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Construction
Documentation
Report
15292.03

Landfill Gas and Leachate Extraction System Refuse Hideaway Landfill Town of Middleton

Dane County, Wisconsin

Prepared for:

Wisconsin Department of Natural Resources Madison, Wisconsin

Prepared by:

Warzyn Inc. Madison, Wisconsin

November 1991





November 18, 1991

Ms. Theresa A. Evanson Wisconsin Department of Natural Resources Bureau of Solid Waste Management GEF II Building - SW/3 101 South Webster Street Madison, Wisconsin 53707

Re: Construction Documentation Report

Landfill Gas and Leachate Extraction System

Refuse Hideaway Landfill Middleton, Wisconsin Project No. 15292.03

Dear Ms. Evanson:

We are pleased to submit three copies of the Construction Documentation Report for the Landfill Gas and Leachate Extraction System at the Refuse Hideaway Landfill. This report includes the drawing set, which was previously submitted with the Operation and Maintenance Manual, (Warzyn, November 1991). This gas and leachate extraction system was constructed in conformance with the Warzyn Design Report "Gas and Leachate Extraction System", September

We appreciate the opportunity to assist the WDNR on this project. Please contact us if you should have questions or comments.

Sincerely,

WARZYN INC.

Dean R. Free

Project Engineer

mck

Jan C. Kucher, P.E. Project Manager

DRF/ccf/JCK/DFK [mad-109b-58] 15292.03

Enclosure: Construction Documentation Report (3)

THE PERFECT BALANCE BETWEEN TECHNOLOGY

AND CREATIVITY:

Landfill Gas and Leachate Extraction System Refuse Hideaway Landfill Town of Middleton Dane County, Wisconsin

TABLE OF CONTENTS

		Page No.
1.	EXECUTIVE SUMMARY	1-1
2	INTRODUCTION	2.1
2.	INTRODUCTION	2-1
	Background	2-1
	Purpose and Scope	2-1
3.	LANDFILL GAS AND LEACHATE EXTRACTION SYSTEM	
		3-1
	CONSTRUCTION	3-1
	General Discussion	3-1
	Gas Extraction Wells	3-1
	Wellheads	3-2
	Wellheads	3-2 3-3
* .	Vacuum Switches	3 - 3
	Condensate Handling System	3 - 4
	Planar Station	3-5 3-5
	Blower Station	_
	Patra Station	3-6
	Flare Station	3-7
	General DiscussionLeachate Extraction System	3-7
	Leachate Extraction System	3-8
	General Discussion	3-8
	Leachate Extraction Wells	3-9
	Wellheads	3-9
	Leachate Header Piping	3-10
	Leachate Storage, Loadout, and Disposal	3-10
	Leachate Headwell Abandonments	3-11
	General Discussion	3-11
٠.	Final Cover Restoration	3-11
	General Discussion	3-11
	Soils Tests	3-12
	Electrical and Control System	3-13
	General Discussion	3-13
	System Telemetry	3-14
4.	SYSTEM START-UP	4-1
	General Discussion	4-1
	Site Specific Limitations	4-1
	Site Specific Limitations	4-1
	Hlare	4-2
	Start-Up	4-2
	Flare Stack Test	4-3
7.7		•
5.	C C I NC I C I N I C I N	5-1
	CO1(CDC)	

TABLES

Table 1 - Ga	ıs Well	Monitor	ing Table
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Table 2 - Leachate Head Monitoring Table
Table 3 - Landfill Gas and Leachate Extraction System Labeling

TABLE OF CONTENTS (Continued)

APPENDICES

Appendix A- Boring Logs

Appendix B - Well Detail Forms
Appendix C - Characterization of Excavated Refuse
Appendix D - Field Density Test Results and Moisture/Density Curves Appendix E - Clay Cover Grain Size Analysis and Atterberg Limits Appendix F - Clay Cover Permeability Test Results

Appendix G - System Integrity Test Data

Appendix H- Drawings

15292-D1 - Gas and Leachate Extraction System Layout

15292-D2 - Soil Test Locations 15292-D3 - Extraction Well Details

15292-D4 - Piping Details

15292-D5 - Piping Details 15292-D6 - Blower Station Details 15292-D7 - Flare Station Details

15292-D8 - Leachate Loadout Facility and Entrance Gate Details

15292-D9 - Electrical System Layout

Appendix I - Photographs

SECTION 1 EXECUTIVE SUMMARY

CONSTRUCTION DOCUMENTATION REPORT LANDFILL GAS AND LEACHATE EXTRACTION SYSTEM REFUSE HIDEAWAY LANDFILL TOWN OF MIDDLETON DANE COUNTY, WISCONSIN

Construction Start:	October 22, 1990
Construction Substantial Completion:	September 1, 1991
No. of Gas & Leachate Extraction Wells Installed:	3
Type of Pump Installed:	Electric, submersible
No. of Gas Only Extraction Wells Installed:	8
No. of Existing Gas Only Extraction Wells:	2
Well Pipe Material:	SCH 80 PVC
Average Gas & Leachate Extraction Well Depth:	62.1 ft
False Starts:	None
Gas Header Pipe Installed:	Approx 3,000 lf
Gas Header Pipe Material:	HDPE SDR 17
Leachate Header Pipe Installed:	Approx 850 lf
Leachate Header Pipe Material:	HDPE SDR 17
No. of Field Density Tests:	60
No. of Passing Field Density Tests:	60
Maximum System Gas Flow Rate:	650 CFM

SECTION 2 INTRODUCTION

BACKGROUND

The Wisconsin Department of Natural Resources (WDNR) retained Warzyn Inc. (Warzyn) to provide engineering and construction services in relation to Remedial Measures at the Refuse Hideaway Landfill (Landfill). The Landfill is located in the Town of Middleton, Dane County, Wisconsin and has been identified as a source of groundwater contamination, including the presence of volatile organic compounds (VOCs) at three local residential water supply wells. Additionally, off-site migration of landfill gas (LFG), in excess of the lower explosive limit (LEL) of methane, has been recorded.

A landfill gas and leachate extraction system has been installed as a remedial measure to address the environmental contamination/hazard issues. The intent of the landfill gas and leachate extraction system is to reduce leachate head levels in the landfill and reduce off-site migration of landfill gas. This work was performed under agreement No. 81217.89-2, and is described in the September 1990 Engineering Design Report, Warzyn Project No. 13928.48 (Engineering Design Report).

PURPOSE AND SCOPE

Construction activities addressed in this report include the installation of the gas and leachate extraction system, the handling of excavated refuse, the abandonment of existing leachate headwells, and the replacement of clay cover and rooting zone material. This report (text and drawings) describes items of construction at the Landfill and presents field and laboratory test results, a description of the system start-up activities, and construction documentation performed to evaluate compliance with project plans and specifications and WDNR requirements. Appendices A through G include boring logs, well details, refuse characterization, soil testing results, and system integrity test data. Warzyn Drawings 15292-D1 through 15292-D9 (Appendix H) have been prepared to illustrate record conditions. Photographs of various construction activities referenced in the text are contained in Appendix I.

SECTION 3 LANDFILL GAS AND LEACHATE EXTRACTION SYSTEM CONSTRUCTION

GAS EXTRACTION SYSTEM

General Discussion

The gas extraction system installed consists of 13 gas extraction wells (2 of which were installed as part of the partial system, Warzyn Project No. 13928.45, Construction Observation Report, November 1990), wellheads, gas header piping, vacuum switches, condensate handling system, blower station, flare station, system electrical service and controls, and security fencing. The site entrance road is secured with a chainlink locking gate off of Dane U.S. Hwy 14. Refer to detail 3/8 on Drawing 15292-D8 for entrance gate details. System installation began on October 22, 1990 and was substantially completed September 1, 1991. The Partial Gas Extraction System was shut down on May 7, 1991 to allow for full system construction.

Construction activities were performed in accordance with the Engineering Design Report. Engineering drawings, which included system layout and details, were prepared and submitted to WDNR prior to system installation. The Engineering Design Report provided a written description of the system along with back-up calculations.

Gas Extraction Wells

A total of 11 gas extraction wells were installed, starting on October 23, 1990 with well GW3, and finishing on October 30, 1990 with well GW13. Boreholes for the wells were advanced by a track-mounted crane with a 36-in. diameter bucket auger (Photograph No. 1-Appendix I). Occasionally a 36-in. diameter flight auger (liquids bucket) and various bladed augers were used when borehole advancement was difficult due to moisture content or spoils characteristics. Well depths range from 36 ft to 81 ft. Refer to Drawing 15292-D1 for well locations and to Detail 1/3 on Drawing 15292-D3 for extraction well details. The boreholes were advanced to the bottom of refuse. Boring logs for the 13 extraction well boreholes (2 from Partial System construction) are presented in Appendix A. (Also included in Appendix A are the boring logs for the 3 leachate/gas monitoring probes installed with the Partial System). Refuse spoils from the boreholes were disposed of as described in the Refuse Spoils Disposal Section

Gas and Leachate Extraction System Refuse Hideaway Landfill November 18, 1991 Page 3-2

of this report. Air monitoring around the boreholes was performed constantly during construction activities with a portable ambient air monitor used to measure hydrogen sulfide, combustible gas and oxygen.

The gas extraction wells were constructed of a non-perforated section of 6 in. diameter Schedule (SCH) 80 polyvinyl chloride (PVC) pipe extending into a perforated section of 8-in. diameter SCH 80 PVC pipe. A 6-in. x 8-in. PVC reducing slip coupler provides a telescopic connection where the 6-in. diameter non-perforated well pipe can slide into the 8-in. diameter perforated pipe. This connection provides compensation for potential landfill settlement (Photograph No. 2 - Appendix I). The perforations provide approximately 6 sq in. of open space per lineal foot of pipe. The annular space around the screen was backfilled with a filter pack composed of 1 1/2-in. diameter washed stone (coarse gravel). The washed stone backfill extends approximately 2 ft above the top of the screened interval. Above the filter pack, a woven geotextile ring was installed to separate the annular seal from the filter pack. Above the geotextile ring, an approximate 1 ft layer composed of 50% bentonite and 50% select general fill was placed. Above the 50/50 bentonite/fill layer, an approximate 1 ft layer of granular bentonite was installed. Both seals were hydrated in place with water (Photograph No. 4-Appendix I). General fill was then placed above the granular bentonite layer to within approximately 2 ft of the existing top of clay. A 2 ft seal consisting of clay was used to complete the borehole. Gas extraction well detail forms are contained in Appendix B.

Wellheads

A piping assembly (wellhead) is installed at each well to connect each well to the buried gas header piping. Each wellhead includes a section of flexible tubing to allow for differential settlement between the well and header piping; a butterfly valve for control of the well's gas extraction flow rate; two 1/4-in. PVC sample ports for gas sampling and vacuum measurement; and one monitoring port for measuring the gas extraction flow rate. Two 1-in. diameter SCH 80 PVC monitoring riser pipes are installed at each well to allow liquid level measurement without dismantling the wellhead (Photograph No. 9 - Appendix I). The wellhead piping is insulated to minimize the potential for freezing of condensate during cold weather. All 13

wellheads have been enclosed in 4 ft wide x 7 ft long x 6 ft high chain-link fence enclosures with tops for security. Refer to Detail 2/3 on Drawing 15292-D3 for wellhead details.

Gas Header Piping

The gas header piping which transports the LFG from the extraction wells to the blower and flare stations consists of approximately 3,000 ft of 6-in. diameter SDR 17 HDPE pipe. System construction resumed April 16, 1991 with gas header piping installation. The gas header piping was connected to the Partial System gas header piping at a blind flange west of extraction well GW2.

A backhoe was used to excavate the trench for header pipe installation. Pipe inverts were installed a minimum of 4 ft below final grade for frost protection. The HDPE pipe and fittings were joined by heat fusion (butt fusion) (Photograph No. 5 -Appendix I). The header pipe was installed with a 6 in. minimum coarse sand bedding. Approximately 6 in. of sand was also installed above the pipe. A continuous warning ribbon and tracing wire were placed above the pipes to alert excavators and aid in locating the pipe in the future (Photograph No. 6 - Appendix I). The tracing wire has been brought to the surface at several key locations including most wellheads and on the header pipes at the blower building. An electrical current induced in the tracing wire will allow for buried header pipe to be located with above grade instruments. To allow for potential differential settlement, liquids drainage, and removal of condensate formed in the pipes, a minimum slope of 2.0% was maintained in the headers. Refer to the pipe bedding detail shown on Drawing 15292-D4. Gas header piping trenches within the limits of refuse were backfilled with 2 ft of compacted clay. Trench backfill was completed by replacing the rooting zone material and topsoil removed during trench excavation and pipe placement. The landfill cover disturbed during well and header piping construction has been restored with clay materials and placement methods in conformance with s.NR 504.07(4), Wisconsin Administrative Code. See the Final Cover Restoration section of this report for more information.

Header piping is composed of three branches: the North, Central, and South. Two header pipe segments contain a buried control valve (CV1 and CV2), consisting of an actuated butterfly valve extended to the surface. The control valves which are normally closed may be opened to re-route flow in the event a branch becomes unusable. Three branches enter the blower building and are valved individually. The three flows are then combined before entering the blower. Refer to Drawing 15292-D1 for the gas header piping layout. The gas header pipe connection to wellheads at wells GW5, GW6, GW10, GW12, and GW13, consists of a 6-in. HDPE 45° wye and riser. This piping will provide cleanout capabilities in the event leachate is pumped into the gas header pipe in the future.

Vacuum Switches

Four vacuum switches are included as part of the gas extraction system. The switches are installed on the gas header pipe in the following locations:

- VS1 2 ft west of GW5;
- VS2 2 ft west of GW9:
- VS3 2 1/2 ft south of GW11: and
- VS4 3 ft south of GW13.

These switches are set such that if pressures in the header pipe, at the above locations, reach zero or any positive value, the switches will open. When open, contact is lost and the Blower/Flare Control panel will shut down the gas extraction system.

The switches have been placed at the furthest points of the gas header piping system to shut the system down in the event pipe breakage or blockage occurs. Refer to Drawing 15292-D1 for vacuum switch locations. The switches will also open if vacuum is not being maintained in the outermost header piping, which indicates the extraction system is greatly in need of balancing. If the vacuum switches open, this will cause the extraction system to shut down; the telemetry system will then notify operating personnel.

A timer has been installed within the blower/flare control enclosure which, when turned on, bypasses the vacuum switch controls. This timer can be used when

performing start-up of the gas extraction system. System down time may allow positive pressure to develop in the landfill.

Condensate Handling System

Condensate produced by the cooling of the saturated gas mixture in the gas header system is removed using four dripleg assemblies. A dripleg consists of a liquid-filled trap and a connection to the leachate conveyance system, through which condensate is transferred from the gas piping system to the leachate piping system. Existing dripleg DL1, is located within the refuse limits, on the South Branch gas header pipe connecting extraction wells to the blower station. Existing condensate dripleg (DL2) was modified (located between the blower and the two flares) to collect and drain condensate formed in the gas discharge pipe. Driplegs DL3 and DL4 are located on the Central and North branches, respectively, of the gas header piping (Photographs No. 7 and 8 - Appendix I). Condensate is routed by gravity from all driplegs to the leachate holding tank. Refer to Drawings 15292-D4 and D5 for dripleg details and Drawing 15292-D1 for dripleg locations. Driplegs DL2, DL3, and DL4 were filled with water prior to start-up of the gas extraction system.

The leachate/condensate conveyance pipes located outside the landfill refuse limits are encased in 2 ft of compacted clay. Clay materials and placement methods were the same as for cover restoration activities performed during trenching activities.

Blower Station

The existing Blower installed with the Partial System is sized to efficiently draw gas from the 13 extraction wells and discharge it at a pressure suitable for proper operation of the ground flare. With minor modifications, the blower can be upgraded to increase the performance, if necessary, by changing wheel and motor sizes. The blower and motor assembly includes the following features:

- · Aluminum wheel, spark resistant construction;
- Indirect drive (V-belt);

Gas and Leachate Extraction System Refuse Hideaway Landfill November 18, 1991 Page 3-6

- 10 Hp, 3600 revolutions per minute (rpm) motor;
- Spark resistant aluminum housings; and
- · Ceramic felt shaft seals.

A 6-in. flame arrester installed at the inlet of the blower isolates the header system and well field from an explosion or flame initiated at the blower station. Blower inlet and discharge piping contains 1/4-in. PVC sample ports for monitoring gas pressure and composition. Four inch diameter butterfly valves are installed before the flame arrester on each of the three header branches (North, Central, and South) coming into the blower station to assist in controlling and balancing the system. This branch monitoring station also provides a 1/4-in. PVC sample port and a flow monitoring port for individual monitoring of branch gas flow, pressure and composition. For details of the blower station, which includes the branch monitoring station, refer to Drawing 15292-D6 and detail 1/7 on Drawing 15292-D7. The blower and flare station are enclosed with an 8 ft high chain-link fence for security.

Flare Station

As part of the Partial System installation, a pedestal LFG flare (VAREC 239A series Waste Gas Burner) was installed as an interim measure for burning saturated, low BTU gas. By utilizing the Partial System evaluation, a fully enclosed ground flare was installed to meet the combustion requirements of NR 445, Wisconsin Administrative Code. Additionally, the fully enclosed ground flare has a capacity compatible with the 13 well gas extraction system. The system is not designed to run both flares simultaneously. A manual gear operated butterfly valve has been installed at the existing pedestal flare which is closed when the ground flare is operating. Refer to Drawing 15292-D7 for flare station details.

The ground flare has been designed to destroy volatile organic compounds by maintaining a temperature of 1500° F for a retention time of 0.6 sec at a flow rate of 650 cfm. The flare has an enclosed flame in a steel housing approximately 7 ft in diameter and approximately 24 ft high. The ground flare has a retractory blanket lining designed to keep the exterior skin temperature on the steel housing below 200°F. The burner for the ground flare is designed for a flow range of 100 to 650 cfm with methane contents from 15% to 60%. Flare performance is monitored with a

thermocouple for temperature sensing, and sampling ports located near the top of the flare for scheduled emission testing. The ground flare may require supplemental fuel to maintain required destruction efficiencies should the LFG methane content drop below 15% at some point in the future. Current flare design is such that the need for pilot gas (propane fuel) is minimized to reduce operational costs (only used during startup).

The ground flare is located east of modified dripleg DL2 rather than to the west as originally designed. The change was made to avoid excavating into the landfill sideslope. The ground flare is installed on a concrete pad designed to support the flare (Photograph No. 10 - Appendix I). The ground flare 6-in. diameter inlet piping includes: a flame arrester, actuated shut-off valve (normally closed), pressure relief vent set at 20 in. water column (WC), manual butterfly valve and, sampling and monitoring ports. The actuated valve closes in the event of power loss, problems with the flame or LFG flow. The flare controls have telemetry linked to other system components at the Landfill, including the blower, vacuum switches, leachate holding tank and leachate extraction pumps. The alarm system includes an automatic telephone dialer (Verbatim system) that contacts system operating personnel and describes the specific alarm condition. Specific system operational logic is presented in the Operation and Maintenance manual.

REFUSE SPOILS DISPOSAL

General Discussion

The refuse containment area used for the Partial System (constructed along the western perimeter of the site near the top of the saddle area) was expanded to receive the excavated refuse from full system construction. Characterization of waste excavated during drilling activities was required before the waste was permanently disposed on-site. Waste samples from drilling extraction wells GW3, GW4, and GW5 served as "test borings" and wastes penetrated were assumed to be representative of wastes excavated during drilling and trenching activities. Waste excavated during well drilling was temporarily stored on-site in a manner which allowed for accessibility and identification. Completion of TCLP characterization testing indicated refuse from borehole GW3 (Sample GW3-2) exceeded the regulatory limit of 5.0 mg/L for lead. Refer to Appendix C for the complete report. Waste from borehole GW3 was removed from the refuse containment area and disposed of near GW3. All other

Gas and Leachate Extraction System Refuse Hideaway Landfill November 18, 1991 Page 3-8

borehole spoils and refuse from trench excavations were permanently disposed of in the refuse containment area. It is estimated that refuse excavated during the construction of the extraction wells, gas header, and leachate conveyance piping included approximately 1,500 cu yd of material. Refer to Drawing 15292-D1 for location of disposal area.

The refuse containment area was constructed on-site as follows:

- Existing cover soils were removed and salvaged (a minimum of approximately 1 ft of soils remained above the waste);
- A synthetic membrane (plastic sheeting or tarps) was placed and covered with approximately 1 ft of cover soils (to form a temporary liner);
- The cell was graded such that surface water run-on was diverted around the containment cell and water exposed to waste, was contained;
- Waste materials were covered with a synthetic membrane to minimize exposure to water and wind.
- Synthetic membranes were punctured at the time of final cover placement to allow for liquids drainage.

The landfill cover over the refuse containment area was restored with clay, rooting zone, topsoil, and seeding materials with placement methods as described in the Final Cover Restoration section of this report. The final cover was graded such that positive drainage and smooth contours result.

LEACHATE EXTRACTION SYSTEM

General Discussion

The leachate extraction system was installed concurrently with the gas extraction system. Although designed as a combined system, the gas and leachate extraction systems operate independently. Background monitoring indicated that 3 wells (GW8P, GW9P, and GW11P) exhibited leachate heads greater than 6 ft, the level established in the Engineering Design Report as requiring leachate well pump installation. After a pump test was performed, it was determined that recharge rates were significant and that submersible pumps were necessary. Refer to Table 2 for leachate head monitoring data. Leachate pumped from these wells is discharged to approximately 850 lineal ft of 6-in. diameter HDPE leachate header piping located in the same trench

as the gas header. The leachate flows by gravity to the existing buried leachate holding tank located at the east edge of the site. Refer to Drawing 15292-D1 for locations of the leachate extraction system.

The objective of the leachate extraction system is to lower the leachate heads on the base of the landfill. Lower leachate heads will result in more of the well screen available for LFG extraction. The leachate extraction rate at the Landfill will be a function primarily of the permeability of the in-place cover materials.

Leachate Extraction Wells

A Grundfos Model 5S, 4-in. nominal diameter, stainless steel, single-phase, electric, submersible pump is installed in extraction wells GW8P, GW9P and GW11P. The pump's flow rate capacity ranges from 2 to 7 gpm, depending on the liquid head. The pumps have been placed as to rest on the stainless steel bolts installed approximately 1 ft above the well pipe base in order to minimize the intake of accumulated sediment. The pump in well GW8P has been placed 1 ft above the bolts due to accumulated sediment. Controls for each pump include a manual power shut-off, elapsed run-time meter, and a pump controller. The controller contains an amperage sensing device which shuts off the pump when the pump runs dry and restarts the pump after a presettime interval, which can be set between 1 minute to 12 hours.

Wellheads

The pump discharge piping (inside the well casing) consists of 1-in. diameter flexible tubing. A 1-in. diameter leachate discharge pipe exits through the top of the 6-in. well head via an adapter assembly. A 1-in. diameter valve is provided on the leachate discharge line above the casing for control of discharge flow rate and pressure. The extracted leachate flows through a 1-in. diameter HDPE discharge pipe to the 6-in. diameter leachate header pipe located in the same trench as the gas header pipe. The leachate discharge piping at the wellhead is insulated to minimize the potential for freezing. A quick-disconnect fitting is also installed on the 1-in. HDPE leachate discharge piping which allows for pump discharge flow rate calculation and leachate sampling. Refer to Drawing 15292-D3 for wellhead details.

Leachate Header Piping

The leachate header piping transports leachate pumped from the extraction wells by gravity directly to the existing leachate holding tank. The existing Partial System leachate header piping, was terminated with a blind flange at extraction well GW2, (currently not used). Gas header piping can be used to transport leachate to the holding tank, if pump installation is deemed necessary in the future at other extraction wells which do not have an adjacent leachate header pipe installed.

Leachate header piping was extended only to extraction wells GW7, GW8P, GW9P, and GW11P. Leachate header piping extending past well GW7 contains a 6-in. x 1-in. reducing tee with a 1-in. lateral extended upward to 1 ft below grade at the well. The 1-in. lateral can be utilized, in the future, if leachate levels in the well necessitate pumping. Leachate header piping placement was equivalent to that of the gas header piping. Leachate header piping installed within the limits of refuse has a minimum 2.0% slope. Cleanouts are installed at strategic points on the leachate header piping network in order to flush out sediment which may accumulate in the piping. All leachate header piping is 6-in. diameter to facilitate cleaning. Refer to Drawing 15292-D1 for location of cleanouts and to detail 3/5 on Drawing 15292-D5 for a cleanout riser detail.

Leachate Storage, Loadout and Disposal

The existing, double-walled steel, STI-P3 tank for the holding of leachate and condensate was installed below grade as part of the Partial System. The 25,000 gal tank was selected based on an estimate of the full system leachate and condensate production.

The interstice (between tank walls), is monitored with a conductivity sensor which will interrupt power to the well pumps in the event moisture is detected between the tank walls. This alarm activates a warning light on-site, and telemetry will contact system operating personnel. The leachate holding tank has two, high-level float sensors which when triggered will shut down the well pumps, activate warning lights on-site and send an alarm through telemetry. Two independent float sensors have been included with the Partial System as a redundant safety precaution to minimize the risk of leachate tank overflow.

As part of the leachate extraction system a loadout facility was installed to allow removal of liquids from the holding tank. As part of the full system, a concrete slab was constructed to contain spills during leachate loading activities. Spills and rainwater which may fall on the slab are collected and conveyed to the leachate holding tank and mixed with leachate and condensate. The perimeter of the concrete slab is graded to minimize rainwater runoff from flowing onto the slab. All aspects of the loadout facility are enclosed within a 6 ft high chain-link fence for security except for the suction standpipe and the concrete pad. During construction of the Partial System, a suction standpipe with a quick-connect coupling was installed to allow leachate removal from the holding tank via a tanker truck suction pump. Refer to details 1/8 and 2/8 on Drawing 15292-D8 for leachate loadout facility details. At present the liquids are loaded onto a tanker truck and hauled to the Madison Metropolitan treatment plant for disposal on a weekly basis. Refer to the leachate treatment agreement contained in the Operation and Maintenance Manual (Warzyn Inc., November, 1991).

LEACHATE HEADWELL ABANDONMENT

General Discussion

Existing leachate headwells LH-1, LH-2 and LH-3 which had been broken or misaligned could not provide accurate estimates of liquid head within the landfill. The headwells could also have served as pathways for air intrusion during gas extraction system operation. These headwells were properly abandoned by removing approximately the upper 5 ft of casing and tremie filling the remaining casing from the bottom with cement/bentonite grout and restoring the landfill cover.

FINAL COVER RESTORATION

General Discussion

The landfill cover areas disturbed during well drilling, trenching activities, and on-site spoils disposal for the landfill gas and leachate extraction system were restored with clay materials and placement methods in conformance with NR 504.07(4), Wisconsin Administrative Code. Final cover was graded in such a way that positive drainage and smooth final contours resulted. On-site clay, rooting zone, and topsoil materials removed during construction were reused for backfilling boreholes and header trenches. Clay material obtained from Northwestern Stone, an off-site borrow source located in Middleton, Wisconsin, was used for backfilling at extraction wells, trenches, and the refuse containment area.

Soil Tests

The off-site borrow source clay and the on-site clay soils used for cover restoration are generally classified as brown lean clay with a little sand. The on-site clay soils' classification includes trace gravel. Bag samples of the in-place clay were taken and undisturbed Shelby tube samples of clay were obtained periodically, with representative samples selected for laboratory testing. After the samples were retrieved, the holes were filled with granular bentonite. The results of the laboratory material property tests (Atterberg limits, grain size analyses and hydraulic conductivities) are contained in Appendices E and F. A total of 60 field density tests were conducted to document the compactive effort as clay was placed during the trench backfill and cover restoration at the refuse containment area. Density tests on the trench clay backfill were performed at a frequency of one test per 100 linear ft per 1-ft thick clay layer. Four of the density tests were performed on the clay cover replacement on the refuse containment area. The test results are contained in Appendix D together with the modified Proctor moisture-density curves.

The laboratory test results show that the on-site clay cover materials used are classified as a CL material under the Unified Soil Classification System (USCS)(ASTM D2487). The percent passing the No. 200 U.S. standard sieve (P200 content based on ASTM D422) ranges from 62.9% to 63.8%, averaging 63.4%. The clay fraction results (ASTM D422), defined as the particles finer than 0.005 mm by Wisconsin Administrative Code, NR 500.03(15), range from 23.3% to 23.7%, averaging 23.5%. Liquid limit values (ASTM D4318) range from 35 to 37, averaging 36. The plasticity index values (ASTM D4318) range from 16 to 18, averaging 17.

Laboratory test results show that the off-site borrow source (Northwestern Stone) clay sample is classified as CL with 93.9% passing the No. 200 sieve and 35.3% clay fraction. The liquid limit is 42 and the plasticity index is 26.

Falling head permeability (hydraulic conductivity) tests performed on 3-in. diameter Shelby tube samples pushed into the compacted clay indicate values of 2.0×10^{-8} cm/s

and 7.5×10^{-9} cm/s. The permeability test procedures were based on Appendix VII of the U.S. Army Corps of Engineers Manual EM 1110-2-1906 (1980).

The percent compaction of the backfilled trench clay and clay cover ranged from 90% to 99% with an approximate median of 93%. The clay compaction results are contained in Field Density Test Report No. 1 in Appendix D. Percent compaction results were determined in the field using modified Proctor maximum dry density values of 118 and 123 pounds per cubic foot (pcf) based on ASTM D1557. The maximum dry density for the off-site borrow source clay is 115 pcf based on laboratory testing. A value of 118 pcf was used for field testing to provide for more conservative compaction results. The value was changed to 123 pcf for field testing compaction when on-site clay materials were used for trench backfill and laboratory results indicated a higher maximum dry density than for off-site clay. The moisture-density curves are contained in Appendix D. Based on these test results, the compaction of the trench backfill and clay cover on the refuse containment area are in compliance with the requirement of 90% or greater of the modified Proctor maximum dry density. Compaction testing was performed using Troxler nuclear moisture-density testing equipment (ASTM D2922 and D3017).

ELECTRICAL AND CONTROL SYSTEM

Géneral Discussion

Electrical service for the landfill gas and leachate extraction system is accessed from electric transmission structure, No. 249, and directed underground to three transformers at the southeast corner of the site, each providing single phase 480 volt (V) power at the service entrance panel. From there the lines are brought underground to the existing control panel within the fenced area at the leachate holding tank. At this panel, power is provided for a 110 V outlet and for the leachate holding tank interstice and high-level monitoring systems. From the leachate holding tank control panel powerlines are extended underground, west, to the control panels located at the blower and flare stations. At this location, power is provided for the blower, pedestal flare ignition system, an outlet, the ground flare, and for the gas and leachate extraction system controls. Power lines are extended in 3/4-in. and 1-in. HDPE conduit from the blower and flare control panel, below grade, to the landfill

Gas and Leachate Extraction System
Refuse Hideaway Landfill
November 18, 1991
Page 3-14

wellfield. These lines provide power to well pumps at GW8P, GW9P and GW11P and to the vacuum switches located near wells GW5, GW9P, GW11P, and GW13. The location of underground electric lines are noted approximately on Drawing 15292-D9.

Telephone service was accessed from the utility structure, No. 249 and the cable was direct buried by Mid-Plains Telephone underground to utility pole No. 144-11/25 and then to the leachate holding tank control panel. From there, telephone service was extended underground through a conduit to the system control enclosure at the blower and flare station for the Verbatim autodialer. The location of underground telephone cable is noted approximately on Drawing 15292-D9. All buried telephone and power line locations must be field-verified before any future excavations are performed.

System Telemetry

The gas and leachate extraction system controls will signal the Verbatim, autodialer, to notify operating personnel in the event of an alarm condition. The autodialer also may be called at anytime to check the status of the gas and leachate extraction system. The phone number is (608) 831-4527. Telemetry may indicate one or more of the following alarm conditions (the numbering corresponds to the channel in which the alarm is programmed into the verbatim autodialer):

- 1 Flame Failure Alarm
- 2 High Temperature Alarm
- 3 Low Temperature Alarm
- 4 General Alarm

The general alarm can be activated by any of the following:

- · power failure;
- high leachate level in the leachate storage tank;
- leachate tank interstitial leak;
- loss of vacuum (vacuum switch);
- high pilot fuel pressure; or
- low pilot fuel pressure.

Gas and Leachate Extraction System Refuse Hideaway Landfill November 18, 1991 Page 3-15

The alarm light on the ground flare control panel enclosure will indicate which alarms have been activated. An exterior red light on the east side of the ground flare control panel enclosure will be illuminated during any alarm condition. An exterior white light will illuminate at the leachate tank control panel during high leachate or interstitial leak detection alarms. Complete autodialer information is available in the Operation and Maintenance Manual (Warzyn Inc., November 1991).

SECTION 4 SYSTEM START-UP

GENERAL DISCUSSION

The performance standards presented in the Engineering Design Report were used to demonstrate, in the field, that the header piping and flare met or exceeded the specifications presented in the document. Documentation of the performance standards is adequately demonstrated satisfying the intent of the specifications. The system start-up was a multi-step operation consisting of integrity tests, background gas and leachate head monitoring at wells, activation of the blower and ground flare, activation of the leachate extraction system, and system monitoring and balancing. A period of several days of integrity and background testing was necessary before the system was started. Several more days of balancing was necessary after the system was operational.

SITE SPECIFIC LIMITATIONS

The Refuse Hideaway Landfill has site-specific conditions which may limit the effectiveness of the gas extraction system. These potential limitations include areas of relatively high permeability cover soils, thin landfill cover, fractured bedrock, and shallow fill depths. These limitations, in addition to the topics discussed in previous sections, have been considered during the design and construction of this system. However, because of the vacuum necessary to control LFG migration and due to the landfill's cover, base and fill conditions, some air intrusion may occur. To determine the gas extraction system's performance, routine system monitoring is recommended. If system performance goals cannot be maintained, further investigation of the site specific limitations may be necessary.

PIPING INTEGRITY

The integrity of the gas header piping, leachate header piping, and driplegs DL3 and DL4 was tested as one unit, on May 6, 1991 to determine whether the system could maintain a vacuum. This piping was pressurized to a positive 3 pounds per square inch (psi) gauge pressure, and was successfully maintained for thirty minutes after closing the valve. The test was performed as specified in the Engineering Design Report and the pipe integrity was considered acceptable. Pipeline integrity test data has been included in Appendix G.

FLARE

The ground flare performance was checked in accordance with the manufacturer's recommendations. The burning capacity of the flare is rated at 650 cubic feet per minute (cfm) in air at 60°F and 14.7 psia (absolute) at 1/2 in. WC (water column) pressure drop, at sea level. The acceptance test for the flare was performed by the flare manufacturer prior to delivery and again verified on-site and included testing of the following design parameters of the flare: flow capacity, turndown ratio, automatic ignition and interlocks. Installation and testing was certified complete by the manufacturer on July 24, 1991. Refer to Appendix G for the a copy of the signed certification.

START-UP

Background gas pressure and composition readings were taken on July 7, 1991 at all thirteen gas extraction wells prior to system start-up. These readings provide base values to which later readings can be compared. Refer to Table 1 for gas well monitoring and Table 2 for leachate head monitoring. Flare start-up consisted of opening the three branch butterfly valves before the blower, opening the manual butterfly valve on the flare inlet piping, and using the automatic flare start-up sequence. Refer to the Operation and Maintenance Manual by Warzyn Inc., November 1991 for more information. The gas extraction system was operational by July 17, 1991. The butterfly valve on the flare inlet piping was used to control the flow. During start-up the blower flow rate was increased incrementally to 650 cfm and maintained to verify flare design capacity. Flow to the flare was then reduced to a normal operating level and system monitoring and balancing was performed. Refer to Table 1 for the Gas Well Monitoring.

The leachate extraction system was started August 13, 1991 when leachate extraction pumps were turned on at wells GW8P, GW9P and GW11P. Prior to start-up, background leachate head levels were recorded at all thirteen extraction wells on several occasions. Refer to Table 2 for the Leachate Head Monitoring Table.

FLARE STACK TEST

Landfill gas testing was performed on August 1 and 2, 1991 by Mostardi-Platt Associates, Inc. to determine flare destruction efficiencies. Tests were performed on the raw landfill gas at the flare inlet piping and on the exhaust from the stack of the ground flare. A summary of the results are as follows:

Benzene destruction efficiency	91.22%
NR 445 required destruction efficiency	90%
Vinyl chloride destruction efficiency	99.98%
NR 445 required destruction efficiency	99%
Methane destruction efficiency	99.99%
Total gaseous non-methane organics (TGNMO) destruction efficiency	94.76%
NR 445 required destruction efficiency	99.9%

The destruction efficiencies were calculated based on the raw gas analyses (flare inlet) as compared to the discharge gas analysis (flare outlet). The results indicate that the ground flare satisfactorily meets the combustion requirements of NR 445 for benzene and vinyl chloride destruction efficiencies. The required destruction efficiency for TGNMO was not achieved during this testing which may be attributed to low outlet concentrations, detection limits of the testing methods used, or the large discrepancy between flare inlet and outlet flow rates. Complete testing results are found in the report titled, "A Gaseous Study Performed for Warzyn Engineering, Inc., Refuse Hideaway Landfill, Landfill Gas System, Destruction Efficiency Tests, Middleton, Wisconsin, August 1 and 2, 1991", which was submitted to the WDNR on October 1, 1991.

SECTION 5 CONCLUSION

Based on field observations made during construction, surveys, soil testing and testing of the gas and leachate extraction system, the Refuse Hideaway Gas and Leachate Extraction System has been constructed in substantial conformance with the Gas and Leachate Extraction System Engineering Design Report (Warzyn No. 13928.48 dated September 1990) with WDNR comments, and with exceptions as noted. Several components of the gas and leachate extraction system have been labeled for identification purposes. Refer to Table 3 which indicates those components labeled and how designated.

Table 1 **Gas Well Monitoring Table**

Refuse Hideaway Landfill Gas and Leachate Extraction System

Dates:

7/7/91 Background

8/15/91(3)

9/16/91(3)

and the second second		*			<u> </u>	
<u>Well</u>	Well Pressure (in. WC)	CH ₄ (2) O ₂ (%)	Well Pressure (in. WC)	CH ₄ (2) O ₂ (%)	Well Pressure CH4(2 (in. WC) (%)) O ₂ (%)
GW1 GW2 GW3 GW4 GW5 GW6 GW7 GW8P(1) GW9P(1) GW10 GW11P(1) GW12 GW13	+2.0 +2.6 +3.3 +7.1 +21.6 +2.5 +4.8 +23.0 >+50.0 +2.0 +35.0 +2.6 +1.8	55 0 50 0 53 0 51 0 45 0 52 0 53 0 50 0 74 0 53 0 55 0 55 0 55 0 55 0	-3.5 -4.0 -4.1 -5.6 -2.9 -4.0 -6.3 -5.4 -2.5 -3.3 -6.0 -3.4 -3.9	14 0 32 0 41 0 44 0 50 0 32 0 43 0 40 1.3 39 3.0 44 0 45 1.3 43 0	-1.6 28 -2.2 39 -3.0 50 -3.6 50 NA NA -2.6 45 -4.5 47 -2.9 44 -0.6 45 -3.0 46 -4.0 45 -2.7 46 -3.3 49	0.3 0.3 0 0 NA 0 0 1.5 1.3 0 1.3
Flow to Flare (cfm)	Zero		560		450	

Notes:

- 1. 2. 3.
- Wells with leachate pumps and controls designated with a "P". Percent combustibles by volume, primarily composed of CH₄. The gas extraction system was activated July 17, 1991.

Table 2 Leachate Head Monitoring Table

Refuse Hideaway Landfill Gas and Leachate Extraction System

Leachate Head (ft)

Well Riser		11/12/90	11/21/90	4/16/91	7/8/91	8/15/91
GW1 -	EAST WEST	< 0.3 0.7	NA	0.3 0.8	0.6 1.0	0.6 1.0
GW2 -	EAST WEST	2.9 2.8	NA	3.2 3.1	3.0 3.0	2.9 3.0
GW3 -	EAST WEST	2.7 3.0	1.5	1.9	2.0 2.2	2.0 2.2
GW4 -	EAST WEST	< 0.3 < 0.3	3.1	3.3	0.9 0.6	1.0 0.6
GW5 -	EAST WEST	1.9 1.7	2.0	2.8	2.8	3.3
GW6 -	EAST WEST	<0.3 <0.3	<1.0	0.5	< 0.3 < 0.3	<0.3 <0.3
GW7 -	EAST WEST	0.6 0.6	<1.0	1.0	* 1.1	* <0.3
GW8P -	EAST WEST	19.6 19.4	18.2	11.7	18.1 18.0	17.9 17.8
GW9P -	NORTH SOUTH	12.6 12.7	17.0	0.9	17.7 17.7	* 2.4
GW10 -	NORTH SOUTH	0.7 0.7	<1.0	0.9	2.4 2.2	2.7 2.5
GW11P -	EAST WEST	17.6 17.7	22.2	16.5	26.7 26.9	4.2 4.2
GW12 -	EAST WEST	<0.3 <0.3	<1.0	4.4	* 5.0	* 5.8
GW13 -	EAST WEST	0.6 0.7	< 1.0	2.8	3.4 3.3	3.7 3.7
Leachate T Head (ft): Volume (g		1.1 1,140	1.1 1,140	2.2 3,200	2.5 3,831	6.9 15,100

Notes:

Wells with leachate extraction pumps and controls installed are indicated with a "P".
 Leachate extraction system started 8/13/91.
 Leachate head measured directly in well risers GW3 through GW13 on 11/21/90 and 4/16/91; otherwise leachate head measured in 1-in. risers located at each wellhead.

Leachate head measurement not available due to unidentified blockage in 1-in. riser pipe.

TABLE 3

GAS AND LEACHATE EXTRACTION SYSTEM LABELING REFUSE HIDEAWAY LANDFILL

The following system components have been labeled with plastic signs with indented lettering for identification purposes.

WELLS	CLEANOUTS	DRIPLEGS
GW1 GW2 GW3 GW4 GW5 GW6 GW7 GW8	CO1 CO2 CO3 CO4 CO5 CO6	DL1 DL1-CO DL2 DL2-CO DL3 DL3-CO DL4 DL4-CO
GW9 GW10 GW11 GW12 GW13 MISCELLANEOUS(1)	BLOWER BUILDING GAS P	IPFS
	BLOWER BUILDING GAST	<u>IFES</u>
CV1 CV2 VS1 VS2	NORTH BRANCH CENTRAL BRANCH SOUTH BRANCH	
VS3 VS4	LEACHATE LOADOUT FAC	יוו ודע
LH4 LH5 LH6	VENT LOADOUT	
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Notes:

(1) CV = CONTROL VALVE VS = VACUUM SWITCH LH = LEACHATE HEADWELL/GAS PROBE

Appendix A
Boring Logs

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Number Length Recovered (in.)	Counts	r r	Sc	il/Rock Description	n.	1						ω.				ú
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eg tes.	3	€		Each Major Unit	·		တ္	[년]	agram	Σ.	p a d	st ite	.=.∓	\$ -	200	_ <u>a</u> ∈
Number Length Recove (in.)	Blow	Depth		Lacii Major Offic		1	nscs	Graphic Log	Ne l	PIO/FIO	Standard Penetra- tion	Moisture Content	Ligu Limi	P in a	Lu L	ROD/ Comments
2 160	ш.	┶	Brown Silty Cl	ayey SAND With Little	Gravel	-+				—	10711	20	77	14.7		<u> </u>
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		<u> </u> 5	Brown Silty Cl	 †	SC								.			
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			REFUSE: Par	per, Cardboard, Plastic, I	Household	1	Refuse									
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		10	Layer of Soil a	t 10-12'				4444			1.					i di di
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			Dark Gray Lav	wn Waste, Rubber Hose	s, Paper						¥ .					
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		L	Refuse, Gray S	Soil with Plastic, Paper			V 2	- -			• ,			r		
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The stratifica	tion lir	nes rep	present the approxi	mate boundary between	soil types	and th	e trans	sition m	ay be g	radual.	•	•			· .	
	fy that	the in	formation on this f	orm is true and correct t	to the best	of my	know	ledge.								
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This form is authorized by Chapters 144.147 and 162, Wis. Stats. Completion of this report is mandatory. Penalties: Forfeit not less than \$10 nor more than \$5,000 for each violation. Fined not less than \$10 or more than \$100 or imprisoned not less than 30 days, or both for each violation. Each day of continued violation is a separate offense, pursuant to ss 144.99 and 162.06, Wis. Stats.

Boring No.: LH06
Page 2 of 2

Sam	ple	u	t			200				Soil	Page Propert		_of	2
Number	Length Recovered (in.)	Blow Counts	Depth in F	Soil/Rock Description And Geologic Origin For Each Major Unit	SOSN	Graphic Log	Well Diagram	PIO/FID	Standard Penetra- tion	Moisture Content	Liquid Limit	Plastic Limit	P 200	RQD/ Comments
			35 - 40 - 45 - 50 - 55	Black Wood, Soil *Gunk* Mix (Still Damp) Wood Scrap Layers Lawn Waste and General Refuse Brown Silty Sand at 46.0 ft End of Boring at 46.0 ft										
			70											

	of Wisco		ral Res		Iaz. W		· · · · ·		OIL I orm 44		NG L	OG IN	IFOR	MATI	ON 7-91
				☐ Wastewater ☐ W		ground Ta Resources						Page	1	of	2
	/Proje				Lice	ense/Perm	it/Mor	itoring	Numb	er		g Numt			
			EAW Firm na	Me and name of crew chief)		te Drilling	Started		 Date	 Drilling		W01 leted	Drillin	g Metho	
				Construction - Earl Kopp		12/6				12/6	_			Bucket	
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Sam	ole	·γ	t		•		Ī				Soil	Proper	ies		
ber	Length Recovered (in.)	w Counts	epth in F	Soil/Rock Description And Geologic Origin For		ပ	aphic ig	agram	PID/FID	Standard Penetra- tion	sture tent	uid it	stic it	200	RaD/ Comments
Number	Len Rec (in	Blow	Dep	Each Major Unit		nscs	Gra Log	Dia B	PID	Star Pen tio	Go.	Liqu	L'a E	r N	Com
: .	•		_	Fine to Coarse, Brown Silty SAND With Little Gravel	:	SM				, ,					
			E	Brown Lean CLAY		CL							* .		
	,		<u> </u>	Brown Silty Fine to Coarse SAND		SM					4 × 3	. ,	, ,		
		2	5	General REFUSE, Paper, Cardboard, Plastic		Refuse									
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			10									74			
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		•		Yellow Plastic Sheets with Shredded Plastic Mi with Wood Scraps and General Refuse, Lawn Clippings	ixed										
		January an	15												١.
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	• •		25	Wood Scraps	• • •				•						
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			E	Paper, Plastic, General Refuse											<u> </u>
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Boring No.: GW01 Page 2 of 2

Sample	Ņ	+							Soil	Propert			
Number Length Recovered (in.)	Blow Counts	Depth in F	Soil/Rock Description And Geologic Origin For Each Major Unit	SOSN	Graphic Log	Well Diagram	PIO/FID	Standard Penetra- tion	Moisture Content	Liquid Limit	Plastic Limit	P 200	RQD∕ Commen†s
	4	35 	Some Wood and Lawn Clippings General Refuse, White Paper Mix, Grass Clippings End of Boring at 50.5 ft										

State of Wisco		ral Re	Route To: Sources Solid Waste	□на	az. Was	ste				BORII 100-122	NG L	OG IN	IFOR	MATI	ION 7-91
Department	111411		Emergency Response	□ U _I	ndergr	ound Ta		•	01111 44	100-122					7-91
			☐ Wastewater	□ W		esource	S					Page	1	of	2
Facility/Proje					Licens	se/Pern	nit/Mo	nitoring	Numb	er		g Numt			
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			ame and name of crewchief)		Date	Drilling		1	Date	Drilling	-	leted		g Moth lucket	od Auger
Terra Engi	neeri	ng &	Construction - Earl Kopp			12/	5/89			12/:	5/89	7. a.			
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Boring Locati	On.		<u> </u>		J <u>-</u>		Feet M	ISL		986.55 I Grid I			L		nches
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Number Length Recovered (in.)	Blow	Depth	Each Major Unit			SOSA	Graphic Log	agr	PIO/FID	Standard Penetra- tion	isi onte	quid mit	as. mi	200	ROD/ Comments
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		E	Brown Clayey Silty Fine to Coarse SAN Occasional Refuse (Paper and Plastic)	D With		S									
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		E	Brown Lean CLAY	,		CL							4.	·	
		5	Brown Clayey Silty Fine to Coarse SAN	D		SC									
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		E	Household Refuse, Paper Plastic				###=							.	
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			Dark Gray REFUSE, Paper, Plastic, Ve with Wood Cardborad Sticks, May be Y	ry Dam	ıp iste	Refuse									
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Boring No.: GW02 Page 2 of 2

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Number	Length Recovered (in.)	Blow Counts	Depth in Ft	Soil/Rock Description And Geologic Origin For Each Major Unit	nscs	Graphic Log	Well Diagram	PID/FID	Standard Penetra- tion		Propert Limit Limit	Plastic Limit	P 200	RQD/ Comments
ĬZ.		- C	35	Wood, Paper, Plastic Approximately 50% Brown Sandy Soil Cardborad, Cloth, Plastic Wet at 47' Brown Silty Sand at 49.0 ft End of Boring at 49.0 ft	50	19			·S · ·	Ξ. C			<u>a. </u>	320
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¥	•			☐ Wastewater	☐ Wa		source	S		·	_		Page	1	_of	2 ′
	y/Proje E FUS I		ne DEAW	AY 15	292.03	Licens	e/Pern	nit/Mon	itoring	Numb	er		y Numb	ег		
				me and name of crew chief)		Date I	Drilling	Started		Date	Drilling	Comp	leted	Drilling	g Mothe	
Terra	a Engi	neeri	ng & (Construction - Earl Kopp			10/2	3/90			10/2	3/90				
DNR	l'acility	Web !	(d)	VI Unique Well No. Common Well GW03		Final:		Water Le Feet M		Surfa	ce Eleva	ation _Feet N	1SL	Boreho		meter nches
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	Length Recovered (in.)	Counts	in	Soil/Rock Description				υ	Ę	0.	ra La	r-e+		ic		1+5
Number	#80°C		Depth	And Geologic Origin F Each Major Unit	Or		. 85	Graphic Log	 agram	PIO/FID	Standard Penetra- tion	Moisture Content	quid mit	asti mit	200	ROD/ Comments
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				REFUSE: Plastic, Moist	· ,		Refuse									
				80% Refuse, 90% Soil												
			10	Wood Log (Large), Large Rocks, Woo Mix, Over 50% Soil	d and Soi	ī	Refuse						ja r		4	
			1	1411A, 0401 5077 5011									1			, v .
			15	Soil-Refuse-Wood Mix, Moist												
		r P	E													
			E	General Refuse: Paper and Plastic, So Logs, Moist	me Wood											
			20	70% Refuse, 30% Soil						.						
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		٠.		General Refuse, Moist Paper and Plastic, Little Soil												
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Boring No.: GW03
Page 2 of 2

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Number	Length Recovered (in.)	Blow Counts	Depth in F	Soil/Rock Description And Geologic Origin For Each Major Unit	nscs	Graphic Log	Well Diagram	PID/FID	Standard Penetra- tion	Moisture Content	Liquid Limit	Plastic Limit	P 200	RQD/ Comments
				Wood and Ash Mix, Moist		HH								
			35 - 40 - 45 - 50 - 55 - 60	Wood, Ash and Refuse Mix, Moist July 20, 1977 Newspaper, Moist General Refuse 10-20% Soil Refuse with 50% Soil, Moist Wet Refuse/Soil Mix, Decomposed More Soils Silty Brown CLAY at 57.0 ft End of Boring at 57.0 ft										
			75											

	of Wisco		l Dae	Route To:	☐ Haz	7 W 20	te				BORII	NG L	OG IN	IFOR	MATI	
Depai	tment o	I Ivali	Irai Res	sources	_		ound Ta	inks	r	orm 44	00-122			4		7-91
· } .				☐ Wastewater	☐ Wa		source	s					Page	1	of	2
Facilit	y/Proje	ct Nar	ne				e/Pern	nit/Mor	nitoring	Numb	er	Borin	g Numb		_01	
RI	EFUSI	EHII	DEAW		15292.03	_	<u> </u>					G	W04			
Boring	g Drilled	By (Firm na	ame and name of crew chief)		Date I	Drilling	Started	J	Date	Drilling	Comp	leted	Drilling	g Metho lucket	od Auger
Terra	a Engi	neeri	ing &	Construction - Earl Kopp			10/2	4/90		,	10/2	4/90				
DVR	l'acity	WeB	Xo 1	W Unique Well St. Common We		Final	Static \	Water L	•	Surfa	ce Elev				ole Diai	
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Number	Length Recover (in.)	Blow	Depth	Each Major Unit			nscs	Graphi Log	Well Diag	PIO⁄FID	Standard Penetra- tion	Moisture Content	Liquid Limit	ø €	200	ROD/ Comments
		ш	-	TOPSOIL	<u> </u>		Top-			ш.	0)[[.+	20	بدر	الـ۵	О.	<u> </u>
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			E.	Soil/Refuse Mix, Some Plastic 60% Refuse/40% Soil			Refuse				, <u>.</u>					
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Sample	10								Soil	Propert	ies	_01	
Number Length Recovered	Blow Counts	Depth in Ft	Soil/Rock Description And Geologic Origin For Each Major Unit	nscs	Graphic Log	Well Diagram	PID/FID	Standard Penetra- tion	Moisture Content	Liquid Limit	Plastic Limit	P 200	RQD/ Comments
		35 	Dec. 1976 Partially Decomposed Newspaper 90% Refuse, Dry Side Moist, Decomposed Refuse High Liquids Content Brown Moist CLAY, Some Sand at 65.0 ft End of Boring at 65.0 ft										

	of Wisco		ıral Res	Route To: Sources Solid Waste	☐ Ha	z. Was	te				BORII 00-122	NG L	OG IN	IFOR	MAT	ION 7-91
				☐ Emergency Response ☐ Wastewater			ound Ta								· · · · · · · · · · · · · · · · · · ·	
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	y/Proje E FUS F			/AV 15	292.03	Licens	e/Pern	nit/Mor	itoring	Numb	er	Borin	g Numb	er		
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Terra	a Engi	neeri	ng &	Construction - Earl Kopp			10/2	4/90			10/2	4/90		36" E	lucket	Auger
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The st	ratifica	tion lin	les ren	resent the approximate boundary between	soil type	s and th	he trans	H-I-I	av be s	radual		<u> </u>	<u> </u>	<u> </u>	1	
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Boring No.: GW05
Page 2 of 2

Samp	ole	v	+					ri,		Soil	Propert		10	
Number	Length Recovered (in.)	Blow Counts	Depth in Ft	Soil/Rock Description And Geologic Origin For Each Major Unit	nscs	Graphic Log	Well Diagram	PID/FID	Standard Penetra- tion	Moisture Content	Liquid Limit	Plastic Limit	P 200	RGD/ Comments
			35 - 40 - 45	80% Refuse, 20% Soils and Decomposed Wastes										
			50	Very Wet (Liquid/Waste Mix) Drier Refuse 80-90% Refuse, Mostly Decomposed										
			60	Drier Refuse 80-90%, Less Decomposed More Soils/Silty Sand	71							×		
			70	Gray SILT, Slightly Moist at 70.0 ft End of Boring at 70.0 ft										
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State of Wisconsin Route To: Department of Natural Resources Solid Waste	Haz. Was	te .				BORII 00-122	NG L	OG IN	IFOR!	MATI	ION 7-91
☐ Emergency Response ☐	Undergro	und Ta			JIIII 44	00-122	5				7-21
	Water Re	source	S			<u> </u>		Page	1_	_of	2
Facility/Project Name REFUSE HIDEAWAY 15292.0		e/Pern	nit/Mon	itoring	Numb	er		g Numb	er		
Boring Drilled By (Firm name and name of crew chief)		Drilling	Started		Date	Drilling			Drillin		
Terra Engineering & Construction - Earl Kopp		10/2	5/90			10/2	5/90		36" B	ucket	Auger
DNR Facility Well No. W. Unique Well No. Common Well Name	Final	Static \	Water Le	evel	Surfa	ce Eleva	ition			ole Dia	meter
Boring Location GW06	<u> </u>		Feet MS	SL	Loca	l Grid L	Feet N				nches
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Each Major Unit		nscs	Graf Log	Me Dia	PIC	Standard Penetra- tion	Moisture Content	Li.	Pla Lim	۵	ROD∕ Comments
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Brown Sandy CLAY		SC									
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April, 1988 Newspaper					,	*					
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80-90% Municipal Refuse, Dry					1	* .	• • •				
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Dry Municipal Refuse, Paper Products, Somo	:										
Plastics — 20							1.				
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The stratification lines represent the approximate boundary between soil type				ay be g	radual.						
I hereby certify that the information on this form is true and correct to the Signature	Firm		1.	1 1		.* ×	٠.	•		* * * *	
Lean K The DRF/JCK		V	VARZ			<u>-:</u>	•				·
This form is authorized by Chapters 144.147 and 162, Wis. Stats. Completio \$5,000 foreach violation. Fined not less than \$10 or more than \$100 or impr											
violation is a separate offense, pursuant to ss 144.99 and 162.06, Wis. Stats.											R 8/91

Boring No.: GW06 Page 2 of 2

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Boring No.: GW07
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				 ☐ Wastewater ☐ W 		Resources	i i	100				Dogg	1		,
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Boring No.: GW08
Page 2 of 2

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			90+% Refuse, Mostly Decomposed, 10% Sand/Silt Mostly Municipal Waste, Some Yard Wastes Gray SILT, Some Clay 90-95% REFUSE, Partially Decomposed, Very Little Moisture Brown Silty CLAY at 69.0 ft End of Boring at 69.0 ft	ML								4	

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Boring No.: GW09
Page 2 of 2

Soil/Rock Description And Geologic Origin For Each Major Unit Soil/Rock Description And Geologic Origin For Each Major Unit Soil/Rock Description And Geologic Origin For Each Major Unit Soil/Rock Description And Geologic Origin For Each Major Unit Soil/Rock Description And Geologic Origin For Each Major Unit Soil/Rock Description And Geologic Origin For Each Major Unit Soil/Rock Description And Geologic Origin For Each Major Unit Soil/Rock Description And Geologic Origin For Each Major Unit Soil/Rock Description And Geologic Origin For Each Major Unit Soil/Rock Description And Geologic Origin For Each Major Unit Soil/Rock Description And Geologic Origin For Each Major Unit Soil/Rock Description And Geologic Origin For Each Major Unit Soil/Rock Description And Geologic Origin For Each Major Unit Soil/Rock Description And Geologic Origin For Each Major Unit Soil/Rock Description And Geologic Origin For Each Major Unit Soil/Rock Description And Geologic Origin For Each Major Unit Soil/Rock Description And Geologic Origin For Each Major Unit And Geologic Origin For Each Major Unit Soil/Rock Description And Geologic Origin For Each Major Unit And Geologic Origin For Each Majo	Sam	nle		* 1							Soil	Propert		_ 10_	
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Boring No.: GW10
Page 2 of 2

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				MAY 15292.03 me and name of crew chief)		Drilling	Started		Date	Drilling		W11 leted	Drillin	g Meth	od
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Number	Length Recover (in.)	Blow	Depth	Each Major Unit		uscs	Graphic Log	 agram	PIO/FID	Standa Penetr	Moisture Content	Liquic Limit	ast mit	200	ROD/ Comments
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			F	TOPSOIL Brown Sandy CLAY		Top- soil									
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			E	50% Municipal Refuse, 50% Sand, Some Clay		Refuse							<i>a</i>		
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Boring No.: GW11
Page 2 of 2

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Sample	آ ه	世	*						Soil	Propert	ies		
Number Length Recovered (in.)	Blow Counts	Depth in F	Soil/Rock Description And Geologic Origin For Each Major Unit	SOSN	Graphic Log	Well Diagram	PID/FID	Standard Penetra- tion	Moisture Content	Liquid Limit	Plastic Limit	P 200	RQD/ Comments
Num Rec	BIO	dəq - - - - - - - - -	Restart at 30' on October 29, 1990 Wet Decomposed Refuse, Black Color Very Wet, Liquids Prevalent Very Decomposed Refuse and Liquids Mixed Perched Leachate at Different Depths Wet Refuse, Very Decomposed Wet Refuse, Very Decomposed 3-4 ft Silty Clay, Glacial Till Mix at 65.0 ft End of Boring at 65.0 ft	OSN .	G.D.	Me I Dia	PID	Sta Pen	Moi	Lig	P.S.		ROD
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Generation Gen	100	of Wisco		ral Res	ources	Route To: Solid Wast		_	ız. Was					BORII 100-122	NG L	OG IN	IFOR	MAT	ION 7-91
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Boring Drilled By (Firm name and name of crew chief) Date Drilling Started 10/29/90 10/29/9					AV	• 4	15	5202.03		e/Pern	nit/Mon	itoring	y Numb	er ·			per		
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Dark Same Plant Dark D	DVR	racility	Wei I	io III V	YI Unique We	Con	mon Well	Name	Final	Static \	Vater L	evel	Surfa	ice Elev	ation		Boreho	ole Dia	meter
State Plane 40/0786.U N. 2112285.D E S/C/N 1/4 of 1/4 of 5 1/4 of Section T. N.R. E/W Long Feet S Feet S Feet W DNR County DNR County County DNR County County DNR County County And Geologic Origin For Each Major Unit S Soil Properties Feet S Feet W Niddleton Feet W Niddleton Feet S Feet W Niddleton Feet W Niddleton Feet W Niddleton Feet W Ni				Ü			GW12	2	_		Feet M	SL							nches
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Dane Sample Soil/Rock Description. And Geologic Origin For Each Major Unit For Each Major Unit Soil/Rock Description. And Geologic Origin For Each Major Unit For Each Major Unit Soil Froperties TOPSOIL Brown Sandy CLAY 60% Refuse, 40% Cover Soils Refuse For Soil Froperties For Soil Froperti	1.	_ 1/4 c	f	_ 1/4	of Section		*		- (ng			:	I				_ Feet	
Soil/Rock Description And Geologic Origin For Each Major Unit TOFSOIL TOPSOIL 60% Refuse, 40% Cover Soils Refuse, Paper Wastes, Some Plastics, Fairly Dry Partially Decomposed Municipal Refuse, Paper Wastes, Some Plastics, Fairly Dry Partially Decomposed Municipal Refuse, Paper Wastes, Little Moisture, Paper Wastes, Plastics The stratification lines represent the approximate boundary between soil types and the transition may be gradual. I bereby certify that the information on this form is true and correct to the best of my knowledge. Signature DRF/JCK Pirm WARZYNINC. This form is suthorized by Chapters 144.147 and 162, Wis, Stats. Completion of this report is mandatory. Penaltics: Forf-cit not less than \$10 nor more than The stratification to the set of my knowledge. Signature WARZYNINC. This form is suthorized by Chapters 144.147 and 162, Wis, Stats. Completion of this report is mandatory. Penaltics: Forf-cit not less than \$10 nor more than								DNR		Code				Village		. •		1 .	
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Brown Sandy CIAY SC 60% Refuse, 40% Cover Soils Refuse 10 80-50% Municipal Refuse, Paper Wastes, Some Plastics, Fairly Dry 90+% Refuse, Still Dry 20 Partially Decomposed Municipal Refuse, Little Moisture, Paper Wastes, Plastics The stratification lines represent the approximate boundary between soil types and the transition may be gradual. I hereby certify that the information pit this form is true and correct to the best of my knowledge. Signature DRF/JCK Firm WARZYNINC. This form is authorized by Chapters 144.147 and 162, Wis. Stats. Completion of this report is mandatory. Penalties: Forfeit not less than 510 nor more than	2	782	B	ä	- TORGOV						وي	30	[<u>N</u> -	ಕ್ಟ	تت		۵	88
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violation is a separate offense, pursuant to ss 144.99 and 162.06, Wis. Stats.

Boring No.: GW12 Page 2 of 3

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	40	Partly Decomposed Refuse, Little Moisture								3		
	50 - 55 - 60 - 65 - 70 - 75 - 75	90% Refuse, Mostly Decomposed, Some Moisture 80% Refuse, 20% Sand Soils, Little Moisture Dry Refuse/Soil Mix										

Boring No.: GW12
Page 3 of 3

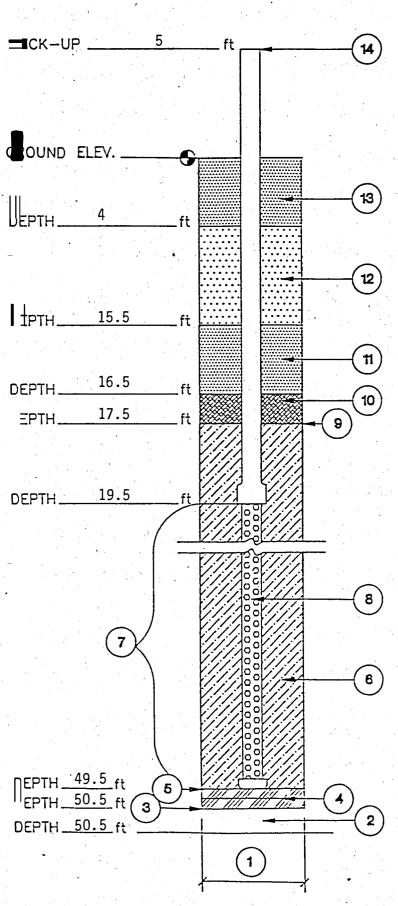
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State of Wisconsin Department of Natural Resources Route To: Solid Waste Emergency Response Underground Tanks										BORIN 100-122	NG LO	OG IN	IFOR!	MAT!	7-91				
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Facility/Project Name REFUSE HIDEAWAY 15292.03							License/Permit/Monitoring Number					er	Boring Number GW13						
						Date	Drilling	Started		Date	Drilling			Drilling Method					
Terra Engineering & Construction - Earl Kopp								10/3	30/90			10/3	0/90		36" Bucket Auger				
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Appendix B Well Detail Forms





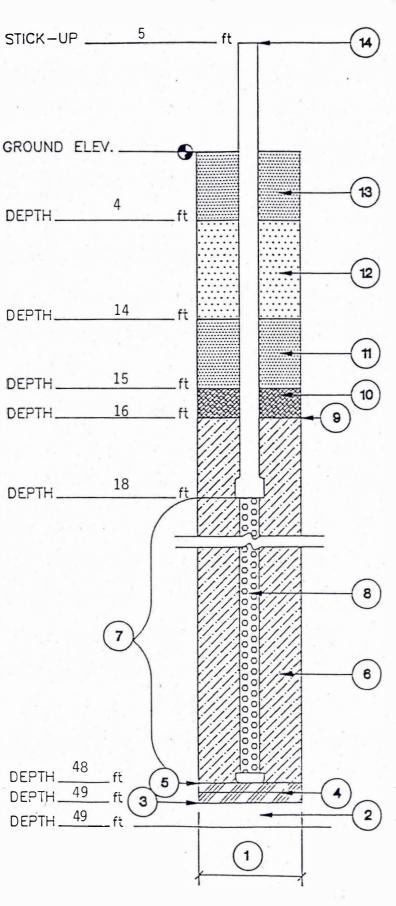
PROJECT NAME	Refuse Hideaway
JOB NO	15292.01
GAS WELL NO.	GW1
DATE	12-7-89
CONTRACTOR	Terra
INSPECTED BY .	JAL - Warzyn
LOCATION	400,374N 2,113,054E
GROUND ELEVAT	ION982.2
LEACHATE LEVEL	<u> </u>

- 1. BOREHOLE DIA. _____ ft
- 2. DISTANCE ABOVE BASE ____ ft
- 3. BOREHOLE DEPTH ______ft
- 4. WELL BASE MATERIAL 1' Bentonite, 0.5' Stone
- 5. WELL PIPE DEPTH _______ft
- 6. FILTER MATERIAL 1 1/2" Washed Stone
- 7. SCREEN LENGTH _______ft
- E. SCREEN MATERIAL 8" Dia. 'Sch. 80 PVC
- 9. GEOTEXTILE RING Yes
- 10. LOWER SEAL #1 1' Bentonite
- 11. LOWER SEAL #2 1' General Fill
- 12. FILL ABOVE SEAL Washed Stone
- 13. SURFACE SEAL 2' Bentonite/Clay Mix
- 14. WELL MATERIAL6" & 8" Dia Sch. 80 PVC Pipe
- 15. COMMENTS Slip coupler installed. Two

 1" dia. risers for leachate monitoring

 at well.





PROJECT NAMERefus	e Hideaway
JOB NO15292	.01
GAS WELL NOGW2	
DATE12-5-	
CONTRACTORTerra	
INSPECTED BY JAL - Warzy	1
LOCATION 400,340N 2,	122,843E
GROUND ELEVATION986	.6
LEACHATE LEVEL	ft
,	

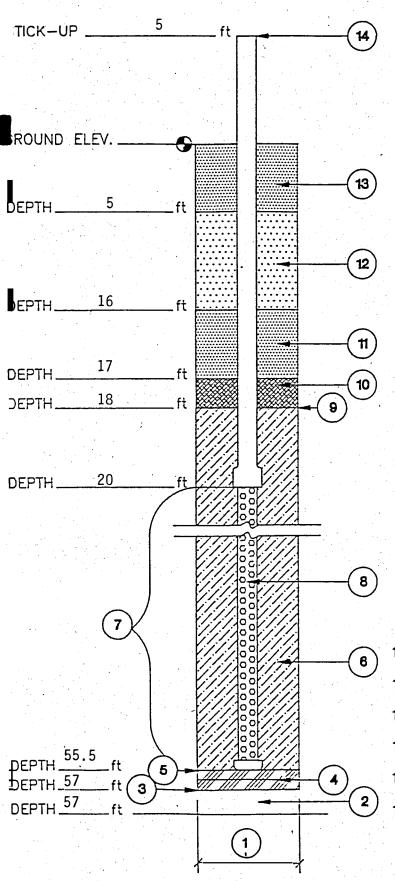
- 1. BOREHOLE DIA. _____ ft
- 2. DISTANCE ABOVE BASE ____ ft
- 3. BOREHOLE DEPTH _____ft
- 4. WELL BASE MATERIAL 1' Bentonite, 0.5' Ston
- 5. WELL PIPE DEPTH 48.0 ft
- 6. FILTER MATERIAL <u>1 1/2" Washed Stone</u>
- 7. SCREEN LENGTH 30.0 ft
- 8. SCREEN MATERIAL 8" Dia. Sch. 80 PVC
- 9. GEOTEXTILE RING Yes_____
- 10. LOWER SEAL #1 1' Bentonite
- 11. LOWER SEAL #2 1' General Fill
- 12. FILL ABOVE SEAL Washed Stone
- 13. SURFACE SEAL 2' Bentonite/Clay Mix
- 14. WELL MATERIAL 6" & 8" Sch 80 PVC
- 15. COMMENTS Slip coupler installed. Two

 1" dia. leachate monitoring risers

 at well.

30.00 3.77

WARZYN



PROJECT NAME	Refuse Hideaway
JOB NO	15292.01
GAS WELL NO	GW3
DATE	10-23-90
CONTRACTOR	Terra
INSPECTED BY	D. Free - Warzyn
	2,112,660E
GROUND ELEVATION_	993.7
LEACHATE LEVEL	

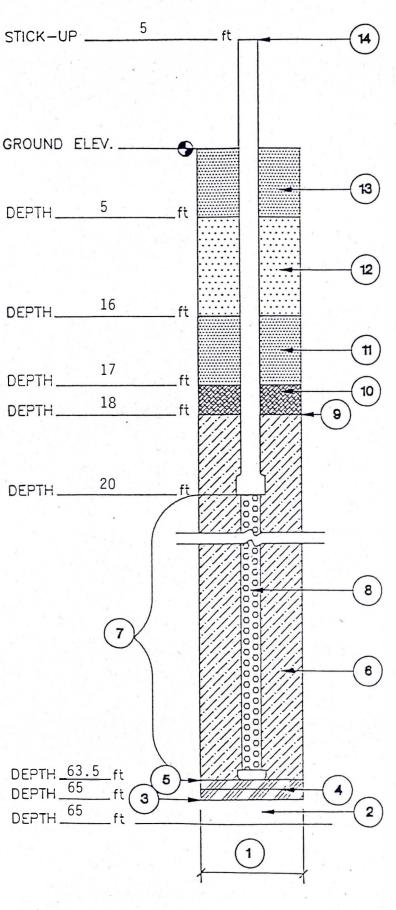
- 1. BOREHOLE DIA. _____ ft
- 2. DISTANCE ABOVE BASE 0 ft
- 3. BOREHOLE DEPTH ______ft
- 4. WELL BASE MATERIAL 1' Bentonite 0.5' Stone
- 5. WELL PIPE DEPTH ______ft
- 6. FILTER MATERIAL 1 1/2" Washed Stone
- 7. SCREEN LENGTH ______ ft
- 8. SCREEN MATERIAL 8" Dia. Sch. 80 PVC
- 9. GEOTEXTILE RING Yes
- 10. LOWER SEAL #1 1' Bentonite/Select Fill Mix
- 11. LOWER SEAL #2 1' Bentonite
- 12. FILL ABOVE SEAL Select Granular Fill
- 13. SURFACE SEAL 2' Bentonite/Clay Mix, Then
- 14. WELL MATERIAL 6" Dia. & 8" Dia. Sch 80 PVC
- 15. COMMENTS Slip coupler installed between solid and perf. pipe. Two-1"

 Dia. Sch. 80 PVC Leach. monitoring

Risers attached to well.

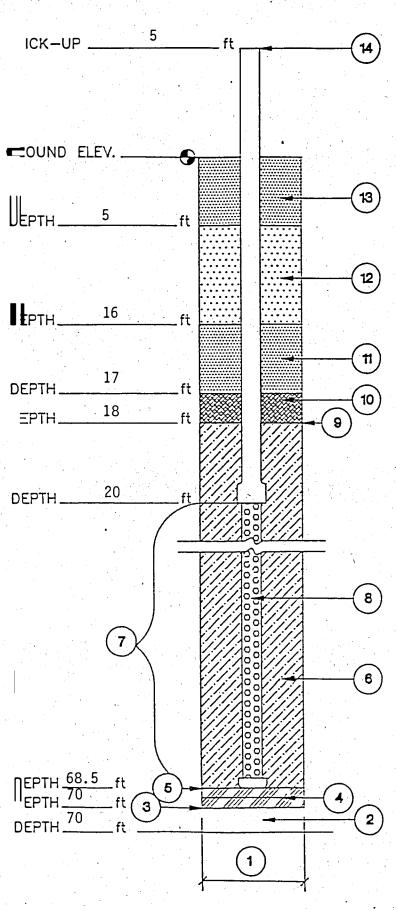
GAS EXTRACTION WELL DETAIL





- 1. BOREHOLE DIA. _____ ft
- 2. DISTANCE ABOVE BASE ____ ft
- 3. BOREHOLE DEPTH ______ft
- 4. WELL BASE MATERIAL 1' Bentonite, 0.5' Ston
- 5. WELL PIPE DEPTH ______ ft
- 6. FILTER MATERIAL 1 1/2" Washed Stone
- 7. SCREEN LENGTH 43.5 ft
- 8. SCREEN MATERIAL 8" Dia. Sch. 80 PVC
- 9. GEOTEXTILE RING Yes
- 10. LOWER SEAL #1 1' Select Fill/Bent. Mix
- 11. LOWER SEAL #2 1' Bentonite
- 12. FILL ABOVE SEAL <u>Select Granular Fill</u>
- 13. SURFACE SEAL 2' Bentonite/Clay Mix, Then Cl
- 14. WELL MATERIAL 6" & 8" Dia. Sch. 80 PVC Pipe
- 15. COMMENTS Slip coupler installed between solid 6" pipe and perf. 8" pipe. Two-1"

 Dia. Sch. 80 PVC leach. monitor. risers attached to well.



PROJECT NAME Refuse Hideaway

JOB NO. 15292.01

GAS WELL NO. GW5

DATE 10-24-90

CONTRACTOR Terra

INSPECTED BY D. Free - Warzyn

LOCATION 400,213N 2,112,197E

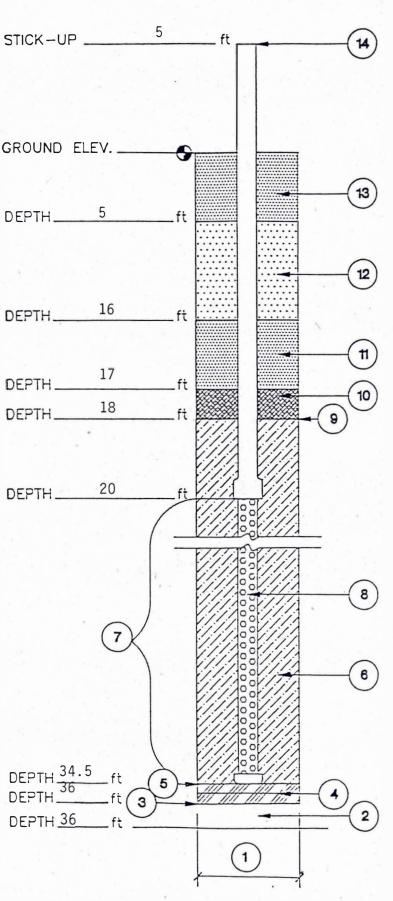
GROUND ELEVATION 1004.7

LEACHATE LEVEL ft

- 1. BOREHOLE DIA. _____ ft
- 2. DISTANCE ABOVE BASE _0_____ft
- 3. BOREHOLE DEPTH ______ft
- 4. WELL BASE MATERIAL 1' Bentonite, 0.5' Stone
- 5. WELL PIPE DEPTH 68.5 ft
- 6. FILTER MATERIAL <u>1 1/2" Washed Stone</u>
- 7. SCREEN LENGTH 48.5 ft
- 8. SCREEN MATERIAL 8" Dia. Sch. 80 PVC
- 9. GEOTEXTILE RING ____ Yes
- 10. LOWER SEAL #1 1' Select Fill/Bent. Mix
- 11. LOWER SEAL #2 1' Bentonite
- 12. FILL ABOVE SEAL Select Granular Fill
- 13. SURFACE SEAL 2' Bentonite/Clay Mix, Then
- 14. WELL MATERIAL6" & 8" Dia. Sch. 80 PVC Pipe
- 15. COMMENTS Slip coupler installed between solid 6" solid and 8" perf. pipe:

 Two-1" Dia. Sch. 80 PVC leach. riser pipes attached to well.





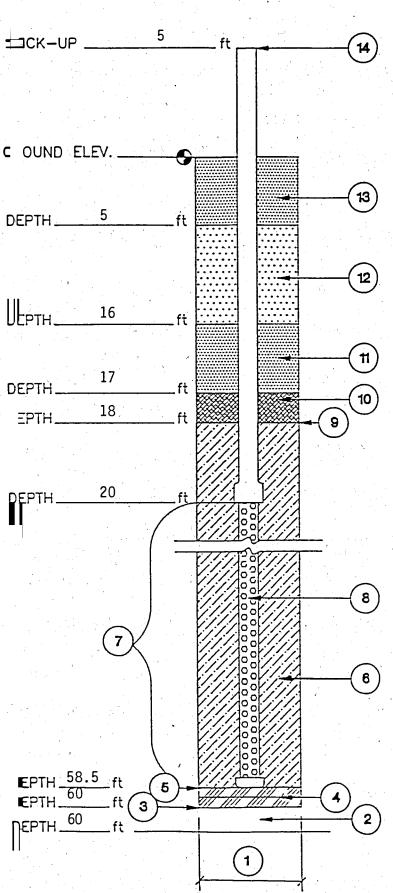
PROJECT NAME	Refuse Hideaway
JOB NO	15292.01
GAS WELL NO	GW6
DATE	10-25-90
*	Terra
INSPECTED BY	D. Free - Warzyn
LOCATION 400,499N	2,112,734E
GROUND ELEVATION_	
LEACHATE LEVEL	ft

- 1. BOREHOLE DIA. ______ ft
- 2. DISTANCE ABOVE BASE _____ ft
- 4. WELL BASE MATERIAL 1' Bentonite, 0.5' Ston
- 5. WELL PIPE DEPTH _______ft
- 6. FILTER MATERIAL 1 1/2" Washed Stone
- 7. SCREEN LENGTH ______ft
- 8. SCREEN MATERIAL 8" Sch. 80 PVC
- 9. GEOTEXTILE RING _____Yes
- 10. LOWER SEAL #1 1' Bentonite/Select Fill Mix
- 11. LOWER SEAL #2 1' Bentonite
- 12. FILL ABOVE SEAL Select Gen. Fill
- 13. SURFACE SEAL 2' Bentonite/Clay, Then Clay
- 14. WELL MATERIAL 6" & 8" Sch. 80 PVC Pipe
- 15. COMMENTS Slip coupler installed between solid and perforated pipe. Two-1" Dia.

 Sch. 80 PVC leachate monitor. risers attached to well.

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WARZYN

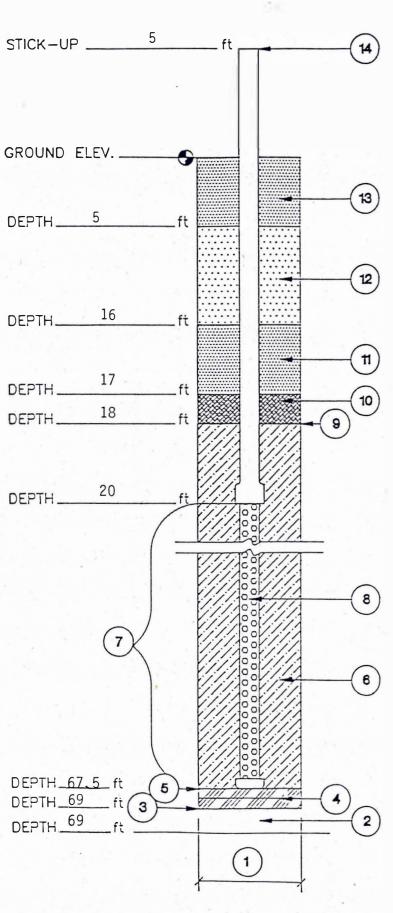


PROJECT NAME	Refuse Hideaway					
JOB NO	15292.01					
GAS WELL NO.	GW7					
DATE	10-26-90					
\ .	Terra					
INSPECTED BY	D. Free - Warzyn					
LOCATION400,531N	2,112,542E					
GROUND ELEVATION	996.1					
LEACHATE LEVEL	ft.					

- 2. DISTANCE ABOVE BASE _____ ft
- 3. BOREHOLE DEPTH 60 ft
- 4. WELL BASE MATERIAL 1' Bentonite, 0.5' Stone
- 5. WELL-PIPE DEPTH ______ft
- 6. FILTER MATERIAL 1 1/2" Washed Stone •
- 7. SCREEN LENGTH _______ 38.5 ft
- 8. SCREEN MATERIAL 8" Dia. Sch. 80 PVC
- 9. GEOTEXTILE RING Yes
- 10. LOWER SEAL #1 1' Bentonite/Select Fill Mix
- 11. LOWER SEAL #2 1' Bentonite
- 12. FILL ABOVE SEAL Select General Fill
- 13. SURFACE SEAL 2' Bentonite/Clay, Then Clay
- 14. WELL MATERIAL 6" & 8" Dia. Sch. 80 PVC Pipe
- 15. COMMENTS Slip coupler installed between solid and perforated pipe. Two-1" Dia.

 Sch. 80 PVC leachate monitor. risers attached to well.





PROJECT NAME Refuse Hideaway

JOB NO. 15292.01

GAS WELL NO. GW8

DATE 10-25-90

CONTRACTOR Terra

INSPECTED BY D. Free - Warzyn

LOCATION 400,537N 2,112,352E

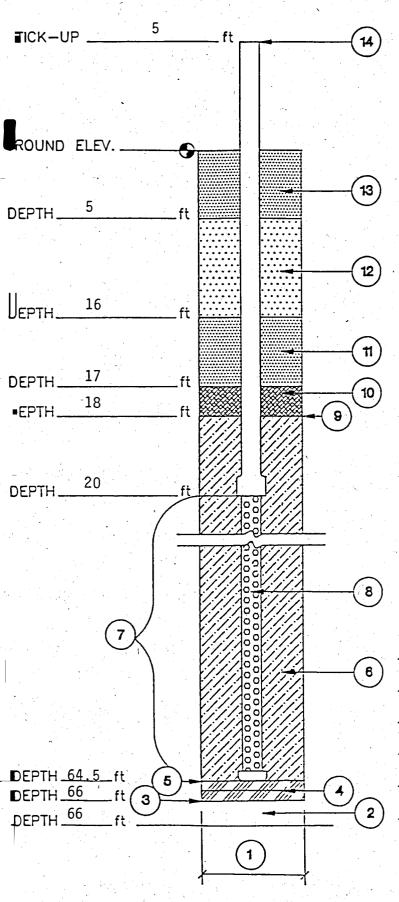
GROUND ELEVATION 1006.0

LEACHATE LEVEL ft

- 1. BOREHOLE DIA. _____ ft
- 2. DISTANCE ABOVE BASE _____ ft
- 3. BOREHOLE DEPTH ______ft
- 4. WELL BASE MATERIAL 1' Bentonite, 0.5' Ston∈
- 5. WELL PIPE DEPTH ______ ft
- 6. FILTER MATERIAL 1 1/2" Washed Stone
- 7. SCREEN LENGTH 47.5 ft
- 8. SCREEN MATERIAL 8" Sch. 80 PVC
- 9. GEOTEXTILE RING _____Yes
- 10. LOWER SEAL #1 1' Bentonite/Select Fill Mix
- 11. LOWER SEAL #2 1' Bentonite
- 12. FILL ABOVE SEAL Select General Fill
- 13. SURFACE SEAL 2' Bentonite/Clay, Then Clay
- 14. WELL MATERIAL 6" & 8" Sch. 80 PVC Pipe
- 15. COMMENTS Slip coupler installed between solid and perforated pipe. Two-1" Dia.

 Sch. 80 PVC leach. monitor. risers attached to well.





PROJECT NAME Refuse Hideaway

JOB NO. 15292.01

GAS WELL NO. GW9

DATE 10-25-90

CONTRACTOR Terra

INSPECTED BY D. Free - Warzyn

LOCATION 400,446N 2,112,210E

GROUND ELEVATION 1012.9

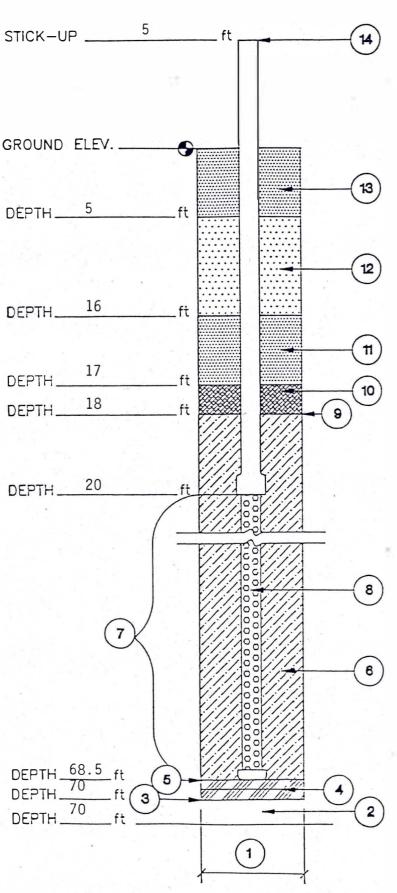
LEACHATE LEVEL ft

- 1. BOREHOLE DIA. _____ ft
- 2. DISTANCE ABOVE BASE 0 ft
- 3. BOREHOLE DEPTH _______ft
- 4. WELL BASE MATERIAL 1' Bentonite, 0.5' Stone
- 5. WELL PIPE DEPTH ______ft
- 6. FILTER MATERIAL 1 1/2" Washed Stone
- 7. SCREEN LENGTH ______ ft
- 8. SCREEN MATERIAL 8" Sch. 80 PVC
- 9. GEOTEXTILE RING _____Yes
- 10. LOWER SEAL #1 1' Bentonite/Select Fill mix
- 11. LOWER SEAL #2 1' Bentonite
- 12. FILL ABOVE SEAL Select Granular Fill
- 13. SURFACE SEAL 2' Bentonite/Clay Mix, Then Cla
- 14. WELL MATERIAL 6" & 8" Dia. Sch. 80 PVC Pipe
- 15. COMMENTS Slip coupler installed between solid and perforated pipe. Two-1" Dia.

 Sch. 80 PVC leach. monitor. risers attached to well.

GAS EXTRACTION WELL DETAIL





PROJECT NAME Refuse Hideaway

JOB NO. 15292.01

GAS WELL NO. GW10

DATE 10-30-90

CONTRACTOR Terra

INSPECTED BY D. Free - Warzyn

LOCATION 400,719N 2,112,532E

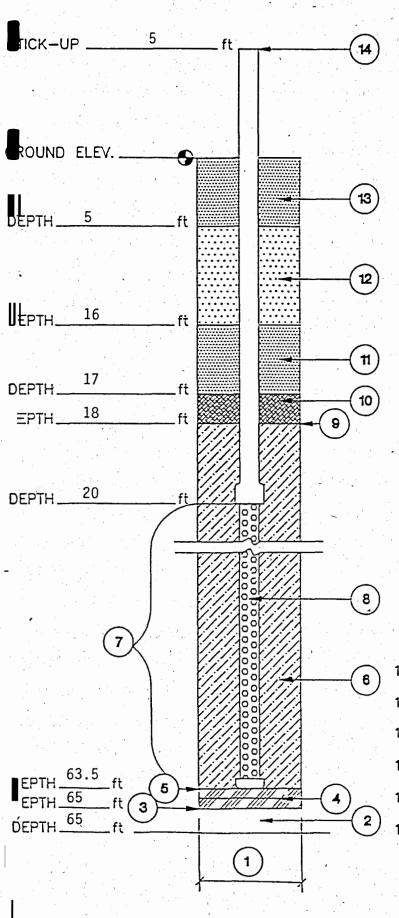
GROUND ELEVATION 1026.9

LEACHATE LEVEL ft

- 1. BOREHOLE DIA. ______ft
- 2. DISTANCE ABOVE BASE _ 0 ft
- 3. BOREHOLE DEPTH ______ft
- 4. WELL BASE MATERIAL 1' Bentonite, 0.5' Ston
- 5. WELL PIPE DEPTH ______ 68.5 ft
- 6. FILTER MATERIAL <u>1 1/2" Washed Stone</u>
- 7. SCREEN LENGTH 48.5 ft
- 8. SCREEN MATERIAL 8" Dia. Sch. 80 PVC Pipe
- 9. GEOTEXTILE RING _____Yes
- 10. LOWER SEAL #1 1' Bentonite/Select Fill Mix
- 11. LOWER SEAL #2 1' Bentonite
- 12. FILL ABOVE SEAL Select General Fill
- 13. SURFACE SEAL 2' Bentonite/Clay Mix, Then C'
- 14. WELL MATERIAL 6" & 8" Dia. Sch. 80 PVC Pipe
- 15. COMMENTS Slip coupler installed between solid and perforated pipe. Two-1" Dia.

 Sch. 80 PVC leachate monitor, risers attached to well.

WARZYN

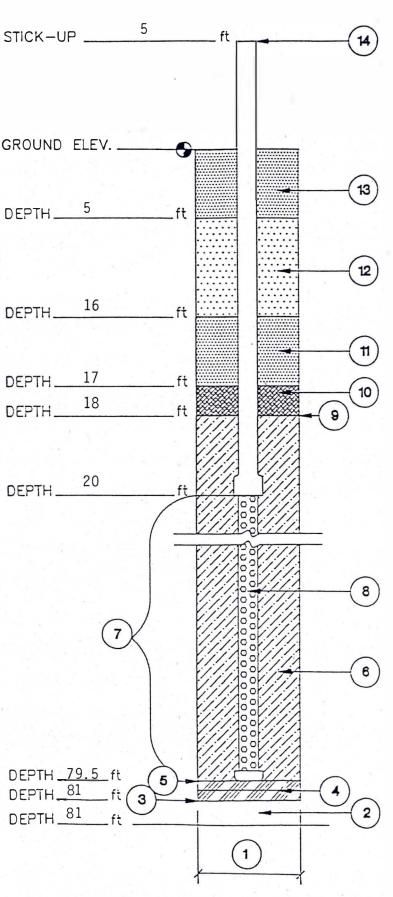


PROJECT NAME	Refuse Hideaway
JOB NO.	15292.01
GAS WELL NO.	GW11
DATE	10-26-90
CONTRACTOR	Terra
INSPECTED BY	
LOCATION 400,626N	
GROUND ELEVATION	•
LEACHATE LEVEL	ft
	The first the second of the second

- 1. BOREHOLE DIA. _______f
- 2. DISTANCE ABOVE BASE ______ ft
- . 3. BOREHOLE DEPTH _______ft
 - 4. WELL BASE MATERIAL 1' Bentonite, 0.5' Stone
- 5. WELL PIPE DEPTH 63.5 ft
- 6. FILTER MATERIAL 1 1/2" Washed Stone
- 7. SCREEN LENGTH 43.5 ft
- 8. SCREEN MATERIAL 8" Dia. Sch. 80 PVC
- 9. GEOTEXTILE RING Yes
- 10. LOWER SEAL #1 1' Bentonite/Select Fill Mix
- 11. LOWER SEAL #2 1' Bentonite
- 12. FILL ABOVE SEAL <u>Select General Fill</u>
- 13. SURFACE SEAL 2' Bentonite/Clay, Then Clay
- 14. WELL MATERIAL 6" & 8" Dia. Sch. 80 PVC Pipe
- 15. COMMENTS Slip coupler installed between solid and perforated pipe. Two-1" Dia.

 Sch. 80 PVC leachate monitor. risers attached to well.





 PROJECT NAME
 Refuse Hideaway

 JOB NO.
 15292.01

 GAS WELL NO.
 GW12

 DATE
 10-29-90

 CONTRACTOR
 Terra

 INSPECTED BY
 D. Free - Warzyn

 LOCATION
 400,798N
 2,112,285E

 GROUND ELEVATION
 1036.0

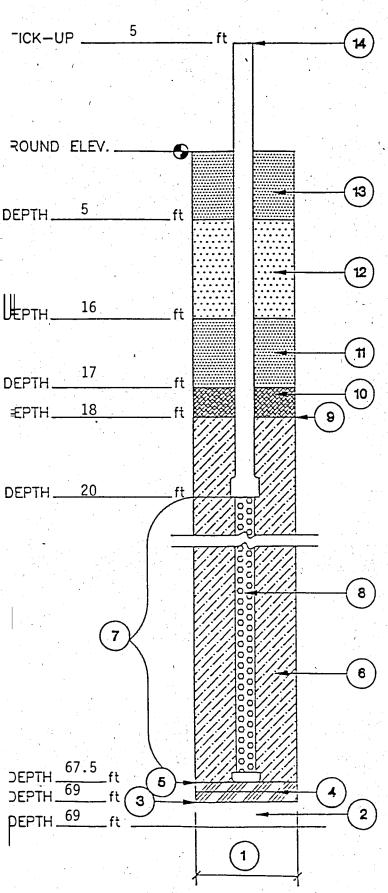
 LEACHATE LEVEL
 ft

- 1. BOREHOLE DIA. _____ ft
- 2. DISTANCE ABOVE BASE ____ ft
- 3. BOREHOLE DEPTH _____ ft
- 4. WELL BASE MATERIAL 1' Bentonite, 0.5' Stor
- 5. WELL PIPE DEPTH _______ ft
- 6. FILTER MATERIAL 1 1/2" Washed Stone
- 7. SCREEN LENGTH ______59.5 ft
- 8. SCREEN MATERIAL 8" Dia. Sch. 80 PVC
- 9. GEOTEXTILE RING Yes
- 10. LOWER SEAL #1 1' Bentonite/Select Fill Mix
- 11. LOWER SEAL #21' Bentonite
- 12. FILL ABOVE SEAL Select General Fill
- 13. SURFACE SEAL2' Clay/Bentonite, Then Clay
- 14. WELL MATERIAL 6" & 8" Dia. Sch. 80 PVC Pip∈
- 15. COMMENTS 6x8" Sch. 80 reducer coupling installed between solid and perforated pip.

 Two-1" Dia. Sch. 80 PVC leachate monitor.

 risers attached to well pipe.

WARZYN



PROJECT NAME	Refuse Hideaway	
JOB NO.	15292.01	
GAS WELL NO	400000	
DATE	10-30-90	
CONTRACTOR	Terra	,
INSPECTED BY	D. Free - Warzyn	
LOCATION 400,978N		1
GROUND ELEVATION		
LEACHATE LEVEL		ft

- 1. BOREHOLE DIA. ______ f
- 2. DISTANCE ABOVE BASE 0 ft
- 3. BOREHOLE DEPTH _______ft
- 4. WELL BASE MATERIAL 1' Bentonite, 0.5' Stone
- 5. WELL PIPE DEPTH ______ft
- 6. FILTER MATERIAL 1 1/2" Washed Stone
- 7. SCREEN LENGTH 47.5 ft
- 8. SCREEN MATERIAL 8", Sch. 80 PVC
- 9. GEOTEXTILE RING _____Yes
- 10. LOWER STAL #1 1' Bentonite/Select Fill Mix
- 11. LOWER SEAL #2 1' Bentonite
- 12. FILL ABOVE SEAL Select General Fill
- 13. SURFACE SEAL 2' Clay/Bentonite, Then Clay
- 14. WELL MATERIAL6" & 8" Sch. 80 PVC pipe
- 15. COMMENTS 6x8" Sch. 80 reducer slip coupling installed between solid and perforated pipe.

Two-1" Dia. Sch. 80 PVC leachate monitor.

risers attached to well pipe.

Appendix C

Characterization of Excavated Refuse



January 25, 1991

Ms. Theresa Evanson Wisconsin Department of Natural Resources Bureau of Solid and Hazardous Waste Management 101 S. Webster Street, GEF II, SW/3 Madison, Wisconsin 53703

Re: TCLP Sampling Results Extraction Well Spoils Refuse Hideaway Landfill Project No. 15292.01

Dear Ms. Evanson:

We are forwarding the Toxic Characteristic Leaching Procedure (TCLP) Analysis results for refuse samples taken during the drilling of extraction wells at Refuse Hideaway Landfill. Refuse was sampled, characterized and temporarily stored as described in Section 5 of the Gas and Leachate Extraction system Design Report; Warzyn, September, 1990.

Samples GW3-1 and GW3-2 were taken on 10/23/90 from refuse removed from borehole GW3 at approximate depths of 8 1/2 ft and 25 ft, respectively. Samples GW4-1 and GW5-1 were taken on 10/24/90 from refuse removed at a depth of 30 ft from boreholes GW4 and GW5, respectively.

The only exceedance of regulatory limits, as listed in 40 CFR 261.24, was identified in sample GW3-2. Lead was detected at 7.9 mg/L with a regulatory limit of 5.0 mg/L.

Due to the lead exceedance in GW3-2, Warzyn performed three additional TCLP lead analyses (Change Order No. 3 12-27-90).

The additional analysis indicated TCLP lead results for GW3-2 were 10.4, 15.5, and 7.39 mg/l respectively. This indicates that borehole spoils from GW3 will need to be disposed of by excavating around well GW3 and placing the GW3 refuse spoils in the excavated area. The cover will then be restored.

Warzyn will draft Change Order No. 4 for Terra Engineering & Construction to perform the GW3 waste disposal.

Please call if you should have questions.

Sincerely,

WARZYN ENGINEERING INC.

Dean R. Free

Project Engineer

THE PERFECT BALANCE AND CREAT (ATY: Jan C. Kucher, P.E. Project Manager

MADISON ONE SCIENCE COURT P.O. BOX 5385

DRF/kml/JCK/SGW [mpb-112-88] FAX (608) 273-2513 15292.01-MD



TOXICITY CHARACTERISTIC LEACHING PROCEDURE **VOLATILE ORGANICS**

WI LAB CERTIFICATION ID#: 113138300

PROJECT: REFUSE HIDEAWAY

LOCATION: MIDDLETON, WISCONSIN

PROJECT #: 15292.01 DATE SAMPLED: 10/23/90

LAB NO. SAMPLE DESCRIPTION	1875-001 	REGULATORY LIMITS (MG/L)
PARAMETER (MG/L)		
BENZENE	<0.005	0.5
CARBON TETRACHLORIDE	<0.005	0.5
CHLOROBENZENE	<0.005	100.0
CHLOROFORM	<0.005	6.0
1,2-DICHLOROETHANE	<0.005	- 0.5
1,1-DICHLOROETHYLENE	<0.005	0.7
METHYL ETHYL KETONE	<0.010	200.0
TETRACHLOROETHYLENE	<0.005	0.7
TRICHLOROETHYLENE	<0.005	0.5
VINYL CHLORIDE	<0.010	0.2

CLASSIFICATION:

THE REGULATORY LIMITS FOR SAMPLE 1875-001 WERE NOT EXCEEDED

FOR THE PARAMETERS ANALYZED.

METHOD REFERENCE:

SW-846, "METHODS FOR CHEMICAL ANALYSIS OF WATER AND WASTES",

MARCH, 1984. (METAL ANALYSES)

METHOD 1311: TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP). FINAL RULE PUBLISHED BY THE USEPA IN THE MARCH 29,1990 FEDERAL REGISTER.

CK'D: المسكم APP'D: المناكبة APP'D: المناكبة ال PAGE 1 OF 6



TOXICITY CHARACTERISTIC LEACHING PROCEDURE VOLATILE ORGANICS WI LAB CERTIFICATION ID#: 113138300

PROJECT: REFUSE HIDEAWAY PROJECT #: 15292.01

LOCATION: MIDDLETON, WISCONSIN DATE SAMPLED: 10/23/90

LAB NO. SAMPLE DESCRIPTION	1875-002 GW3-2	REGULATORY LIMITS (MG/L)
PARAMETER (MG/L)		
BENZENE	<0.005	0.5
CARBON TETRACHLORIDE	<0.005	0.5
CHLOROBENZENE	0.001	100.0
CHLOROFORM	<0.005	6.0
1,2-DICHLOROETHANE	<0.005	0.5
1,1-DICHLOROETHYLENE	<0.005	0.7
METHYL ETHYL KETONE	0.040	200.0
TETRACHLOROETHYLENE	0.059	0.7
TRICHLOROETHYLENE	<0.005	0.5
VINYL CHLORIDE	<0.010	0.2
	and the second s	

CLASSIFICATION: THE REGULATORY LIMITS FOR SAMPLE 1875-002 WERE NOT EXCEEDED

FOR THE PARAMETERS ANALYZED.

SW-846, "METHODS FOR CHEMICAL ANALYSIS OF WATER AND WASTES", MARCH, 1984. (METAL ANALYSES) METHOD REFERENCE:

METHOD 1311: TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP). FINAL RULE PUBLISHED BY THE USEPA IN THE MARCH 29,1990 FEDERAL REGISTER.

CK'D:JW/APP'D: 57
DATE ISSUED: 12/14/70
PAGE ~ OF 6



TOXICITY CHARACTERISTIC LEACHING PROCEDURE SEMIVOLATILE ORGANICS

WI LAB CERTIFICATION ID#: 113138300

PROJECT: REFUSE HIDEAWAY

LOCATION: MIDDLETON, WISCONSIN

PROJECT #: 15292.01 DATE SAMPLED: 10/23/90

LAB NO. SAMPLE DESCRIPTION	1875-001 <u>GW3-1</u>	REGULATORY LIMITS (MG/L)
PARAMETER (MG/L)		
O-CRESOL	<0.010	200.0
M/P-CRESOLS	<0.010	200.0
1,4-DICHLOROBENZENE	<0.010	7.5
2,4-DINITROTOLUENE	<0.010	0.13
HEXACHLOROBENZENE	<0.010	0.13
HEXACHLORO-1,3-BUTADIENE	<0.010	0.5
HEXACHLOROETHANE	<0.010	3.0
NITROBENZENE	<0.010	2.0
PENTACHLOROPHENOL	<0.020	100.0
PYRIDINE	<0.010	5.0
2,4,5-TRICHLOROPHENOL	<0.020	400.0
2,4,6-TRICHLOROPHENOL	<0.020	2.0

CLASSIFICATION:

THE REGULATORY LIMITS FOR SAMPLE 1875-001 WERE NOT

EXCEEDED FOR THE PARAMETERS ANALYZED.

METHOD REFERENCE:

SW-846, "METHODS FOR CHEMICAL ANALYSIS OF WATER AND WASTES", MARCH, 1984. (METAL ANALYSES)

METHOD 1311: TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP). FINAL RULE PUBLISHED BY THE USEPA IN THE MARCH 29,1990 FEDERAL REGISTER.

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> DATE ISSUED: 12/14/90 PAGE 3 OF 6



TOXICITY CHARACTERISTIC LEACHING PROCEDURE SEMIVOLATILE ORGANICS WI LAB CERTIFICATION ID#: 113138300

PROJECT: REFUSE HIDEAWAY

LOCATION: MIDDLETON, WISCONSIN

PROJECT #: 15292.01

DATE SAMPLED: 10/23/90

LAB NO. SAMPLE DESCRIPTION	1875-002 <u>GW3-2</u>	REGULATORY LIMITS (MG/L)
PARAMETER (MG/L)		
0-CRESOL	<0.030	200.0
M/P-CRESOLS	<0.030	200.0
1,4-DICHLOROBENZENE	<0.030	7.5
2,4-DINITROTOLUENE	<0.030	0.13
HEXACHLOROBENZENE	<0.030	0.13
HEXACHLORO-1,3-BUTADIENE	<0.030	0.5
HEXACHLOROETHANE	<0.030	3.0
NITROBENZENE	<0.030	2.0
PENTACHLOROPHENOL	<0.060	100.0
PYRIDINE	<0.030	5.0
2,4,5-TRICHLOROPHENOL	<0.060	400.0
2,4,6-TRICHLOROPHENOL	<0.060	2.0

CLASSIFICATION:

THE REGULATORY LIMITS FOR SAMPLE 1875-002 WERE NOT

EXCEEDED FOR THE PARAMETERS ANALYZED.

METHOD REFERENCE:

SW-846, "METHODS FOR CHEMICAL ANALYSIS OF WATER AND WASTES", MARCH, 1984. (METAL ANALYSES)

METHOD 1311:

TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP). FINAL RULE PUBLISHED BY THE USEPA IN THE MARCH 29,1990 FEDERAL REGISTER.

CK'D: SWAPP'D: M DATE ISSUED: 12/11/15 PAGE 4 OF L



TOXICITY CHARACTERISTIC LEACHING PROCEDURE

WI LAB CERTIFICATION ID#: 113138300

PROJECT: REFUSE HIDEAWAY

PROJECT #: 15292.01

LOCATION: MIDDLETON, WISCONSIN

DATE SAMPLED: 10/23/90

HERBICIDES

LAB NO.	1875-001	REGULATORY
SAMPLE DESCRIPTION	<u>GW3-1</u>	LIMITS (MG/L)
2,4-D	<0.10	10.0
2,4,5-TP (SILVEX)	<0.010	1.0

RESULTS ARE REPORTED IN MG/L.

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TOXICITY CHARACTERISTIC LEACHING PROCEDURE

WI LAB CERTIFICATION ID#: 113138300

PROJECT: REFUSE HIDEAWAY PROJECT #: 15292.01

LOCATION: MIDDLETON, WISCONSIN DATE SAMPLED: 10/23/90

HERBICIDES

LAB NO. SAMPLE DESCRIPTION	1875-002 GW3-2	REGULATORY LIMITS (MG/L)
2,4-D	<0.10	10.0
2,4,5-TP (SILVEX)	<0.010	1.0

RESULTS ARE REPORTED IN MG/L.

CK'D: Sum APP'D: 18 DATE ISSUED: 12/14/50 PAGE 6 OF 6



TOXICITY CHARACTERISTIC LEACHING PROCEDURE METALS

WI LAB CERTIFICATION ID#: 113138300

PROJECT: REFUSE HIDEAWAY

PROJECT #: 15292.01

LOCATION: MIDDLETON, WISCONSIN

DATE SAMPLED: 10/23/90

LAB NO. SAMPLE DESCRIPTION	1875-001 _GW3-1	REGULATORY LIMITS (MG/L)
PARAMETER (MG/L)		
ARSENIC	0.005	5.0
BARIUM	2.43	100.0
CADMIUM	<0.01	1.0
CHROMIUM, TOTAL	<0.10	5.0
LEAD	<0.10	5.0
MERCURY	<0.0002	0.2
SELENIUM	<0.004	1.0
SILVER	<0.01	5.0

CLASSIFICATION:

THE REGULATORY LIMITS FOR SAMPLE 1875-001 WERE NOT EXCEEDED

FOR THE PARAMETERS ANALYZED.

METHOD REFERENCE: SW-846, "TEST METHODS FOR EVALUATING SOLID WASTE", SEPTEMBER,

1986. (METAL ANALYSES)

METHOD 1311:

TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP). FINAL RULE

PUBLISHED BY THE USEPA IN THE MARCH 29,1990 FEDERAL REGISTER.

DATE ISSUED: 11/13/50

PAGE 1 OF 1



TOXICITY CHARACTERISTIC LEACHING PROCEDURE **METALS**

WI LAB CERTIFICATION ID#: 113138300

PROJECT: REFUSE HIDEAWAY

LOCATION: MIDDLETON, WISCONSIN

PROJECT #: 15292.01

DATE SAMPLED: 10/23/90

1875-002 	REGULATORY LIMITS (MG/L)
0.006	5.0
4.28	100.0
0.01	1.0
<0.05	5.0
7.9	5.0
<0.0002	0.2
<0.002	1.0
<0.01	5.0
	0.006 4.28 0.01 <0.05 7.9 <0.0002 <0.002

CLASSIFICATION: THE REGULATORY LIMIT FOR SAMPLE 1875-002 WAS EXCEEDED FOR

LEAD.

METHOD REFERENCE: SW-846, "TEST METHODS FOR EVALUATING SOLID WASTE", SEPTEMBER, 1986. (METAL ANALYSES)

METHOD 1311: TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP). FINAL RULE PUBLISHED BY THE USEPA IN THE MARCH 29,1990 FEDERAL REGISTER.

CK'D:JW APP'D: DATE ISSUED: 1/13/3: PAGE 2 OF 4



TOXICITY CHARACTERISTIC LEACHING PROCEDURE PESTICIDES

WI LAB CERTIFICATION ID#: 113138300

PROJECT: REFUSE HIDEAWAY

LOCATION: MIDDLETON, WISCONSIN

PROJECT #: 15292.01 DATE SAMPLED: 10/23/90

LAB NO. SAMPLE DESCRIPTION	1875-001 GW3-1	REGULATORY LIMITS (MG/L)
PARAMETER (MG/L)	*	
CHLORDANE	<0.0006	0.03
ENDRIN	<0.00025	0.02
HEPTACHLOR	<0.00015	0.008
P,P-METHOXYCHLOR	<0.0015	10.0
TOXAPHENE	<0.005	0.5
GAMMA-BHC (LINDANE)	<0.00015	0.4

CLASSIFICATION:

THE REGULATORY LIMITS FOR SAMPLE 1875-001 WERE NOT EXCEEDED

FOR THE PARAMETERS ANALYZED.

METHOD 1311: TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP). FINAL RULE

PUBLISHED BY THE USEPA IN THE MARCH 29,1990 FEDERAL REGISTER.

CK'D: APP'D: DATE ISSUED: 19975



TOXICITY CHARACTERISTIC LEACHING PROCEDURE **PESTICIDES** WI LAB CERTIFICATION ID#: 113138300

PROJECT: REFUSE HIDEAWAY

LOCATION: MIDDLETON, WISCONSIN

PROJECT #: 15292.01 DATE SAMPLED: 10/23/90

LAB NO. SAMPLE DESCRIPTION	1875-002 GW3-2	REGULATORY LIMITS (MG/L)
PARAMETER (MG/L)		
CHLORDANE	<0.0006	0.03
ENDRIN	<0.00025	0.02
HEPTACHLOR	<0.00015	0.008
P,P-METHOXYCHLOR	<0.0015	10.0
TOXAPHENE	<0.005	0.5
GAMMA-BHC (LINDANE)	<0.00015	0.4

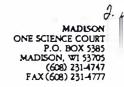
CLASSIFICATION:

THE REGULATORY LIMITS FOR SAMPLE 1875-002 WERE NOT EXCEEDED

FOR THE PARAMETERS ANALYZED.

METHOD 1311: TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP). FINAL RULE PUBLISHED BY THE USEPA IN THE MARCH 29,1990 FEDERAL REGISTER.

CK'D: APP'D: TO DATE ISSUED: 4/5/50 PAGE 4 OF 4





TOXICITY CHARACTERISTIC LEACHING PROCEDURE WI LAB CERTIFICATION ID#: 113138300

Project: Refuse Hideaway

Project #: 15292.01

Location: Middleton, Wisconsin

Date Sampled: 10/23/90

Lab No. Sample <u>Description</u>	2121-001 GW3-2 <u>Replicate #1</u>	2121-002 GW3-2 <u>Replicate #2</u>	2121-003 GW3-2 <u>Replicate #3</u>	Regulatory Limits (mg/L)
Lead	10.4	15.5	7.39	5.0

Results are reported in mg/L.

Classification:

The regulatory limits for samples 2121-001, 2121-002 and 2121-003 have been exceeded for lead.

Method Reference:

SW-846, "Methods for Chemical Analysis of Water and Wastes", March, 1984.

Method 7420: Lead

Method 1311: Toxicity Characteristic Leaching Procedure (TCLP). Final rule

published by the USEPA in the March 29,1990 Federal Register.

Ck'd: 19 App'd: Jun Date Issued: 1-10-9 Page | of |



TOXICITY CHARACTERISTIC LEACHING PROCEDURE **VOLATILE ORGANICS** WI LAB CERTIFICATION ID#: 113138300

PROJECT: REFUSE HIDEAWAY PROJECT #: 15292.01

LOCATION: MIDDLETON, WISCONSIN DATE SAMPLED: 10/24/90

LAB NO. SAMPLE DESCRIPTION	1879-001 GW4-1	REGULATORY LIMITS (MG/L)
PARAMETER (MG/L)		
BENZENE	<0.005	0.5
CARBON TETRACHLORIDE	<0.005	0.5
CHLOROBENZENE	<0.005	100.0
CHLOROFORM	<0.005	6.0
1,2-DICHLOROETHANE	<0.005	0.5
1,1-DICHLOROETHYLENE	<0.005	0.7
METHYL ETHYL KETONE	0.005	200.0
TETRACHLOROETHYLENE	0.009	0.7
TRICHLOROETHYLENE	<0.005	0.5
VINYL CHLORIDE	<0.010	0.2
· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	

CLASSIFICATION:

THE REGULATORY LIMITS FOR SAMPLE 1879-001 WERE NOT EXCEEDED FOR THE PARAMETERS ANALYZED.

METHOD REFERENCE:

SW-846, "METHODS FOR CHEMICAL ANALYSIS OF WATER AND WASTES", MARCH, 1984. (METAL ANALYSES)

METHOD 1311:

TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP). FINAL RULE PUBLISHED BY THE USEPA IN THE MARCH 29,1990 FEDERAL REGISTER.

CK'D: JW APP'D: PODATE ISSUED: 12-12-90 PAGE 1 OF 6



TOXICITY CHARACTERISTIC LEACHING PROCEDURE **VOLATILE ORGANICS**

WI LAB CERTIFICATION ID#: 113138300

PROJECT: REFUSE HIDEAWAY PROJECT #: 15292.01

LOCATION: MIDDLETON, WISCONSIN DATE SAMPLED: 10/24/90

LAB NO. SAMPLE DESCRIPTION	1879-002 <u>GW5-1</u>	REGULATORY LIMITS (MG/L)
PARAMETER (MG/L)		
BENZENE	<0.005	0.5
CARBON TETRACHLORIDE	<0.005	0.5
CHLOROBENZENE	<0.005	100.0
CHLOROFORM	<0.005	6.0
1,2-DICHLOROETHANE	<0.005	0.5
1,1-DICHLOROETHYLENE	<0.005	0.7
METHYL ETHYL KETONE	0.120	200.0
TETRACHLOROETHYLENE	0.008	0.7
TRICHLOROETHYLENE	0.010	0.5
VINYL CHLORIDE .	<0.010	0.2

CLASSIFICATION: THE REGULATORY LIMITS FOR SAMPLE 1879-002 WERE NOT

EXCEEDED FOR THE PARAMETERS ANALYZED.

SW-846, "METHODS FOR CHEMICAL ANALYSIS OF WATER AND WASTES", MARCH, 1984. (METAL ANALYSES) METHOD REFERENCE:

TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP). FINAL RULE METHOD 1311:

PUBLISHED BY THE USEPA IN THE MARCH 29,1990 FEDERAL REGISTER.

CK'D:JW APP'D: DATE ISSUED: 12-12-90 PAGE 2 OFC



TOXICITY CHARACTERISTIC LEACHING PROCEDURE SEMIVOLATILE ORGANICS WI LAB CERTIFICATION ID#: 113138300

PROJECT: REFUSE HIDEAWAY LOCATION: MIDDLETON, WISCONSIN

PROJECT #: 15292.01

DATE SAMPLED: 10/24/90

LAB NO. SAMPLE DESCRIPTION	1879-001 <u>GW4-1</u>	REGULATORY LIMITS (MG/L)
PARAMETER (MG/L)		
O-CRESOL	<0.010	200.0
M/P-CRESOLS	0.018 (X)	200.0
1,4-DICHLOROBENZENE	0.002	7.5
2,4-DINITROTOLUENE	<0.010	0.13
HEXACHLOROBENZENE	<0.010	0.13
HEXACHLORO-1,3-BUTADIENE	<0.010	0.5
HEXACHLOROETHANE	<0.010	3.0
NITROBENZENE	<0.010	2.0
PENTACHLOROPHENOL	0.001	100.0
PYRIDINE	<0.010	5.0
2,4,5-TRICHLOROPHENOL	<0.020	400.0
2,4,6-TRICHLOROPHENOL	<0.020	2.0

(X) = INDISTINGUISHABLE ISOMERS

CLASSIFICATION:

THE REGULATORY LIMITS FOR SAMPLE 1879-001 WERE NOT

EXCEEDED FOR THE PARAMETERS ANALYZED.

METHOD REFERENCE:

SW-846, "METHODS FOR CHEMICAL ANALYSIS OF WATER AND

WASTES", MARCH, 1984. (METAL ANALYSES)

METHOD 1311: TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP). FINAL RULE

PUBLISHED BY THE USEPA IN THE MARCH 29,1990 FEDERAL REGISTER.

CK'D: SW APP'D: (5) DATE ISSUED: 12.12.90 PAGE 3 OF 4



TOXICITY CHARACTERISTIC LEACHING PROCEDURE SEMIVOLATILE ORGANICS

WI LAB CERTIFICATION ID#: 113138300

PROJECT: REFUSE HIDEAWAY LOCATION: MIDDLETON, WISCONSIN PROJECT #: 15292.01 DATE SAMPLED: 10/24/90

LAB NO. SAMPLE DESCRIPTION	1879-002 <u>GW5-1</u>	REGULATORY LIMITS (MG/L)
PARAMETER (MG/L)		
O-CRESOL	0.001	200.0
M/P-CRESOLS	0.034 (X)	200.0
1,4-DICHLOROBENZENE	0.002	7.5
2,4-DINITROTOLUENE	<0.010	0.13
HEXACHLOROBENZENE	<0.010	0.13
HEXACHLORO-1,3-BUTADIENE	<0.010	0.5
HEXACHLOROETHANE	<0.010	3.0
NITROBENZENE	<0.010	2.0
PENTACHLOROPHENOL	<0.020	100.0
PYRIDINE	<0.010	5.0
2,4,5-TRICHLOROPHENOL	<0.020	400.0
2,4,6-TRICHLOROPHENOL	<0.020	2.0

(X) = INDISTINGUISHABLE ISOMERS

CLASSIFICATION:

THE REGULATORY LIMITS FOR SAMPLE 1879-002 WERE NOT

EXCEEDED FOR THE PARAMETERS ANALYZED.

METHOD REFERENCE:

SW-846, "METHODS FOR CHEMICAL ANALYSIS OF WATER AND WASTES", MARCH, 1984. (METAL ANALYSES)

METHOD 1311: TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP). FINAL RULE

PUBLISHED BY THE USEPA IN THE MARCH 29,1990 FEDERAL REGISTER.

CK'D: APP'D: PS DATE ISSUED: 12.12.90 PAGE 4 OF 6



TOXICITY CHARACTERISTIC LEACHING PROCEDURE

WI LAB CERTIFICATION ID#: 113138300

PROJECT: REFUSE HIDEAWAY PROJECT #: 15292.01

LOCATION: MIDDLETON, WISCONSIN DATE SAMPLED: 10/24/90

HERBICIDES

LAB NO. SAMPLE DESCRIPTION	1879-001 GW4-1
2,4-D	<0.10
2,4,5-TP (SILVEX)	<0.010
2,4,5-T	<0.010

RESULTS ARE REPORTED IN MG/L.

CK'D:JW APP'D: PS DATE ISSUED: 12.(2.90 PAGE & OF 6



TOXICITY CHARACTERISTIC LEACHING PROCEDURE

WI LAB CERTIFICATION ID#: 113138300

PROJECT: REFUSE HIDEAWAY PROJECT #: 15292.01

LOCATION: MIDDLETON, WISCONSIN DATE SAMPLED: 10/24/90

HERBICIDES

LAB NO. SAMPLE DESCRIPTION	1879-002 GW5-1
2,4-D	<0.10
2,4,5-TP (SILVEX)	<0.010
2.4.5-T	<0.010

RESULTS ARE REPORTED IN MG/L.

CK'D: TW APP'D: 19 DATE ISSUED: 12-12-PAGE 6 OF 6



TOXICITY CHARACTERISTIC LEACHING PROCEDURE METALS

WI LAB CERTIFICATION ID#: 113138300

PROJECT: REFUSE HIDEAWAY PROJECT #: 15292.01

LOCATION: MIDDLETON, WISCONSIN DATE SAMPLED: 10/24/90

LAB NO. SAMPLE DESCRIPTION	1879-001 <u>GW4-1</u>	1879-002 <u>GW5-1</u>	REGULATORY LIMITS (MG/L)
PARAMETER (MG/L)			
ARSENIC	0.006	0.025	5.0
BARIUM	2.93	0.54	100.0
CADMIUM	<0.01	<0.01	1.0
CHROMIUM, TOTAL	<0.05	<0.05	5.0
LEAD	<0.1	<0.1	5.0
MERCURY	<0.0002	<0.0002	0.2
SELENIUM	<0.002	<0.002	1.0
SILVER	<0.01	<0.01	5.0

CLASSIFICATION: THE REGULATORY LIMITS FOR SAMPLE 1879-001 AND 1879-002 WERE

NOT EXCEEDED.

SW-846, "TEST METHODS FOR EVALUATING SOLID WASTE", SEPTEMBER, 1986. (METAL ANALYSES) METHOD REFERENCE:

TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP). FINAL RULE PUBLISHED BY THE USEPA IN THE MARCH 29,1990 FEDERAL REGISTER. METHOD 1311:

CK'D: aw APP'D: FO DATE ISSUED: 11/3/30



TOXICITY CHARACTERISTIC LEACHING PROCEDURE - PESTICIDES

WI LAB CERTIFICATION ID#: 113138300

PROJECT: REFUSE HIDEAWAY PROJECT #: 15292.01

LOCATION: MIDDLETON, WISCONSIN DATE SAMPLED: 10/24/90

LAB NO. SAMPLE DESCRIPTION	-	1879-001 <u>GW4-1</u>	1879-002 <u>GW5-1</u>	REGULATORY LIMITS (MG/L)
PARAMETER (MG/L)				
CHLORDANE		<0.00060	<0.00060	0.03
ENDRIN		<0.00025	<0.00025	0.02
HEPTACHLOR		<0.00015	<0.00015	0.008
P,P'-METHOXYCHLOR		<0.0015	<0.0015	10.0
TOXAPHENE		<0.0050	<0.0050	0.5
GAMMA-BHC (LINDANE)		<0.00015	<0.0015	0.4

CLASSIFICATION: THE REGULATORY LIMITS FOR SAMPLES 1879-001 AND 1879-002 WERE

NOT EXCEEDED FOR THE PARAMETERS ANALYZED.

METHOD 1311: TOXICITY CHARACTERISTIC LEACHING PROCEDURE (TCLP). FINAL RULE

PUBLISHED BY THE USEPA IN THE MARCH 29,1990 FEDERAL REGISTER.

CK'D: shui APP'D: PST DATE ISSUED: 4/19/90

Appendix D

Field Density Test Results and Moisture/Density Curves



Job No: 15292.03 Tested By: DRF/JAL

FIELD DENSITY TEST REPORT - NO. 1

Warzyn Inc., 1 Science Ct., Madison, WI 53705

PROJECT:

Landfill Gas & Leachate Extraction System Refuse Hideaway Landfill

TO: WDNR-GEFII, SW/3 P.O. Box 7921

Madison, WI 53707

ATTN: Ms. Theresa A. Evanson

TEST METHODS: Moisture-density relationship of soils based on MODIFIED proctor (ASTM D1557).

"METHOD" indicates: (N) Nuclear (ASTM D2922) or (S) Sand Cone (ASTM D1556)

100	1		constant de la consta	A. 10 A. 20 A. 20 A. 20 A. 20 A. 20 A. 20 A. 20 A. 20 A. 20 A. 20 A. 20 A. 20 A. 20 A. 20 A. 20 A. 20 A. 20 A.		- Udatakan sasa Na			000000000000000000000000000000000000000	aliania in interpreta	ala Visali	v.144-14489
	. N										Jacob de Septi Pero de Septi	
	E				+	DISTANCE						
						BELOW						
	۲	•				FILL			DRY	MAXIMUM	机并分离物管	
Test				LIFT	TEST	SURFACE		MOISTURE	DENSITY	DENSITY	COMP.	
No.	••	.,	4	NO.	ELEVATION	in.	MATERIAL TESTED	96	lb/cuft	lb/cuft	<u> </u>	<u> </u>
4/17	91											
Hea	der	Trench							•			
1	١	N 400316N	l, 2122735E	1		12	Brown Lean CLAY, Little Sand	19.9	108.6	118	92	90
2	١	N 400303N	l, 2112676E	1		. 12	Brown Lean CLAY, Little Sand	19.6	107.1	118	91	90
4/18	/91								,			
3	١	V 400316N	l, 2112735E	. 1		12	Brown Lean CLAY, Little Sand	15.1	113.2	118	96	, 90
4	1	V 400291N	I, 2112623E	1		. 12	Brown Lean CLAY, Little Sand	17.0	111.4	118	94	90
5	١	N 400306N	l, 2112691E	2		0	Brown Lean CLAY, Little Sand	18.0	110.8	118	94	90
6	١	N 400317N	I, 2112740E	2		, 0,	Brown Lean CLAY, Little Sand	17.0	112.8	118	96	90
7	١	N 400287N	I, 2112603E	2		0	Brown Lean CLAY, Little Sand	14.3	116.1	118	98	90
8	1	N 4002671	N, 2112515E	2		. 0	Brown Lean CLAY, Little Sand	11.7	115.6	118	. 98	90
9	. 1	N 4002421	N, 2112392E	1		12	Brown Lean CLAY, Little Sand	17.3	108.6	118	92	90
10	1	N 4002241	1, 2112286E	1		12	Brown Lean CLAY, Little Sand	21.4	106.4	118	90	90
11	ı	N 4002271	N, 2112303E	. 2		0	Brown Lean CLAY, Little Sand	17.1	110.8	118	94	1 90
12	. 1	N 4002371	N, 2112367E	2		. 0	Brown Lean CLAY, Little Sand	17.0	. 110.9	118	94	90
13		N 4002601	N, 2112191E	1		12	Brown Lean CLAY, Little Sand	16.2	111.9	118	95	90
							and the second s					

	M				B						
	E T				DISTANCE						
	Н				FILL			DRY	MAXIMUM	MEAS	SPEC
Test				LIFT	TEST SURFACE	DESCRIPTION OF	MOISTURE		DENSITY		
No.	D	LOCATION			ELEVATION in.	MATERIAL TESTED	%	lb/cuft	lb/cuft	%	%
14	N	400250N,	2112190E	2		Brown Lean CLAY, Little Sand	16.9	112.4	118	95	90
15	Ν	400358N,	2112199E	1	12	Brown Lean CLAY, Little Sand	19.7	106.6	118	90	90
16	N	400363N,	2112199E	2	0	Brown Lean CLAY, Little Sand	20.6	107.1	118	91	90
17	Ν	400509N,	2112181E	1	12	Brown Lean CLAY, Little Sand	17.3	113.5	118	96	90
18	Ν	400604N,	2112149E	1	12	Brown Lean CLAY, Little Sand	15.6	116.4	118	99	90
19	Ν	400495N,	2112186E	2	0	Brown Lean CLAY, Little Sand	16.8	110.9	118	94	90
20	N	400561N,	2112163E	2	0	Brown Lean CLAY, Little Sand	19.0	107.3	118	91	90
4/19/	91										
21	Ν	400623N,	2112200E	1	12	Brown Lean CLAY, Little Sand	18.4	109.5	118	93	90
22	Ν	400617N,	2112259E	1	12	Brown Lean CLAY, Little Sand	16.0	108.9	118	92	90
23	Ν	400623N,	2112205E	2	0	Brown Lean CLAY, Little Sand	17.2	106.3	118	90	90
24	N	400618N,	2112249E	2	0	Brown Lean CLAY, Little Sand	17.2	109.1	118	92	90
4/22/											
25	N	400751N,	2112307E	1	12	Brown Lean CLAY, Little Sand,	15.0	114.7	123	93	90
						Trace Gravel					
26	N	400656N,	2112342E	1	12	Brown Lean CLAY, Little Sand,	16.7	113.1	123	92	90
					_	Trace Gravel					
2/	N	400/41N,	2112311E	2	0	Brown Lean CLAY, Little Sand,	14.6	113.9	123	93	90
20	N	400690N	21122205	•		Trace Gravel	15.7	1100	100	0.1	
28	IN	40000914,	2112330E	2	0	Brown Lean CLAY, Little Sand, Trace Gravel	15.7	112.3	123	91	90
29	N	400837N	2112320E	1	12	Brown Lean CLAY, Little Sand,	18.1	112.0	123	91	90
		40003714,	21123200	•	12	Trace Gravel	10.1	112.0	123	31	30
30	N	400741N	2112311E	1	12	Brown Lean CLAY, Little Sand,	15.5	114.5	123	93	90
				·		Trace Gravel	10.0		,20		
31	N	400935N.	2112394E	2	0	Brown Lean CLAY, Little Sand,	15.2	113.2	123	92	90
				_	-	Trace Gravel				-	-
32	N	400833N,	2112317E	2	0	Brown Lean CLAY, Little Sand,	16.5	111.1	123	90	90
						Trace Gravel					
33	N	400633N,	2112411E	1	12	Brown Lean CLAY, Little Sand,	18.2	111.2	123	90	90
						Trace Gravel					
34	Ν	400642N,	2112490E	1	12	Brown Lean CLAY, Little Sand,	13.8	115.7	123	94	90
						Trace Gravel					
35	Ν	400632N,	2112401E	2	0	Brown Lean CLAY, Little Sand,	16.5	113.3	123	92	90
						Trace Gravel					
36	Ν	400643N,	2112500E	2	0	Brown Lean CLAY, Little Sand,	18.3	111.3	123	91	90
		~				Trace Gravel					
37	Ν	400669N,	2112542E	1	12	Brown Lean CLAY, Little Sand,	12.5	117.0	123	95	90
						Trace Gravel					
38	Ν	400669N,	2112542E	2	0	Brown Lean CLAY, Little Sand,	13.9	116.3	123	95	90
						Trace Gravel					

H est O			LIFT TEST	FILL SURFACE	DESCRIPTION OF	MOISTURE	DENSITY D		COMP. C	SPEC
o. D	LOCATION		NO. ELEVATION	ON in.	MATERIAL TESTED	%	lb/cuft	lb/cuft	%	%
25/91 39 N	400471N	2112265E	1	12	Brown Lean CLAY, Little Sand,	15.0	117.7	123	96	9
33 11	40047111,	21122032			Trace Gravel	15.0	117.7	120	· ,3	
10 N	400495N.	2112309E	1	12	Brown Lean CLAY, Little Sand,	15.1	116.0	- 123	94	ç
					Trace Gravel		· . ·	1 8		
41 N	400461N.	2112247E	2	0	Brown Lean CLAY, Little Sand,	13.7	117.2	123	95	9
					Trace Gravel					
12 N	400499N,	2112317E	2	. 0	Brown Lean CLAY, Little Sand,	14.9	116.3	123	95	
				•	Trace Gravel					
13 N	400519N,	2112372E	1	12	Brown Lean CLAY, Little Sand,	16.1	114.6	123	93	٤
V + V			e de la composición dela composición de la composición de la composición de la composición de la composición de la composición de la composición de la composición de la composición dela composición de la composición de la composición de la composición de la composición de la composición de la composición de la composición de la composición de la composición de la compos		Trace Gravel					
44 N	400523N,	2112472E	1.	. 12	Brown Lean CLAY, Little Sand,	13.9	117.6	123	96	9
		, z			Trace Gravel					
45 N	400519N,	2112382E	2	0	Brown Lean CLAY, Little Sand,	16.6	111.3	123	91	
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	•		1 1 1 1	Trace Gravel					
46 N	400522N,	2112452E	2	,0	Brown Lean CLAY, Little Sand,	16.4	111.9	123	91	,
					Trace Gravel			*		
47 N	400532N,	2112592E	1	12	Brown Lean CLAY, Little Sand,	13.7	117.7	123	96	,
					Trace Gravel					
48 N	400532N,	2212592E	2	0	Brown Lean CLAY, Little Sand,	14.2	116.9	123	95	
	* * *			•	Trace Gravel			<u> </u>		
/26/91				1.						
49 N	400541N,	2112692E	1	12	Brown Lean CLAY, Little Sand,	13.9	112.3	123	90	,
					Trace Gravel					
50 N	400541N,	2112692E	2	0	Brown Lean CLAY, Little Sand,	14.8	110.9	123	90	
	• .				Trace Gravel					
51 N	400618N,	2112580E	1	12	Brown Lean CLAY, Little Sand,	15.1	114.9	123	94	
					Trace Gravel					•
52 N	400577N,	2112672E	1	12	Brown Lean CLAY, Little Sand,	13.3	117.5	123	96	
					Trace Gravel					
53 N	400631N,	2112588E	2	0	Brown Lean CLAY, Little Sand,	15.2	118.1	123	96	. !
			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	, , , , ,	Trace Gravel			•		
54 N	400572N,	2112681E	2	, , , 0	Brown Lean CLAY, Little Sand,	14.7	118.6	123	97	
					Trace Gravel					
55 N	400520N,	2112726E	1	12	Brown Lean CLAY, Little Sand,	14.5	111.7	123	91	
				•	Trace Gravel					
56 N	400525N	2112726E	2	0	Brown Lean CLAY, Little Sand,	15.4	111.9	123	91	
	· · · · · · · · · · · · · · · · · · ·				Trace Gravel					
/12/91	ta. Anno 1980		1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -							
poils Pi										
57 N		, 2112111E	1		Brown Lean CLAY, Little Sand	11.2	112.7	. 118	96	•
58 N		, 2112139E	2	0	Brown Lean CLAY, Little Sand	16.3	110.8	118	94	
59 N		, 2112145E	1		Brown Lean CLAY, Little Sand	12.4	113.6	118	96	
60 N	400365N	, 2112117E	. 2	. 0	Brown Lean CLAY, Little Sand	16.1	110.9	118	94	

М									
E			DISTANCE	•					
Т			BELOW						
Н			FILL			DRY	MAXIMUM	MEAS.	SPEC.
Test O	LIFT	TEST	SURFACE	DESCRIPTION OF	MOISTURE	DENSITY	DENSITY	COMP.	COMP.
No. D LOCATION	NO. E	LEVATION	in,	MATERIAL TESTED	%	lb/cuft	lb/cuft	%	%

Remarks:

Test 1 through 56 were performed in compacted clay material used to backfill header pipe trenches in the landfill cover. Tests 57 through 60 were performed in compacted clay cover material placed over the refuse spoils disposal area. "Distance below fill surface" refers to the depth of the test below the surface of the compacted clay. The results indicate the specified compaction of 90% or greater was obtained. This report confirms results given to Terra at the job site on the given test dates.

Signed:

Jan C. Kucher, P.E.

Engineering Associates, Inc.

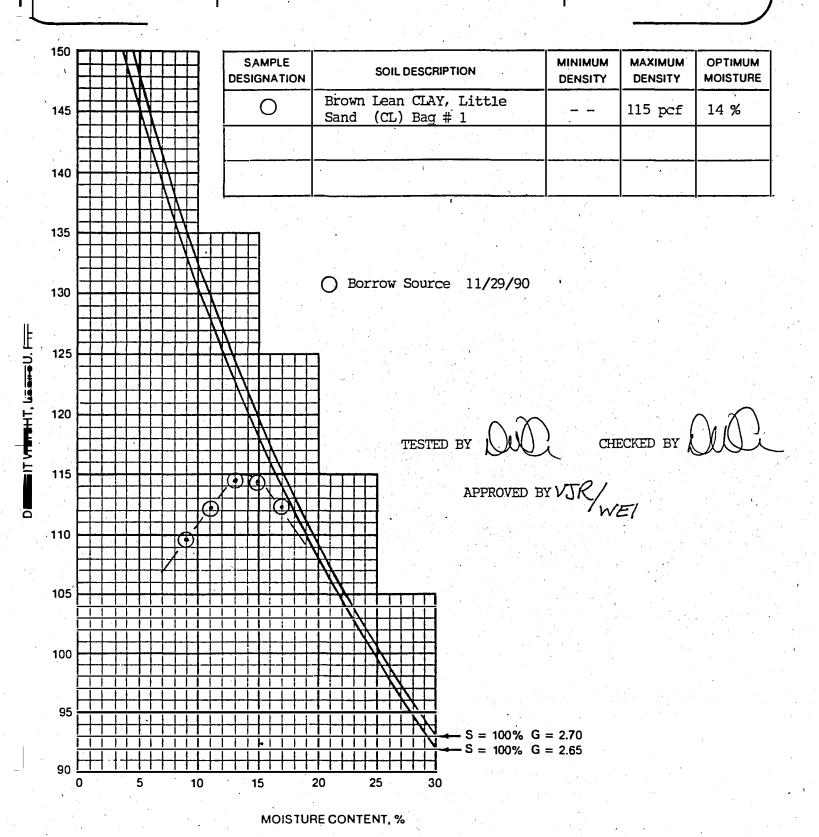
MOISTURE-DENSITY CURVE

PROJECT: REFUSE HIDEAWAY LANDFILL

LOCATION:

Hwy. 14, Middleton Wi

WEI # 15292.01 FDT.Report No., Job No. 15251.72 Date ___12/12/90 Sheet __



TEST METHOD:

MODIFIED PROCTOR

☐ STANDARD PROCTOR



Engineering Associates, Inc.

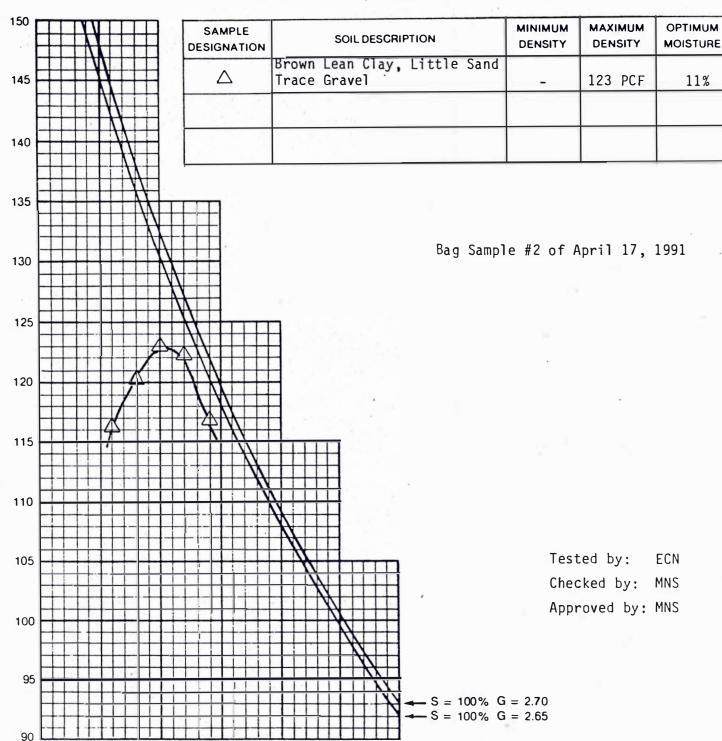
MOISTURE - DENSITY CURVE

PROJECT: Refuse Hideaway Landfill

WEI #15292.01

LOCATION: Middleton, Wisconsin

EWI Engineering Associates . 1409 Emil Street . Madison, WI 53713 . Tel. 608/257-6377 . FAX 608/257-3479



MOISTURE CONTENT, %

25

30

20

TEST METHOD:

DRY UNIT WEIGHT, LBS./CU. FT.

MODIFIED PROCTOR

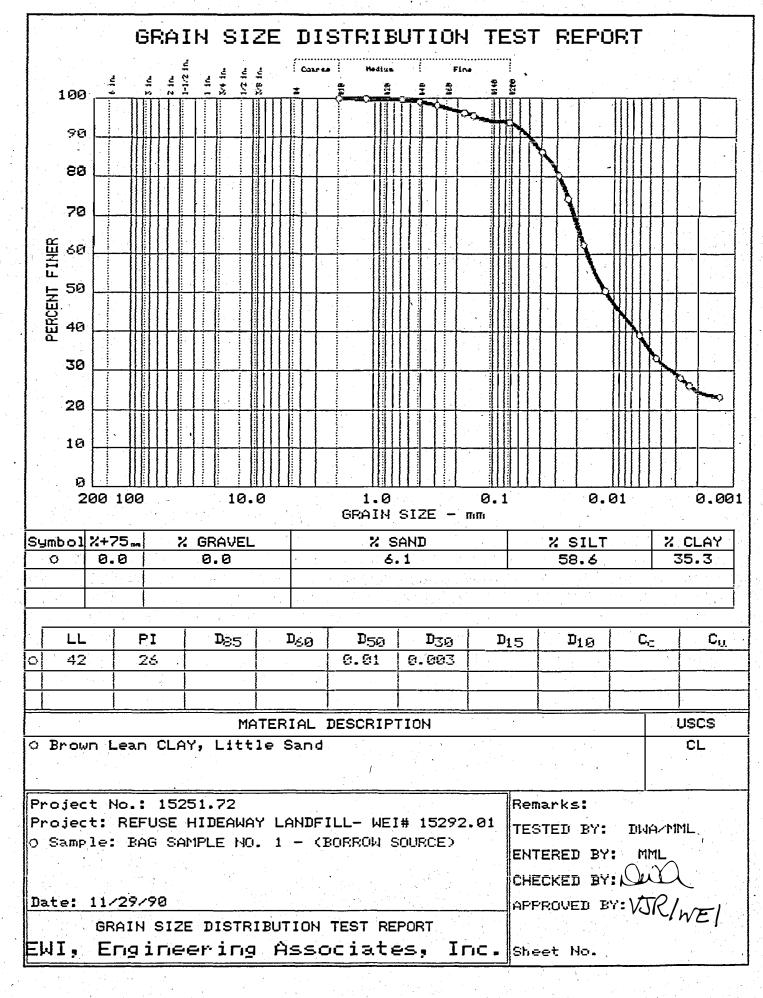
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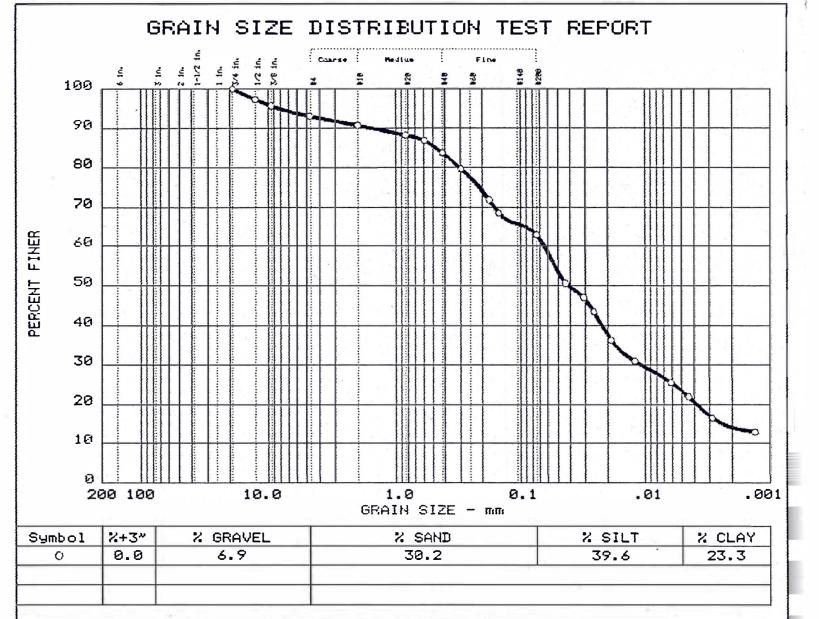
10

☐ STANDARD PROCTOR

Appendix E

Clay Cover Grain Size Analysis and Atterberg Limits





	LL	PI	D ₈₅	Deg	D ₅₀	Dzg	D ₁₅	D ₁₈	C,c	Cı
0	35	16	0.47		0.04	0.011	0.0024			
								. 4		

MATERIAL DESCRIPTION				
O Brown Lean CLAY, Some Sand, Little Gravel	CL			

Project No.: 15292.01 Project: REFUSE HIDEAWAY

o Sample: FDT#26, Lift #1, 400,656N/2,112,342E

Date: 5/13/91

GRAIN SIZE DISTRIBUTION TEST REPORT WARZYN ENGINEERING INC.

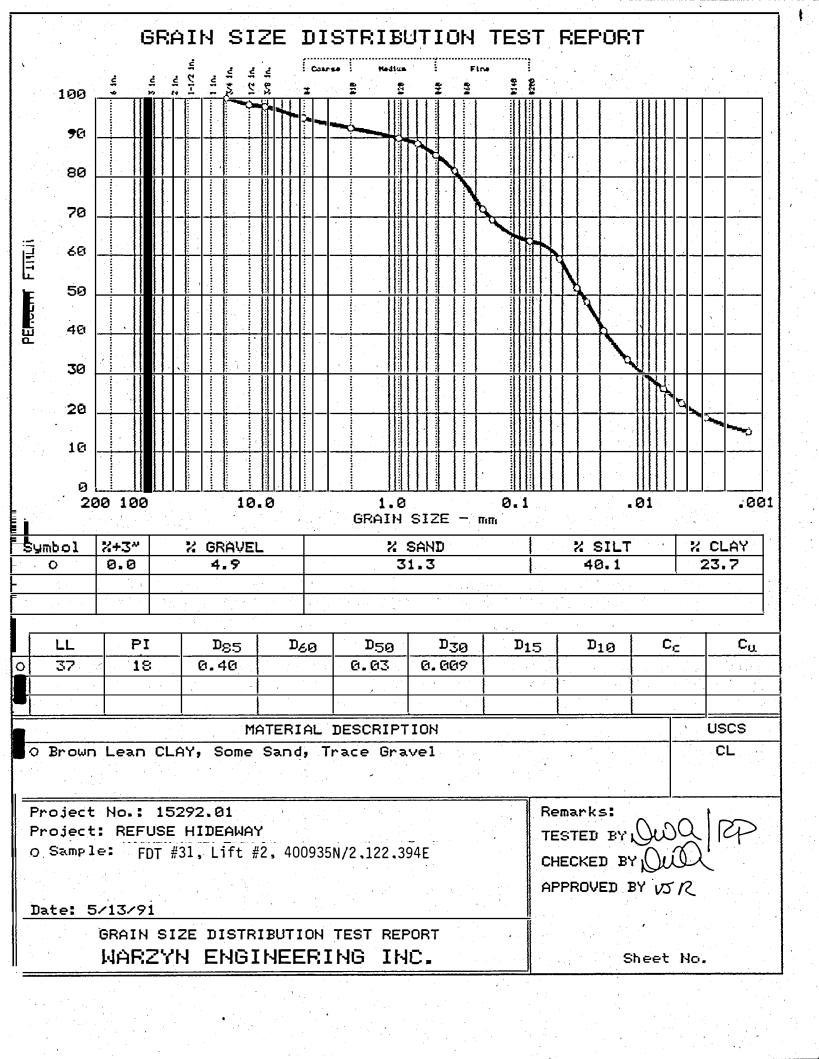
Remarks:

TESTED BY OUT

CHECKED BY

APPROVED BY VSR

Sheet No.



Appendix F

Clay Cover Permeability Test Results

Job No. 15292 Date: 05/14/91

FALLING HEAD PERMEABILITY TEST

Warzyn Inc., 1 Science Court, Madison, WI 53711 Phone: (608) 231-6755 or 231-4747

PROJECT LACATION SMPLE (a)

REFUSE HIDEAWAY MIDDLETON, WISCONSIN

FDT 26, LIFT 1 @ 400656N/2112342E

S IL DESCRIPTION

Brown Lean CLAY, Some Sand, Little Gravel (CL)

MFLE DIAMETER (cm) SAMPLE AREA, A(cm²)

7.4 42.6

UMPLE LENGTH, L(cm) MOISTURE CONTENT,%. I Y DENSITY (1b/cu ft)

FINAL INITIAL 20.8 20.8 18.7 17.8 104.3 104.3

COEFFICIENT OF

RUN PERMEABILITY, k(cm/sec)

3.7E-08 1 2 1.8E-08 \mathcal{Z} 1.4E-08 4 1.1E-08 1.2E-08 6 9.0E-09 7 8.1E-09 8 7.2E-09 7.2E-09

AVERAGE COEFFICIENT OF PERMEABILITY = 7.5E-09 cm/sec (Based on run numbers 7 through 19)

2.3aŁ

RMULA: k = ---- log.o -- , Where a = cross-sectional area of standpipe,

h, t = time for water level to fall from initial height, ho, to final height, h, (All other terms are defined above)

DOTNOTES: (a) This permeability test was performed on a relatively undisturbed 3-inch diameter Shelby tube sample.

HECKED BY: DATE: 5/15/91

APPROVED BY: VJR DATE: 11/17/91

Job No. 15292 Date: 05/14/91

FALLING HEAD PERMEABILITY TEST

Warryn Inc., 1 Science Court, Madison, WI 53711 Phone: (608) 231-6955 or 231-4747

PROJECT LOCATION

REFUSE HIDEAWAY MIDDLETON, WISCONSIN

SAMPLE (a)

FDT 31, LIFT 2 400935N/2122394E

SOIL DESCRIPTION

Brown Lean CLAY, Some Sand, Trace Gravel

SAMPLE DIAMETER (cm) SAMPLE AREA, A(cm2)

7.4 42.6

SAMPLE LENGTH, L(cm)

INITIAL 19.5 19.5 18.3 18.8

MOISTURE CONTENT,% DRY DENSITY (15/cu ft)

108.2 108.2

COEFFICIENT OF

FERMEABILITY.k(cm/sec) RUN

4.8E-08

3.4E-08

E 3.0E-08

4 2.1E-08

Ξ, 2.1E-08

2.25-08

7 2.0E-08

 Ξ 1.9E-08

1.9E-08

AVERAGE COEFFICIENT OF FERMEABILITY = 2.0E-08 cm/sec (Based on run numbers 7 through 9)

2.3aL tio

FORMULA: k = ---- logio -- , Where a = cross-sectional area of standpipe,

h, t = time for water level to fall from initial height, ho, to final height, h, (All other terms are defined above)

FOOTNOTES: (a) This permeability test was performed on a relatively undisturbed 3-inch diameter Shelby tube sample.

DATE: 5/15/91 APPROVED BY: VSR DATE: 11/12/9/

Appendix G
System Integrity Test Data

JOB NO:338
TESTERS NAME: Mike Elmote

TERRA ENGINEERING & CONSTRUCTION CORP.

Pipe Line Test Forms	
Location: (Bidg. to Bidg., Struct. to Struct., M.H. to Entire Gas and leachate extro	
tested from 6" outside blower &	Ma.
Description: (Material and Line Usage, Ex: PVC-Sanita	ary, DI-Water, Etc.)
	7,113
Type of Test: Hydrostatic, Infiltration, Exfilt	ration, Other)
Test Pressure Per Spec. (PSI) Gal/Day, Etc Test Results: (FIII In Applicable Section) AIR HYDROSTATIC INFILT	RATION/EXFILTRATION
Start Press. 3 GAL/DAY	GAL/HR
End Press3	
Time Amin.	
Comments: Pass / Fall (Circle One)	
	<u>s ignatures</u>
Tester (Contractor Rep.): Mike Elmore	Wil Elm
Engineer/Owner (Rep.): DEAN R. FREE	Dean R. Free
Date Test Performed: MAV 6.1991	

LINKLATER CORPORATION **CUSTOM COMBUSTION ENGINEERING**

July 24, 1991

Warzyn Engineering, Inc. P.O. Box 5385 Madison, WI 53705

ATTENTION: JAN KUCHER

RE: REFUSE HIDEAWAY LANDFILL TOWN OF MIDDLETON, WI PROJECT NO. 91 SW 435

Dear Mr. Kucher,

This letter is to certify that the ground flare supplied by Linklater Corporation/Custom Combustion Engineering, Model No. GF-3000-SP, Serial No. GF-1003, has been installed by Terra Engineering & Construction Corporation.

The electrical and mechanical installation is complete as required. All functions have been tested, and the flare is fully operational as required.

Date 7-24-9/ Certified by:

John W. Gwinn

Manager, Technical Service Linklater Corporation/

Custom Combustion Engineering

JWG/md

cc: Terra Engineering (John Karsten)

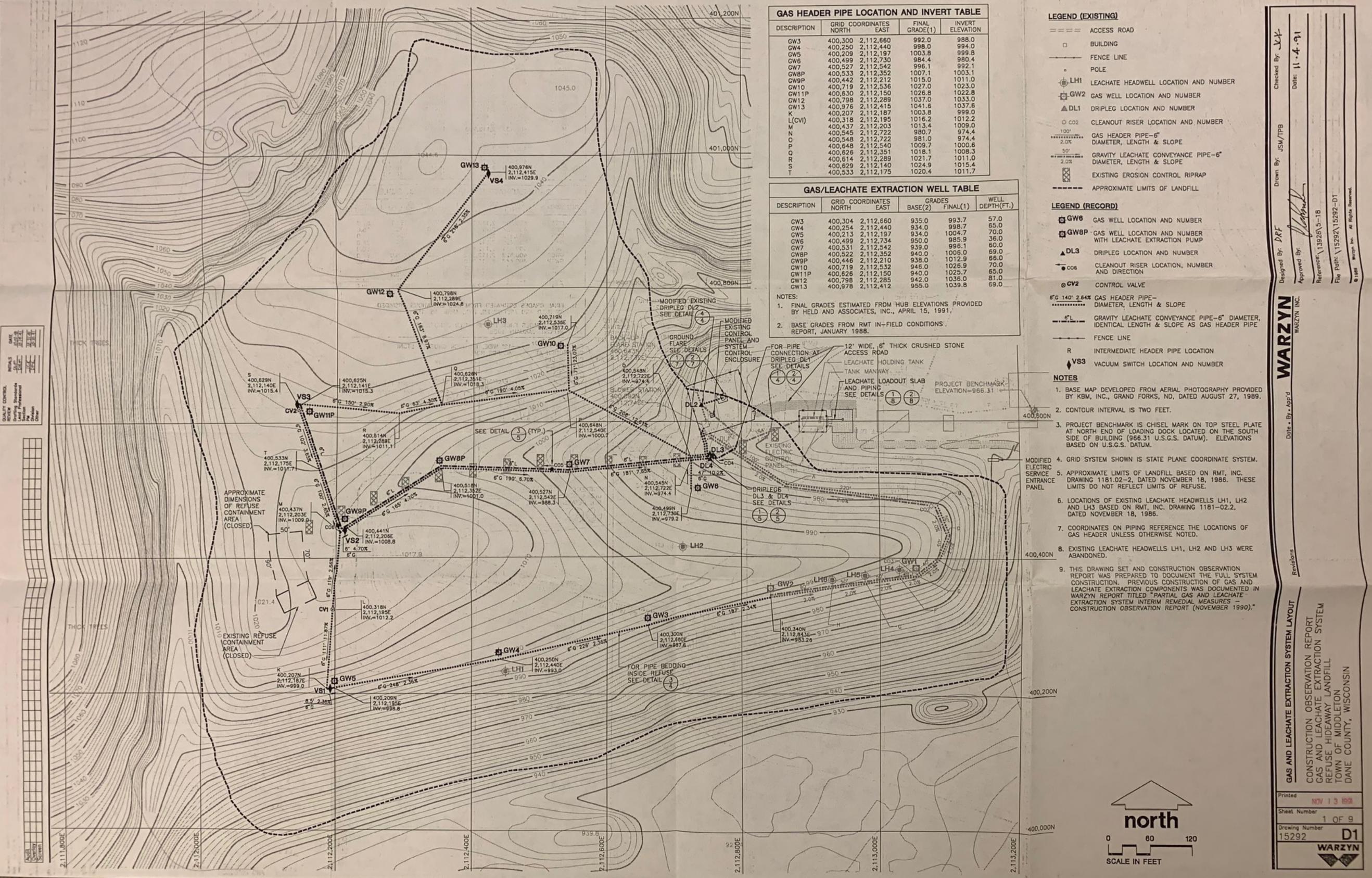


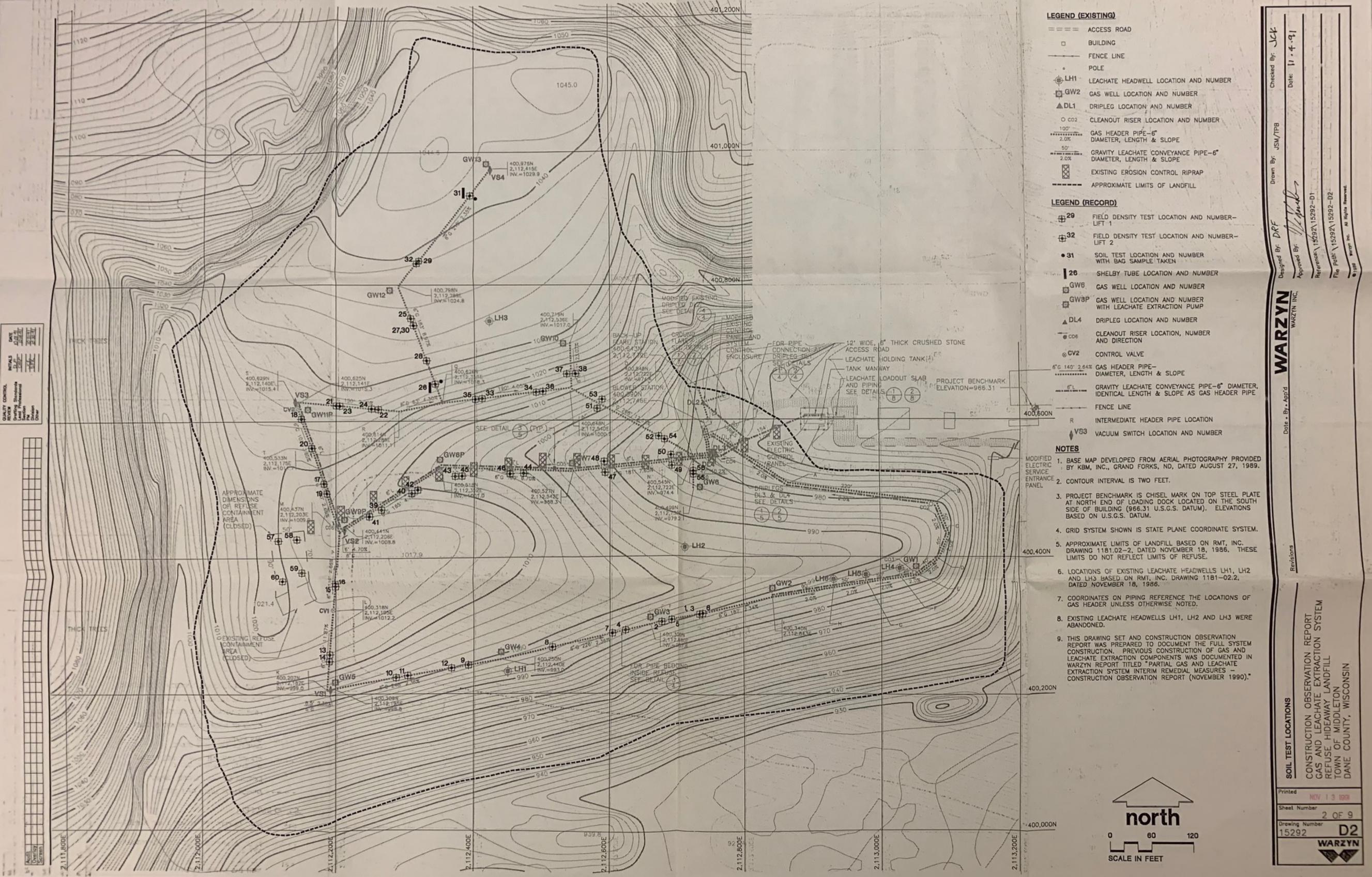
Appendix H

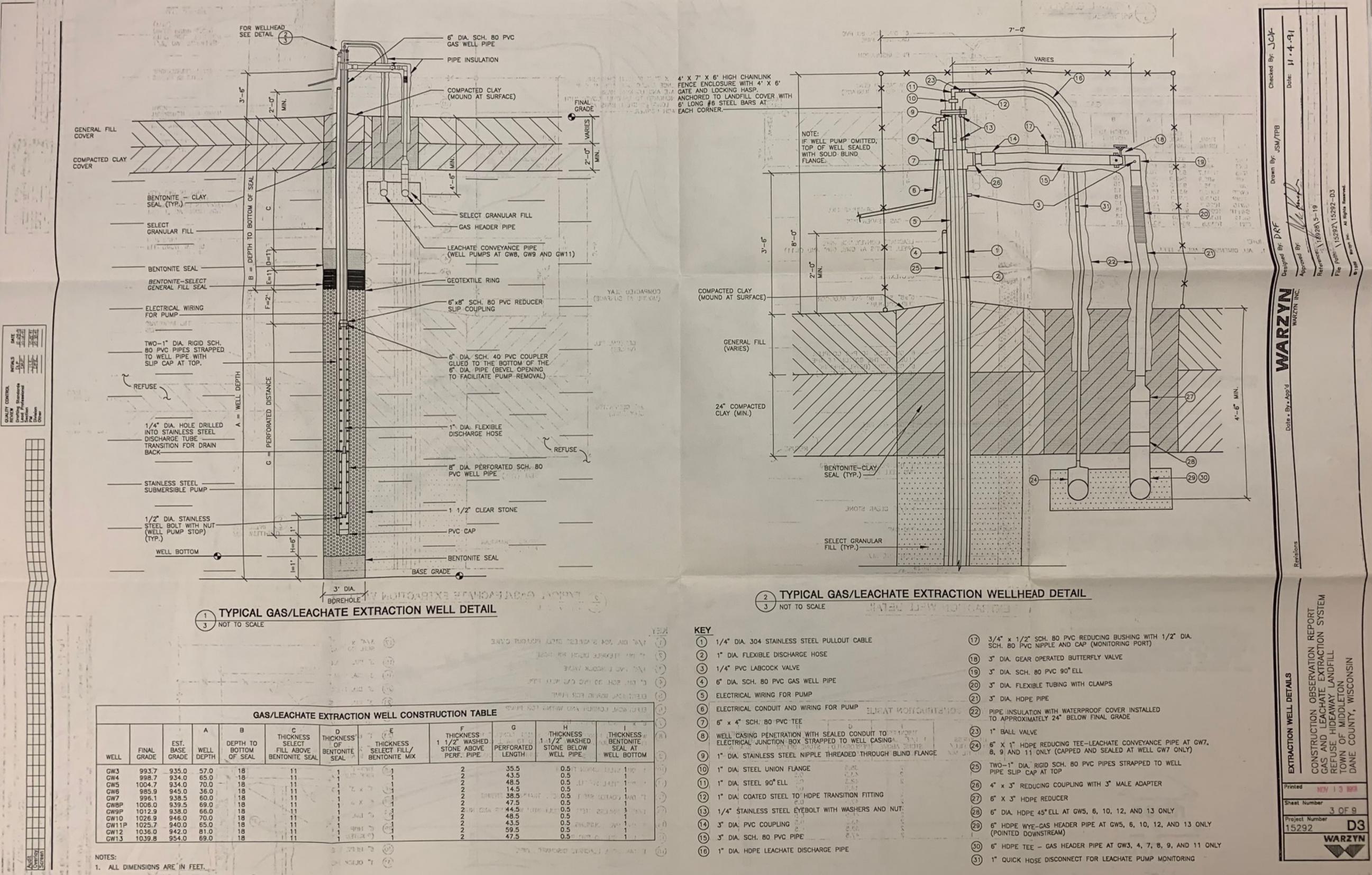
Drawings

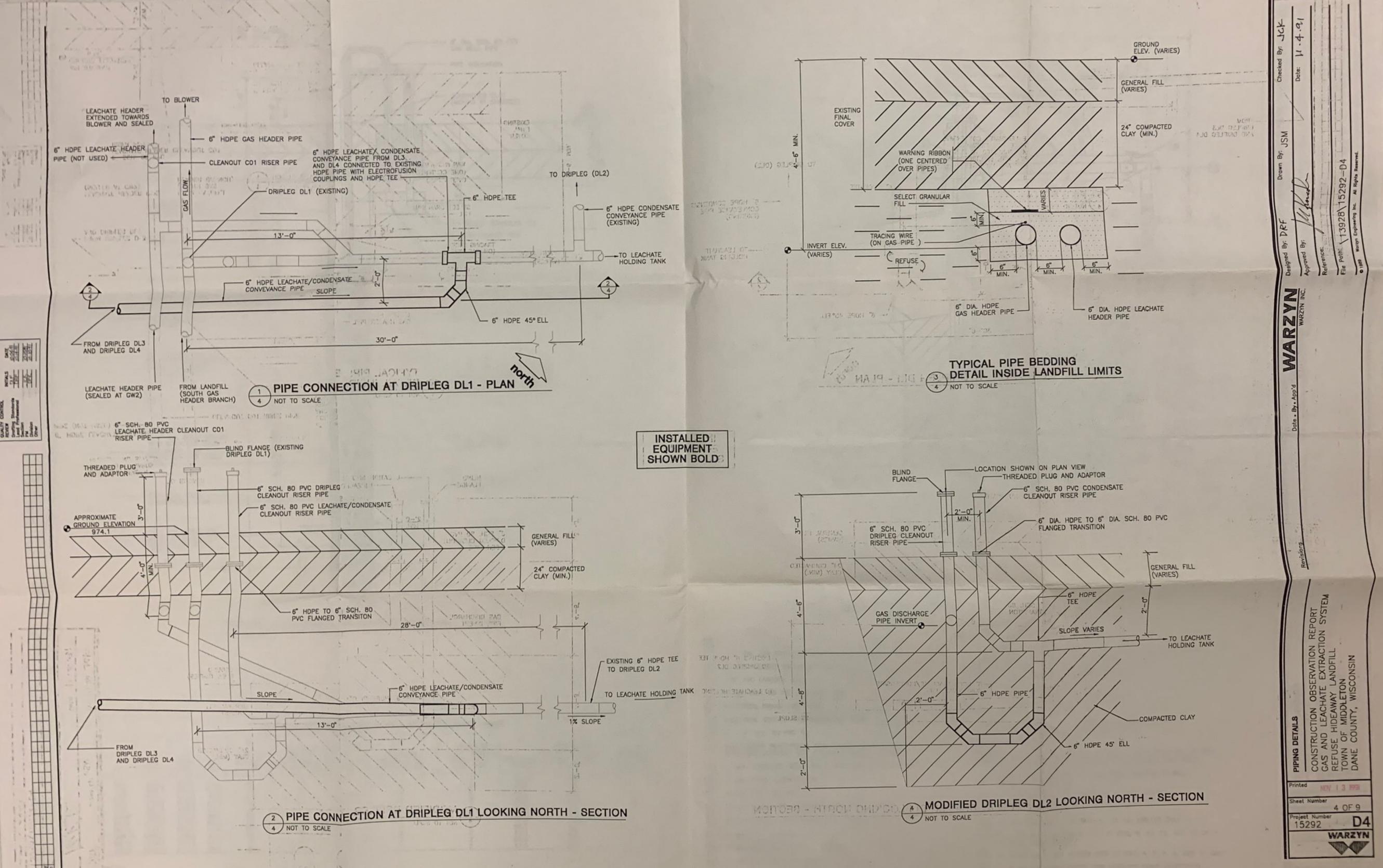
- D1 Gas and Leachate Extraction System Layout D2 Soil Test Locations

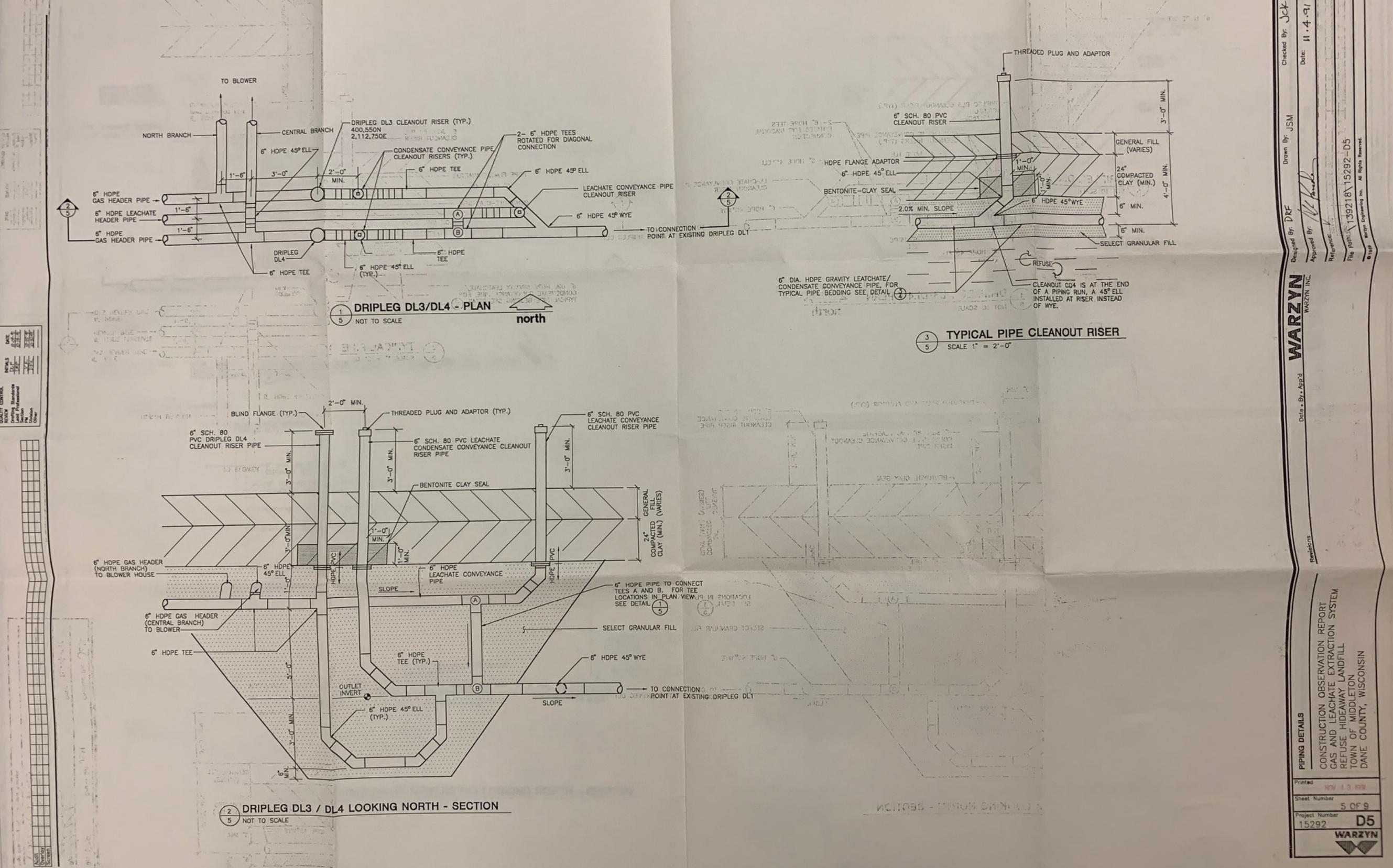
- D3 Extraction Well Details
 D4 Piping Details
 D5 Piping Details
 D6 Blower Station Details
- **D7 Flare Station Details**
- D8 Leachate Loadout Facility and Entrance Gate Details
 D9 Electrical System Layout

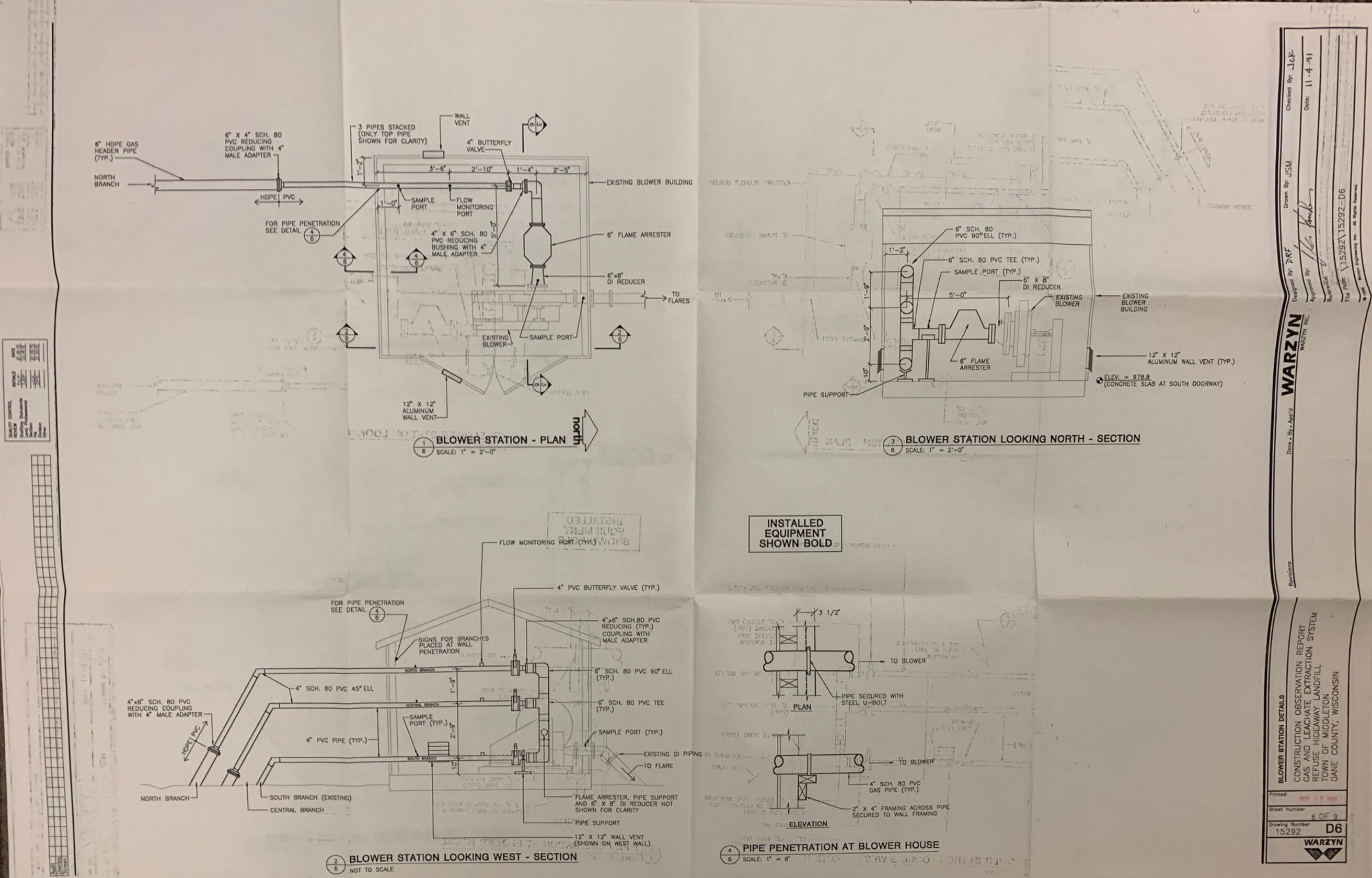


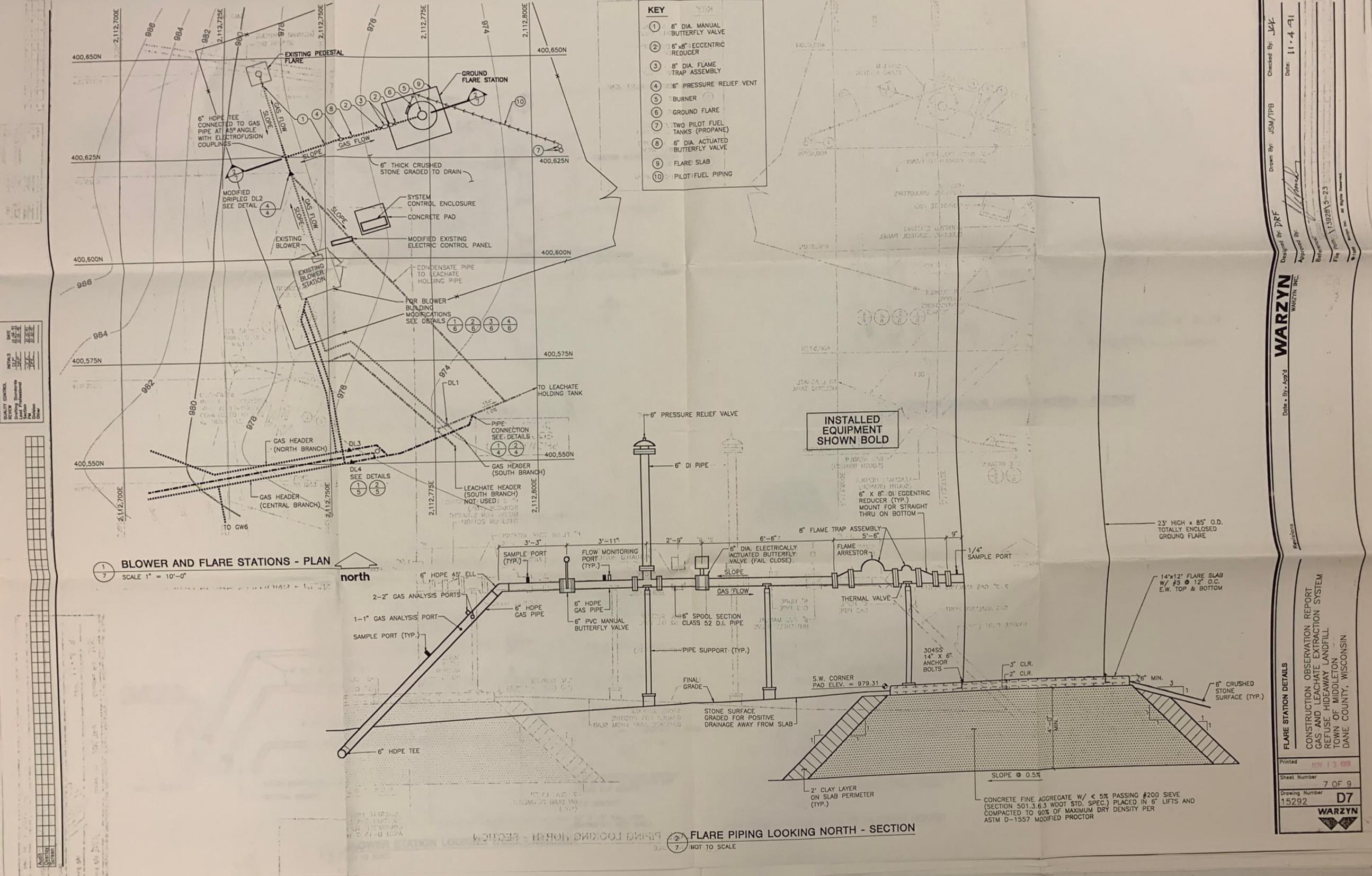


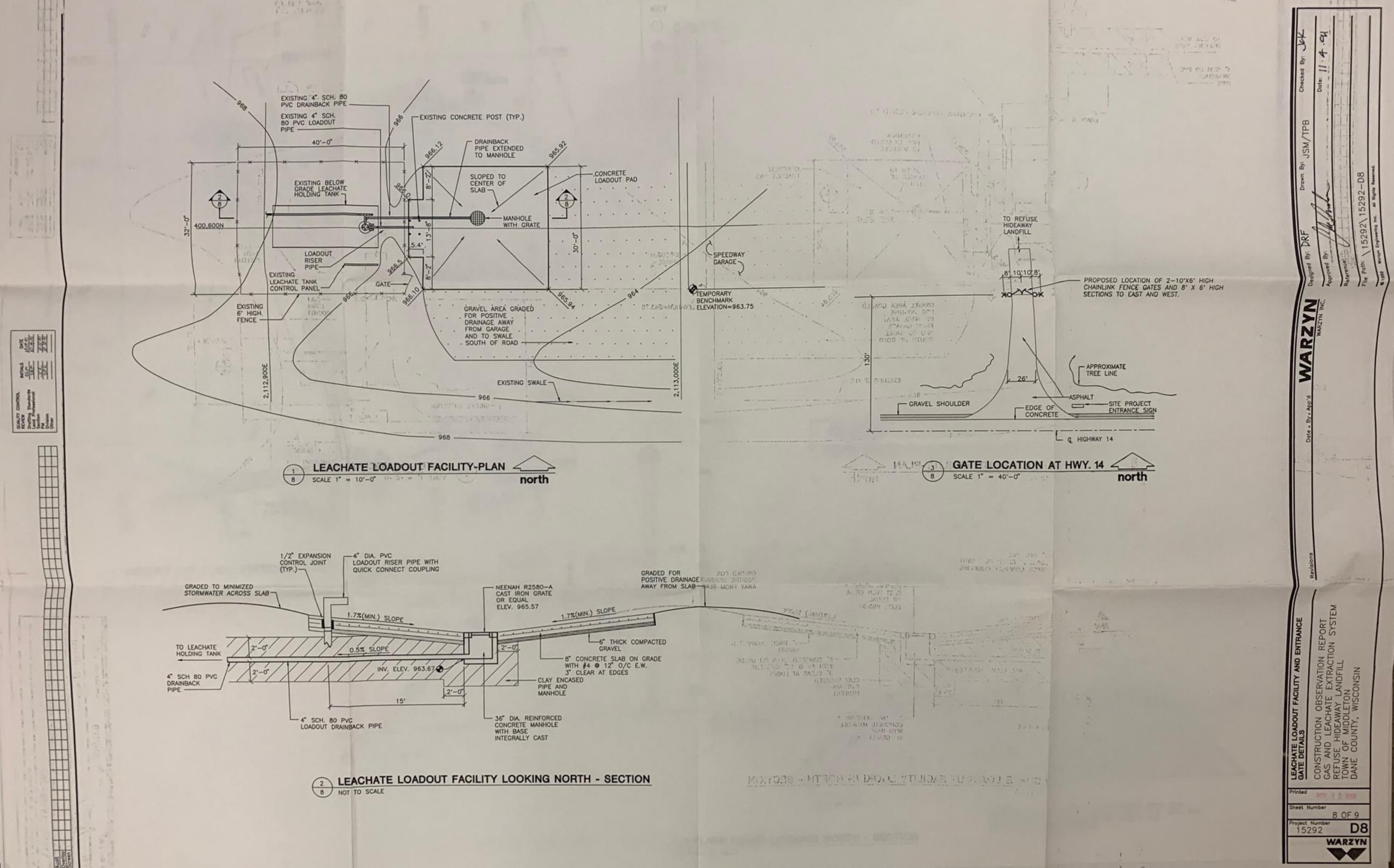


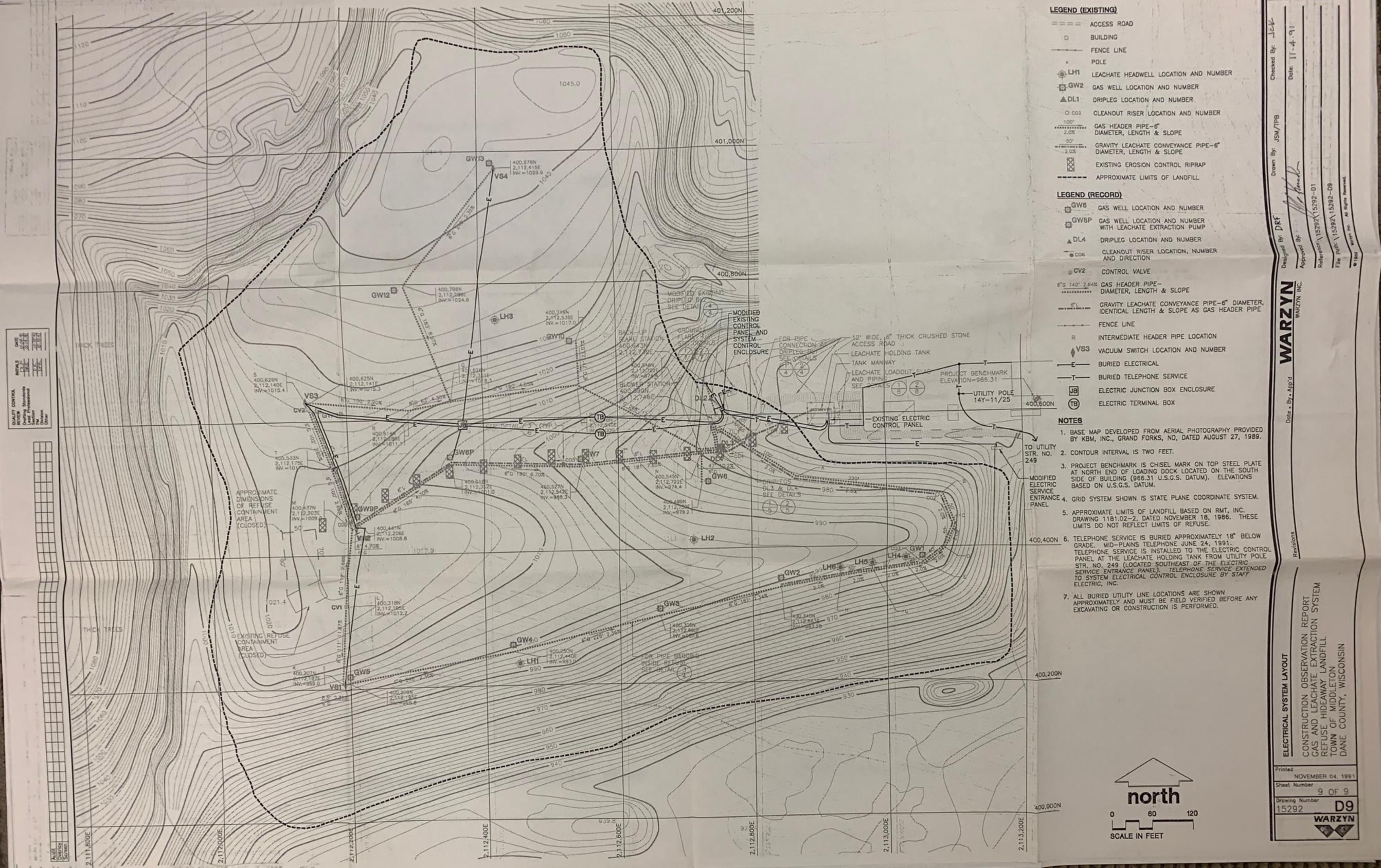








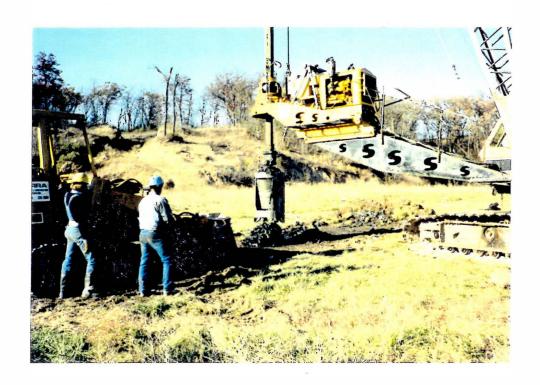




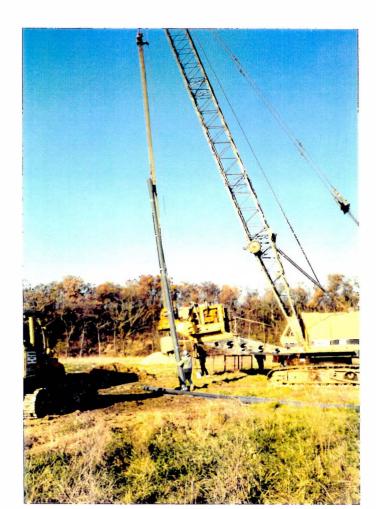
Appendix I

Photographs

Appendix I
Photographs



Photograph No. 1: Excavating refuse from borehole GW13 with bucket auger. (Looking north).



Photograph No. 2:

Installing wellpipe into borehole GW13. (Looking north)

[mad-602-43g]



Photograph No. 3: Placing 1 ft bentonite seal at bottom of borehole.

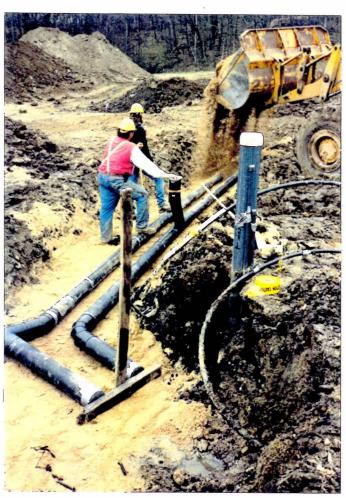


Photograph No. 4: Hydrating well seals with water.



Photograph No. 5:

Fusing gas header pipe and installing wellhead at well GW5. (Looking west)



Photograph No. 6: Bedding gas header and leachate header pipe in sand at well GW9. (Looking northwest)



Photograph No. 7: Installing driplegs DL3 and DL4.



Photograph No. 8: Backfilling driplegs DL3 and DL4. (Looking east)



Photograph No. 9: Wellhead installed at well GW4. (Looking west)



Photograph No. 10: Installing ground flare on slab. (Looking east) [mad-602-43g]