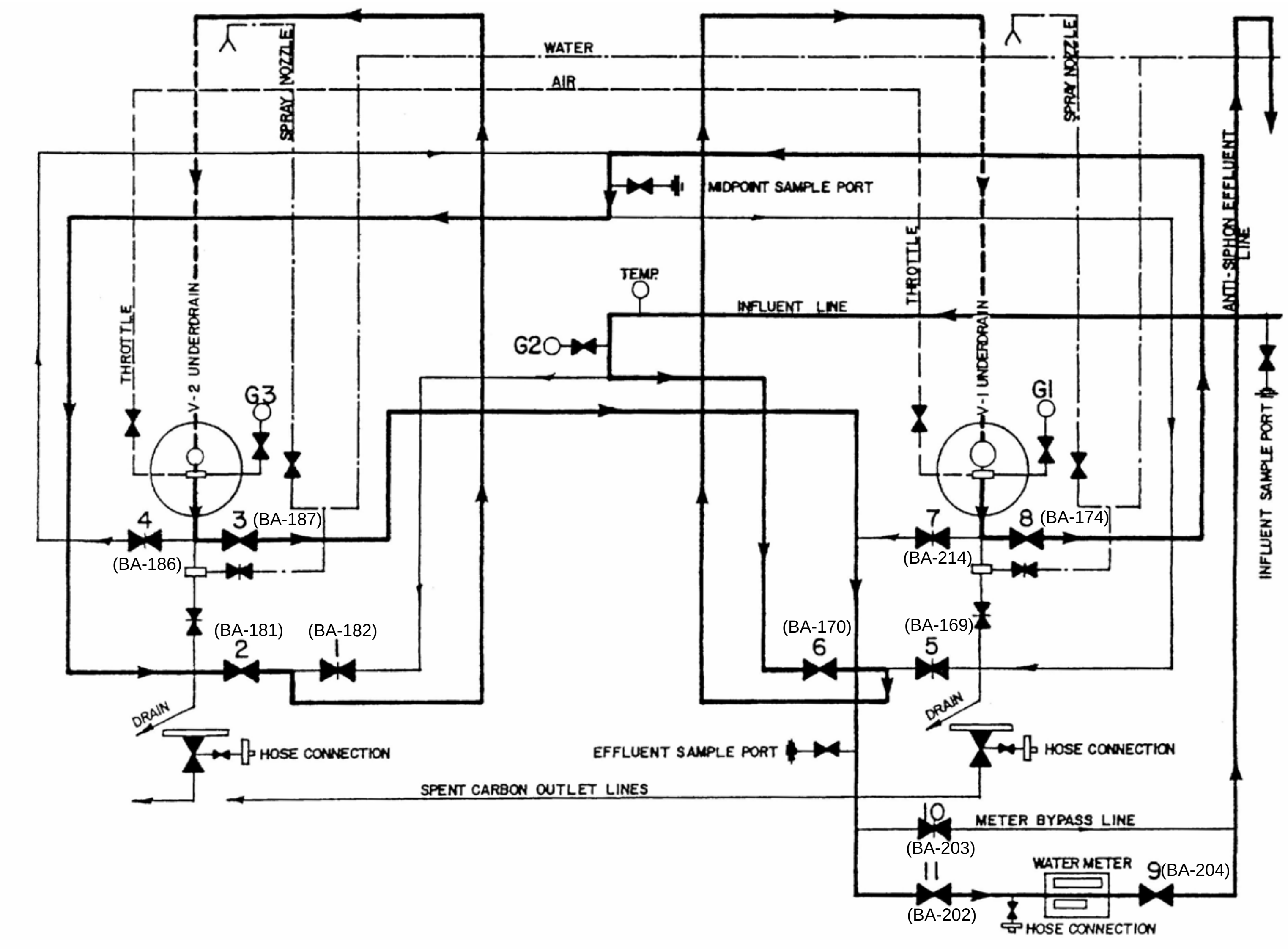
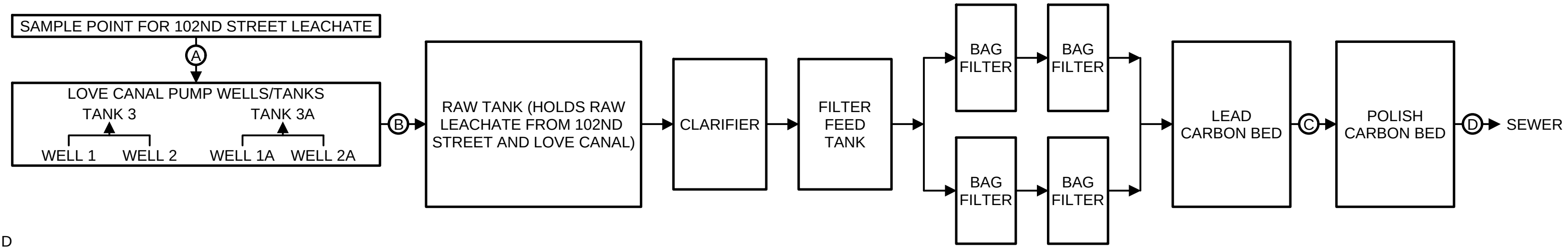


figure 4.2

ADSORBER SEQUENCING SCHEMATIC
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
Niagara Falls, New York



LEGEND

Ⓐ SAMPLE LOCATION

Frequency	Sample Location	Sample type	Sampler	Laboratory, T/A	Analyses	Sample Method	Driver	Permit/Action Levels
Monthly	D - Effluent	NA	Operator	NA	Flow, pH, Temperature	1	Flow - SIU Permit #44 pH, Temperature - Internal	Daily Max Discharge Limitations
Quarterly	A - 102nd Street	Grab	Operator	TA-Pitts STD	VOCs	2	Internal Use Only	Process Information
	D - Effluent	Lab Composite	Operator	TA-Pitts STD	SIU Permit #44 (1), SIU Permit #44 (2)	3	SIU Permit #44	Daily Max Discharge Limitations, Quarterly Treatment Levels
	B - Influent	Grab	Operator	TA-Pitts STD	SIU Permit #44 (2)	2	SIU Permit #44	Process Information, Quarterly Treatment Levels
	C - Interstage	Composite	Operator	TA-Pitts STD	SIU Permit #44 (2)	4	SIU Permit #44	Process Information, Quarterly Treatment Levels

SIU Permit #44 (1) - Quarterly Analytes
TSS, SOC, PPL VOCs, PPL Acid Extractables, PPL Base/Neutral, Hexachlorocyclohexanes/Pesticides, Total Phenols

SIU Permit #44 (2) - Quarterly Treatment System Check
Trichloroethylene, Tetrachloroethylene, Monochlorotoluene, Monochlorobenzenes Trichlorobenzenes, Tetrachlorobenzenes, Hexachlorocyclohexanes, Hexachlorobenzene

Daily Max Discharge Limitations - Flow - 0.3 MGD, TSS - 50 lbs/d, SOC - 75 lbs/d, PPL VOCs (monitor only), PPL Acid Extractables (monitor only), PPL Base/Neutral (monitor only), Hexachlorocyclohexanes/Pesticides (monitor only), Total Phenols (monitor only)

Process Information - TSS, SOC, PPL VOCs, PPL Acid Extractables, PPL Base/Neutral, Hexachlorocyclohexanes/Pesticides, Total Phenols

Quarterly Treatment Levels - 10 µg/L

Notes:
- Location A (102nd Street sample) is collected from PC-3.
- Location B (Influent) is collected before the Raw Tank.
- Location C (Interstage) is collected between the Lead Carbon Bed and the Polish Carbon Bed.
- Location D (Effluent) is collected from MS #1.

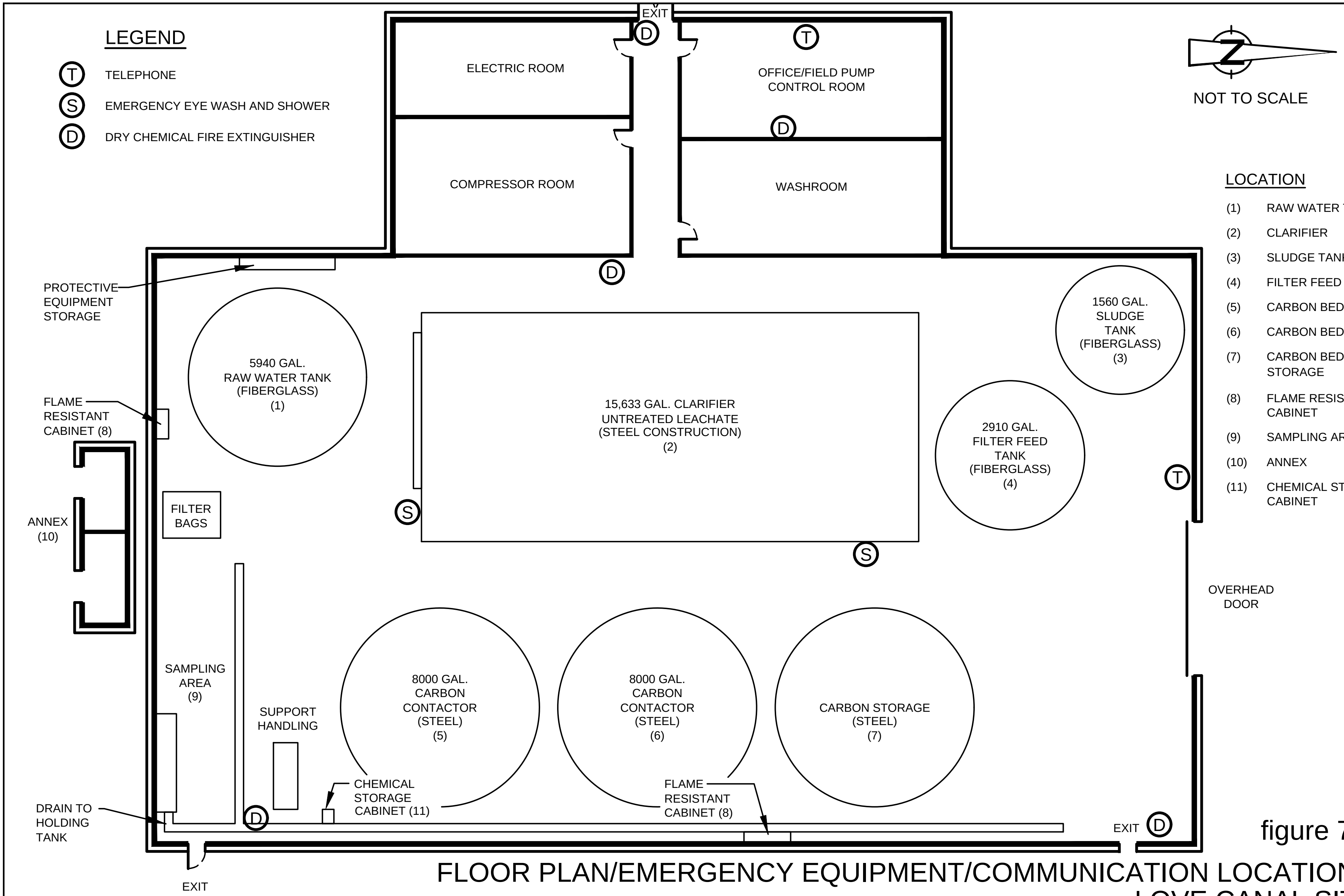
1. Flow will be continuously monitored with the use of a water meter or another acceptable flow metering device.
2. Grab sample.
3. Each sample will consist of four (4) grabs collected spaced throughout the batch discharge, such that they are representative of the effluent being discharged pursuant to 40CFR 403.12.b5iii. The four (4) grabs will be composited in the laboratory and analyzed as one sample.
4. Composite sample over a 24-hour period. Composited by operator.

figure 6.1

PROCESS SAMPLING SCHEMATIC
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
Niagara Falls, New York

GHD

09954-D23101(016)GN-WA007 NOV 22, 2018



LEGEND

- Ⓣ TELEPHONE
- Ⓢ EMERGENCY EYE WASH AND SHOWER
- Ⓓ DRY CHEMICAL FIRE EXTINGUISHER

LOCATION

(1)	RAW WATER TANK
(2)	CLARIFIER
(3)	SLUDGE TANK
(4)	FILTER FEED TANK
(5)	CARBON BED
(6)	CARBON BED
(7)	CARBON BED STORAGE
(8)	FLAME RESISTANT CABINET
(9)	SAMPLING AREA
(10)	ANNEX
(11)	CHEMICAL STORAGE CABINET

figure 7.1

FLOOR PLAN/EMERGENCY EQUIPMENT/COMMUNICATION LOCATIONS
LOVE CANAL SITE
GLENN SPRINGS HOLDINGS, INC.
Niagara Falls, New York

09954-D23101(016)GN-WA012 NOV 22, 2018

Table 1.1

Site Contact List
Love Canal Landfill Site
Niagara Falls, New York

Joseph Branch (Glenn Springs Holdings, Inc. [GSH])
Western New York Operations Manager (WNYOM)
cell – 231-670-6809

Clint Babcock (GSH)
Western New York Operations Coordinator (WNYOC)
972-687-7506; cell – 859-421-4233

John Pentilchuk (Conestoga-Rovers & Associates [CRA])
Project Manager, reports to GSH
519-884-0510; cell - 519-572-5644

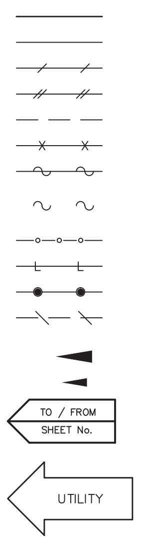
Dennis Hoyt (CRA)
Project Coordinator, reports to GSH
716-297-6150; cell – 716-345-1978

Darrell Crockett (CRA)
Facility Coordinator, reports to CRA PM/PC
cell 716-998-5804

Appendices

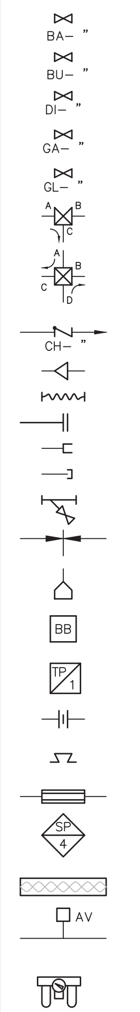
Appendix A
Process Flow and Piping and Instrumentation Diagrams

PROCESS / INSTRUMENT LINES

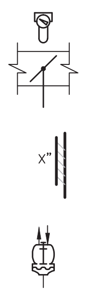


MAIN PROCESS LINE
SECONDARY PROCESS LINE
UNDEFINED SIGNAL
PNEUMATIC SIGNAL
ELECTRICAL SIGNAL
CAPILLARY TUBE
ELECTROMAGNETIC OR SONIC SIGNAL (GUIDED)
ELECTROMAGNETIC OR SONIC SIGNAL (NOT GUIDED)
INTERNAL SYSTEM LINK
HYDRAULIC SIGNAL
MECHANICAL LINK
ELECTRICAL BINARY SIGNAL
MAIN PROCESS FLOW INDICATION
SECONDARY PROCESS FLOW INDICATION
OFF PAGE CONNECTOR
UTILITY IN/OUT

LINE SYMBOLS

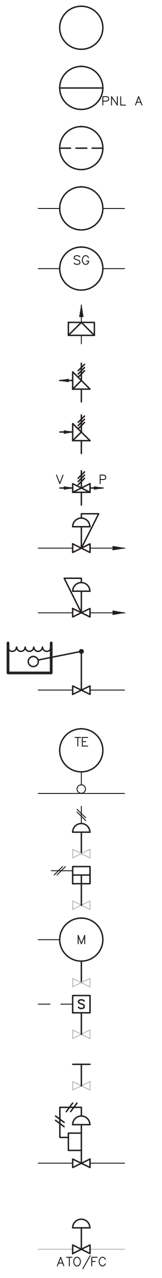


BALL VALVE
BUTTERFLY VALVE
DIAPHRAM VALVE
GATE VALVE
GLOBE VALVE
THREE WAY VALVE (FAIL OPEN TO PATH A–C)
FOUR WAY VALVE (FAIL OPEN TO PATH A–C AND B–D)
CHECK VALVE
REDUCER
FLEXIBLE PIPE
BLIND FLANGE
HOSE CONNECTION
SCREWED CAP, CLEANOUT
Y–LINE STRAINER
SPECIFICATION CHANGE
LEVEL DEVICE, FLOAT TYPE
BLOCK & BLEED VALVE SETUP
TIE POINT TO EXISTING SYSTEM
RESTRICTION ORIFICE
DRAIN
FLOW STRAIGHTENING VANE
SPECIALITY PART
STATIC MIXER
AIR VENT, AUTOMATIC
FILTER/REGULATOR/LUBRICATOR



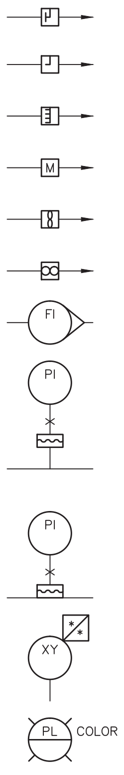
FILTER/REGULATOR
DAMPER OR LOUVER
EQUIPMENT INSULATED WITH X" OF INSULATION
PULSATION DAMPER

INSTRUMENT SYMBOLS



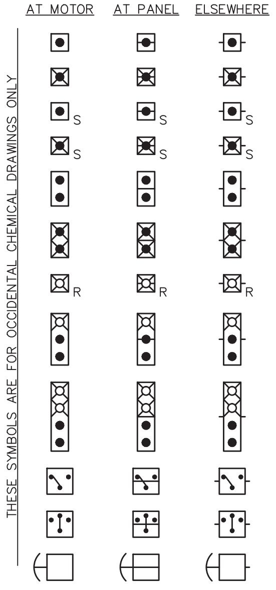
LOCALLY MOUNTED INSTRUMENTS
PANEL MOUNTED INSTRUMENTS
A = PANEL No. WHEN MORE THAN ONE PANEL IS PRESENT
BEHIND BOARD MOUNTED INSTRUMENTS
IN LINE INSTRUMENTS AS INDENTIFIED
SIGHT GLASS
RUPTURE DISC
PRESSURE RELIEF VALVE
VACUUM RELIEF VALVE
CONSERVATION VENT
PRESSURE REDUCING REGULATOR (SELF CONTAINED)
BACKPRESSURE REGULATOR (SELF CONTAINED)
LEVEL REGULATOR WITH MECHANICAL LINKAGE
TEMPERATURE ELEMENT WITH THERMOWELL
DIAPHRAM ACTUATOR, SPRING–OPPOSED
CYLINDER ACTUATOR SPRING – OPPOSED
ROTARY MOTOR ACTUATOR
SOLENOID ACTUATOR
HAND ACTUATOR OR HANDWHEEL
AIR ACTUATED VALVE W/POSITIONER

VALVE FAIL SYMBOLS
ATO – AIR TO OPEN
ATC – AIR TO CLOSE
FO – FAIL OPEN
FC – FAIL CLOSED
FL – FAIL LOCKED (LAST POSITION)
FI – FAIL INDETERMINATE



TARGET TYPE FLOW SENSOR
SINGLE PORT PITOT TUBE
AVERAGING PITOT TUBE
MAGNETIC FLOWMETER
TURBINE OR PROPELLER FLOWMETER
POSITIVE–DISPLACEMENT FLOWMETER
VARIABLE AREA FLOWMETER
DIAPHRAM SEAL WITH PRESSURE LEAD LINE
DIAPHRAM SEAL (LINE–MOUNTED)
SIGNAL CONVERTER (INPUT/OUTPUT)
*E – VOLTAGE P – PNEUMATIC
I – CURRENT B – BINARY (MODBUS, R5232...)
PILOT LIGHT
A – AMBER
G – GREEN
R – RED

ELECTRICAL SYMBOLS



NOMENCLATURE
START – MOMENTARY CONTACT
START – GREEN ILLUMINATED BUTTON
STOP – MOMENTARY CONTACT
STOP – RED ILLUMINATED BUTTON
START/STOP
START/STOP – GREEN & RED ILLUMINATED BUTTONS
PILOT LIGHT LENS
START – STOP W/GREEN RUNNING PILOT LIGHT
START – STOP W/GREEN RUNNING PILOT LIGHT AND RED STOP PILOT LIGHT
SELECTOR SWITCH 2 POSITION
SELECTOR SWITCH 3 POSITION
PUSHBUTTON WITH MUSHROOM HEAD

SUBSCRIPTS

LIGHTS
A = AMBER
B = BLUE
C = CLEAR
G = GREEN
R = RED
W = WHITE
Y = YELLOW

PUSHBUTTONS
ES = EMERGENCY STOP
J = JOG
L = LOCAL PANEL
LO = LOCK OUT
SP = STOP
ST = START

TYPICAL ISA LETTER COMBINATIONS

First–Letters	Initiating or Measured Variable	Controllers				Readout Devices		Switches and Alarm Devices *			Transmitters			Solenoids, Relays, Computing Devices	Primary Element	Test Point	Well or Probe	Viewing Device, Glass	Safety Device	Final Element
		Recording	Indicating	Blind	Self–Actuated Control Valves	Recording	Indicating	High **	Low	Comb	Recording	Indicating	Blind							
A	Analysis	ARC	AIC	AC		AR	AI	ASH	ASL	ASHL	ART	AIT	AT	AY	AE	AP	AW			AV
B	Burner/Combustion	BRC	BIC	BC		BR	BI	BSH	BSL	BSHL	BRT	BIT	BT	BY	BE		BW	BG		BZ
C	User's Choice																			
D	User's Choice																			
E	Voltage	ERC	EIC	EC		ER	EI	ESH	ESL	ESHL	ERT	EIT	ET	EY	EE					EZ
F	Flow Rate	FRC	FIC	FC	FCV, FICV	FR	FI	FSH	FSL	FSHL	FRT	FIT	FT	FY	FE	FP		FG		FV
FQ	Flow Quantity	FQRC	FQIC			FQR	FQI	FQSH	FQSL			FQIT	FQT	FQY	FQE					FQV
FF	Flow Ratio	FFRC	FFIC	FFC		FFR	FFI	FFSH	FFSL						FE					FFV
G	User's Choice																			
H	Hand		HIC	HC						HS										HV
I	Current	IRC	IIC			IR	II	ISH	ISL	ISHL	IRT	IIT	IT	IY	IE					IZ
J	Power	JRC	JIC			JR	JI	JSH	JSL	JSHL	JRT	JIT	JT	JY	JE					JV
K	Time	KRC	KIC	KC	KCV	KR	KI	KSH	KSL	KSHL	KRT	KIT	KT	KY	KE					KV
L	Level	LRC	LIC	LC	LCV	LR	LI	LSH	LSL	LSHL	LRT	LIT	LT	LY	LE		LW	LG		LV
M	User's Choice																			
N	User's Choice																			
O	User's Choice																			
P	Pressure/Vacuum	PRC	PIC	PC	PCV	PR	PI	PSH	PSL	PSHL	PRT	PIT	PT	PY	PE	PP			PSV, PSE	PV
PD	Pressure, Differential	PDRC	PDIC	PDC	PDCV	PDR	PDI	PDSH	PDSL		PDRT	PDIT	PDT	PDY	PE	PP				PDV
Q	Quantity	QRC	QIC			QR	QI	QSH	QSL	QSHL	QRT	QIT	QT	QY	QE					QZ
R	Radiation	RRC	RIC	RC		RR	RI	RSH	RSL	RSHL	RRT	RIT	RT	RY	RE		RW			RZ
S	Speed/Frequency	SRC	SIC	SC	SCV	SR	SI	SSH	SSL	SSHL	SRT	SIT	ST	SY	SE					SV
T	Temperature	TRC	TIC	TC	TCV	TR	TI	TSH	TSL	TSHL	TRT	TIT	TT	TY	TE	TP	TW		TSE	TV
TD	Temperature, Differential	TDRC	TDIC	TDC	TDCV	TDR	TDI	TDSH	TDSL		TDRT	TDIT	TDT	TDY	TE	TP	TW			TDV
U	Multivariable					UR	UI							UY						UV
V	Vibration/Machinery Analysis					VR	VI	VSH	VSL	VSHL	VRT	VIT	VT	VY	VE					VZ
W	Weight/Force	WRC	WIC	WC	WCV	WR	WI	WSH	WSL	WSHL	WRT	WIT	WT	WY	WE					WZ
WD	Weight/Force, Differential	WDRC	WDIC	WDC	WDCV	WDR	WDI	WDSH	WDSL		WDRT	WDIT	WDT	WDY	WE					WDZ
X	Unclassified																			
Y	Event/State/Presence		YIC	YC		YR	YI	YSH	YSL				YT	YY	YE					YZ
Z	Position/Dimension	ZRC	ZIC	ZC	ZCV	ZR	ZI	ZSH	ZSL	ZSHL	ZRT	ZIT	ZT	ZY	ZE					ZV
ZD	Gauging/Deviation	ZDRC	ZDIC	ZDC	ZDCV	ZDR	ZDI	ZDSH	ZDSL		ZDRT	ZDIT	ZDT	ZDY	ZDE					ZDV

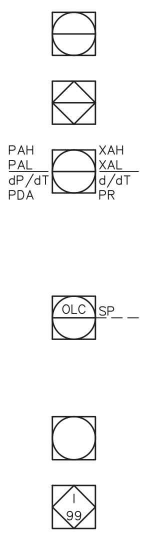
Note: This table is not all–inclusive.
* A, alarm, the annunciating device, may be used in the same fashion as S, switch, the actuating device.

** The letters H and L may be omitted in the undefined case.

Other Possible Combinations:

FO	(Restriction Orifice)	TJR	(Scanning Recorder)	PFR	(Ratio)	WKIC	(Rate–of–Weight–Loss Controller)
FRK, HIK	(Control Stations)	LLH	(Pilot Light)	KQI	(Running Time Indicator)	HMS	(Hand Momentary Switch)
FX	(Accessories)	LCH	(Level Control High)	QQI	(Indicating Counter)	LCL	(Level Control Low)

DISTRIBUTED CONTROL / SHARED DISPLAY INSTRUMENTS



INDICATOR/CONTROLLER/RECORDER OR ALARM POINTS – USUALLY USED TO INDICATE VIDEO DISPLAY
* NORMALLY ACCESSIBLE TO OPERATOR

DISTRIBUTED CONTROL INTERCONNECTING LOGIC CONTROLLER OR PC WITH BINARY OR SEQUENTIAL LOGIC FUNCTIONS
* NORMALLY ACCESSIBLE TO OPERATOR

INPUT ALARMS	OUTPUT ALARMS
PAH – HIGH	XAH – HIGH
PAL – LOW	XAL – LOW
dP/dT – RATE CHANGE	d/dT – RATE CHANGE
PDA – DEVIATION	BQ – BAD QUALITY

MISCELLANEOUS
PR – TREND
* NORMALLY ACCESSIBLE TO OPERATOR

OLC – OPERATIONAL LIGHTED CONTROL
OA – OPERATIONAL ALARM (STATUS)
SP – STOP/INHIBIT FUNCTION FROM CRT
ST – START/ENABLE FUNCTION FROM CRT
A – AUTO ON/OFF FUNCTION FROM CRT
O – OFF FUNCTION FROM CRT
H – HAND/MANUAL FUNCTION FROM CRT

NORMALLY BLIND OPERATION
* NOT NORMALLY ACCESSIBLE TO OPERATOR

DISTRIBUTED CONTROL INTERCONNECTING LOGIC CONTROLLER OR PC WITH BINARY OR SEQUENTIAL LOGIC FUNCTIONS NUMBER IN DIAMOND REFERS TO SEQUENCE NUMBER

INSTRUMENT / PROCESS LINES DESIGNATIONS

XXX	UNDERGROUND INSTRUMENTS
XXX	PROCESS INSTRUMENTS
XXX	VENDOR SUPPLIED INSTRUMENTS
XXX	UTILITY INSTRUMENTS
0000	UNDERGROUND LINES
1000	PROCESS LINES
2000	VENDOR SUPPLIED LINES
3000	UTILITY LINES
CS	CARBON STEEL PIPE
CSVD	CARBON STEEL VENT DUCT (12 GAUGE)
DVW	DRAIN VENT WASTE PIPE
HDPE	HIGH DENSITY POLYETHYLENE PIPE
KYA	KYNAR
PDE	CPVC, SOLID
PVC	POLYVINYL CHLORIDE PIPE SCHEDULE 40
PVE	POLYVINYL CHLORIDE PIPE SCHEDULE 80
PPL	POLYPROPYLENE LINED/LINED DUCTILE PIPE
SS	STAINLESS STEEL
TFD	TEFLON
B	BARE
I	INSULATED
J	JACKETED AND INSULATED
TE	ELECTRICALLY TRACED AND INSULATED

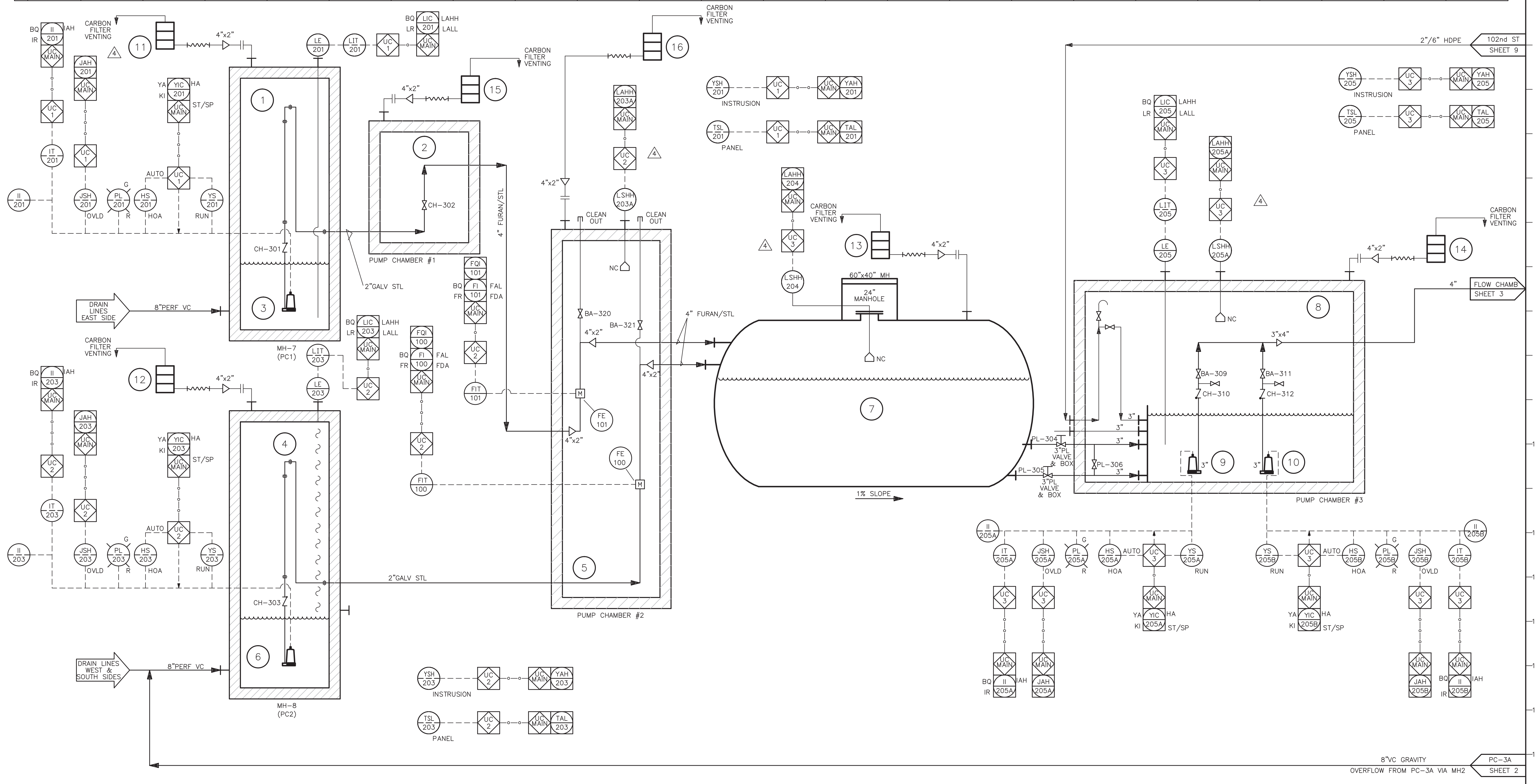
CONESTOGA-ROVERS & ASSOCIATES

REV. NO.	REV. DATE	CHK'D BY	DESCRIPTION
5	10/13	JJE	AS BUILTS
4	01/14/13	JJE	CONTROL UPGRADE DESIGN
3	3/13/09	LVN	UPDATED INSTR/EQUIP/VALVE NUMBERS & EQUIP DESC
2	02/01/01	JW	UPDATED INSTR./EQUIP./VALVE NUMBERS & EQUIP. DESC.
1	11/30/00	JGRW	AS BUILT

GLENN SPRINGS HOLDINGS INC.
LOVE CANAL TREATMENT FACILITY
PIPING AND INSTRUMENTATION DIAGRAM
LEGEND

DRAWN BAB	SCALE NONE	APPROVED	DRAWING NUMBER 9954–EF–00	REV 5
DATE 2–23–96	CHK'D –	PROJ. NO. 9954		

PLANT ID.		PC1 ①	– ②	P–201 ③	PC2 ④	– ⑤	P–203 ⑥	LC–201 ⑦	– ⑧	P–205A ⑨	P–205B ⑩	– ⑪	– ⑫	– ⑬	– ⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑	㉒	㉓
NAME		MANHOLE No. 7 WET WELL	PUMP CHAMBER No. 1, DRY WELL EAST SIDE	MANHOLE No. 7 PUMP	MANHOLE No. 8 WET WELL	PUMP CHAMBER No. 2, DRY WELL WEST SIDE	MANHOLE No. 8 PUMP	SOUTH SECTOR COLLECTION SYSTEM STORAGE TANK	PUMP CHAMBER No. 3 WEST SIDE	PUMP CHAMBER No. 3 PUMP–A	PUMP CHAMBER No. 3 PUMP–B	CARBON VENT SCRUBBER	CARBON VENT SCRUBBER	CARBON VENT SCRUBBER	CARBON VENT SCRUBBER	CARBON VENT SCRUBBER	CARBON VENT SCRUBBER							
DESCRIPTION	MATERIAL	CONCRETE	CONCRETE	316 SS	CONCRETE	CONCRETE	316 SS	STEEL (FURAN COAT.)	CONCRETE	316 SS	316 SS	POLYETHYLENE	POLYETHYLENE	POLYETHYLENE	POLYETHYLENE	POLYETHYLENE	POLYETHYLENE							
	SIZE	–	–	2"	–	–	2"	132" x 406"	–	2"	2"	55 GALLON	55 GALLON	55 GALLON	55 GALLON	55 GALLON	55 GALLON							
	CAPACITY	1500 GALLONS	–	–	1500 GALLONS	–	–	25380 GALLONS	–	–	–	–	–	–	–	–	–							
	TEMP/PRESS	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–							
	HP/V/RPM	–	–	2HP/230V/3450	–	–	2HP/230V/3450	–	–	2HP/230V/3450	2HP/230V/3450	–	–	–	–	–	–							
	WEIGHT	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–							
	MANUFACTURE	–	–	GORMAN–RUPP	–	–	GORMAN–RUPP	–	–	GORMAN–RUPP	GORMAN–RUPP	SIEMENS	SIEMENS	SIEMENS	SIEMENS	SIEMENS	SIEMENS							
	MODEL	–	–	S2B65–E2	–	–	S2B65–E2	–	–	S2B65–E2	S2B65–E2	200SCAP	200SCAP	200SCAP	200SCAP	200SCAP	200SCAP							
	VENDOR	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–							



NOTE ⚠4
FOR INTERLOCK DESCRIPTIONS REFERENCE:
- LOVE CANAL FUNCTIONAL PROCESS DESCRIPTION
- LOVE CANAL OPERATIONS AND MAINTANANCE MANUAL

CONESTOGA-ROVERS & ASSOCIATES

REV. NO.	REV. DATE	CHK'D BY	DESCRIPTION
5	10/13	JJE	AS BUILTS
4	01/14/13	JJE	CONTROL UPGRADE DESIGN
3	3/13/09	LVN	UPDATED INSTR/EQUIP/VALVE NUMBERS & EQUIP DESC
2	02/01/01	JW	UPDATED INSTR/EQUIP/VALVE NUMBERS & EQUIP DESC
1	11/30/00	JGRW	AS BUILT

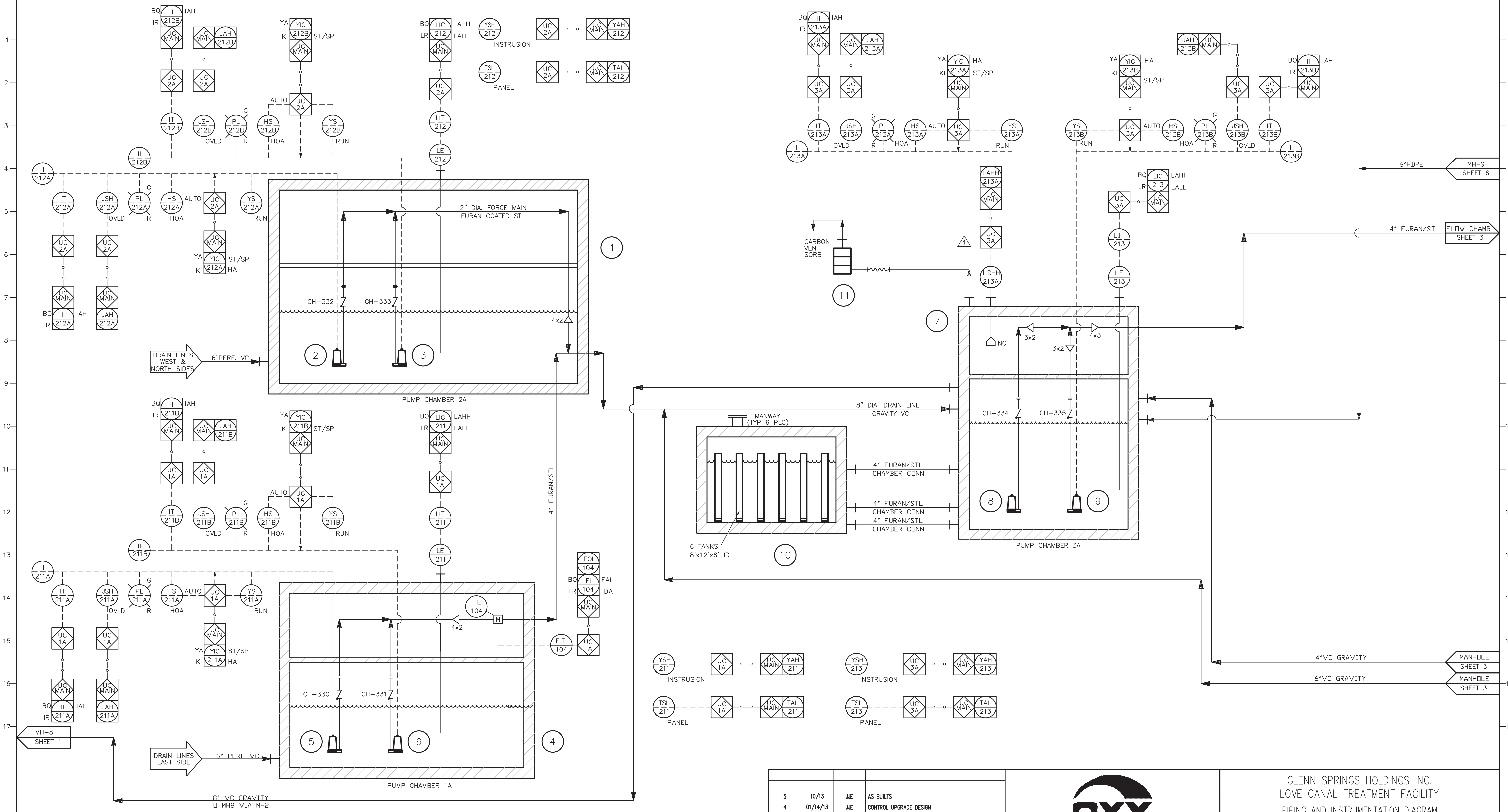
OXY

GLENN SPRING HOLDINGS INC.
LOVE CANAL TREATMENT FACILITY
PIPING AND INSTRUMENTATION DIAGRAM
SOUTHERN SECTION

DRAWN JF	SCALE NONE	APPROVED	DRAWING NUMBER 9954–EF–01	REV 5
DATE 8–16–00	CHK'D –	PROJ. NO. 9954		

09954–00(027)EF–BU001 NOV 25/2013

PLANT ID.		– ①	P–212A ②	P–212B ③	– ④	P–211A ⑤	P–211B ⑥	– ⑦	P–213A ⑧	P–213B ⑨	LC–211 ⑩	– ⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑	㉒	㉓
NAME		PUMP CHAMBER No. 2A WEST WET WELL	PUMP CHAMBER No. 2A PUMP A	PUMP CHAMBER No. 2A PUMP B	PUMP CHAMBER No. 1A EAST WET WELL	PUMP CHAMBER No. 1A PUMP A	PUMP CHAMBER No. 1A PUMP B	PUMP CHAMBER No. 3A WEST WET WELL	PUMP CHAMBER No. 3A PUMP A	PUMP CHAMBER No. 3A PUMP B	STORAGE TANK (NORTH)	CARBON VENT SCRUBBER												
DESCRIPTION	MATERIAL	CONCRETE	316 SS	316 SS	CONCRETE	316 SS	316 SS	CONCRETE	316 SS	316 SS	CONCRETE	POLYETHYLENE												
	SIZE	72" DIA.	2"	2"	–	2"	2"	60" DIA.	2"	2"	–	55 GALLON												
	CAPACITY	1100 GALLONS	–	–	1100 GALLONS	–	–	1100 GALLONS	–	–	25,850 GALLONS	–												
	TEMP/PRESS	–	–	–	–	–	–	–	–	–	–	–												
	HP/V/RPM	–	2HP/230V/3450	2HP/230V/3450	–	2HP/230V/3450	2HP/230V/3450	–	2HP/230V/3450	2HP/230V/3450	–	–												
	WEIGHT	–	–	–	–	–	–	–	–	–	–	–												
	MANUFACTURE	–	GORMAN–RUPP	GORMAN–RUPP	–	GORMAN–RUPP	GORMAN–RUPP	–	GORMAN–RUPP	GORMAN–RUPP	–	SEIMENS												
	MODEL	–	S2B65–E2	S2B65–E2	–	S2B65–E2	S2B65–E2	–	S2B65–E2	S2B65–E2	–	200 SCAP												
	VENDOR	–	–	–	–	–	–	–	–	–	–	–												



NOTE ⚠4
FOR INTERLOCK DESCRIPTIONS REFERENCE:
- LOVE CANAL FUNCTIONAL PROCESS DESCRIPTION
- LOVE CANAL OPERATIONS AND MAINTANANCE MANUAL

CONESTOGA–ROVERS & ASSOCIATES

5	10/13	JJE	AS BUILTS
4	01/14/13	JJE	CONTROL UPGRADE DESIGN
3	3/13/09	LVN	UPDATED INSTR/EQUIP/VALVE NUMBERS & EQUIP DESC
2	02/01/01	JW	UPDATED INSTR./EQUIP./VALVE NUMBERS & EQUIP. DESC.
1	11/30/00	JGRW	AS BUILT
REV. NO.	REV. DATE	CHK'D BY	DESCRIPTION

GLENN SPRINGS HOLDINGS INC.
LOVE CANAL TREATMENT FACILITY

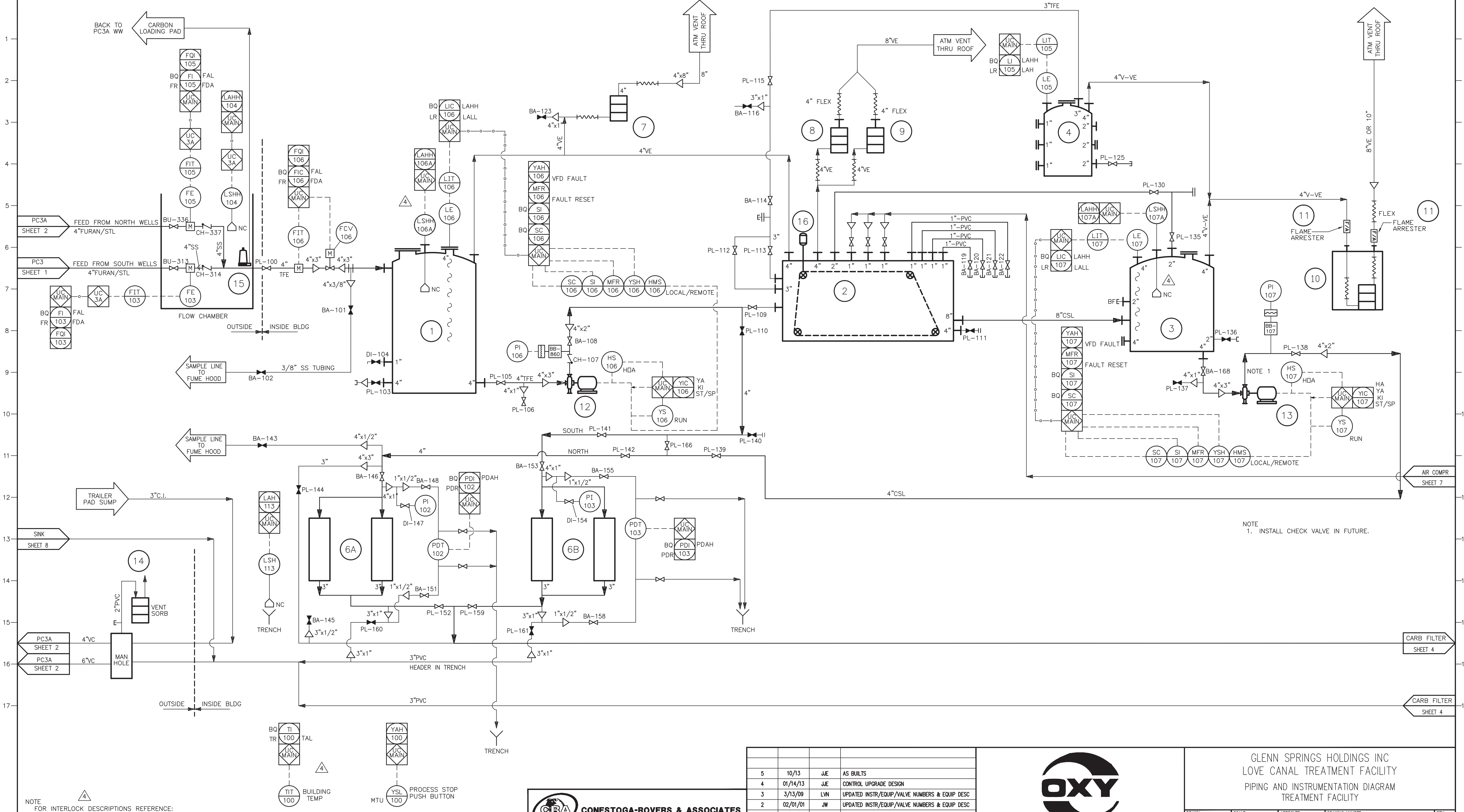
PIPING AND INSTRUMENTATION DIAGRAM
NORTHERN SECTION

DRAWN JF	SCALE NONE	APPROVED	DRAWING NUMBER 9954–EF–02	REV 5
DATE 8–16–00	CHK'D –	PROJ. NO. 9954		

09954–00(027)EF–BU002 NOV 25/2013

PLANT ID.		LC-106 ①	LC-101 ②	LC-107 ③	LC-105 ④	⑤	LC-102A,B (6A)	LC-103A,B (6B)	- ⑦	- ⑧	- ⑨
NAME		RAW WATER TANK	CLARIFIER (CLOW MECHANICAL CLARIFIER)	FILTER FEED TANK	SLUDGE TANK		BAG FILTERS No. 1 (NORTH)	BAG FILTERS No. 2 (SOUTH)	CARBON VENT SCRUBBER	CARBON VENT SCRUBBER	CARBON VENT SCRUBBER
DESCRIPTION	MATERIAL	FIBERGLASS	EPOXY COATED STEEL	FIBERGLASS	FIBERGLASS		316 SS	316 SS	POLYETHYLENE	POLYETHYLENE	POLYETHYLENE
	SIZE	-	11' x 11' x 20'	-	-		-	-	55 GALLON	55 GALLON	55 GALLON
	CAPACITY	6000 GALLONS	15633 GALLONS	3000 GALLONS	1600 GALLONS		-	-	-	-	-
	TEMP/PRESS	-	-	-	-		150 PSI	150 PSI	-	-	-
	HP/V/RPM	-	-	-	-		-	-	-	-	-
	WEIGHT	-	-	745 POUNDS	580 POUNDS		-	-	-	-	-
	MANUFACTURE	OWENS CORNING	PURE STREAM INC.	OWENS CORNING	OWENS CORNING		GAFLO	GAFLO	SEIMENS	SEIMENS	SEIMENS
	MODEL	106 MACW	-	83MAC	61.5MAC		RB2A	RB2A	200SCAP	200SCAP	200SCAP
	VENDOR	-	-	-	-		CUTLER METAL PROD.	CUTLER METAL PROD.	-	-	-

PLANT ID.		- ⑩	- ⑪	P-106 ⑫	P-107 ⑬	- ⑭	- ⑮	- ⑯	⑰	⑱	⑲	⑳	(21)	(22)
NAME		ACCUMULATOR CABINET	FLAME ARRESTOR	RAW WATER TANK DISCHARGE PUMP	FILTER FEED TANK DISCHARGE PUMP	CARBON VENT SCRUBBER	FLOW CHAMBER PUMP	CLARIFIER SLUDGE COLLECTOR DRIVE						
DESCRIPTION	MATERIAL	-	-	316SS/316SS	316SS/316SS	POLYETHYLENE	-	-						
	SIZE	-	4"	2 x 3-6 STX	2 x 3-6 STX	55 GALLON	-	-						
	CAPACITY	-	-	150 GPM @ 115'	150 GPM @ 115'	-	-	-						
	TEMP/PRESS	-	-	-	-	-	-	-						
	HP/V/RPM	-	-	10/460/3600	10/460/3600	-	120V	.25/480/3 PH						
	WEIGHT	-	-	-	-	-	CORD & PLUG	-						
	MANUFACTURE	TIGG CORP.	SHAND & JURS	GOULDS	GOULDS	SEIMENS	CONNECTOR	-						
	MODEL	-	94306	3196	3196	200SCAP	-	-						
	VENDOR	-	-	ESTABROOK	ESTABROOK	-	-	-						



NOTE
1. INSTALL CHECK VALVE IN FUTURE.

NOTE ④
FOR INTERLOCK DESCRIPTIONS REFERENCE:
- LOVE CANAL FUNCTIONAL PROCESS DESCRIPTION
- LOVE CANAL OPERATIONS AND MAINTANANCE MANUAL

CONESTOGA-ROVERS & ASSOCIATES

REV. NO.	REV. DATE	CHK'D BY	DESCRIPTION
5	10/13	JJE	AS BUILTS
4	01/14/13	JJE	CONTROL UPGRADE DESIGN
3	3/13/09	LVN	UPDATED INSTR/EQUIP/VALVE NUMBERS & EQUIP DESC
2	02/01/01	JW	UPDATED INSTR/EQUIP/VALVE NUMBERS & EQUIP DESC
1	11/30/00	JGRW	AS BUILT

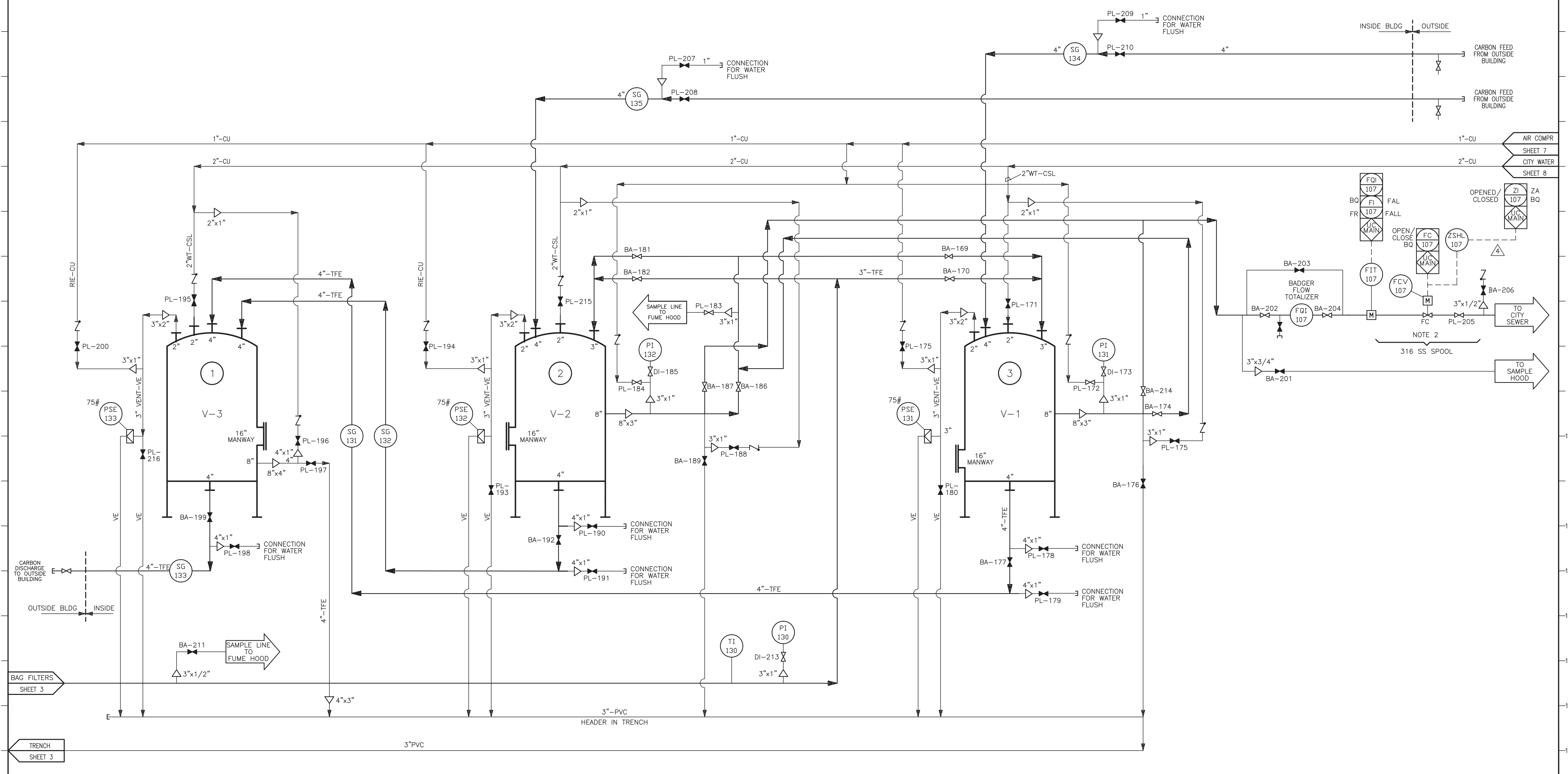
OXY

GLENN SPRINGS HOLDINGS INC
LOVE CANAL TREATMENT FACILITY
PIPING AND INSTRUMENTATION DIAGRAM
TREATMENT FACILITY

DRAWN JF
DATE 8-16-00
SCALE NONE
CHK'D -
APPROVED
PROJ. NO. 9954
DRAWING NUMBER 9954-EF-03
REV 5

09954-00(027)EF-BU003 NOV 25/2013

PLANT ID.		LC–133 ①	LC–132 ②	LC–131 ③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑	㉒	㉓
NAME		TRANSFER TANK V–3	TRANSFER TANK V–2	TRANSFER TANK V–1																				
DESCRIPTION	MATERIAL	LINED CARBON STEEL	LINED CARBON STEEL	LINED CARBON STEEL																				
	SIZE	–	–	–																				
	CAPACITY	7600 GALLONS	7600 GALLONS	7600 GALLONS																				
	TEMP/PRESS	75 PSIG @ 75°F	75 PSIG @ 75°F	75 PSIG @ 75°F																				
	HP/V/RPM	–	–	–																				
	WEIGHT	–	–	–																				
	MANUFACTURE	CALGON CORP.	CALGON CORP.	CALGON CORP.																				
	MODEL	–	–	–																				
	VENDOR	–	–	–																				



NOTE ⚠4
FOR INTERLOCK DESCRIPTIONS REFERENCE:
- LOVE CANAL FUNCTIONAL PROCESS DESCRIPTION
- LOVE CANAL OPERATIONS AND MAINTANANCE MANUAL

CONESTOGA–ROVERS & ASSOCIATES

REV. NO.	REV. DATE	CHK'D BY	DESCRIPTION
5	10/13	JJE	AS BUILTS
4	01/14/13	JJE	CONTROL UPGRADE DESIGN
3	3/13/09	LVN	UPDATED INSTR/EQUIP/VALVE NUMBERS & EQUIP DESC
2	02/01/01	JW	UPDATED INSTR/EQUIP/VALVE NUMBERS & EQUIP DESC
1	11/30/00	JGRW	AS BUILT

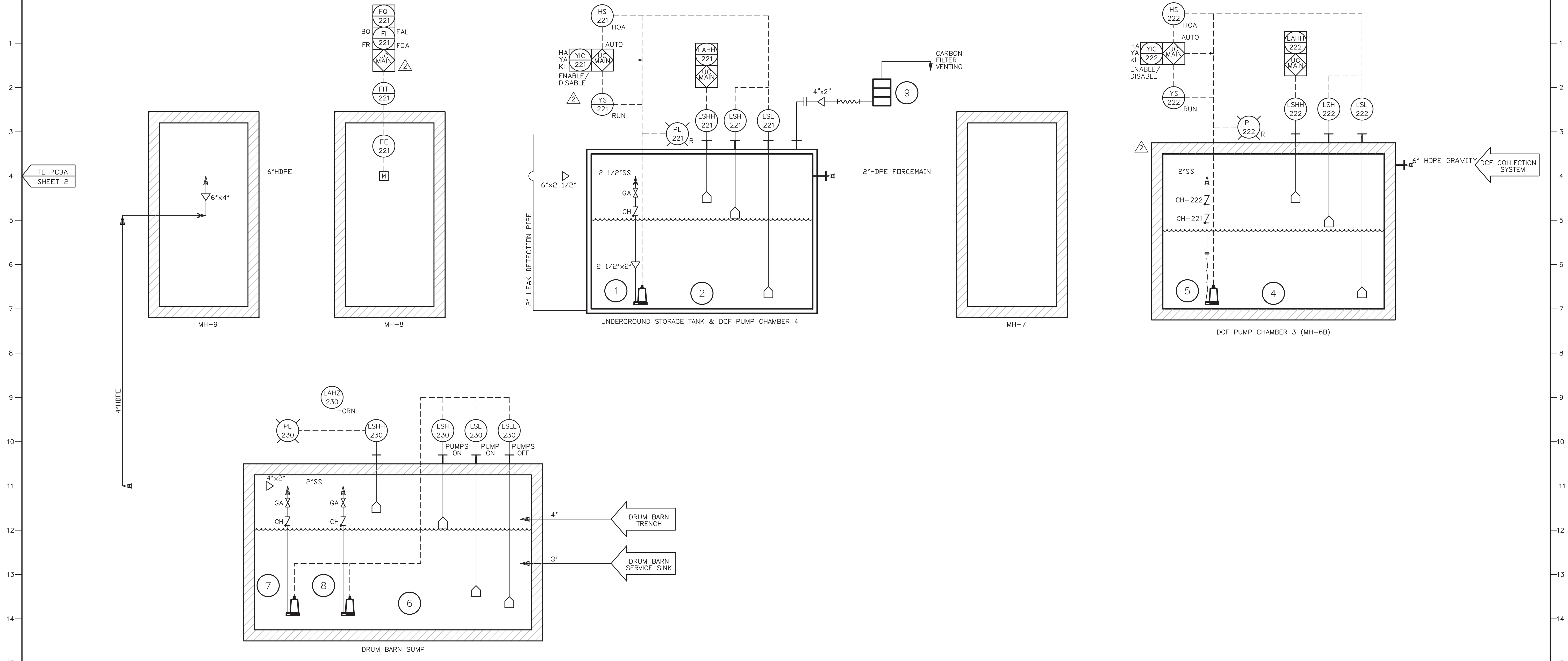
GLENN SPRINGS HOLDINGS INC
LOVE CANAL TREATMENT FACILITY

PIPING AND INSTRUMENTATION DIAGRAM
TREATMENT FACILITY

DRAWN	JF	SCALE	NONE	APPROVED		DRAWING NUMBER	REV
DATE	8–16–00	CHK'D	–	PROJ. NO.	9954	9954–EF–04	5

09954–00(027)EF–BU004 NOV 25/2013

PLANT ID.		P-221 ①	LC-220 ②	- ③	- ④	P-222 ⑤	- ⑥	P-230A ⑦	P-230B ⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑	㉒	㉓
NAME		DCF PUMP CHAMBER No. 4 PUMP	UST AND DCF PUMP CHAMBER No.4		DCF PUMP CHAMBER No. 3 (MANHOLE No. 6B)	DCF PUMP CHAMBER No. 3 PUMP	DRUM BARN SUMP	DRUM BARN SUMP PUMP-A	DRUM BARN SUMP PUMP-B	CARBON VENT SCRUBBER														
DESCRIPTION	MATERIAL	316 SS	DOUBLE WALL STL		CONCRETE	CAST IRON	CONCRETE	316 SS	316 SS	POLYETHYLENE														
	SIZE	2"	–		–	3"	–	2"	2"	55 GALLON														
	CAPACITY	–	10000 GALLONS		–	–	–	–	–	–														
	TEMP/PRESS	–	–		–	–	–	–	–	–														
	HP/V/RPM	2HP/460V/3450	–		–	2.2HP/460V/1750	–	2HP/460V/3450	2HP/460V/3450	–														
	WEIGHT	–	–		–	–	–	–	–	–														
	MANUFACTURE	GORMAN-RUPP	–		–	FLYGT	–	GORMAN-RUPP	GORMAN-RUPP	SIEMENS														
	MODEL	S2B65-E2	–		–	3085.092	–	S2B65-E2	S2B65-E2	200SCAP														
	VENDOR	–	–		–	–	–	–	–	–														



NOTE 2
FOR INTERLOCK DESCRIPTIONS REFERENCE:
- LOVE CANAL FUNCTIONAL PROCESS DESCRIPTION
- LOVE CANAL OPERATIONS AND MAINTANANCE MANUAL

CONESTOGA-ROVERS & ASSOCIATES

REV. NO.	REV. DATE	CHK'D BY	DESCRIPTION
3	10/13	JJE	AS BUILTS
2	01/14/13	JJE	CONTROL UPGRADE DESIGN
1	3/13/09	LVN	UPDATED INSTR/EQUIP/VALVE NUMBERS & EQUIP DESC

OXY

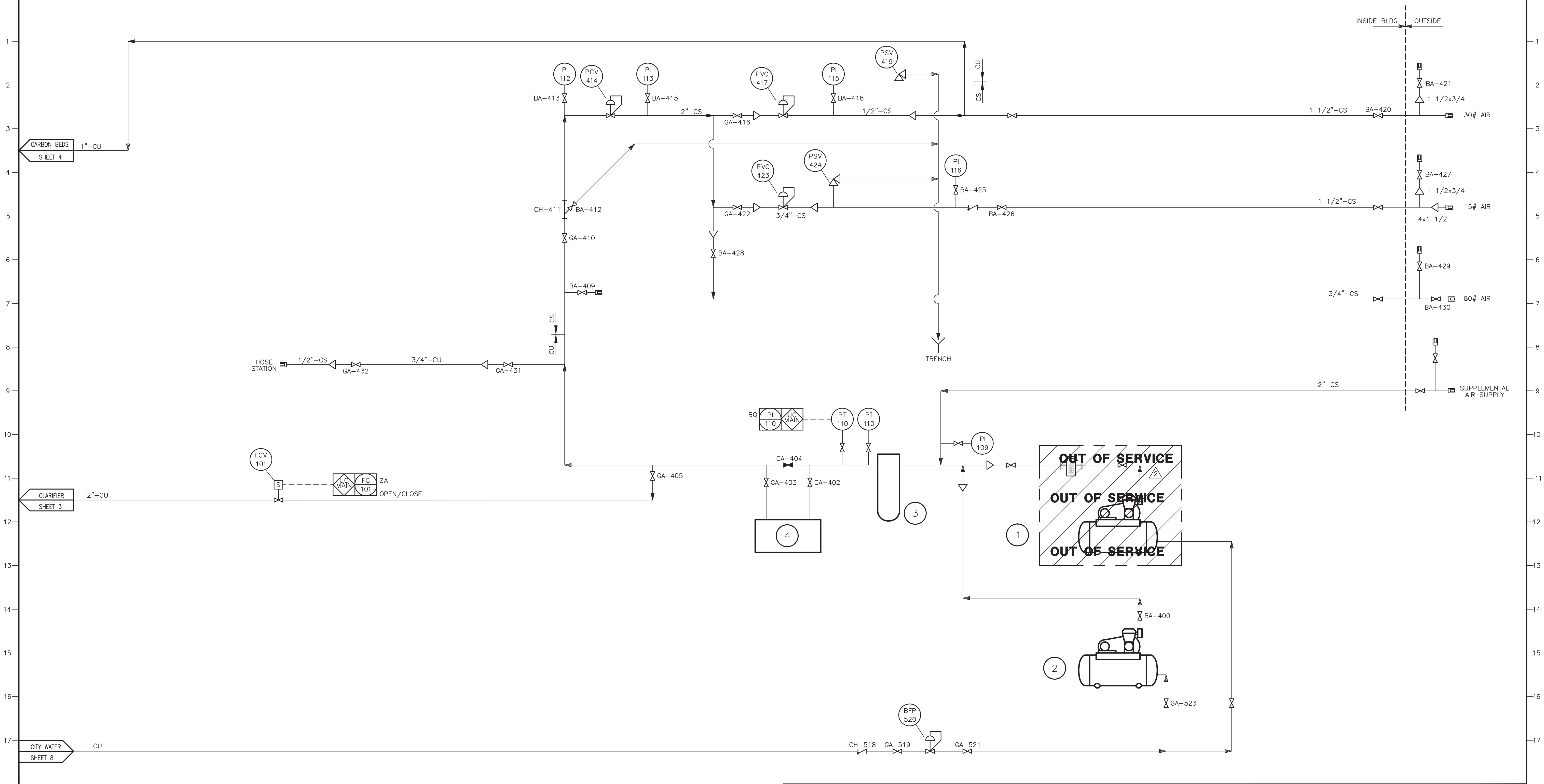
GLENN SPRINGS HOLDINGS INC
LOVE CANAL TREATMENT FACILITY

PIPING AND INSTRUMENTATION DIAGRAM
DCF / DRUM BARN

DRAWN JF	SCALE NONE	APPROVED	DRAWING NUMBER	REV
DATE 8-06-00	CHK'D –	PROJ. NO. 9954	9954-EF-06	3

09954-00(027)EF-BU006 NOV 25/2013

	PLANT ID.	– ①	M–111 ②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑	㉒	㉓
	NAME		COMPRESSOR –	FILTER	DRYER																			
DESCRIPTION	MATERIAL		–																					
	SIZE		–																					
	CAPACITY		–																					
	TEMP/PRESS		–																					
	HP/V/RPM		–																					
	WEIGHT		–																					
	MANUFACTURE	WORTHINGTON	WORTHINGTON																					
	MODEL	25RS11012	ROLLAIR 40–100																					
	VENDOR		–																					



NOTE ②
FOR INTERLOCK DESCRIPTIONS REFERENCE:
- LOVE CANAL FUNCTIONAL PROCESS DESCRIPTION
- LOVE CANAL OPERATIONS AND MAINTANANCE MANUAL

CONESTOGA-ROVERS & ASSOCIATES

REV. NO.	REV. DATE	CHK'D BY	DESCRIPTION
3	10/13	JJE	AS BUILTS
2	01/14/13	JJE	CONTROL UPGRADE DESIGN
1	3/13/09	LVN	UPDATED INSTR/EQUIP/VALVE NUMBERS & EQUIP DESC

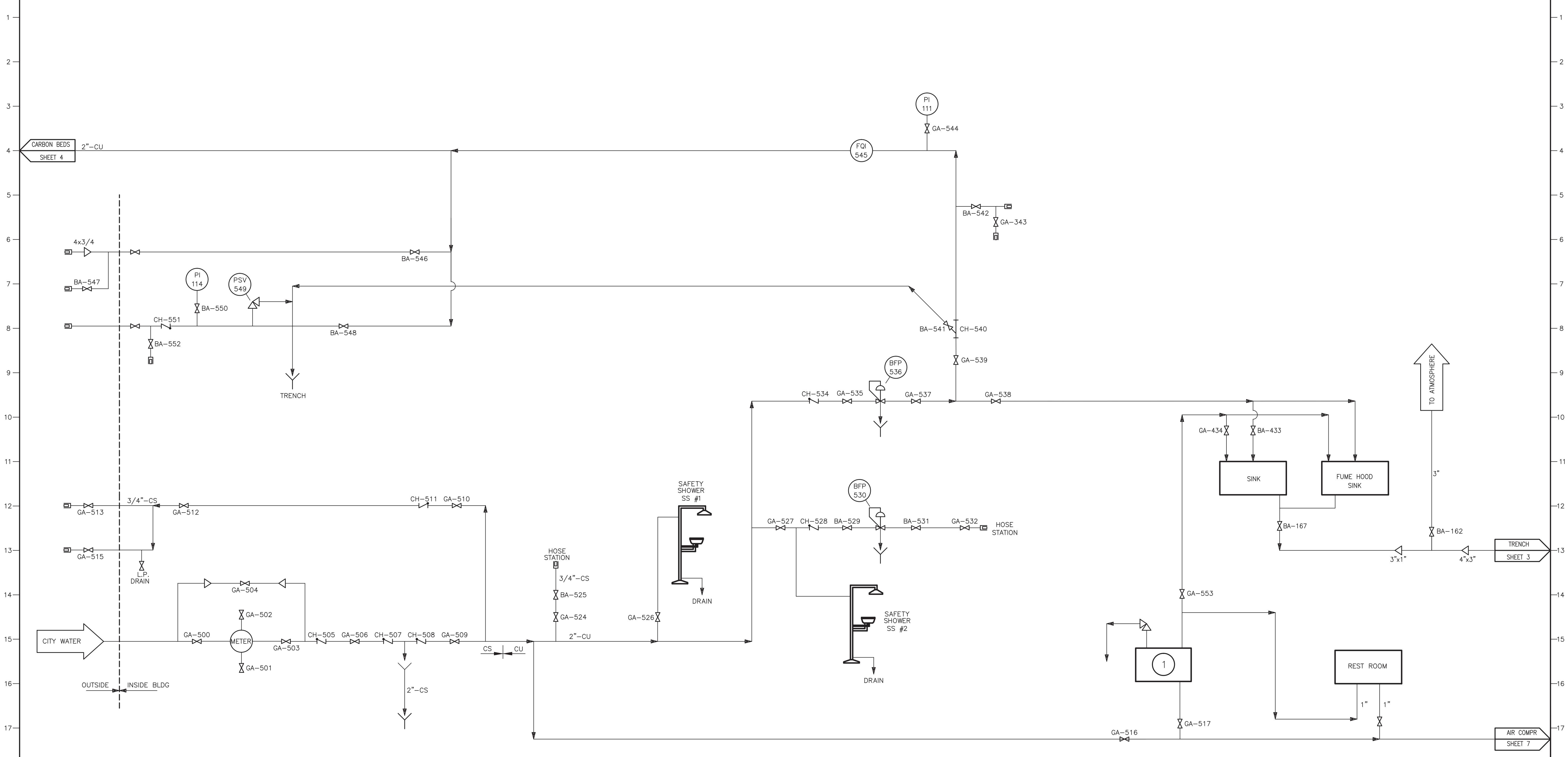
GLENN SPRINGS HOLDINGS INC
LOVE CANAL TREATMENT FACILITY

PIPING AND INSTRUMENTATION DIAGRAM
TREATMENT FACILITY

DRAWN ZM	SCALE NONE	APPROVED	DRAWING NUMBER 9954–EF–07	REV 3
DATE 7–12–01	CHK'D –	PROJ. NO. 9954		

09954–00(027)EF–BU007 NOV 25/2013

PLANT ID.		①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑	㉒	㉓
NAME		HOT WATER TANK																						
DESCRIPTION	MATERIAL																							
	SIZE																							
	CAPACITY																							
	TEMP/PRESS																							
	HP/V/RPM																							
	WEIGHT																							
	MANUFACTURE																							
	MODEL																							
	VENDOR																							



NOTE △2
FOR INTERLOCK DESCRIPTIONS REFERENCE:
- LOVE CANAL FUNCTIONAL PROCESS DESCRIPTION
- LOVE CANAL OPERATIONS AND MAINTANANCE MANUAL

CONESTOGA-ROVERS & ASSOCIATES

REV. NO.	REV. DATE	CHK'D BY	DESCRIPTION
3	10/13	JJE	AS BUILTS
2	01/14/13	JJE	CONTROL UPGRADE DESIGN
1	3/13/09	LVN	UPDATED INSTR/EQUIP/VALVE NUMBERS & EQUIP DESC

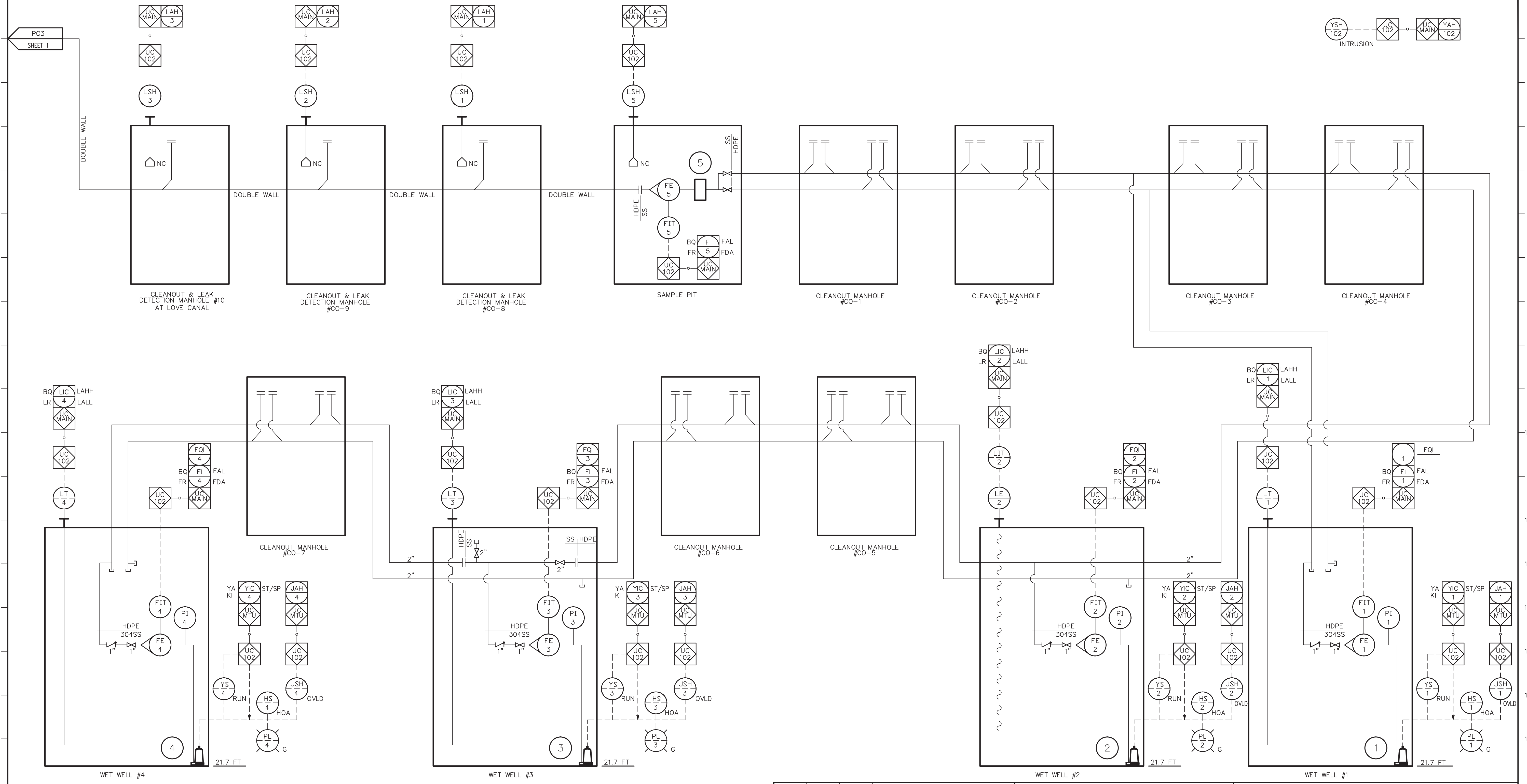
GLENN SPRINGS HOLDINGS INC
LOVE CANAL TREATMENT FACILITY

PIPING AND INSTRUMENTATION DIAGRAM
TREATMENT FACILITY

DRAWN	LVN	SCALE	NONE	APPROVED		DRAWING NUMBER	9954–EF–08	REV	3
DATE	7–12–01	CHK'D	–	PROJ. NO.	9954				

09954–00(027)EF–BU008 NOV 25/2013

PLANT ID.		P-201 ①	P-202 ②	P-203 ③	P-204 ④	– ⑤	(6A)	(6B)	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰	⑱	⑲	⑳	㉑	㉒
NAME		WET WELL #1 PUMP	WET WELL #2 PUMP	WET WELL #3 PUMP	WET WELL #4 PUMP	COMPOSITE SAMPLER																		
DESCRIPTION	MATERIAL	–	–	–	–	–																		
	SIZE	–	–	–	–	–																		
	CAPACITY	10 GPM @ 100'	10 GPM @ 100'	10 GPM @ 100'	10 GPM @ 100'	–																		
	TEMP/PRESS	–	–	–	–	–																		
	HP/V/RPM	.5HP/460V/	.5HP/460V/	.5HP/460V/	.5HP/460V/	–																		
	WEIGHT	–	–	–	–	–																		
	MANUFACTURE	–	–	–	–	–																		
	MODEL	–	–	–	–	XN-5																		
	VENDOR	–	–	–	–	–																		



NOTE ⚠1
FOR INTERLOCK DESCRIPTIONS REFERENCE:
- LOVE CANAL FUNCTIONAL PROCESS DESCRIPTION
- LOVE CANAL OPERATIONS AND MAINTANANCE MANUAL

CONESTOGA-ROVERS & ASSOCIATES

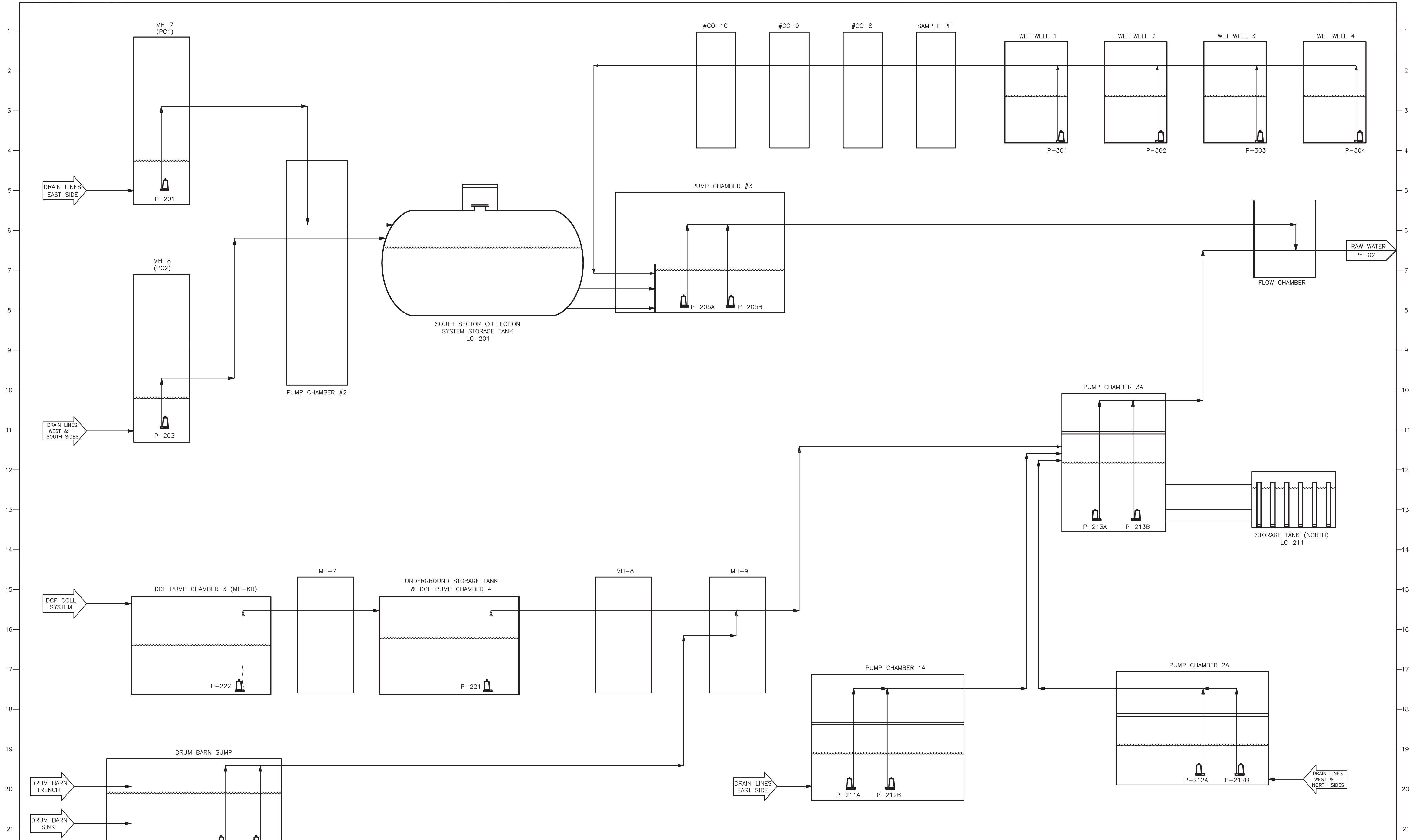
2	10/13	JJE	AS BUILTS
1	01/14/13	JJE	CONTROL UPDRADE DESIGN
REV. NO.	REV. DATE	CHK'D BY	DESCRIPTION

GLENN SPRINGS HOLDINGS INC
LOVE CANAL TREATMENT FACILITY

PIPING AND INSTRUMENTATION DIAGRAM
102ND STREET

DRAWN LVN	SCALE NONE	APPROVED	DRAWING NUMBER 9954-EF-09	REV 2
DATE 01-14-13	CHK'D –	PROJ. NO. 9954		

09954-00(027)EF-BU009 NOV 25/2013



CONESTOGA-ROVERS & ASSOCIATES

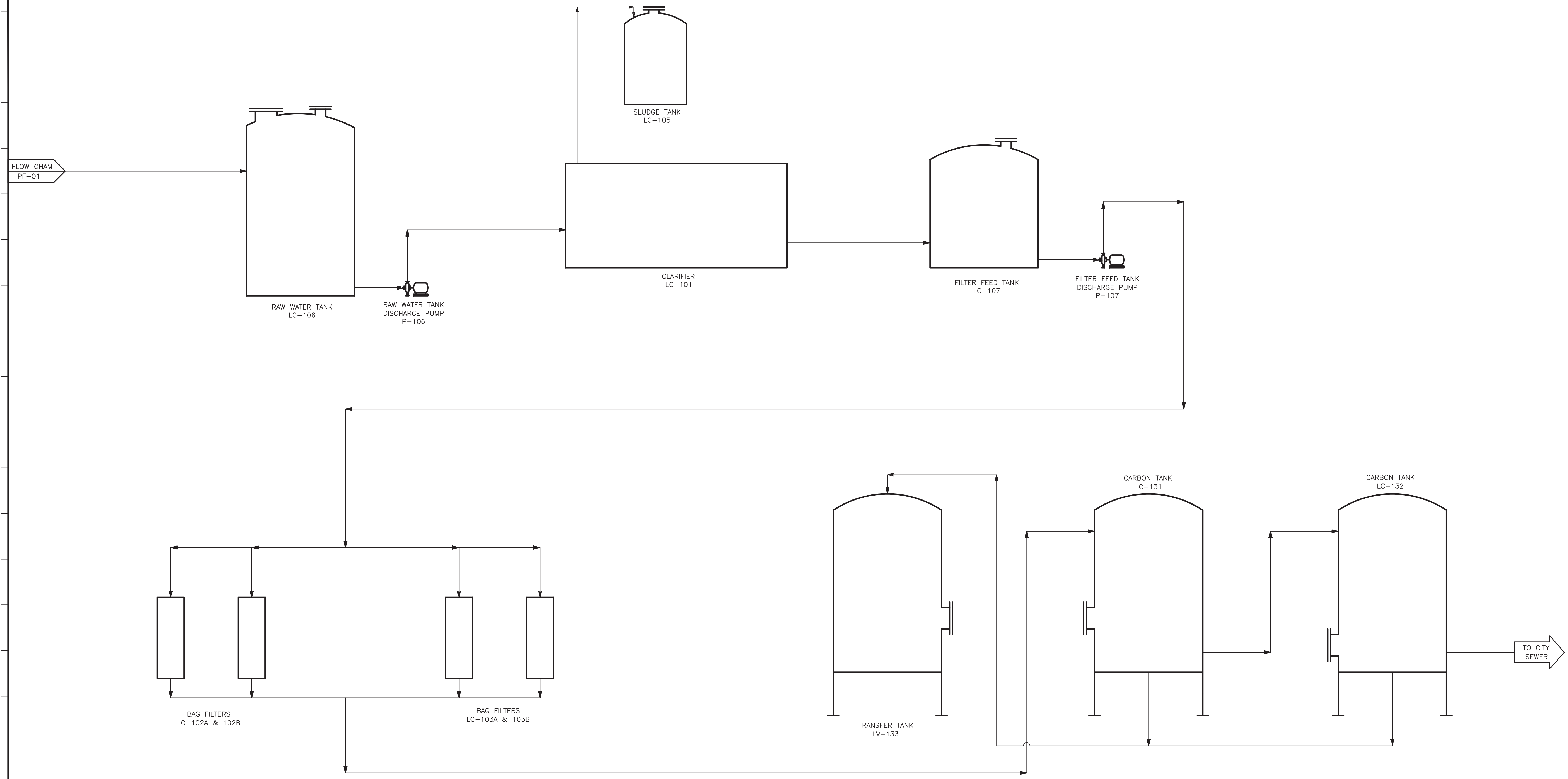
REV. NO.	REV. DATE	CHK'D BY	DESCRIPTION
1	10/13	JJE	AS BUILTS

GLENN SPRING HOLDINGS INC.
LOVE CANAL TREATMENT FACILITY

PROCESS FLOW DIAGRAM
COLLECTION SYSTEM

DRAWN	SCALE	APPROVED	DRAWING NUMBER	REV
LVN	NONE		9954-PF-01	1
DATE 10/13	CHK'D JE	PROJ. NO. 9954		

09954-00(027)PF-BU001 NOV 25/2013



CONESTOGA-ROVERS & ASSOCIATES

REV. NO.	REV. DATE	CHK'D BY	DESCRIPTION
1	10/13	JJE	AS BUILTS

GLENN SPRING HOLDINGS INC.
LOVE CANAL TREATMENT FACILITY

PROCESS FLOW DIAGRAM
TREATMENT FACILITY

DRAWN LVN	SCALE NONE	APPROVED	DRAWING NUMBER 9954–PF–02
DATE 10/13	CHK'D JE	PROJ. NO. 9954	REV 1

09954–00(027)PF–BU001 NOV 25/2013

Appendix B
Operation Setpoints

Appendix B Love Canal Operation Setpoints

Pump ON/OFF Levels

Pump	State	Level
Raw Water Feed Pump	ON	50% *
(Permissive from Raw Water Feed Tank)	OFF	40% *
Raw Water Feed Pump	ON	60% *
(Permissive from Filter Feed Tank)	OFF	70% *
Filter Feed Pump	ON	50% *
(Permissive from Filter Feed Tank)	OFF	40% *
PC3 Pumps A and B	ON	3.7 ft.
(Permissive from PC3)	OFF	2.7 ft.
PC3 Pumps A and B	ON	5.0 ft.
(Permissive from Raw Water Feed Tank)	OFF	6.0 ft.
PC3A Pumps A and B	ON	2.8 ft.
(Permissive from PC3A)	OFF	1.8 ft.
PC3A Pumps A and B	ON	5.0 ft.
(Permissive from Raw Water Feed Tank)	OFF	6.0 ft.
PC1 Pump	ON	2.5 ft.
(Permissive from PC1)	OFF	1.5 ft.
PC1 Pump	ON - REMOTE AUTO	6.0 ft.
(Permissive from PC3)	OFF - REMOTE AUTO	7.0 ft.
	OFF - REMOTE MANUAL	8.0 ft.
PC2 Pump	ON	5.0 ft.
(Permissive from PC2)	OFF	1.5 ft.
PC2 Pump	ON - REMOTE AUTO	6.0 ft.
(Permissive from PC3)	OFF - REMOTE AUTO	7.0 ft.
	OFF - REMOTE MANUAL	8.0 ft.
PC1A Pumps A and B	ON	2.5 ft.
(Permissive from PC1A)	OFF	1.5 ft.

Pump ON/OFF Levels

Pump	State	Level
PC1A Pumps A and B	ON - REMOTE AUTO	4.0 ft.
(Permissive from PC3A)	OFF - REMOTE AUTO OFF- REMOTE MANUAL	5.0 ft. 5.0 ft.
PC2A Pumps A and B	ON	3.8 ft.
(Permissive from PC2A)	OFF	1.8 ft.
PC2A Pumps A and B	ON - REMOTE AUTO	4.0 ft.
(Permissive from PC3A)	OFF - REMOTE AUTO OFF - REMOTE MANUAL	5.0 ft. 5.0 ft.
102nd Street Well Pump #2	ON	8.2 ft.
(Permissive from Wetwell #2)	OFF	8.0 ft.
102nd Street Well Pump #3	ON	7.6 ft.
(Permissive from Wetwell #3)	OFF	7.4 ft.
102nd Street Well Pump #4	ON	8.0 ft.
(Permissive from Wetwell #4)	OFF	7.8 ft.
102nd Street Well Pumps #1, 2, 3, and 4	ON	5.8 ft.
(Permissive from PC3)	OFF	6.8 ft.
DCF3 (Permissive from DCF4)	ON - REMOTE OFF - REMOTE	DCF4 NO HI-HI ALARM DCF4 HI-HI ALARM
DCF4 (Permissive from PC3A)	OFF - REMOTE MANUAL	5.0 ft.
Note: * Cannot be set by operator through the HMI.		

Appendix C

Niagara Falls Water Board Discharge Permit No. 44 and City of Niagara Falls Letter to Cease Discharge

NIAGARA FALLS WATER BOARD
WASTEWATER FACILITIES
SIGNIFICANT INDUSTRIAL USER
WASTEWATER DISCHARGE PERMIT

PERMIT NO. 44 Glenn Springs Holdings, Inc. -
Love Canal Leachate Treatment Facility

In accordance with all terms and conditions of the Niagara Falls Water Board Regulations Part 1960 and also with all applicable provisions of Federal and State Law or regulation:

Permission is Hereby Granted To: Glenn Springs Holdings, Inc. -
Love Canal Leachate Treatment Facility

Located at: 805 - 97th Street, Niagara Falls, NY 14304

Classified by SIC No(s): 4952

For the contribution of wastewater, into the Niagara Falls Water Board Publicly-Owned Treatment Works (POTW).

Effective this 9th day of, January 2015
To Expire this 9th day of, January 2020

Albert C. Zaepfel for

Paul J. Drof
Executive Director of Niagara Falls Water Board

Signed this 31TH day of December, 2014

DISCHARGE IDENTIFICATION

OUTFALL	DESCRIPTION	LOCATION	RECEIVING
#1	97th Street Discharge	97th Street	Carbon Treated Leachate from Love Canal Leachate Treatment Facility and the 102nd Street landfill

	WASTEWATER DISCHARGE PERMIT REQUIREMENTS FOR:	**ACTION REQUIRED**	**REQUIRED DATE OF SUBMISSION**
A.	**Discharges to the Niagara Falls Water Board (NFWB) Sewer**		
1.	Identification of all discharges to the NFWB Sewer System on a current plant sewer map certified by a New York State licensed professional engineer.	None	Submitted 12/24/14
2.	Identification of each contributing waste stream to each discharge to the NFWB Sewer System clearly marked on, or referenced to, a current plant sewer map certified by a New York State licensed professional engineer.	None	Submitted 12/24/14
3.	Elimination of all uncontaminated discharges to the NFWB Sewer System. All uncontaminated flows should be clearly identified on a current sewer map certified by a New York State licensed professional engineer.	N/A	
4.	Establishment of a control manhole that is continuously and immediately accessible for each discharge to the NFWB Sewer System.	None	Previously Established
B.	**Wastewater Discharge Management Practices**		
1.	Identification of a responsible person(s) (day to day and in emergencies).	None	Performed by NFWB

C. Slug Control Plan**

Pursuant to Section 40 CFR 403.12 (v) of the Federal Pretreatment Standards the Niagara Falls Water Board will evaluate the permittee, a minimum of once every two years for the need for a "Slug Control Plan." If a plan is required by the Niagara Falls Water Board, then the plan will contain, at a minimum, the following elements:

a) Description of discharge practices, including non-routine batch discharges;
b) Description of stored chemicals;
c) Procedures for immediately notifying the POTW of slug discharges, including any discharge that would violate a prohibition under 40 CFR 403.5 (b), with procedures for follow-up written notification within five days;
d) If necessary, procedures to prevent adverse impact from accidental spills, including inspection and maintenance of storage areas, handling and transfer of materials, loading and unloading operations, control of plant site runoff, worker training, building of containment structures or equipment, measures for containing toxic organic pollutants (including solvents), and/or measures and equipment necessary for emergency response.

**This section applies to all pollutants limited by the Niagara Falls Water Board SPDES Permit and all prohibited wastewater discharges (See Section 1960.5 of the Niagara Falls Water Board Wastewater Regulations).

D. General Wastewater Discharge Permit Conditions

1. Flow monitoring should be performed concurrently with any Wastewater Discharge Permit sampling and should be reported at the same time as analytical results. If it is not feasible to perform flow monitoring, an estimate of flow (method of estimated flow preapproved by the Niagara Falls Water Board) should be submitted with the analytical results.

2. All sampling for billing and pretreatment compliance purposes will be coordinated through the Niagara Falls Water Board Industrial Monitoring Coordinator.

3. All analysis must be performed by a State certified laboratory using analytical methods consistent with 40 CFR 136 and quality control provisions as required by the Niagara Falls Water Board Laboratory Technical Director. The permittee will report the results as directed in Section G of this permit. Results should be reported using the Method Detection Limit (MDL). Reporting results less than MDL will be indicated in the report by a less than sign (<) followed by the numeric MDL concentration reported by the laboratory. In these cases the pollutant load will be calculated and reported as zero (0). The MDL will be defined as the level at which the analytical procedure referenced is capable of determining with a 99% probability that the substance is present. The value is determined in reagent water. The precision at this level is +/- 100%.

4. An estimate of relative production levels for wastewater contributing processes at the time of any pretreatment compliance sampling will be submitted upon request of the Director of Niagara Falls Water Board - Wastewater Facilities.

5. All samples will be handled in accordance with EPA approved methods. Chain of Custody records will be submitted with all sampling results.

6. All conditions, standards and numeric limitations of Niagara Falls Water Board Wastewater Regulations are hereby incorporated into this permit by reference. These conditions, standards and numeric limitations must be complied with. Failure to comply with any part of said Regulations constitutes a violation and is subject to enforcement actions(s) described in Section 1960.9 of said Regulations, and in the Niagara Falls Water Board Pretreatment Administrative Procedure Number Five (5) - "Enforcement Response Guide." In the event of a violation, including slug discharges or spills, the Niagara Falls Water Board must be notified immediately by phone and confirmed by letter within five (5) working days.

   Any person adjudicated of violating any provision in the Niagara Falls Water Board Wastewater Regulations shall be assessed a fine in the amount of up to $10,000. This amount is available for each violation, and each day of a violation is a separate incident for which penalties may be sought.

6. The person violating any of the provisions of the Niagara Falls Water Board Wastewater Regulations will be liable for any expense, loss, or damage occasioned by reason of such violation. The expense, loss or damage will be taken to be the extent determined by the Director.

   In addition, any person who knowingly makes any false statements, representation or certification in any application, record, report, plan or other document filed or required to be maintained pursuant to the Niagara Falls Water Board Wastewater Regulations, or Wastewater Discharge Permit, or who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required under the Niagara Falls Water Board Wastewater Regulations will, upon conviction be punished by a fine up to $5,000. Furthermore, the Niagara Falls Water Board may recover reasonable attorney's fees, court costs, court reporting fees, and other expenses of litigation by appropriate suit at law against the person found to have violated applicable laws, orders, rules and permits required by the Niagara Falls Water Board Wastewater Regulations.

7. In accordance with Federal Regulation CFR 40, Part 403.12(g), any exceedance of a numeric limitation noted by the SIU must be re-sampled, analyzed and resubmitted to the Niagara Falls Water Board - Wastewater Facilities within 30 days.

   Specifically, if any limit that is *listed* in Section F of this permit is exceeded, then the permittee will undertake a short term monitoring program for that pollutant. Samples will be collected identical to those required for routine monitoring purposes and will be collected on each of at least *two (2)* operating days and analyzed. Results will be reported in both concentration and mass, and will be submitted within *30* days of becoming aware of the exceedence.

8. Sampling frequency for any permitted compounds may be increased beyond the requirements set forth in Section F and G of this permit. If the permittee monitors (sample and analysis) more frequent than required under this permit, **all** results of this monitoring must be reported.

9. As noted in Section 1960.5g of the Niagara Falls Water Board Wastewater Regulations, "Personnel as designated by the Director will be permitted at any time for reasonable cause to enter upon all properties served by the Niagara Falls Water Board for the purpose of, and to carry out, inspection of the premises, observation, measurement, sampling and testing, in accordance with provisions of the Regulations."

10. As noted in Section 1960.5c of the Niagara Falls Water Board Wastewater Regulations, significant changes in discharge characteristics or volume must be reported immediately to the Niagara Falls Water Board - Wastewater Facilities.

11. As noted in Section 1960.6b of the Niagara Falls Water Board Wastewater Regulations, samples required to be collected via a 24-hour composite sampler must be retained refrigerated for an additional 24 hour plus un-refrigerated an additional 48 hours (total 72 hours).

12. As noted in Section 1960.5d of the Niagara Falls Water Board Wastewater Regulations, all "SIU's will keep on file for a minimum of three years, all records, flow charts, laboratory calculations or any other pertinent data on their discharge to the Niagara Falls Water Board - Wastewater Facilities."

13. As noted in Section 1960.6g of the Niagara Falls Water Board Wastewater Regulations, "Permits are issued to a specific user for a specific monitoring station. A permit will not be reassigned or transferred without the approval of the Director which approval will not be unreasonably withheld. Any succeeding owner or user to which a permit has been transferred and approved will also comply with all the terms and conditions of the existing permit."

14. The Annual Average Limitation is equivalent to the specific SIU allocation, and will be defined as the permissible long term average discharge of a particular pollutant. These limitations are listed in Section F of this permit. The computation of the Annual Average will be as follows; for each compound listed in Section G of this permit, the Annual Average will be the average of the present monitoring quarter and three previous quarters data.

15. The Daily Maximum Limitation will be defined as the maximum allowable discharge on anyone day. The Daily Maximum Limitation will allow for periodic short term discharge fluctuations. These specific limitations are listed in Section F of this permit.

16. Enforcement of the Annual Average Limitation will be based on the reported average of the last four quarters data vs. the Annual Average Limited listed in Section F of this permit. Enforcement of the Daily Maximum Limitation will be based on individual analysis results vs. the Daily Maximum Limit listed in Section F of this permit. These results may be obtained from self monitoring (Section G), City of Niagara Falls Verification, incident investigation or billing samples.

17. The Niagara Falls Water Board Administrative Procedure Number 6 "Procedure for Determination and Use of Local Limits" lists all pollutants noted in the Niagara Falls Water Board – Wastewater Facilities SPDES Permit. The limits defined in the procedure are values which are based on the quantity of substances discharged which can be easily related to the Treatment Plant's removal capacity.
The pollutants listed in this procedure that are <u>not</u> specifically listed in Section F and G of this permit may be present in the permittee's wastewater discharge, but at levels which do not require specific permit limitations. Consequently, if any of the limits listed in this procedure, for pollutants <u>not</u> identified in Section F and G of this permit, are exceeded then the permittee will undertake a short-term, high intensity monitoring program for that pollutant. Samples identical to those required for routine monitoring purposes will be collected on each of at least three operating days and analyzed. Results will be expressed in terms of both concentration and mass, and will be submitted no later than the end of the third month following the month when the limit was first exceeded.

    If levels higher than the limit are confirmed, the permit may be reopened by the Niagara Falls Water Board for consideration of revised permit limits.

E. Specific Wastewater Discharge Permit Conditions

1. Billing Agreement:

a) Flow quantities will be derived from the Wastewater Treatment Facility flow meter. The results of the daily flow readings will be compiled and submitted in a Monthly Flow Report by the 15th day of the following month.

b) Charges for TSS, SOC and Substances of Concern shall be developed based on Quarterly Self Monitoring data.

2. Love Canal Leachate Treatment Facility (LCLTF)

The Niagara Falls Water Board agrees to accept wastewater processed from the Glenn Springs Holdings (GSH) LCLTF. These waters in addition to Love Canal wastewater shall include wastewater from the 102nd Street remedial site. This approval is subject to the following conditions:

a) The LCLTF shall be properly operated and maintained at all times.

b) To ensure proper operation GSH shall ensure sufficient feed, inter-stage (breakthrough), and effluent analysis to ensure timely carbon changes. Treatment levels of 10 ug/ℓ shall be achieved and verified with quarterly composite sample analysis for the following compounds: trichloroethylene, tetrachloroethylene, monochlorotoluene, monochlorobenzenes, trichlorobenzenes, tetrachlorobenzenes, hexachlorocyclohexanes and hexachlorobenzene.

E. Specific Wastewater Discharge Permit Conditions

2. Love Canal Leachate Treatment Facility (LCLTF) Continued

c) The issuance of this approval if based on GSH's previous assertions that there is no reason to anticipate the presence of tetrachlorodibenzo-p-dioxins in the discharge from the treatment facility. The Niagara Falls Water Board hereby reserves the right to collect samples from the treatment facility effluent and analyze such wastewaters for their chemical constituents, including tetrachlorodibenzo-p-dioxins. If such analysis indicates the presence of tetrachlorodibenzo-p-dioxins, this approval may be withdrawn. If at anytime, the Niagara Falls Water Board determines on any basis that the discharge of these wastewater to the POTW is interfering with the operation of that facility, the Niagara Falls Water Board will direct GSH to discontinue the discharge.

d) These pretreated wastewaters shall be discharged to the POTW via Outfall MS # 1.

e) Periodically wet weather flow in the area around LCLTF results in surcharged sewers. The resultant surcharge requires overflow at combined sewer and storm sewer overflow points. Other points in the sewer shed require manual bypass pumping. Consequently, to minimize this overflow, the Niagara Falls Water Board will require the permittee to cease discharge from the LCLTF during these surcharge events.

A notification procedure has been established by the Niagara Falls Water Board to formalize the communication between the Niagara Falls Water Board and the permittee to halt and resume the LCLTF discharge. This procedure by reference is hereby incorporated as a condition of this permit.

F. Discharge Limitations & Monitoring Requirements

During the Period beginning the effective date of this Permit and lasting until the expiration date, discharge from the permitted facility outfall(s) will be limited and monitored by the permittee as specified below.

OUTFALL NUMBER/ EFFLUENT PARAMETER	DISCHARGE LIMITATIONS		UNITS	MINIMUM MONITORING REQUIREMENTS	
	ANNUAL AVERAGE	DAILY MAXIMUM		MEASUREMENT FREQUENCY	SAMPLE TYPE
#1 Flow	0.3	0.3	MGD	Continuous	4
#1 Total Suspended Suspended	25	50	lbs/d	1/Qtr.	1
#1 Soluble Organic Carbon	50	75	lbs/d	1/Qtr.	1
#1 Volatile - Priority Pollutants (See Attached list Section G)	MONITOR	ONLY	lbs/d	1/Qtr.	1
#1 Acid Extractable - Priority Pollutants (See attached list Section G)	MONITOR	ONLY	lbs/d	1/Qtr.	1
#1 Base/Neutral - Priority Pollutants (See attached list Section G)	MONITOR	ONLY	lbs/d	1/Qtr.	1
# 1 Pesticides - Hexachlorocyclohexanes	MONITOR	ONLY	lbs/d	1/Qtr.	1
#1 Total Phenols	MONITOR	ONLY	lbs/d	1/Qtr.	1

F. DISCHARGE LIMITATIONS & MONITORING REQUIREMENTS CONTINUED

SAMPLE TYPE FOOTNOTES

(1) Each sample will consist of four (4) grabs collected spaced throughout the **batch** discharge, such that they are representative of the effluent being discharged pursuant to 40CFR 403.12.b5iii. The four (4) grabs will be **composited in the laboratory** and analyzed as one sample.

(2) Each sample will consist of four (4) grabs collected spaced over the 24-hour period, such that they are representative of the effluent being discharged pursuant to 40CFR 403.12.b5iii. The four (4) grabs will be **composited in the laboratory** and analyzed as one sample.

(3) Each sample will consist of a 24-hour, **flow proportioned** composite sample collected from the monitoring point.

(4) Flow will be monitored continuously with the use of a water meter or another acceptable flow metering device.

(5) Each sample will consist of a 24-hour, **time proportioned** composite sample collected from the monitoring point.

(6) Reserved

(7) Same as (3), however, five (5) samples will be collected per quarter from the monitoring point and analyzed by and at the Niagara Falls Water Board's expense.

(8) Four (4) grab samples will be collected spaced over the 24-hour period, such that they are representative of the effluent being discharged pursuant to 40CFR 403.12.b5iii. Each grab will be **analyzed and reported separately**.

(9) A grab sample is defined as an aliquot collected over a period of not more than 15 minutes.

G. Discharge Monitoring Reporting Requirements

During the period beginning the effective date of this permit and lasting until its expiration date, discharge monitoring results will be summarized and reported by the permittee; Monthly - 14 days after monitoring period, Quarterly - by the last day of the monitoring period = February 28, May 31, August 31, November 30. Semiannual reports will be submitted on the last day of the monitoring period = February 28, August 31. The annual average for each parameter listed in Section F, will be computed and reported quarterly. The individual sample analysis for present quarter will also be reported quarterly unless directed otherwise in this permit.

OUTFALL NO	PARAMETER	REPORTING FREQUENCY
#1	Flow	Monthly
#1	Total Suspended Solids	Quarterly
#1	Volatile - Priority Pollutants	Quarterly
#1	Acid Extractables - Priority Pollutants	Quarterly
#1	Base/Neutral - Priority Pollutants	Quarterly
#1	Total Phenols	Quarterly

Discharge Monitoring Compounds

Volatile	Base/Neutrals Extractables
Benzene	Dimethyl Phthalate
Carbon Tetrachloride	Butyl Benz Phthalate
Chlorodibromethane	Di-N-Butyl Phthalate
Monochlorobenzene	Di-N-Octyl Phthalate
Dichlorobromethane	Diethyl Phthalate
Chloroform	Nitrosodiphenylamine
Dichloroethylenes	Dichlorobenzenes
Bromoform	Dichlorotoluene
Dichloropropylenes	Acenaphthlene
Ethylbenzene	Fluoranthene
Tetrachloroethanes	Chrysene
Tetrachloroethylene	Napthalene
Toluene	Benzo (a) Anthracene
Trichloroethanes	Pyrene
Trichloroethylene	Trichlorobenzene
Methylene Chloride	Trichlorotoluene
Vinyl Chloride	Hexachlorobutadiene
Monochlorotoluenes	Tetrachlorobenzene
Monochlorobenzotrifluoride	Hexachlorocyclopentadiene
	Hexachlorobenzene
	Dichlorobenzotrifluoride

Discharge Monitoring Compounds

Acids	Pesticides
Monochlorophenol	Alpha, beta, delta, gama – hexachlorocyclohexane
Dichlorophenol	
Monochlorocresol	
Trichlorophenol	
Pentachlorophenol	

Conventionals	
Total Phenols	
Total Suspended Solids	
Soluble Organic Carbon	

H. Comments/Revisions

City of Niagara Falls, New York

P.O. Box 69, Niagara Falls, NY 14302-0069

March 9, 1998

Mr. Donald Tubridy, Site Manager
Glenn Springs Holdings Inc.
Love Canal Treatment Facility
805 – 97th Street
Niagara Falls, NY 14304

Dear Mr. Tubridy:

The City of Niagara Falls and the Occidental Chemical Corporation have mutually agreed that conditional to accepting leachate from the 102nd Street Landfill, pretreated at the Love Canal Leachate Treatment Facility (LCLTF), a communication procedure to cease discharge during wet weather is required. This procedure is outlined below.

(a) During elevated sewer flows in the LaSalle area during wet weather, the Outside Sewer Maintenance (OSM) Crew Leader will contact the Shift Operation Supervisor (SOS) at the treatment plant.
(b) The SOS will call Occidental Chemical Corporation Love Canal Leachate Treatment Facility staff member, Darrell Crocket at (716) 283-0111 and notify him or leave a recorded message to stop the LCLTF discharge.
(c) After the wet weather condition has subsided the OSM Crew Leader will again contact the SOS to notify him of the conditions in the sewer.
(d) The SOS will immediately call the LCLTF (Darrell Crocket) and inform him to resume discharge. Details of the phone communications will be recorded in the SOS's Log Book at the treatment facility.

If you have questions during these events, the SOS maybe contacted at (716) 286-4973.

Sincerely,

DEPARTMENT OF WASTEWATER FACILITIES

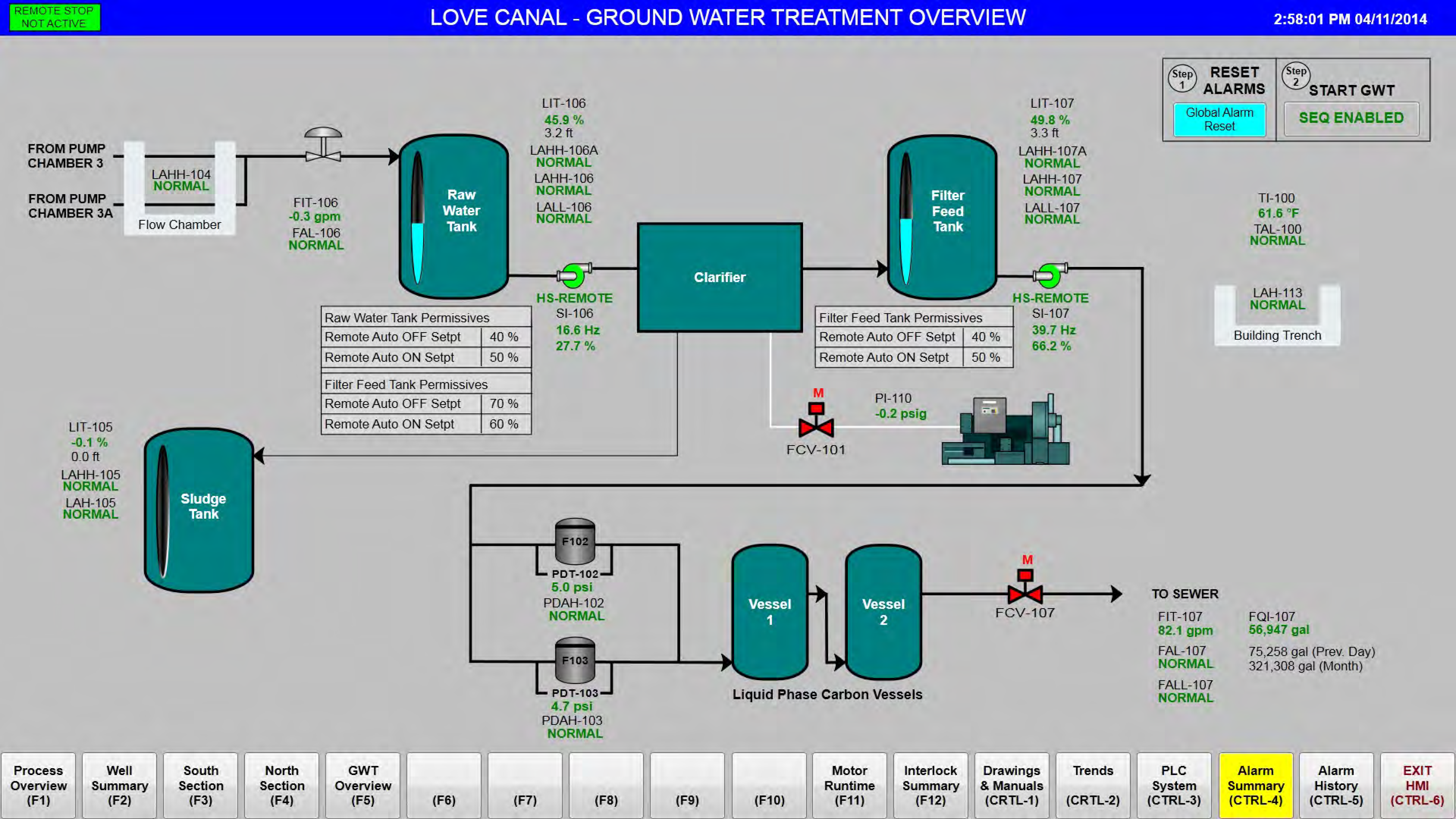
Albert C Zaepfel

Albert C. Zaepfel
Industrial Monitoring Coordinator

ACZ:md
Cc: D. Crocker
R. Roll
File: 44 A

7.DOC

Appendix D
Sample HMI Screens



LOVE CANAL - GROUND WATER TREATMENT OVERVIEW

2:58:01 PM 04/11/2014

REMOTE STOP
NOT ACTIVE

LAHH-104 NORMAL

FIT-106 -0.3 gpm
FAL-106 NORMAL

LIT-106 45.9 %
3.2 ft
LAHH-106A NORMAL
LAHH-106 NORMAL
LALL-106 NORMAL

HS-REMOTE
SI-106 16.6 Hz
27.7 %

Raw Water Tank Permissives	
Remote Auto OFF Setpt	40 %
Remote Auto ON Setpt	50 %

Filter Feed Tank Permissives	
Remote Auto OFF Setpt	70 %
Remote Auto ON Setpt	60 %

LIT-107 49.8 %
3.3 ft
LAHH-107A NORMAL
LAHH-107 NORMAL
LALL-107 NORMAL

HS-REMOTE
SI-107 39.7 Hz
66.2 %

Filter Feed Tank Permissives	
Remote Auto OFF Setpt	40 %
Remote Auto ON Setpt	50 %

TI-100 61.6 °F
TAL-100 NORMAL

LAH-113 NORMAL

PI-110 -0.2 psig

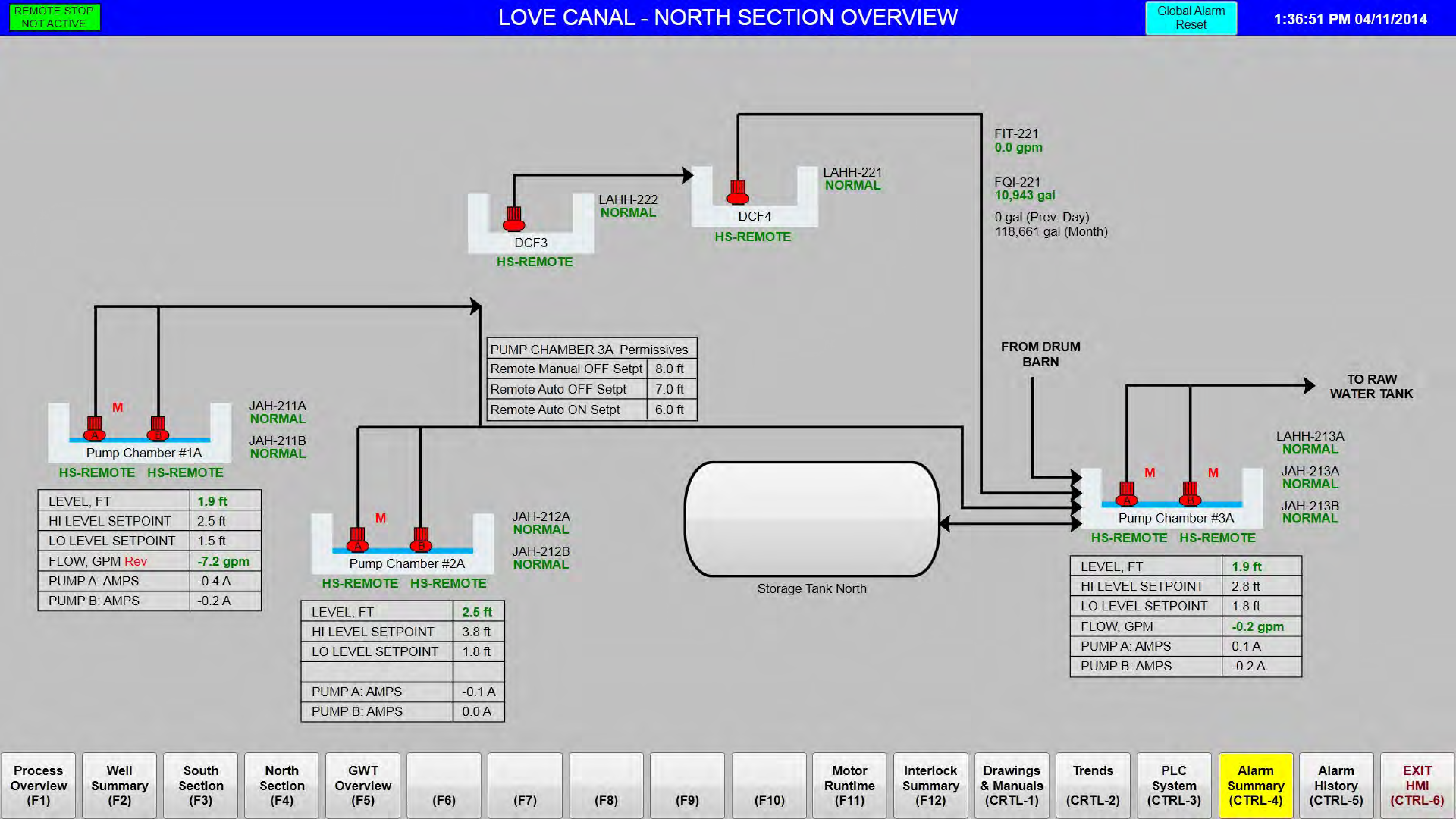
LIT-105 -0.1 %
0.0 ft
LAHH-105 NORMAL
LAH-105 NORMAL

PDT-102 5.0 psi
PDAH-102 NORMAL

PDT-103 4.7 psi
PDAH-103 NORMAL

FIT-107 82.1 gpm
FAL-107 NORMAL
FALL-107 NORMAL

FQI-107 56,947 gal
75,258 gal (Prev. Day)
321,308 gal (Month)



LOVE CANAL - NORTH SECTION OVERVIEW

1:36:51 PM 04/11/2014

FIT-221
0.0 gpm

FQI-221
10,943 gal

0 gal (Prev. Day)
118,661 gal (Month)

PUMP CHAMBER 3A Permissives	
Remote Manual OFF Setpt	8.0 ft
Remote Auto OFF Setpt	7.0 ft
Remote Auto ON Setpt	6.0 ft

Pump Chamber #1A

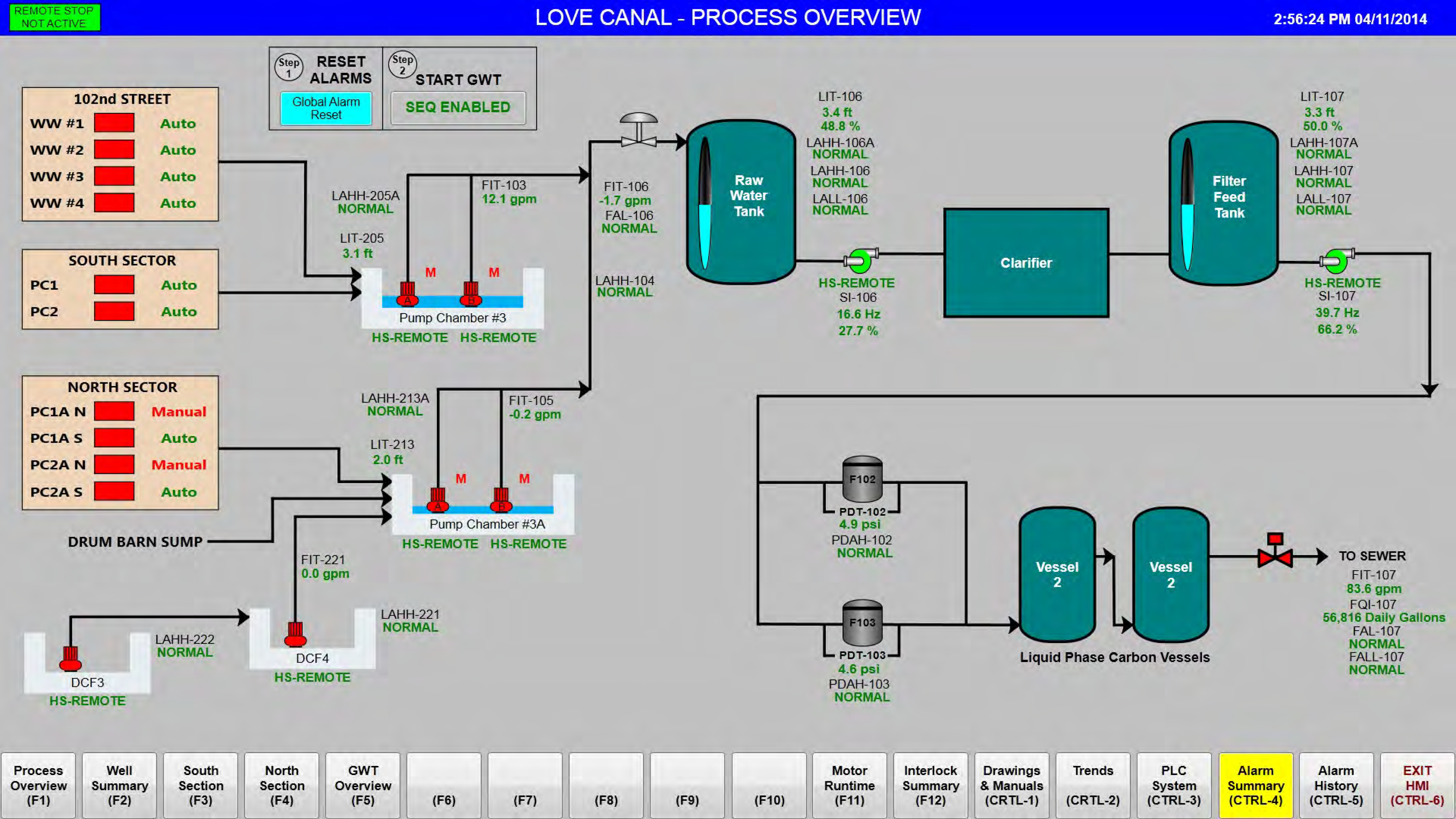
LEVEL, FT	1.9 ft
HI LEVEL SETPOINT	2.5 ft
LO LEVEL SETPOINT	1.5 ft
FLOW, GPM Rev	-7.2 gpm
PUMP A: AMPS	-0.4 A
PUMP B: AMPS	-0.2 A

Pump Chamber #2A

LEVEL, FT	2.5 ft
HI LEVEL SETPOINT	3.8 ft
LO LEVEL SETPOINT	1.8 ft
PUMP A: AMPS	-0.1 A
PUMP B: AMPS	0.0 A

Pump Chamber #3A

LEVEL, FT	1.9 ft
HI LEVEL SETPOINT	2.8 ft
LO LEVEL SETPOINT	1.8 ft
FLOW, GPM	-0.2 gpm
PUMP A: AMPS	0.1 A
PUMP B: AMPS	-0.2 A



LOVE CANAL - PROCESS OVERVIEW

2:56:24 PM 04/11/2014

102nd STREET

WW #1	🟥	Auto
WW #2	🟥	Auto
WW #3	🟥	Auto
WW #4	🟥	Auto

SOUTH SECTOR

PC1	🟥	Auto
PC2	🟥	Auto

NORTH SECTOR

PC1A N	🟥	Manual
PC1A S	🟥	Auto
PC2A N	🟥	Manual
PC2A S	🟥	Auto

LAHH-205A NORMAL
LIT-205 3.1 ft
FIT-103 12.1 gpm
HS-REMOTE HS-REMOTE

LAHH-213A NORMAL
LIT-213 2.0 ft
FIT-105 -0.2 gpm
HS-REMOTE HS-REMOTE

FIT-221 0.0 gpm
LAHH-221 NORMAL
HS-REMOTE

LAHH-222 NORMAL
HS-REMOTE

FIT-106 -1.7 gpm
FAL-106 NORMAL
LAHH-104 NORMAL

LIT-106 3.4 ft 48.8 %
LAHH-106A NORMAL
LAHH-106 NORMAL
LALL-106 NORMAL

HS-REMOTE
SI-106 16.6 Hz 27.7 %

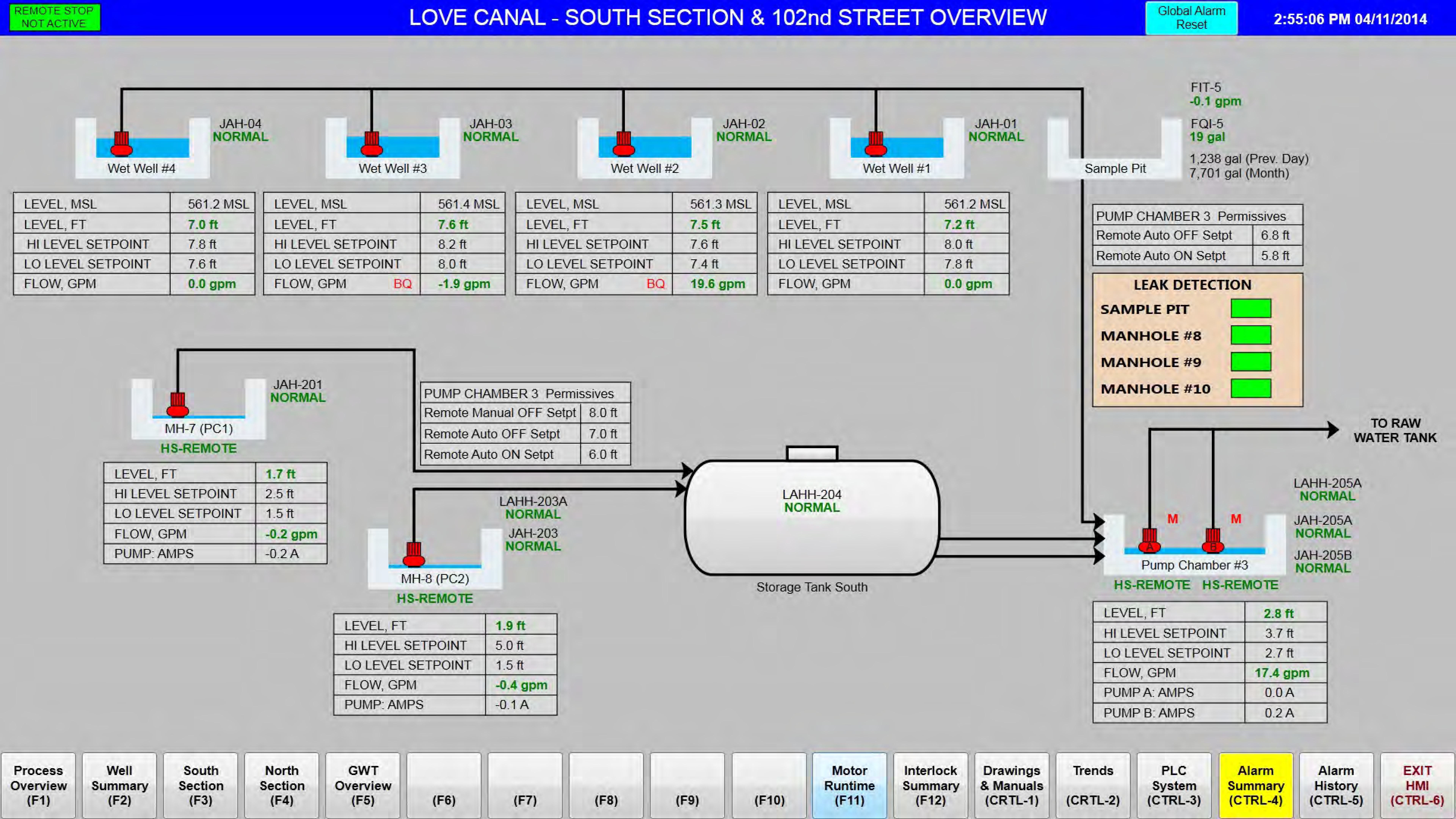
LIT-107 3.3 ft 50.0 %
LAHH-107A NORMAL
LAHH-107 NORMAL
LALL-107 NORMAL

HS-REMOTE
SI-107 39.7 Hz 66.2 %

PDT-102 4.9 psi
PDAH-102 NORMAL

PDT-103 4.6 psi
PDAH-103 NORMAL

FIT-107 83.6 gpm
FQI-107 56,816 Daily Gallons
FAL-107 NORMAL
FALL-107 NORMAL



LOVE CANAL - SOUTH SECTION & 102nd STREET OVERVIEW

2:55:06 PM 04/11/2014

JAH-04 NORMAL

LEVEL, MSL	561.2 MSL
LEVEL, FT	7.0 ft
HI LEVEL SETPOINT	7.8 ft
LO LEVEL SETPOINT	7.6 ft
FLOW, GPM	0.0 gpm

JAH-03 NORMAL

LEVEL, MSL	561.4 MSL
LEVEL, FT	7.6 ft
HI LEVEL SETPOINT	8.2 ft
LO LEVEL SETPOINT	8.0 ft
FLOW, GPM BQ	-1.9 gpm

JAH-02 NORMAL

LEVEL, MSL	561.3 MSL
LEVEL, FT	7.5 ft
HI LEVEL SETPOINT	7.6 ft
LO LEVEL SETPOINT	7.4 ft
FLOW, GPM BQ	19.6 gpm

JAH-01 NORMAL

LEVEL, MSL	561.2 MSL
LEVEL, FT	7.2 ft
HI LEVEL SETPOINT	8.0 ft
LO LEVEL SETPOINT	7.8 ft
FLOW, GPM	0.0 gpm

FIT-5
-0.1 gpm

FQI-5
19 gal
1,238 gal (Prev. Day)
7,701 gal (Month)

PUMP CHAMBER 3 Permissives	
Remote Auto OFF Setpt	6.8 ft
Remote Auto ON Setpt	5.8 ft

LEAK DETECTION	
SAMPLE PIT	🟩
MANHOLE #8	🟩
MANHOLE #9	🟩
MANHOLE #10	🟩

JAH-201 NORMAL

HS-REMOTE

LEVEL, FT	1.7 ft
HI LEVEL SETPOINT	2.5 ft
LO LEVEL SETPOINT	1.5 ft
FLOW, GPM	-0.2 gpm
PUMP: AMPS	-0.2 A

PUMP CHAMBER 3 Permissives	
Remote Manual OFF Setpt	8.0 ft
Remote Auto OFF Setpt	7.0 ft
Remote Auto ON Setpt	6.0 ft

LAHH-203A NORMAL

JAH-203 NORMAL

HS-REMOTE

LEVEL, FT	1.9 ft
HI LEVEL SETPOINT	5.0 ft
LO LEVEL SETPOINT	1.5 ft
FLOW, GPM	-0.4 gpm
PUMP: AMPS	-0.1 A

LAHH-204 NORMAL

LAHH-205A NORMAL

JAH-205A NORMAL

JAH-205B NORMAL

HS-REMOTE HS-REMOTE

LEVEL, FT	2.8 ft
HI LEVEL SETPOINT	3.7 ft
LO LEVEL SETPOINT	2.7 ft
FLOW, GPM	17.4 gpm
PUMP A: AMPS	0.0 A
PUMP B: AMPS	0.2 A

Appendix E
List of Alarms

Appendix E Love Canal List of Alarms

No.	Tag	Description
1.	UA-100A	Controller Power Up In Run Mode
2.	UA-100B	MTU-100 Controller Battery Bad Alarm
3.	UA-100C	MTU-100 PLC Controller Major Fault Alarm
4.	UA-100D	PLC System Hardware Problem Alarm
5.	YA-PB-100	Love Canal Process Stop Push Button Active
6.	JAL-PS3	MTU-100 Control Panel 24VDC Power Supply 3 Fault Alarm
7.	YA-ETH-A	MTU-100 Ethernet Switch-A Port Communication Alarm
8.	YA-ETH-B	MTU-100 Ethernet Switch-B Port Communication Alarm
9.	YA-ETH-C	RTU-3 Ethernet Switch Port Communication Alarm
10.	YA-ETH-D	RTU-102 Ethernet Switch Port Communication Alarm
11.	BQ-100-20	MTU-100 Enclosure Analog Input 2-0 Bad Quality (FIT-107)
12.	BQ-100-21	MTU-100 Enclosure Analog Input 2-1Bad Quality (LIT-105)
13.	BQ-100-22	MTU-100 Enclosure Analog Input 2-2 Bad Quality (LIT-106)
14.	BQ-100-23	MTU-100 Enclosure Analog Input 2-3 Bad Quality (LIT-107)
15.	BQ-100-24	MTU-100 Enclosure Analog Input 2-4 Bad Quality (FIT-106)
16.	BQ-100-30	MTU-100 Enclosure Analog Input 3-0 Bad Quality (SI-106)
17.	BQ-100-31	MTU-100 Enclosure Analog Input 3-1 Bad Quality (SI-107)
18.	BQ-100-34	MTU-100 Enclosure Analog Input 3-4 Bad Quality (PT-110)
19.	BQ-100-35	MTU-100 Enclosure Analog Input 3-5 Bad Quality (PDT-102)
20.	BQ-100-40	MTU-100 Enclosure Analog Input 4-0 Bad Quality (PDT-103)
21.	BQ-100-41	MTU-100 Enclosure Analog Input 4-1 Bad Quality (TIT-100)
22.	BQ-100-42	MTU-100 Enclosure Analog Input 4-2 Bad Quality (ZSHL-107)
23.	BQ-100-50	MTU-100 Enclosure Analog Output 5-0 Bad Quality (SC-106)
24.	BQ-100-51	MTU-100 Enclosure Analog Output 5-1 Bad Quality (SC-107)
25.	BQ-100-53	MTU-100 Enclosure Analog Output 5-3 Bad Quality (FCV106)
26.	FAL-106	Raw Water Tank Influent Water Flow Alarm Low
27.	FAL-107	Treatment Facility Effluent Water Flow Alarm Low
28.	FALL-107	Treatment Facility Effluent Water Flow Alarm Low Low
29.	FDA-106	Raw Water Tank Influent Water Flow Reverse Alarm
30.	HA-106	Raw Water Tank Discharge Pump HOA NOT in Auto Alarm
31.	HA-107	Filter Feed Tank Discharge Pump HOA NOT in Auto Alarm
32.	LAH-105	Sludge Tank Level Alarm High
33.	LAH-113	Treatment Facility Trench Level Alarm High
34.	LAHH-105	Sludge Tank Level Alarm High High
35.	LAHH-106A	Raw Water Tank Level Alarm High High
36.	LAHH-106	Raw Water Tank Water Level Alarm High High
37.	LAHH-107A	Filter Feed Tank Level Alarm High High
38.	LAHH-107	Filter Feed Tank Water Level Alarm High High
39.	LALL-106	Raw Water Tank Water Level Alarm Low Low
40.	LALL-107	Filter Feed Tank Water Level Alarm Low Low
41.	PDAH-102	Bag Filters No.1 (North) Pressure Differential Alarm High

No.	Tag	Description
42.	PDAH-103	Bag Filters No.2 (South) Pressure Differential Alarm High
43.	TAL-100	Treatment Facility Building Temperature Alarm Low
44.	YA-106	Raw Water Tank Discharge Pump Fault Alarm - Logic
45.	YA-107	Filter Feed Tank Discharge Pump Fault Alarm - Logic
46.	YAH-106	Raw Water Tank Discharge Pump Fault Alarm - VFD
47.	YAH-107	Filter Feed Tank Discharge Pump Fault Alarm - VFD
48.	ZA-107	Treatment Facility Effluent Water Flow Control Valve Fail Alarm
49.	BQ-100-25	MTU-100 Enclosure Analog Input 2-5 Bad Quality (FIT-221)
50.	FAL-221	DCF Pump Chamber No.4 Effluent Water Flow Alarm Low
51.	FDA-221	DCF Pump Chamber No.4 Effluent Water Flow Reverse Alarm
52.	HA-221	DCF Pump Chamber No.4 HOA NOT in Auto Alarm
53.	HA-222	DCF Pump Chamber No.3 HOA NOT in Auto Alarm
54.	LAHH-221	DCF Pump Chamber No.4 Level Alarm High High
55.	LAHH-222	DCF Pump Chamber No.3 Level Alarm High High
56.	YA-221	DCF Pump Chamber No.4 Pump Fault Alarm - Logic
57.	YA-222	DCF Pump Chamber No.3 Pump Fault Alarm - Logic
58.	BQ-201-30	RTU-1 Enclosure Analog Input 3-0 Bad Quality (IT-201)
59.	BQ-201-31	RTU-1 Enclosure Analog Input 3-1Bad Quality (LIT-201)
60.	HA-201	Manhole No.7 Pump HOA NOT in Auto Alarm
61.	IAH-201	Manhole No.7 Pump Amps Alarm High
62.	JAH-201	Manhole No.7 Pump Overload Alarm
63.	LAHH-201	Manhole No.7 Water Level Alarm High High
64.	LALL-201	Manhole No.7 Water Level Alarm Low Low
65.	TAL-201	RTU-1 Enclosure Temperature Alarm Low
66.	YA-201	Manhole No.7 Pump Fault Alarm - Logic
67.	YAH-201	RTU-1 Enclosure Intrusion Alarm
68.	YAH-201-30	RTU-1 Enclosure Analog Input 3-0 Surge Alarm (IT-201)
69.	YAH-201-31	RTU-1 Enclosure Analog Input 3-1 Surge Alarm (LIT-201)
70.	YAH-201-120	RTU-1 Enclosure 120VAC Surge Alarm
71.	BQ-203-30	RTU-2 Enclosure Analog Input 3-0 Bad Quality (IT-203)
72.	BQ-203-31	RTU-2 Enclosure Analog Input 3-1 Bad Quality (LIT-203)
73.	BQ-203-33	RTU-2 Enclosure Analog Input 3-3 Bad Quality (FIT-100)
74.	BQ-203-40	RTU-2 Enclosure Analog Input 4-0 Bad Quality (FIT-101)
75.	FAL-100	Manhole No.8 Effluent Water Flow Alarm Low
76.	FAL-101	Manhole No.7 Effluent Water Flow Alarm Low
77.	FDA-100	Manhole No.8 Effluent Water Flow Reverse Alarm
78.	FDA-101	Manhole No.7 Effluent Water Flow Reverse Alarm
79.	HA-203	Manhole No.8 Pump HOA NOT in Auto Alarm
80.	IAH-203	Manhole No.8 Pump Amps Alarm High
81.	JAH-203	Manhole No.8 Pump Overload Alarm
82.	LAHH-203A	Pump Chamber No.2 Level Alarm High High
83.	LAHH-203	Manhole No.8 Water Level Alarm High High
84.	LALL-203	Manhole No.8 Water Level Alarm Low Low
85.	TAL-203	RTU-2 Enclosure Temperature Alarm Low
86.	YA-203	Manhole No.8 Pump Fault Alarm - Logic

No.	Tag	Description
87.	YAH-203	RTU-2 Enclosure Intrusion Alarm
88.	YAH-203-30	RTU-2 Enclosure Analog Input 3-0 Surge Alarm (IT-203)
89.	YAH-203-31	RTU-2 Enclosure Analog Input 3-1 Surge Alarm (LIT-203)
90.	YAH-203-33	RTU-2 Enclosure Analog Input 3-3 Surge Alarm (FIT-100)
91.	YAH-203-40	RTU-2 Enclosure Analog Input 4-0 Surge Alarm (FIT-101)
92.	YAH-203-120	RTU-2 Enclosure 120VAC Surge Alarm
93.	BQ-205-30	RTU-3 Enclosure Analog Input 3-0 Bad Quality (IT-205A)
94.	BQ-205-31	RTU-3 Enclosure Analog Input 3-1 Bad Quality (LIT-205)
95.	BQ-205-32	RTU-3 Enclosure Analog Input 3-2 Bad Quality (IT-205B)
96.	HA-205A	Pump Chamber No.3 Pump-A HOA NOT in Auto Alarm
97.	HA-205B	Pump Chamber No.3 Pump-B HOA NOT in Auto Alarm
98.	IAH-205A	Pump Chamber No.3 Pump-A Amps Alarm High
99.	IAH-205B	Pump Chamber No.3 Pump-B Amps Alarm High
100.	JAH-205A	Pump Chamber No.3 Pump-A Overload Alarm
101.	JAH-205B	Pump Chamber No.3 Pump-B Overload Alarm
102.	LAHH-204	Storage Tank (South) Level Alarm High High
103.	LAHH-205A	Pump Chamber No.3 Level Alarm High High
104.	LAHH-205	Pump Chamber No.3 Water Level Alarm High High
105.	LALL-205	Pump Chamber No.3 Water Level Alarm Low Low
106.	TAL-205	RTU-3 Enclosure Temperature Alarm Low
107.	YA-205A	Pump Chamber No.3 Pump-A Fault Alarm - Logic
108.	YA-205B	Pump Chamber No.3 Pump-B Fault Alarm - Logic
109.	YAH-205	RTU-3 Enclosure Intrusion Alarm
110.	YAH-205-30	RTU-3 Enclosure Analog Input 3-0 Surge Alarm (IT-205A)
111.	YAH-205-31	RTU-3 Enclosure Analog Input 3-1 Surge Alarm (LIT-205)
112.	YAH-205-32	RTU-3 Enclosure Analog Input 3-2 Surge Alarm (IT-205B)
113.	YAH-205-120	RTU-3 Enclosure 120VAC Surge Alarm
114.	BQ-211-30	RTU-1A Enclosure Analog Input 3-0 Bad Quality (IT-211A)
115.	BQ-211-31	RTU-1A Enclosure Analog Input 3-1 Bad Quality (LIT-211)
116.	BQ-211-32	RTU-1A Enclosure Analog Input 3-2 Bad Quality (IT-211B)
117.	BQ-211-33	RTU-1A Enclosure Analog Input 3-3 Bad Quality (FIT-104)
118.	FAL-104	Pump Chamber No.1A Effluent Water Flow Alarm Low
119.	FDA-104	Pump Chamber No.1A Effluent Water Flow Reverse Alarm
120.	HA-211A	Pump Chamber No.1A Pump-A HOA NOT in Auto Alarm
121.	HA-211B	Pump Chamber No.1A Pump-B HOA NOT in Auto Alarm
122.	IAH-211A	Pump Chamber No.1A Pump-A Amps Alarm High
123.	IAH-211B	Pump Chamber No.1A Pump-B Amps Alarm High
124.	JAH-211A	Pump Chamber No.1A Pump-A Overload Alarm
125.	JAH-211B	Pump Chamber No.1A Pump-B Overload Alarm
126.	LAHH-211	Pump Chamber No.1A Water Level Alarm High High
127.	LALL-211	Pump Chamber No.1A Water Level Alarm Low Low
128.	TAL-211	RTU-1A Enclosure Temperature Alarm Low
129.	YA-211A	Pump Chamber No.1A Pump-A Fault Alarm - Logic
130.	YA-211B	Pump Chamber No.1A Pump-B Fault Alarm - Logic
131.	YAH-211	RTU-1A Enclosure Intrusion Alarm

No.	Tag	Description
132.	YAH-211-30	RTU-1A Enclosure Analog Input 3-0 Surge Alarm (IT-211A)
133.	YAH-211-31	RTU-1A Enclosure Analog Input 3-1 Surge Alarm (LIT-211)
134.	YAH-211-32	RTU-1A Enclosure Analog Input 3-2 Surge Alarm (IT-211B)
135.	YAH-211-33	RTU-1A Enclosure Analog Input 3-3 Surge Alarm (FIT-104)
136.	YAH-211-120	RTU-1A Enclosure 120VAC Surge Alarm
137.	BQ-212-30	RTU-2A Enclosure Analog Input 3-0 Bad Quality (IT-212A)
138.	BQ-212-31	RTU-2A Enclosure Analog Input 3-1 Bad Quality (LIT-212)
139.	BQ-212-32	RTU-2A Enclosure Analog Input 3-2 Bad Quality (IT-212B)
140.	HA-212A	Pump Chamber No.2A Pump-A HOA NOT in Auto Alarm
141.	HA-212B	Pump Chamber No.2A Pump-B HOA NOT in Auto Alarm
142.	IAH-212A	Pump Chamber No.2A Pump-A Amps Alarm High
143.	IAH-212B	Pump Chamber No.2A Pump-B Amps Alarm High
144.	JAH-212A	Pump Chamber No.2A Pump-A Overload Alarm
145.	JAH-212B	Pump Chamber No.2A Pump-B Overload Alarm
146.	LAHH-212	Pump Chamber No.2A Water Level Alarm High High
147.	LALL-212	Pump Chamber No.2A Water Level Alarm Low Low
148.	TAL-212	RTU-2A Enclosure Temperature Alarm Low
149.	YA-212A	Pump Chamber No.2A Pump-A Fault Alarm - Logic
150.	YA-212B	Pump Chamber No.2A Pump-B Fault Alarm - Logic
151.	YAH-212	RTU-2A Enclosure Intrusion Alarm
152.	YAH-212-30	RTU-2A Enclosure Analog Input 3-0 Surge Alarm (IT-212A)
153.	YAH-212-31	RTU-2A Enclosure Analog Input 3-1 Surge Alarm (LIT-212)
154.	YAH-212-32	RTU-2A Enclosure Analog Input 3-2 Surge Alarm (IT-212B)
155.	YAH-212-120	RTU-2A Enclosure 120VAC Surge Alarm
156.	BQ-213-30	RTU-3A Enclosure Analog Input 3-0 Bad Quality (IT-213A)
157.	BQ-213-31	RTU-3A Enclosure Analog Input 3-1 Bad Quality (LIT-213)
158.	BQ-213-32	RTU-3A Enclosure Analog Input 3-2 Bad Quality (IT-213B)
159.	BQ-213-40	RTU-3A Enclosure Analog Input 4-0 Bad Quality (FIT-105)
160.	BQ-213-41	RTU-3A Enclosure Analog Input 4-1 Bad Quality (FIT-103)
161.	FAL-103	Pump Chamber No.3 Effluent Water Flow Alarm Low
162.	FAL-105	Pump Chamber No.3A Effluent Water Flow Alarm Low
163.	FDA-103	Pump Chamber No.3 Effluent Water Flow Reverse Alarm
164.	FDA-105	Pump Chamber No.3A Effluent Water Flow Reverse Alarm
165.	HA-213A	Pump Chamber No.3A Pump-A HOA NOT in Auto Alarm
166.	HA-213B	Pump Chamber No.3A Pump-B HOA NOT in Auto Alarm
167.	IAH-213A	Pump Chamber No.3A Pump-A Amps Alarm High
168.	IAH-213B	Pump Chamber No.3A Pump-B Amps Alarm High
169.	JAH-213A	Pump Chamber No.3A Pump-A Overload Alarm
170.	JAH-213B	Pump Chamber No.3A Pump-B Overload Alarm
171.	LAHH-104	Flow Chamber Level Alarm High High
172.	LAHH-213A	Pump Chamber No.3A Level Alarm High High
173.	LAHH-213	Pump Chamber No.3A Water Level Alarm High High
174.	LALL-213	Pump Chamber No.3A Water Level Alarm Low Low
175.	TAL-213	RTU-3A Enclosure Temperature Alarm Low
176.	YA-213A	Pump Chamber No.3A Pump-A Fault Alarm – Logic

No.	Tag	Description
177.	YA-213B	Pump Chamber No.3A Pump-B Fault Alarm – Logic
178.	YAH-213	RTU-3A Enclosure Intrusion Alarm
179.	YAH-213-30	RTU-3A Enclosure Analog Input 3-0 Surge Alarm (IT-213A)
180.	YAH-213-31	RTU-3A Enclosure Analog Input 3-1 Surge Alarm (LIT-213)
181.	YAH-213-32	RTU-3A Enclosure Analog Input 3-2 Surge Alarm (IT-213B)
182.	YAH-213-40	RTU-3A Enclosure Analog Input 4-0 Surge Alarm (FIT-105)
183.	YAH-213-41	RTU-3A Enclosure Analog Input 4-1 Surge Alarm (FIT-103)
184.	YAH-213-120	RTU-3A Enclosure 120VAC Surge Alarm
185.	BQ-102-50	RTU-102 Enclosure Analog Input 5-0 Bad Quality (FIT-1)
186.	BQ-102-51	RTU-102 Enclosure Analog Input 5-1 Bad Quality (FIT-2)
187.	BQ-102-52	RTU-102 Enclosure Analog Input 5-2 Bad Quality (FIT-3)
188.	BQ-102-53	RTU-102 Enclosure Analog Input 5-3 Bad Quality (FIT-4)
189.	BQ-102-60	RTU-102 Enclosure Analog Input 6-0 Bad Quality (LT-1)
190.	BQ-102-61	RTU-102 Enclosure Analog Input 6-1 Bad Quality (LT-2)
191.	BQ-102-62	RTU-102 Enclosure Analog Input 6-2 Bad Quality (LT-3)
192.	BQ-102-63	RTU-102 Enclosure Analog Input 6-3 Bad Quality (LT-4)
193.	BQ-102-70	RTU-102 Enclosure Analog Input 7-0 Bad Quality (FIT-5)
194.	FAL-1	Wet Well 1 Effluent Water Flow Alarm Low
195.	FAL-2	Wet Well 2 Effluent Water Flow Alarm Low
196.	FAL-3	Wet Well 3 Effluent Water Flow Alarm Low
197.	FAL-4	Wet Well 4 Effluent Water Flow Alarm Low
198.	FAL-5	Sample Pit Effluent Water Flow Alarm Low
199.	FDA-1	Wet Well 1 Effluent Water Flow Reverse Alarm
200.	FDA-2	Wet Well 2 Effluent Water Flow Reverse Alarm
201.	FDA-3	Wet Well 3 Effluent Water Flow Reverse Alarm
202.	FDA-4	Wet Well 4 Effluent Water Flow Reverse Alarm
203.	FDA-5	Sample Pit Effluent Water Flow Reverse Alarm
204.	JAH-1	Wet Well 1 Pump Overload Alarm
205.	JAH-2	Wet Well 2 Pump Overload Alarm
206.	JAH-3	Wet Well 3 Pump Overload Alarm
207.	JAH-4	Wet Well 4 Pump Overload Alarm
208.	LAH-1	102nd Street Manhole No.8 Level Alarm High
209.	LAH-2	102nd Street Manhole No.9 Level Alarm High
210.	LAH-3	102nd Street Manhole No.10 Level Alarm High
211.	LAH-5	102nd Street Sample Pit Level Alarm High
212.	LAHH-1	Wet Well 1 Water Level Alarm High High
213.	LAHH-2	Wet Well 2 Water Level Alarm High High
214.	LAHH-3	Wet Well 3 Water Level Alarm High High
215.	LAHH-4	Wet Well 4 Water Level Alarm High High
216.	LALL-1	Wet Well 1 Water Level Alarm Low Low
217.	LALL-2	Wet Well 2 Water Level Alarm Low Low
218.	LALL-3	Wet Well 3 Water Level Alarm Low Low
219.	LALL-4	Wet Well 4 Water Level Alarm Low Low
220.	YA-1	Wet Well 1 Pump Fault Alarm – Logic or HOA in Hand
221.	YA-2	Wet Well 2 Pump Fault Alarm – Logic or HOA in Hand

No.	Tag	Description
222.	YA-3	Wet Well 3 Pump Fault Alarm – Logic or HOA in Hand
223.	YA-4	Wet Well 4 Pump Fault Alarm – Logic or HOA in Hand
224.	YAH-102	RTU-102 Enclosure Intrusion Alarm
225.	YAH-102-50	RTU-102 Enclosure Analog Input 5-0 Surge Alarm (FIT-1)
226.	YAH-102-51	RTU-102 Enclosure Analog Input 5-1 Surge Alarm (FIT-2)
227.	YAH-102-52	RTU-102 Enclosure Analog Input 5-2 Surge Alarm (FIT-3)
228.	YAH-102-53	RTU-102 Enclosure Analog Input 5-3 Surge Alarm (FIT-4)
229.	YAH-102-60	RTU-102 Enclosure Analog Input 6-0 Surge Alarm (LT-1)
230.	YAH-102-61	RTU-102 Enclosure Analog Input 6-1 Surge Alarm (LT-2)
231.	YAH-102-62	RTU-102 Enclosure Analog Input 6-2 Surge Alarm (LT-3)
232.	YAH-102-63	RTU-102 Enclosure Analog Input 6-3 Surge Alarm (LT-4)
233.	YAH-102-70	RTU-102 Enclosure Analog Input 7-0 Surge Alarm (FIT-5)
234.	YAH-102-120	RTU-102 Enclosure 120VAC Surge Alarm

Appendix F
Potential Operating Problems/Troubleshooting

Appendix F Love Canal
Potential Operating Problems/Troubleshooting

Problem	Potential Sources of Problems	Solution	Associated Alarms
Pump Chambers			
1. Too little or no water to treatment system	• Pump problems • Power failure • Pump chambers dry • Line leaks • Lines plugged • PLC malfunction • High system pressure • Influent valve malfunction	• Repair or replace • Check power, disconnects, breakers, etc. • Verify • Find leaks and repair • Find plugs and clean • Reset PLC, and call for programming assistance • Verify valve positions • Repair or replace	Station PC3 Wetwell Level Station PC3A Wetwell Level
2. Too much water to system	• Influent valve malfunction • PLC malfunction	• Repair or replace • Reset PLC, and call for programming assistance	
3. PC1, PC2, PC1A, and PC2A dry	• Drain system damaged or plugged • •Faulty level transmitter	• Find problem and repair • Repair or replace	Station PC1 Wetwell Level Station PC1A Wetwell Level Station PC2 Wetwell Level Station PC2A Wetwell Level
4. PC3 and PC3A dry	• PC1, PC2, PC1A, or PC2A pumps not running • Power failure • Lines to chambers plugged • PLC malfunction • High system pressure • Faulty level transmitter	• Repair or replace • Check power, disconnects, breakers, etc. • Find plugs and clean • Reset PLC, and call for programming assistance • Verify valve positions • Repair or replace	Station PC3 Wetwell Level Station PC3A Wetwell Level

Problem	Potential Sources of Problems	Solution	Associated Alarms
5. PC1, PC2, PC1A, and PC2A full	• PC1, PC2, PC1A, or PC2A pumps not running • Power failure • Lines from chambers plugged • PLC malfunction • High system pressure • Faulty level transmitter	• Repair or replace • Check power, disconnects, breakers, etc. • Find plugs and clean • Reset PLC, and call for programming assistance • Verify valve positions • •Repair or replace	Station PC1 Wetwell Level Station PC1A Wetwell Level Station PC2 Wetwell Level Station PC2A Wetwell Level
6. PC3 and PC3A full	• PC1, PC2, PC1A, or PC2A pumps running • PC3 or PC3A pumps not running • Power failure • Lines from chambers plugged • PLC malfunction • High system pressure • Faulty level transmitter	• Check flows and controls (are pumps in hand) • Repair or replace • Check power, disconnects, breakers, etc. • Find plugs and clean • Reset PLC, and call for programming assistance • Verify valve positions • Repair or replace	Station PC3 Wetwell Level Station PC3A Wetwell Level
7. RTU panel high temperature	• Excessive heat generated by equipment in the panel or by outside source • Faulty heater • Faulty temperature switch	• Find heat source and resolve • Repair or replace heater • Repair or replace switch	RTU L Temp PC1 RTU L Temp PC1A RTU L Temp PC2 RTU L Temp PC2A RTU L Temp PC3 RTU L Temp PC3A
8. RTU panel intrusion	• Someone has opened the door on the panel • Faulty switch	• Confirm and correct • Repair or replace switch	Station PC1 Intrusion Alarm Station PC1A Intrusion Alarm Station PC2 Intrusion Alarm Station PC2A Intrusion Alarm Station PC3 Intrusion Alarm Station PC3A Intrusion Alarm

Problem	Potential Sources of Problems	Solution	Associated Alarms
9. Motor overload tripped or amps high	• The motor to the respective pump is drawing excessive current	• Replace or repair motor and/or pump	Station PC1 Pump AMP 1 Station PC1A Pump A AMP 1 Station PC2 Pump AMP 1 Station PC2A Pump A AMP 1 Station PC3 Pump A AMP 1 Station PC3A Pump A AMP 1 Station PC1A Pump B AMP 1 Station PC2 Pump B AMP 1 Station PC2A Pump B AMP 1 Station PC3 Pump B AMP 1 Station PC3A Pump B AMP 1 Station PC1 Pump Overload Alarm Station PC1A Pump A Overload Alarm Station PC2 Pump Overload Alarm Station PC2A Pump A Overload Alarm Station PC3 Pump A Overload Alarm Station PC3A Pump A Overload Alarm Station PC1A Pump B Overload Alarm Station PC2A Pump B Overload Alarm Station PC3 Pump B Overload Alarm Station PC3A Pump B Overload Alarm
Treatment Building			
Raw Water Tank			Raw Water Tank (LTI-106) Level (Ft), identified as LT-6 on HMI screen
1. High level	• Flow from pump chambers too high • Discharge line plugged or valve shut • Raw Water Feed Pump not running • Instrument malfunction	• Verify, correct • Find plug and clean, or open valve • Electrical or instrument problem, repair • Check instrument	Raw Water Tank BQA
2. Low level	• Tank leak • Raw Water Feed Pump pumping too fast • Instrument malfunction • Feed to tank too low	• Repair • Verify level instruments, VFD • Check instrument • Check flow setpoint (see above)	

Problem	Potential Sources of Problems	Solution	Associated Alarms
Raw Water Feed Pump and Filter Feed Pump			
1. High pressure	• Discharge line plugged or valve shut	• Find plug and clean or open valve	
2. Pump not reacting (design flow rate/design head)	• Insufficient NPSH • System head greater than anticipated • Entrained air • Direction of rotation wrong • Impeller too small • Impeller clearance too large • Plugged impeller/suction line • Wet end parts worn	• Recalculate NPSH available/required • Reduce system head • Release air • Reverse 2 of 3 leads (phase) • Replace • Reset clearance • Clean • Repair/replace	
3. No discharge when pump running	• Not primed • Suction line plugged or valve shut • Direction of rotation wrong • Entrained air • Plugged impeller • Damaged pump shaft/impeller	• Repeat priming • Find plug and clean, or open valve • Reverse 2 of 3 leads (phase) • Release air • Clean • Replace	
4. Pump operates for short period, then loses prime	• Insufficient NPSH • Entrained air	• Recalculate NPSH available/required • Check and repair	
5. Excessive noise from wet end	• Cavitation • Abnormal fluid rotation • Impeller rubbing	• Recalculate NPSH available/required • Redesign suction piping • Check/reset clearance and outboard bearing assembly	
6. Excessive noise from power end	• False brinelling • Thrust overload on bearing • Misalignment • Bearing damage	• Correct vibration source • Remount bearings • Remount properly • Refer to manufacturer's instructions	

Problem	Potential Sources of Problems	Solution	Associated Alarms
7. Pump not running	• VFD in manual • Auto mode on VFD needs to be reset	• Press [F2] on VFD to place VFD in AUTO • Turn HOA switch on pump from AUTO to OFF and back to AUTO	
Filter Feed Tank			Filter Feed Tank (LIT-107) Level (Ft), identified as LT-1 on HMI screen Filter Feed Tank Level BQA
1. High level	• Flow from clarifier too high • Discharge line plugged or valve shut • Filter Feed Pump not running • Instrument malfunction • Bag filters plugged • Carbon vessels plugged	• Verify, correct • Find plug and clean or open valve • Electrical or instrument problem, repair • Check instrument • Replace bag filters • Backwash or change carbon	
2. Low Level	• Tank Leak • Filter Feed Pump pumping too fast • Instrument malfunction • Feed to tank too low	• Repair • Verify level instruments, VFD • Check instrument • Check flow from clarifier/Raw Water Tank	
Clarifier			
1. High level	• Flow from Raw Water Tank too high • Discharge line plugged	• Verify, correct • Find plug and clean	
Effluent metering pump (If needed)			
1. Pump loses prime	• Dirty check valve • Ball checks not seating/sealing properly • Drum allowed to run dry	• Clean or replace • Clean or replace • Replace drum and prime pump	
2. Fitting	• Loose fittings • Broken or twisted gasket • Chemical attack	• Tighten fittings • Check/replace gasket • Replace pump	
3. Leakage at tubing	• Worn tube ends • Chemical attack	• Cut off end of tubing and replace • Replace pump	

Problem	Potential Sources of Problems	Solution	Associated Alarms
4. Failure	• Too much pressure at discharge • Check valves not sealing • Output dials not at maximum • Suction lift too high	• Check ball check valves and injectors • Clean or replace • Prime with output dials at maximum • Decrease suction lift	
Sludge Tank			Sludge Holding Tank (LIT-105) Level (Ft), identified as LT-5 on HMI screen
1. High level	• Flow from clarifier tank too high • Discharge line plugged or valve shut • Instrument malfunction	• Verify, correct • Find plug and clean or open valve • Check instrument	
Bag Filters			North Bag Filter Differential Pressure
1. High differential pressure	• Plugged bags	• Change bags	South Bag Filter Differential Pressure
2. Low differential pressure	• Leaks • Hole in bag • Instrument malfunction	• Repair leaks • Change bags • Check instrument	
Carbon Vessels			
1. High differential pressure	• Plugged carbon • Bed not flooded • Plugged line • Leaks • Instrument malfunction • Closed valves in the GAC system	• Backwash or change carbon • Open vent valve to release pressure • Find plugged area and clean • Repair leaks • Check instrument • Check all valves for correct positions	
2. Low differential pressure	• Faulty pressure relief valve or rupture disk	• Replace or repair (Replace rupture disk when source of overpressurization, if any, is removed)	
3. Carbon in the effluent	• Internal mechanical (underdrain) failure	• Remove carbon and repair	
4. Excessive flow out vent line	• Broken rupture disk	• Replace rupture disk when source of over pressurization is removed (check manufacturer's instructions)	

Appendix G
Sequence Summary

Appendix G Sequence Summary for Love Canal Landfill Site

SEQ	Description
1	Shutdown Treatment Plant
2	Inhibit Manhole 7 Pump From Running
3	Inhibit Manhole 8 Pump From Running
4	Inhibit Pump Chamber 3 Pump A From Running
5	Inhibit Pump Chamber 3 Pump B From Running
6	Inhibit 102nd Street Well Pumps From Running
7	Inhibit Pump Chamber 1A Pump A From Running
8	Inhibit Pump Chamber 1A Pump B From Running
9	Inhibit Pump Chamber 2A Pump A From Running
10	Inhibit Pump Chamber 2A Pump B From Running
11	Inhibit Pump Chamber 3A Pump A From Running
12	Inhibit Pump Chamber 3A Pump B From Running
13	Inhibit Raw Water Feed Pump From Running
14	Inhibit Filter Feed Pump From Running
15	Inhibit DCF Pump Chamber 4 Pump From Running
16	Inhibit DCF Pump Chamber 3 Pump From Running

Appendix H
Inspection Forms

Glenn Springs Holdings, Inc.

A subsidiary of Occidental Petroleum

WNY Daily Inspection Sheet

Date: ________________

Time: _______________

Love Canal: ______ S-Area: ______

Hyde Park: ______ NT: ______

102nd St: ______

Inspected By: ________________

Weekend Inspection: Y ☐ N ☐

Satisfactory

Y / N **Security:** Fence Integrity; Postings/Signs; Buildings; and Lighting.

Y / N **Vehicles:** Secure; and Properly Operating.

Y / N **Communications:** Phone Systems; Network(s); Auto-dialers; and HMI's.

Y / N **Utilities:** Gas; Electric; and Water/Sewer.

Y / N **House Keeping:** Garbage; Fence Lines; Walkways/Roadways; Control Room; Locker Room; Offices; Auxiliary Buildings; Maintenance Work Areas; MCC's; and Process.

Y / N **HMI Data:** Reviewed data. Wells Operating at Set Point (Any Discrepancy Noted in Comments).

Y / N **Process:** Tanks and Associated Piping and Transfer Lines; Containment; and Sumps.

Y / N **Storage Dikes:** Tanks; Decanters; Sumps; and Piping.

Y / N **Containment:** Secondary and Leak Detection.

Y / N

Container Storage Area: Container(s) Non-Leaking, Non-Corroded; Closed; Labeled; and Contained (Stored containers meet all applicable regulations).

Earliest Stored Drum Date ________________ (<90 Days)

Quantity of Containers ________________

COMMENTS: ____

____

____

____

If any Inspections item(s) are NOT Satisfactory comment above and describe what corrective actions were taken.

Signature: ________________________________

Glenn Springs Holdings, Inc.

A subsidiary of Occidental Petroleum

MONTHLY INSPECTION LOG SHEET

Date: __________________________ Inspected By: ___________________________________

____ Fire extinguisher inspection conducted and recorded on fire extinguisher tags

____ First aid kits inspected and recorded on kit log

____ Safety Showers/Eye Wash Stations inspected (clean, adequate flow) and recorded on tags

____ Check for breakthrough (>20 ppm) of carbon vent sorb drums (with PID)

Indicate drums requiring replacement ____

____ Ladders inspected and recorded on tags

____ Portable electrical equipment, extension cords, hand tools inspected

____ Autodialer - low battery light

____ Exits (free of obstructions, clear path to exit)

____ Exit Lights/Emergency Lights (operational)

____ Visual inspection of all process vessels and tanks (leaks, corrosion)

____ Perimeter Fence (cursory visual from distance - no obvious damage, signage in place)

____ Dielectric matting -free from damage, holes, cuts, or deterioration or imbedded objects that may affect its insulating properties

Repairs/Replacements Required: ____

____

____.

Glenn Springs Holdings, Inc.
A subsidiary of Occidental Petroleum

Love Canal Semi-Annual Barrier Drain Manhole Inspection

Date ____________________

Sector	MH No.	Location	Water Y/N	Level Feet	Debris Y/N	Structure OK	Cleaning Y/N	Comments
North Colvin	MH-10A	NW						
	MH-8A	NW						
	MH-6C	NW						
	MH-6B	NW						
	MH-6A	NW						
	PC-2A	NW						
	MH-4A	NW						
	MH-2A	NW						
	MH-2	SW						
	MH-4	SW						
	MH-6	SW						
	MH-8/PC2	SW						
	MH-10	SW						
	MH-12	SW						
South Frontier	MH-14	SW						
North Colvin	NH-17A	NE						
	MH-15A	NE						
	MH-13A	NE						
	PC1A	NE						
	MH-11A	NE						
	MH-9A	NE						
	MH-7A	NE						
	MH-5A	NE						
	MH-3A	NE						
	MH-1A	NE						
	MH-1	SE						
	MH-3	SE						
	MH-5	SE						
	MH-7/PC1	SE						
	MH-9	SE						
	MH-11	SE						
South Frontier	MH-13	SE						

Signature: ____________________

Glenn Springs Holdings, Inc.
A subsidiary of Occidental Petroleum

SEMIANNUAL LANDFILL CAP, SITE COVER, AND FENCE INSPECTION

Site: ______________________

Date: ______________________ **Weather:** ______________

Inspector: ______________________

Inspection Item	Applicable to Site	Inspect For	
1. **Landfill Cap**	Y / N	- signs of erosion (cap, ditches, swales)	Y / N
		- exposure of the HDPE Liner	Y / N
		- areas of insufficient grass coverage	Y / N
		- signs of dead/dying grass	Y / N
		- presence of washouts	Y / N
		- settlement causing ponding of water	Y / N
		- signs of slope instability	Y / N
		- signs of burrowing by animals	Y / N
		- presence of rooting trees (cap, ditches, swales)	Y / N
		- signs of poor drainage in ditches/swales	Y / N
2. **Site Cover**	Y / N	- signs of erosion (cover, ditches, swales)	Y / N
(Asphalt, Grass, Vegetation)		- areas of insufficient asphalt, grass, vegetation coverage	Y / N
		- signs of dead/dying grass/vegetation	Y / N
		- presence of washouts	Y / N
		- settlement causing ponding of water	Y / N
		- signs of slope instability	Y / N
		- signs of burrowing by animals	Y / N
		- presence of rooting trees (cover, ditches, swales)	Y / N
		- signs of poor drainage in ditches/swales	Y / N
3. **Perimeter Fence**	Y / N	- breaches in fence	Y / N
		- gates secure	Y / N
		- locks in place	Y / N
		- missing or illegible signage	Y / N

Comments/Remarks **(Note: If repair/maintenance is recommended, describe its location/extent below)**

____

____

____

____

____

____

OXY Glenn Springs Holdings, Inc.
A subsidiary of Occidental Petroleum

Love Canal Semiannual Barrier System / Pump Chamber Inspections

Date: ______________________
Inspector: ______________________

Weather: ______________________
____

Check the Following as Appropriate:

Visual Inspection of chamber piping
Verification of level probe performance
Inspection of pump chamber integrity
Inspection of pump chamber security

Wells	Satisfactory	Needs Maintenance
PC-1		
PC-2		
PC-3		
PC-1A		
PC-2A		
PC-3A		

Comments:

Signature: ______________________

Glenn Springs Holdings, Inc.
A subsidiary of Occidental Petroleum

ANNUAL LEVEL SWITCH INSPECTION

Site: Love Canal

Date: ____________________ **Weather:** ____________________

Inspector: ____________________

Inspection Item **Trigger level switch to verify interlock functioning**

			Interlock functioning
1. **Level Switch Operation**	- PC-3	LAHH-205A	Y / N
	- PC-3A	LAHH-213A	Y / N
	- DCF PC-4	LAHH-221	Y / N
	- Raw Water Tank	LAHH-106A	Y / N
	- Filter Feed Tank	LAHH-107A	Y / N
	- Treatment Facility Trench	LAH-113	Y / N
	- Leak Detection MH No. 8	LSH-1	Y / N
	- Leak Detection MH No. 9	LSH-2	Y / N
	- Leak Detection MH No. 10	LSH-3	Y / N
	- Sample Pit	LSH-5	Y / N

Comments/Remarks **(Note: If repair/maintenance is recommended, describe its location/extent below)**

about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

John Pentilchuk
John.Pentilchuk@ghd.com
519.340.4313

www.ghd.com

Appendix E
Institutional and Engineering Controls Certification Form

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Division of Environmental Remediation
625 Broadway, 11th Floor, Albany, NY 12233-7020
P: (518)402-9543 | F: (518)402-9547
www.dec.ny.gov

12/14/2017

Joseph Branch Project Coordinator
OCC/Glenn Springs Holdings, Inc.
7601 Old Channel Trail
Montaque, MI 49437

RE: Reminder Notice: Site Management Periodic Review Report and IC/EC Certification Submittal
Site Name: Love Canal
Site No.: 932020
Site Address: 805 97th Street

Dear Mr. Branch:

This letter serves as a reminder that sites in active Site Management (SM) require the submittal of a periodic progress report. This report, referred to as the Periodic Review Report (PRR), must document the implementation of and compliance with, site specific SM requirements. Section 6.3(b) of DER-10 Technical Guidance for Site Investigation and Remediation (available online at http://www.dec.ny.gov/regulations/67386.html) provides guidance regarding the information that must be included in the PRR. Further, if the site is comprised of multiple parcels, then you as the Certifying Party must arrange to submit one PRR for all parcels that comprise the site. The PRR must be received by the Department no later than **January 31, 2018**. Guidance on the content of a PRR is enclosed.

Site Management is defined in regulation (6 NYCRR 375-1.2(at)) and in Chapter 6 of DER-10. Depending on when the remedial program for your site was completed, SM may be governed by multiple documents (e.g., Operation, Maintenance, and Monitoring Plan; Soil Management Plan) or one comprehensive Site Management Plan.

A Site Management Plan (SMP) may contain one or all of the following elements, as applicable to the site: a plan to maintain institutional controls and/or engineering controls ("IC/EC Plan"); a plan for monitoring the performance and effectiveness of the selected remedy ("Monitoring Plan"); and/or a plan for the operation and maintenance of the selected remedy ("O&M Plan"). Additionally, the technical requirements for SM are stated in the decision document (e.g., Record of Decision) and, in some cases, the legal agreement directing the remediation of the site (e.g., order on consent, voluntary agreement, etc.).

When you submit the PRR (by the due date above), include the enclosed forms documenting that all SM requirements are being met. The Institutional Controls (ICs) portion of the form (Box 6) must be signed by you or your designated representative. The Engineering Controls (ECs) portion of the form (Box 7) must be signed by a Qualified Environmental Professional (QEP). If you cannot certify that all SM requirements are being met, you must submit a Corrective Measures Work Plan that identifies the actions to be taken to restore compliance. The work plan must include a schedule to be approved by the Department. The Periodic Review process will not be considered complete until all necessary corrective measures are completed and all required controls are certified. Instructions for completing the certifications are enclosed.

All site-related documents and data, including the PRR, are to be submitted in electronic format to the Department of Environmental Conservation. The Department will not approve the PRR unless all documents and data generated in support of that report have been submitted in accordance with the electronic submissions protocol. In addition, the certification forms are required to be submitted in both paper and electronic formats.

Information on the format of the data submissions can be found at:
http://www.dec.ny.gov/regulations/2586.html

The signed certification forms should be sent to Brian Sadowski, Project Manager, at the following address:

New York State Department of Environmental Conservation
270 Michigan Avenue Buffalo, NY 14203-2915

Phone number: 716-851-7220 E-mail: brian.sadowski@dec.ny.gov

The contact information above is also provided so that you may notify the project manager about upcoming inspections, or for any other questions or concerns that may arise in regard to the site.

Enclosures

PRR General Guidance
Certification Form Instructions
Certification Forms

ec: w/enclosures
Brian Sadowski, Project Manager
Chad Staniszewski, Hazardous Waste Remediation Engineer, Region 9
John Pentilchuk, GHD Group

Enclosure 1 Certification

Instructions

I. Verification of Site Details (Box 1 and Box 2):

Answer the three questions in the Verification of Site Details Section. The Owner and/or Qualified Environmental Professional (QEP) may include handwritten changes and/or other supporting documentation, as necessary.

II. Certification of Institutional / Engineering Controls (Boxes 3, 4, and 5)

Review the listed IC/ECs, confirming that all existing controls are listed, and that all existing controls are still applicable. If there is a control that is no longer applicable the Owner / Remedial Party should petition the Department separately to request approval to remove the control.

In Box 5, complete certifications for all Plan components, as applicable, by checking the corresponding checkbox.

If you cannot certify "YES" for each Control listed in Box 3 & Box 4, sign and date the form in Box 5. Attach supporting documentation that explains why the **Certification** cannot be rendered, as well as a plan of proposed corrective measures, and an associated schedule for completing the corrective measures. Note that this **Certification** form must be submitted even if an IC or EC cannot be certified; however, the certification process will not be considered complete until corrective action is completed.

If the Department concurs with the explanation, the proposed corrective measures, and the proposed schedule, a letter authorizing the implementation of those corrective measures will be issued by the Department's Project Manager. Once the corrective measures are complete, a new Periodic Review Report (with IC/EC Certification) must be submitted within 45 days to the Department. If the Department has any questions or concerns regarding the PRR and/or completion of the IC/EC Certification, the Project Manager will contact you.

III. IC/EC Certification by Signature (Box 6 and Box 7**):**

If you certified "YES" for each Control, please complete and sign the IC/EC Certifications page as follows:

- Where the only control is an Institutional Control on the use of the property, the certification statement in Box 6 shall be completed and may be made by the property owner.
- Where the site has Institutional and Engineering Controls, the certification statement in Box 7 must be completed by a Professional Engineer or Qualified Environmental Professional, as noted on the form.

Enclosure 2

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Site Management Periodic Review Report Notice
Institutional and Engineering Controls Certification Form

Site Details **Box 1**

Site No. 932020

Site Name Love Canal

Site Address: 805 97th Street Zip Code: 14304
City/Town: Niagara Falls
County: Niagara
Site Acreage: 70.0

Reporting Period: January 1, 2017 to December 31, 2017

	YES	NO
1. Is the information above correct?	☐	☐
If NO, include handwritten above or on a separate sheet.		
2. Has some or all of the site property been sold, subdivided, merged, or undergone a tax map amendment during this Reporting Period?	☐	☐
3. Has there been any change of use at the site during this Reporting Period (see 6NYCRR 375-1.11(d))?	☐	☐
4. Have any federal, state, and/or local permits (e.g., building, discharge) been issued for or at the property during this Reporting Period?	☐	☐

If you answered YES to questions 2 thru 4, include documentation or evidence that documentation has been previously submitted with this certification form.

	YES	NO
5. Is the site currently undergoing development?	☐	☐

Box 2

	YES	NO
6. Is the current site use consistent with the use(s) listed below?	☐	☐
7. Are all ICs/ECs in place and functioning as designed?	☐	☐

IF THE ANSWER TO EITHER QUESTION 6 OR 7 IS NO, sign and date below and DO NOT COMPLETE THE REST OF THIS FORM. Otherwise continue.

A Corrective Measures Work Plan must be submitted along with this form to address these issues.

____ ____________________
Signature of Owner, Remedial Party or Designated Representative Date

SITE NO. 932020

Description of Engineering and Institutional Controls **Boxes 3 and 4**

Parcel	Engineering Control	Institutional Control
232 Parcels	Cover System Fencing/Access Control Groundwater Containment Leachate Collection Pump & Treat	Building Use Restriction Ground Water Use Restriction Landuse Restriction Monitoring Plan O&M Plan

161.19-1-1
161.57-1-1
161.65-1-1
161.73-1-1
161.57-1-2
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161.73-1-2
161.57-1-3
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161.18-1-18

Periodic Review Report (PRR) Certification Statements **Box 5**

1. I certify by checking "YES" below that:

   a) the Periodic Review report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

   b) to the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and the information presented is accurate and complete.

YES	NO
☐	☐

2. If this site has an IC/EC Plan (or equivalent as required in the Decision Document), for each Institutional or Engineering control listed in Boxes 3 and/or 4, I certify by checking "YES" below that all of the following statements are true:

(a) the Institutional Control and/or Engineering Control(s) employed at this site is unchanged since the date that the Control was put in-place, or was last approved by the Department;

(b) nothing has occurred that would impair the ability of such Control, to protect public health and the environment;

(c) access to the site will continue to be provided to the Department, to evaluate the remedy, including access to evaluate the continued maintenance of this Control;

(d) nothing has occurred that would constitute a violation or failure to comply with the Site Management Plan for this Control; and

(e) if a financial assurance mechanism is required by the oversight document for the site, the mechanism remains valid and sufficient for its intended purpose established in the document.

YES	NO
☐	☐

IF THE ANSWER TO QUESTION 2 IS NO, sign and date below and DO NOT COMPLETE THE REST OF THIS FORM. Otherwise continue.

A Corrective Measures Work Plan must be submitted along with this form to address these issues.

____
Signature of Owner, Remedial Party or Designated Representative

____
Date

IC CERTIFICATIONS
SITE NO. 932020

Box 6

SITE OWNER OR DESIGNATED REPRESENTATIVE SIGNATURE

I certify that all information and statements in Boxes 1, 2 and 3 are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

I ________________________________ at ____,
print name print business address

am certifying as ____(Owner or Remedial Party)

for the Site named in the Site Details Section of this form.

____ ________________
Signature of Owner or Remedial Party Rendering Certification Date

IC/EC CERTIFICATIONS

Box 7

Qualified Environmental Professional Signature

I certify that all information in Boxes 4 and 5 are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

I ______________________ at ______________________________________,
print name print business address

am certifying as a Qualified Environmental Professional for the ______________________
(Owner or Remedial Party)

Signature of Qualified Environmental Professional, for the Owner or Remedial Party, Rendering Certification	Stamp (Required for PE)	Date

Enclosure 3
Periodic Review Report (PRR) General Guidance

I. Executive Summary: (1/2-page or less)
  A. Provide a brief summary of site, nature and extent of contamination, and remedial history.
  B. Effectiveness of the Remedial Program - Provide overall conclusions regarding;
    1. progress made during the reporting period toward meeting the remedial objectives for the site
    2. the ultimate ability of the remedial program to achieve the remedial objectives for the site.
  C. Compliance
    1. Identify any areas of non-compliance regarding the major elements of the Site Management Plan (SMP, i.e., the Institutional/Engineering Control (IC/EC) Plan, the Monitoring Plan, and the Operation & Maintenance (O&M) Plan).
    2. Propose steps to be taken and a schedule to correct any areas of non-compliance.
  D. Recommendations
    1. recommend whether any changes to the SMP are needed
    2. recommend any changes to the frequency for submittal of PRRs (increase, decrease)
    3. recommend whether the requirements for discontinuing site management have been met.

II. Site Overview (one page or less)

A. Describe the site location, boundaries (figure), significant features, surrounding area, and the nature and extent of contamination prior to site remediation.

B. Describe the chronology of the main features of the remedial program for the site, the components of the selected remedy, cleanup goals, site closure criteria, and any significant changes to the selected remedy that have been made since remedy selection.

III. Evaluate Remedy Performance, Effectiveness, and Protectiveness

Using tables, graphs, charts and bulleted text to the extent practicable, describe the effectiveness of the remedy in achieving the remedial goals for the site. Base findings, recommendations, and conclusions on objective data. Evaluations and should be presented simply and concisely.

IV. IC/EC Plan Compliance Report (if applicable)
  A. IC/EC Requirements and Compliance
    1. Describe each control, its objective, and how performance of the control is evaluated.
    2. Summarize the status of each goal (whether it is fully in place and its effectiveness).
    3. Corrective Measures: describe steps proposed to address any deficiencies in ICECs.
    4. Conclusions and recommendations for changes.
  B. IC/EC Certification
    1. The certification must be complete (even if there are IC/EC deficiencies), and certified by the appropriate party as set forth in a Department-approved certification form(s).

V. Monitoring Plan Compliance Report (if applicable)

A. Components of the Monitoring Plan (tabular presentations preferred) - Describe the requirements of the monitoring plan by media (i.e., soil, groundwater, sediment, etc.) and by any remedial technologies being used at the site.

B. Summary of Monitoring Completed During Reporting Period - Describe the monitoring tasks actually completed during this PRR reporting period. Tables and/or figures should be used to show all data.

C. Comparisons with Remedial Objectives - Compare the results of all monitoring with the remedial objectives for the site. Include trend analyses where possible.

D. Monitoring Deficiencies - Describe any ways in which monitoring did not fully comply with the monitoring plan.

E. Conclusions and Recommendations for Changes - Provide overall conclusions regarding the monitoring completed and the resulting evaluations regarding remedial effectiveness.

VI. Operation & Maintenance (O&M) Plan Compliance Report (if applicable)

A. Components of O&M Plan - Describe the requirements of the O&M plan including required activities, frequencies, recordkeeping, etc.

B. Summary of O&M Completed During Reporting Period - Describe the O&M tasks actually completed during this PRR reporting period.

C. Evaluation of Remedial Systems - Based upon the results of the O&M activities completed, evaluated the ability of each component of the remedy subject to O&M requirements to perform as designed/expected.

D. O&M Deficiencies - Identify any deficiencies in complying with the O&M plan during this PRR reporting period.

E. Conclusions and Recommendations for Improvements - Provide an overall conclusion regarding O&M for the site and identify any suggested improvements requiring changes in the O&M Plan.

VII. Overall PRR Conclusions and Recommendations

A. Compliance with SMP - For each component of the SMP (i.e., IC/EC, monitoring, O&M), summarize;

1. whether all requirements of each plan were met during the reporting period
2. any requirements not met
3. proposed plans and a schedule for coming into full compliance.

B. Performance and Effectiveness of the Remedy - Based upon your evaluation of the components of the SMP, form conclusions about the performance of each component and the ability of the remedy to achieve the remedial objectives for the site.

C. Future PRR Submittals

1. Recommend, with supporting justification, whether the frequency of the submittal of PRRs should be changed (either increased or decreased).
2. If the requirements for site closure have been achieved, contact the Departments Project Manager for the site to determine what, if any, additional documentation is needed to support a decision to discontinue site management.

VIII. Additional Guidance

Additional guidance regarding the preparation and submittal of an acceptable PRR can be obtained from the Departments Project Manager for the site.

Appendix F
Remedial Site Optimization Table of Contents

Table of Contents

about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

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